PUBLIC ENVIRONMENTAL REVIEW

FOR

PROPOSED RURAL RESIDENTIAL SUBDIVISION

OF

LOT 2, DIAGRAM 64767
CERTIFICATE OF TITLE
VOLUME 1648, FOLIO 199
ELLENBROOK ROAD
BULLSBROOK WA 6084

ASSESSMENT - 1418

OWNER

MR H J HAWKE
61 ELLENBROOK ROAD
BULLSBROOK WA 6084

PREPARED
BY
FERGUSON, KENNEISON AND ASSOCIATES
113 BRAZIER ROAD
YANCHEP WA 6035

DATE: 8 JULY 2005

INVITATION

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal.

Mr Howard Hawke proposes a rural/ residential subdivision of Lot 2 Ellenbrook Road Bullsbrook. The proposal is to subdivide the 17 ha lot into eight lots of approximately 2 hectares for rural residential purposes. In accordance with the *Environmental Protection Act 1986*, a PER has been prepared which describes this proposal and its likely effects on the environment. The PER is available for a public review period of 4 weeks from 7 November 2005, closing on 5 December 2005.

Comments from government agencies and from the public will assist the EPA to prepare an assessment report in which it will make recommendations to government. If you are able to, the EPA would welcome electronic submissions in particular, emailed to the project assessment officer or via the EPA's Website (see address below).

Where to get copies of this document

Printed copies of this document may be obtained from Mr J Ferguson at Ferguson, Kenneison and Associates, 113 Brazier Road Yanchep, at a cost of $10. Mr Ferguson can also be contacted at 9561 6842.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received by the EPA will be acknowledged. Submissions will be treated as public documents unless provided and received in confidence subject to the requirements of the Freedom of Information Act, and may be quoted in full or in part in each report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining with a group or other groups interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the PER or the specific proposals. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal environmentally more acceptable.

When making comments on specific proposals in the PER:

- clearly state your point of view;
- indicate the source of your information or argument if this is applicable;
- suggest recommendations, safeguards or alternatives.

Points to keep in mind.

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- attempt to list points so that issues raised are clear. A summary of your submission is helpful;
- refer each point to the appropriate section, chapter or recommendation in the PER;
- if you discuss different sections of the PER, keep them distinct and separate, so there is no confusion as to which section you are considering;
- attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- your name,
- address,
- date; and
- whether you want your submission to be confidential.

The closing date for submissions is: **5 December 2005**

The EPA prefers submissions to be sent in electronically. You can either e-mail the submission to the project officer at the following address:

emma.glencross@environment.wa.gov.au

OR

use the submission form on the EPA's website:

www.epa.gov.au/submissions.asp and click on the EIA Assessment Submission option

OR

if you do not have access to e-mail then please post your submission to:

The Chairman
Environmental Protection Authority
PO Box K822
PERTH WA 6842

Attention: Emma Glencross

CONTENTS

REFERENCES

Burbidge, A, A and Kuchling, B, 2004, Western Swamp Tortoise Recovery Plan, 3rd Edition, January 2003 – December 2007. Wildlife Management Program No. 37. Department of Conservation and Land Management, Western Australian Threatened Species and Communities Unit, PO Box 51, Wanneroo, WA 6946.

EPA, 2001. Revised Draft Environmental Protection (Western Swamp Tortoise Habitat) Policy 2001. Report to the Minister for the Environment and Heritage. As required under section 28 of the Environmental Protection Act, 1986. Environmental Protection Authority, Perth, Western Australia, September 2001.

APPENDICES

1 **Land Capability and Environmental Management: Ellenbrook Road Structure Plan, Bullsbrook, 28 March 1998. Attached Plans 12 July, 2002.**
2 **Correspondence EPA to H Hawke on Proposal Unlikely to be Environmentally Acceptable. Date: 21 January 2002.**
3 **Appeals Report to the Minister for the Environment Against the Level of Assessment of Proposal Unlikely to be Environmentally Acceptable. Date: 29 April 2002.**
4 **Western Swamp Tortoise. Ellen Brook – Western Swamp Tortoise Reserves. Land Management on a Local Area Basis by Gerry Parlevliet, Senior Development Officer, Department of Agriculture, 3 Baron-Hay Court, South Perth, WA, 6151.**
5 **Correspondence from the Department of Conservation and Land Management: Response to Questions. Dates: 2 April 2003 and 1 July 2003.**
6 **Correspondence: Department of Conservation and Land Management to the Western Australian Planning Commission. Date: 13 November 2001.**
7 **Aboriginal Sites Inquiry. Information from the Register System. Date: 5 September 2003.**

FIGURES

SUMMARY

The owner of Lot 2, Mr Howard Hawke of Ellenbrook Road, Bullsbrook, located in the City of Swan, lodged an application in 2001 with the Western Australian Planning Commission (WAPC) to subdivide the 17.0594 ha into eight lots of above 2.0ha for Rural Residential purposes. The application was then referred to the Environmental Protection Authority (EPA) by the WAPC.

The EPA, 21/01/2002, informed Mr Hawke that the proposal was incapable of meeting the EPA's environmental objectives and a level of assessment imposed of Proposal Unlikely to be Environmentally Acceptable (PUEA). Mr Hawke appealed the EPA decision to the Minister for the Environment, prior to the 04/02/2002. After an assessment by the Appeals Convenor, the appeal was upheld by the Minister, with the EPA then requiring an Environmental Review to be submitted by Mr Hawke. The Appeals Convenor also noted his concerns regarding the procedure utilised by the EPA and Agencies to determine minimum lot size with a requirement to justify that decision.

The following four environmental issues are addressed in this Environmental Review. The first is **Specially Protected (Threatened) Fauna**, the objective being to protect the remaining populations of the Western Swamp Tortoise. The issues of fire, predation, changes in water quality and quantity, can be and are satisfactorily addressed in this review document. Predation by domestic pets is also addressed requiring confining of cats at night to an enclosed area/s connected to the house, with dogs confined to the owner's property unless on a lead and being exercised. The proposed activities for this subdivision will not adversely impact on the Western Swamp Tortoise or other beneficial activities in the Policy Area.

The second and third environmental issues, **Regionally significant wetlands and watercourse** and **Surface and groundwater quality** require similar management strategies to not only maintain, but improve both wetlands, watercourse and surface and ground water quality. As outlined in section four, the commitment is through revegetation, to bring the vegetated area of Lot 2 to one third of its total area over the eight lots, including 40 metres of vegetation adjacent to Ellen Brook, there should be a positive impact on water quality over a short period of time, which then should be maintained. This will be assisted by using the natural mineral Zeolite (of the calcium-rich Clinoptilolite species), which enables soils to retain elements and inhibits their leaching into waterways and groundwater.

The final environmental issue, **Soil and groundwater contamination** will be addressed by testing for contamination of the soil to determine what quantity must be removed. This will be transported to an off-site suitable repository. The two drainage and settlement ponds to retain possible contaminants resulting from the previous use of part of the site for a piggery, will be filled and leveled once any contaminated soil is removed. The site then being revegetated.

*The EPA concluded that while this proposal in itself would not necessarily contribute to the degradation of the environment in the area, it would set an undesirable precedent for subdivision of other rural lots in proximity to the Twin Swamps and Ellen Brook Nature Reserves (*Appendix 2, p5). The above statement is significant, firstly as the subdivision will not contribute to degradation and secondly EPA must consider this Environmental review on the merits of the case, with, we argue, the setting of a precedent not being a factor. Evident from the actions of the EPA and the Agencies in regard to this Policy Area, is that subdivision of land in the proposed manner can occur, with a resulting positive impact on the Western Swamp Tortoise habitat and adjacent land.

Environmental Commitments for the implementation of this proposal will make certain that the environmental issues raised by the EPA are offset. The aim of Mr Hawke is to present this subdivision that will serve as an example to the community, the concerned Agencies and the EPA, and that his proposal recognises sustainable and environmentally acceptable use of the land.

Implementation of this proposal will assist the Recovery Plan for the Western Swamp Tortoise (*Pseudemydura umbrina*). This will be through the correct use of fertilizer, for both garden and agricultural activities, and on site nutrient retention through the extensive proposed revegatation and judicious use of Zeolite throughout this subdivision.

Also all purchasers of land will be provided with an information package, which includes the Western Swamp Tortoise Recovery Plan 2004, Wildlife Management Program No. 37, the importance of this animal to Western Australia and Internationally and how they can successfully contribute to its survival and removal from the Critically Endangered Species list.

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1.0 INTRODUCTION

The owner and proponent of subdivision on Lot 2, Ellenbrook Road, Bullsbrook, located within the City of Swan and on the northern border of the Swan Valley (Figures 1 and 2), lodged an application with the Western Australian Planning Commission (WAPC) to subdivide this 17.0594 hectare property, at present zoned General Rural to a zoning of Rural Residential. The application to subdivide Lot 2 is now before the State Administrative Tribunal, Appeal No. 55 of 2004. This Environmental Review, with the issues to be addressed being outlined by the Environmental Protection Authority (EPA), is necessary to enable the application to subdivide Lot 2 into eight lots to be progressed before the State Administrative Tribunal.

Prior to lodging of the application to subdivide Lot 2, every effort had been made since 1994 by a group of landowners, including Mr Howard Hawke, to obtain some financial relief from the reduced value of their land through its inclusion within the Policy Area Boundary of the Twin Swamps Nature Reserve, 7897 and Ellen Brook Nature Reserve 7715. These two reserves contain populations of *Pseudemydura umbrina,* commonly known as the "Western Swamp Tortoise" or "Short Necked Tortoise."

The efforts of the Landholders Group have been largely unsuccessful, in all that was permitted was an allowance of subdivision to a minimum of 8.0 hectare lot size, with many restrictions on land use activities that are allowable on the subdivided lots. They made every endeavour to have subdivision to a minimum of 2.0 hectares included in the Scheme, with a restriction on land use within the subdivided land as required by the EPA. The restrictions the landowners were prepared to accept for a subdivision down to 2.0 hectares has now been imposed on the 8.0 hectare lots.

It will be demonstrated in this Environmental Review that little will be achieved by the setting of this minimum 8.0 hectare lot size, but Mr Hawke' proposal, when implemented, will lead to positive environmental impacts, with no negative impacts.

1.1 OBJECTIVES OF THE ENVIRONMENTAL REVIEW

The objectives of this Environmental Review are to:

- examine the proposal in the context of the local and regional environment;
- adequately describe all components of the proposal;
- provide the basis for the acceptable management of possible negative environmental impacts;

Suburban Perth and Tourist Regions

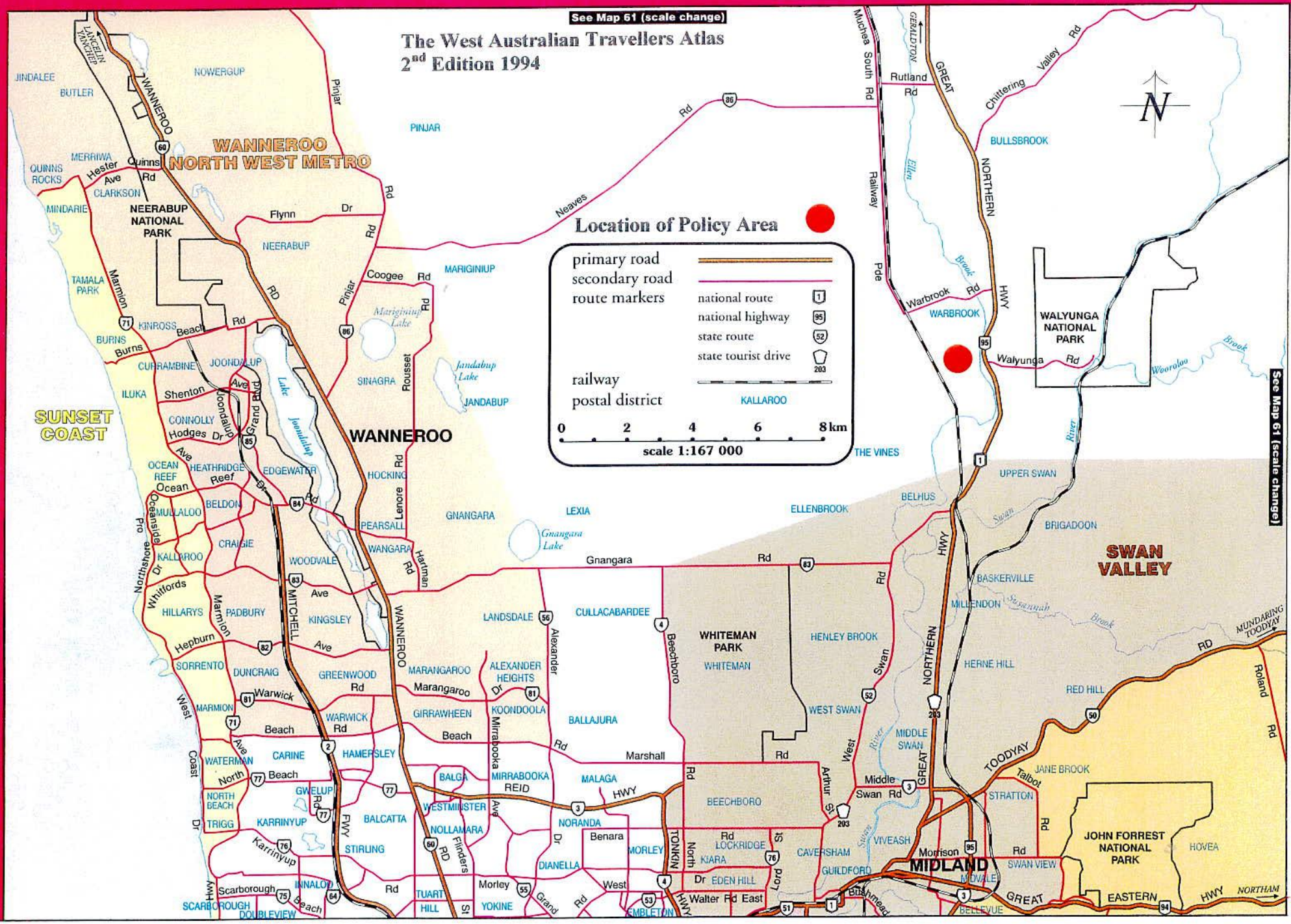
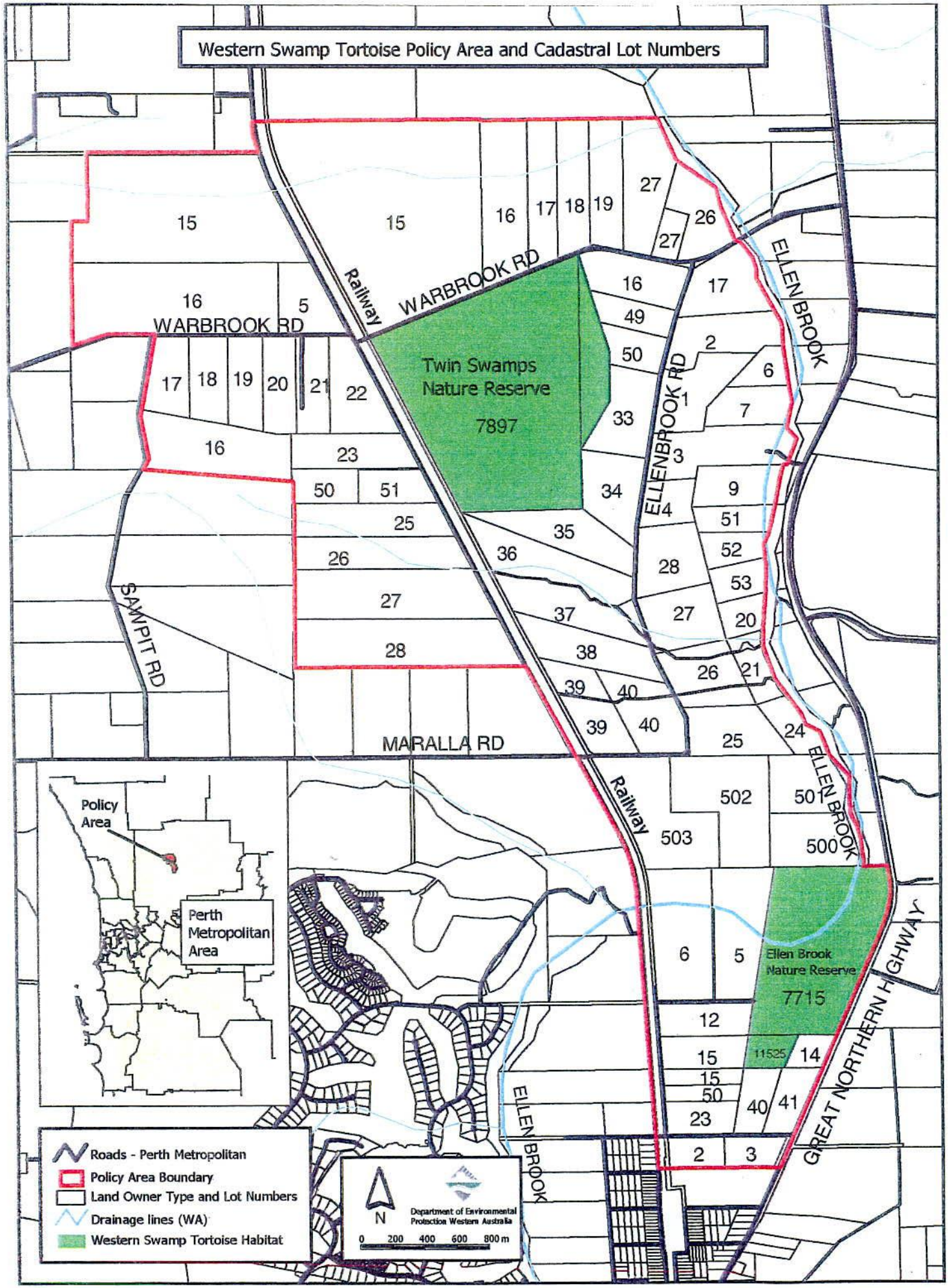


Figure 1. Location of Western Swamp Tortoise Policy Area

Figure 2. Western Swamp Tortoise Policy Area and Cadastral Lot Numbers



- communicate clearly through this environmental review document, enabling those interested in the public, and Government agencies, through the EPA, enabling environmental and other advice to be provided to Government, that conforms with both Statute and Administrative Law; and
- provide this document in a format which clearly outlines the reasons why this proposal should be judged by the EPA to be environmentally acceptable.

1.2 CONTENTS AND STRUCTURE OF THE ENVIRONMENTAL REVIEW

This Environmental Review commences with the Executive Summary, briefly outlining the key elements of the proposal, the environmental impacts and how these impacts will be managed. Also included will be comments on any other factors applicable to this Environmental Review, of which the Minister for the Environment should be aware, when Government through the Minister, make the final decision.

The Introduction, section one, includes sections 1.1, the Objectives of this Environmental Review and 1.2, Contents and Structure of this Environmental Review.

A Summary of Reasons is included in section two, outlining why the EPA's Statement of Reasons for Setting the Level of Assessment at Proposal Unlikely to be Environmentally Acceptable is unsound and inappropriate. These are examined in more detail in section four, Description of Environmental Issues. Section two also includes comments on the Appeals Report, dated 29 April 2002, of the Appeals Convenor, Mr Derek Carew Hopkins, upholding the appeal lodged by Mr Hawke against the Level of Assessment being set at Proposal Unlikely to be Environmentally Acceptable (PUEA).

Following this in section three, a description of the proposal is outlined which includes:

1. location;
2. the description of the background and history for the subject land and surrounding area;
3. the justification and objectives for the proposed development;
4. the proposed subdivision plan;
5. the legal framework, including existing zoning and environmental approvals, decision making authorities and involved agencies; and
6. the consideration of alternative options.

Section four of this Environmental Review includes the examination of each of the following environmental issues. They are:

- specially protected fauna;
- regionally significant wetlands and watercourse;
- surface and groundwater quality; and
- soil and groundwater contamination.

Each Environmental Issue noted above will be examined and include the following:

- the EPA's objective;
- how the proposal relates to or impacts upon the environmental issue; and
- the justification of why and how the proposal meets the EPA objective as opposed to the EPA Statement of Reasons for imposing the PUEA.

Environmental Management for the subdivision is outlined in section five and includes all requirements necessary to ensure the proposal as outlined in this Environmental Review is environmentally acceptable to the EPA. It will demonstrate that the proposal, with its methods of offsetting any environmental impacts, will provide a positive outcome, both for the future of the Western Swamp Tortoise, the City of Swan, those purchasing the approximately two hectare lots proposed for this subdivision and act as an example of sustainable land use to the public.

Section six will include brief comments related to Mr Adrian Molloy and Mr Howard Hawke when acting on behalf of seventeen landholders were affected by restraints imposed on them through various Government Agencies. These included the Department of Planning and Infrastructure (DPI), Western Australian Planning Commission (WAPC), the EPA, Department of Environmental Protection (DEP, now the Department of Environment (DoE) and the Department of Conservation and Land Management (Department of CALM).

The Commitments of Mr Howard Hawke, the proponent, will be outlined in section seven.

References are included in the document. The Appendices vary and include items of correspondence from Government Agencies, including the Department of CALM, EPA and information on Aboriginal Sites. Included is the Land Capability and Environmental Management Ellenbrook Road Structure Plan, dated 28 March, 1998 (LCEM Plan, 1998), compiled by Landform Research of 25 Heather Road, Roleystone, WA, 6111 (Appendix 1).

2.0 SUMMARY OF REASONS AGAINST LEVEL OF ASSESSMENT, PUEA

Mr Hawke was advised on the 21/01/2002, that the EPA had considered his proposal to subdivide Lot 2, Ellenbrook Road, Bullsbrook into eight lots of approximately two hectares each in area and set the level of assessment at Proposal Unlikely to be Environmentally Acceptable (PUEA). This was to be advertised in the West Australian newspaper on 21/01/2002. Mr Hawke successfully appealed the level of assessment, being allowed to undertake an Environmental Review pursuant to section 40(2)b of the *Environmental Protection Act 1986.*

This summary of reasons and the brief response for the present in this section, with a more comprehensive response in section four, outlines why the EPA Statement of reasons for setting the Level of Assessment at PUEA is environmentally unjustifiable and inappropriate.

2.1 EPA REASONS FOR IMPOSITION OF LEVEL OF ASSESSMENT OF PUEA

The EPA outlined seven reasons for setting the level of assessment at PUEA (Appendix 2), which on appeal by Mr Hawke, were upheld by the Minister for the Environment on Recommendations of the Appeals Convenor (Appendix 3). The summarised reasons are itemised below.

1. Proximity to the Twin Swamps Nature Reserve and density of development resulting in detrimental impacts on the viability of the existing wild populations of the Western Swamp Tortoise though the increase in human population from the increased development;
    a) this causing reduced water quality;
    b) increases in the risk of fire;
    c) pressure to burn the reserve;
    d) uses of chemicals for pest control;
    e) weed invasion; and
    f) impacts from domestic animals.

2. The land is zoned General Rural under the City of Swan Town Planning Scheme (TPS) No.9. This zone provides limited control over the subsequent land use of smaller lots proposed in this subdivision.
3. The proposed subdivision is inconsistent with the proposed scheme provisions for the "Special Purpose – Ellenbrook Road" zone.
4. The significance of Ellen Brook as a regionally significant bushland and wetland linkage from the Swan River north to Bullsbrook and through to the forest areas to the north. The subdivision does not propose any mechanisms to protect the Brook.
5. Rural residential subdivision of this density is likely to increase nutrient export from the site through surface and groundwater, contributing to change in the water quality within the habitat area of the Western Swamp Tortoise.
6. The issue of the subdivision contributing to the nutrient loading of the Swan River, the relativity of the *Environmental Protection (Swan and Canning Rivers) Policy 1998* and the fact that the Ellenbrook catchment is currently the highest contributing catchment of nutrients to the Swan River and Canning Rivers. Development within the catchment should be designed to reduce the nutrient loading of the river system, thereby reducing the frequency of toxic algal blooms.
7. The issue of inconsistency with the desired environmental planning objectives for the area is raised, this then setting an undesirable precedent for other landowners to subdivide. Impacts would be magnified, with additional infrastructure requirements being necessary with added environmental impacts and risks.

2.2 BRIEF RESPONSE TO REASONS FOR EPA LEVEL OF ASSESSMENT PUEA

Following are brief responses by the proponent to the seven Reasons for the EPA Level of Assessment set as PUEA, presented in the order outlined in Appendix 2. They are:

1. The proximity of Lot 2 to the Twin Swamps Nature Reserve, being between 340.0 metres and 480.0 metres to the west of Lot 2 on the boundary of Ellenbrook Road with the eastern boundary averaging approximately one kilometre from the Nature Reserve;
    a) that reduced water can be adequately addressed by recognising the problem and incorporating remedies, as outlined in (Appendix 1, Land Capability and Environmental Management Plan, [LCEM Plan, 1998] Section 4.4, pages 20-23, through the use of Amended Waste Water Systems (AWWS). These include either Ecomax or self contained aerobic systems, (Envirocycle, Biocycle), which use irrigation for the dispersal of waste water. In either case all the phosphate is absorbed by amended soil and the nitrates reduced by at least half during normal working conditions. Replanting of vegetation to reduce surface flow and infiltration to groundwater will also assist in retention of water on site and restrict the flow of nutrients to water bodies;
    b) that the risk of fire will be reduced by the extra firebreaks required on the two hectare lots, contrary to what the EPA maintain (LCEM Plan 1998, Section 4.9, p. 27). Examine the regular occurrence of fire in the Ellenbrook Nature Reserve and the misuse of information on fire in this area by the EPA. It is the proponents view that misrepresentation of a Fire Report, which took place, does not enhance the veracity of the EPA and will be placed before the State Administrative Tribunal;
    c) that pressure to burn the Reserve will arise as a reason, is evidence of the EPA being unrealistic. Burning of the Reserve will take place to ensure the safety of residents, whether they are on eight or two hectare lots. This is a matter solely for the City of Swan and the Bush Fires Board. The Department of CALM have

responsibility for the maintenance of low fuel loadings within the Reserve, with it being their responsibility if the Reserves become dangerous through their willingness to tolerate excessive and high fuel loadings;

d) that the use of chemicals for pest control remains a factor, whether the lots are a half, one, two or eight hectares or greater. This is another example of the EPA raising this as a problem, which is irrelevant, as it does not depend on the number of holdings within the area, but the responsibility, knowledge and land use of the individual lots in either their present state, or subdivided into smaller areas;

e) that weed invasion is raised as an issue. With this proposed subdivision of two hectares weed invasion will not present a problem. This perceived problem can be negated by the planting of indigenous vegetation of similar species types to that in the area adjoining Ellen Brook, providing an extra 40.0 metres of vegetation on the eastern boundary of the three lots adjacent to Ellen Brook. Again it is argued that EPA in raising this issue have demonstrated a lack of knowledge in this area, particularly as the Department of CALM are very tolerant of weed invasion.

f) that impact from domestic animals is the final issue raised in No.1 of the Reasons. This will be negated in the proposed subdivision by the placing of restrictions on domestic dogs and cats through conditions of subdivision, similar to those imposed by the Department of CALM for the maintenance of fauna and flora under a Deed of Covenant (Restrictive Covenant) for the Conservation of Land, pursuant to section 129 BA of the Transfer of Land Act 1893. The stocking rate of other farm animals can be controlled through subdivision. Land use and stocking rates are outlined (EMLC Plan, 1998, section 4.4.2, page 23) and should be complied with. Once again the size of the lot is irrelevant, but it must be acknowledged that at least as much, or more control can be exercised under the submitted subdivision plan, as with the eight hectare lots as allowed at present.

2. The previous and present zoning of the land will not provide better control over the subsequent land use. However it is clear that better outcomes will be available through controls implemented through this proposed subdivision with its commitments.
That the inconsistency of the proposed subdivision with the proposed scheme provisions for the "Special Purpose – Ellenbrook Road" zone is raised as a Reason is surprising. The EPA would be aware that the environmental planning objectives, which suited the City of Swan, with flexibility in lot sizes dependant on land capability, should provide better environmental outcomes than what now applies. Furthermore the eight lot subdivision of Mr Hawke, oriented towards environmental outcomes, will provide a more sustainable environmental result than that available by the restrictive approach now implemented by the WAPC, with support from EPA, DoE and the Department of CALM. With the minimum lot size of eight hectares for the Policy Area, the EPA are aware that the Landowners' Group, for which Mr Hawke was a representative, finally had eight hectares set as the minimum lot size for the Policy Area, with more restrictive conditions applicable on granting of subdivision.

3. The significance of Ellen Brook as a regionally significant bushland and wetland linkage has not been recognised and the subdivision does not propose any mechanisms to protect the Brook is raised as a Reason. As stated earlier, 30.0 metres of indigenous vegetation will be planted on the cleared area in the eastern sector of the three proposed lots, adjoining and parallel to Ellen Brook. This action, combined with the inclusion of the recommendations outlined in section 1(a) and the LCEM Plan, sections 4.4 and 4.5, will be included in the commitments provided for this subdivision.

4. Rural residential subdivision of this density is likely to increase nutrient export from the site and will contribute to change in water quality is cited as a Reason. This will not occur with the commitments outlined in Section 5.0, Environmental Management. Rates of fertiliser, planting of vegetation, the use of Zeolite and use of effluent treatment units will all combine to improve and reduce the nutrient export from Lot 2 to Ellen Brook.
5. Contrary to what is referred to by the EPA, this development will improve the quality of water flowing to Ellen Brook, as it is intended to implement the commitments and recommendations outlined in Nos. 4 and 5 above.
6. The issue of inconsistency with the desired planning objectives for the area and the setting of an undesirable precedent for other landowners to subdivide is incorrect. One reason is that Mr Hawke had lodged his application for subdivision with the WAPC prior to any minimum lot size being set as outlined in Town Planning Scheme No.9, Amendment 356. Comments by the EPA are, besides other matters, relevant to lot size. Another is the ability of Lot 2 to sustain lot sizes to two hectares and lower, depending on land capability and implementation of sustainable environmental management principles. The subdivision proposed by Mr Hawke with its commitments and the implementation of the recommendations outlined in the LCEM Plan, 1998, will provide an improved and more sustainable environmental outcome for the Western Swamp Tortoise, the surrounding land and water, than that existing at the present time.

The proponent considers that it is difficult to believe that with the involvement of the EPA, the Department of CALM and the Department of Environment, that the ability has not been exhibited to provide an improved and more sustainable environmental outcome for both the Western Swamp Tortoise and affected landowners within the Policy Area..

In concluding this section, the setting of the Level of PUEA, was in many instances unsound and inappropriate. However information provided to date, and to be provided in sections four and five, will demonstrate that this proposed subdivision will impact positively on both land use and water quality, without any detriment to the Western Swamp Tortoise.

2.3 REPORT OF THE APPEALS CONVENOR, MR DEREK CAREW-HOPKINS

The Minister for the Environment upheld the appeal of Mr Hawke on the level of assessment of his subdivision proposal as Proposal Unlikely to be Environmentally Acceptable. Also it was recommended that a full formal assessment of the proposal be undertaken. A copy of the appeal report is included as Appendix No.3.

The EPA reasons for the level of assessment set as PUEA were outlined. Reference was also made to the Grounds of Appeal of Mr Hawke, which included the failure of the EPA to provide sufficient scientific evidence to support its decision that intensification of development will impact on the Western Swamp Tortoise or its habitat within the Twin Swamps Nature Reserve.

Reference was made to the Land Capability and Environmental Management Plan undertaken on behalf of the landowners in the area. This was completed as part of a proposed rezoning and Outline Development Plan for Ellenbrook Road, Bullsbrook (May 1998).

Mr Hawke also raised the issue of the City of Swan support for Town Planning Scheme 9 (TPS9) Amendment 356 to rezone land between Twin Swamps Nature Reserve and Ellen Brook Nature Reserve from General Rural to Special Purpose – Ellenbrook Road. The Level of Assessment was

set at Scheme Not Assessed – Advice Given, with the Director, Evaluation Division informing the now City of Swan of the decision on 8 October 1999. Certain environmental issues relevant to TPS9 Amendment 356 will be addressed in section three. The Appeals Convenor noted that the proponent considered that the necessary environmental documentation has already been provided through the LCEM Plan, 1998 (Appendix 1).

The EPA and WAPC have taken the approach that subdivision within the area of the Western Swamp Tortoise should be of low density. A minimum lot size of 8.0 hectares was suggested by the Department of CALM and the Department of Planning and Infrastructure. The EPA have received advice from the Department of CALM supporting their stance on lot size.

The EPA concluded that whilst this proposal itself would not contribute highly to the degradation of the environment in the area, it would set an undesirable precedent for subdivision of other rural lots in proximity to the two Nature Reserves. This would then lead to significant pressure for development of similar densities throughout the Policy area, which it considered to compromise the long term viability of the two habitat reserves.

Other relevant matters raised by the Appeals Convenor included:

1. that in relation to EPA assessment of TPS 9, Amendment 356 of September 1999, the DEP provided advice on the Scheme's key environmental factors. The DEP did not identify protection of the Western Swamp Tortoise habitat as a key environmental factor and provided no advice with respect to minimum lot size for the Amendment area;
2. that under the provisions of section 48A(a) of the *Environmental Protection Act (1986)* the Scheme Amendment was deemed assessed by the EPA;
3. that subsequent to the above advice on Amendment 356, the DEP provided the then Ministry for Planning with an interpretation of the recommendations of the original Draft Environmental Protection (Western Swamp Tortoise Habitat) Policy, EPP, July 1994 which equated to an average lot size of 10.0 hectares for land within the EPP area, with the DEP also now supporting the WAPC recommendation of an 8.0 hectare minimum lot size;
4. that the DEP considered that this did not contradict the provisions of section 48A(a), EP Act 1986 as no further assessment was undertaken;
5. that the DEP considered it appropriate for the planning agencies to seek further advice on environmental issues relating to town planning scheme amendments as these are relevant considerations in making planning decisions;
6. that the WAPC advised the City of Swan in July 2001 that the Minister for Planning and Infrastructure had decided not to approve the Amendment until various amendments to the TPS9, Amendment 356 had been effected;
7. that these changes included a requirement for a minimum lot size of 8.0 hectares;
8. that the City of Swan then modified the Amendment documents;
9. that in returning the documentation to the Minister, the City of Swan advised of Council's continued support for the Amendment as originally submitted for final approval;
10. that the Appeals Convenor stated *it is unfortunate that in the DEP advice on Amendment 356 that it made no reference to protection of the Western Swamp Tortoise habitat as a key environmental factor, but subsequently provided advice to the WAPC on lot sizes;*
11. that given the environmental advice on the Amendment, it is understandable that landowners considered that proposed subdivisions and the matter of lot sizes was to be dealt with through the planning process and that the EPA had no further role to comment on such matters;

12. that in the case of Lot 2 Ellenbrook Road located in the area of the proposed Scheme Amendment 356, the Amendment had still to be gazetted and the EPA did not assess the current Rural zoning of the property;
13. that the Amendment as originally adopted by Council did not include a minimum lot size, the issue of appropriate lot sizes to be addressed through the Outline Development Plan;
14. that the Minister for Planning's decision does not negate the need of requiring a eight hectare minimum lot size and also does not negate the need for the overall planning through the Outline Development Plan;
15. that the City of Swan has resolved not to support the proposed subdivision of Lot 2 for various reasons including it being premature, the Amendment not being finalised and the need to prepare an Outline Development Plan for the whole area;
16. that in its advice on the proposed subdivision, Council's re-iterated its original support of Amendment 356 as resolved at its meeting on 23 February 2000, adding that Council still contends that this is the most appropriate approach to determination of lot sizes for this Amendment area;
17. that in concluding the Appeals Convenor noted the following:
    a). that the EPA did not formally assess Amendment 356 and the Western Swamp Tortoise habitat was not identified as a key environmental factor in DEP advice on the Amendment;
    b). that the EPA encouraged the landowner to modify the proposal, with the DEP meeting with the proponent to explain EPA concerns and discuss alternatives. The proponent did not modify the proposal;
    c). that in the statement on the level of assessment to the Appeals Convenor, the proponent stated that the EPA has insufficient scientific evidence to support its decision on the negative impacts of intensification of development;
    d). that the proponent questioned the ability of the EPA to assess the proposed subdivision of Lot 2, Ellenbrook Road, given that it had previously assessed Amendment 356;
    e). that Mr Hawke be provided with the opportunity to demonstrate his proposal in the knowledge of the EPA's current thinking, or if necessary, to modify his proposal during the assessment such that it meets the EPA's environmental objectives;
    f). that the means by which the EPA's environmental objectives for the Western Swamp Tortoise habitat are met are most appropriately addressed through the planning process;
    g) that the process by which the planning and environmental agencies have determined a minimum lot size, after the EPA decided not to assess Amendment 356, is a matter of concern which should be raised with the EPA;
    h) that the Department of Environmental Protection's (DEP) advice on the Amendment did not address the protection of the Western Tortoise habitat as an environmental factor early in the planning process is also of concern;
    i) that the Appeals Convenor's emphasised items Nos. 17(g and h) above; and
    j) that the Minister for Planning and Infrastructure be advised of Items 17(g and h) above and that further justification needs to be provided for a minimum lot size of eight hectares in Amendment 356.

In summary, the proponent argues these issues are relevant to this Environmental Review, being identified by the Appeals Convenor in his Report of 29/04/2002. The planning issues will be examined within the parameters of the State Administrative Tribunal. The main issues are:

1. that the EPA assessment of TPS 9, Amendment 356 of September 1999, the DEP provided advice on environmental factors, not identifying protection of the Western Swamp Tortoise as a key environmental factor;
2. that it also provided no advice in respect to minimum lot sizes for the Amendment area;
3. that under s48A(a) *EP Act 1986,* the Scheme Amendment was deemed assessed by the EPA;
4. that subsequent to that advice on Amendment 356, DEP provided the Ministry of Planning with an interpretation of Environmental Protection (Western Swamp Tortoise Habitat) Policy, EPP, July 1994, of an average lot size of 10.0 hectares, also supporting the WAPC recommendation of an 8.0 hectare minimum lot size;
5. that the now Swan City Council in its advice on the proposed subdivision reiterated its original support of Amendment 356 from its meeting of 23/02/2000, this according to them being the most appropriate approach to determine lot sizes in the Amendment area;
6. that the DEP considered that this action did not contradict the provisions of section 48A(a), *EP Act 1986,* as no further assessment was undertaken;
7. that the proponent, Mr H Hawke argued that the EPA had insufficient scientific evidence to support its decision on the negative impacts of intensification of development;
8. that the proponent, Mr Hawke questioned the ability of the EPA to assess the proposed subdivision of Lot 2, Ellenbrook Road, given it had previously assessed Amendment 356;
9. that the process by which the WAPC, DEP and EPA have determined a minimum lot size, after the EPA decided not to assess Amendment 356, is a matter of concern; and
10. that further justification needs to be provided for a minimum lot size of eight hectares in Amendment 356.

2.4 OUTCOMES FROM THE REPORT OF THE APPEALS CONVENOR

Issues raised in the Appeals Report by the Appeals Convenor require further discussion, this being relevant to the remaining four sections. This applies to part of section three, item No.5, but is especially applicable to section four, the environmental isues, as the proponent has been provided with the opportunity in this Environmental Review to demonstrate that his subdivision application in the presented format will overcome the impediments enumerated by the EPA in the imposition of the PUEA. Comments by the Appeals Convenor are relevant to section five, Environmental Management, which includes the commitments. Some issues raised in the Appeals Report are relevant to section six and will be briefly discussed in that section.

3.0 DESCRIPTION OF THE PROPOSAL

Section three, the description of the proposal, outlined in section 1.2, describes and examines the following issues. They are:

1. the location;
2. the description of the background and history for the subject land and surrounding area;
3. the justifications and objectives for the proposed development;
4. the proposed subdivision plan;
5. the existing zoning and environmental approvals, decision making authorities and involved agencies; and
6. the consideration of alternative options.

3.1 LOCATION

Lot 2 Ellenbrook Road, Bullsbrook is located within the City of Swan, approximately 18.0 kilometres north of Midland and 5.0 kilometres south of Bullsbrook. The approximate location of the Western Swamp Tortoise Policy Area is noted in Figure 1. Figure 2 shows the Western Swamp Tortoise Policy Area and cadastral lot numbers of all lots within that Area.

The western boundary of Lot 2, Ellenbrook Road, Bullsbrook is located between 330.0 and 450.0 metres east of the Twin Swamps Nature Reserve, 7897. The eastern boundary adjoins Ellenbrook, this being over one kilometre from the Reserve (Figure 2). Figure 3 indicates both distance and vegetation cover over the area.

The Ellenbrook Nature Reserve, 7715, is located three kilometres south of Lot 2, with Ellen Brook flowing through the north eastern sector of that Reserve. Lot 4, Railway Parade, not designated on the cadastral map, is located less than 800.0 metres to the west of Ellenbrook Nature Reserve, with Ellen Brook flowing through its south eastern corner. The proposal on Lot 4 for rezoning from General Rural to Residential Development is relevant as it is high density. Given the argument by the EPA that the density of development for Lot 2 at 2.0 hectare lots is opposed because of environmental concerns, the location of Lot 4, TPS9, Amendment 362 with its supported rezoning from General Rural to Residential Development, it is also arguable that support for that rezoning must have environmental relevance to that of Lot 2.

3.2 BACKGROUND AND HISTORY OF LOT 2 AND ENVIRONS

Land in the general area has been utilised for agriculture for many years, with some lots being involved in intensive animal production pursuits of poultry and pig production. The present poultry operation is located towards the centre of the Policy Area. Most of the land is used for hobby farming, with horses the most common occupation. In general the land is under utilised, being capable of sustaining higher production levels, without negatively impacting on the environment (Appendix 1, p.1).

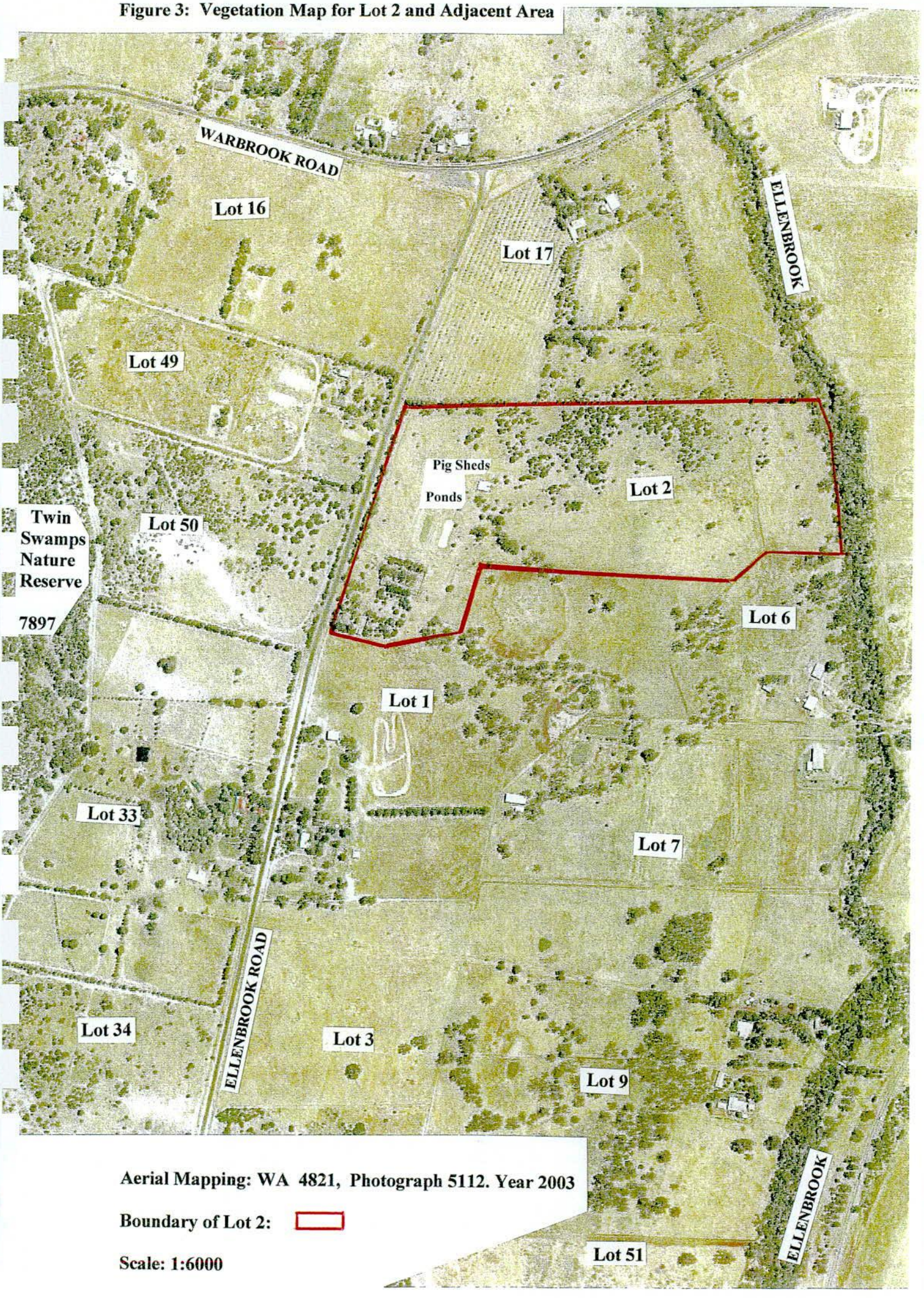
Parlevliet 1997, stated that there are horticultural and nursery activities in the area, but these may all change depending on the circumstances (Appendix 4, p.2).

Lot 2 was already producing pigs for the pork and bacon markets when purchased by Mr Hawke in 1998. Production of pigs from the property was discontinued in 1992.

Subsequent to the commencement of the development of an Environmental Protection Policy for the Western Swamp Tortoise Habitat in 1994, there was a Community Committee formed to preserve the rights of landholders.

In 1997 the Environmental Protection Authority requested Mr Gerry Parlevliet of Agriculture Western Australia to handle the community development of a land management plan for the Policy Area (Appendix 4). The EPA agreed to try the development of a land management process, which involved the community.

Figure 3: Vegetation Map for Lot 2 and Adjacent Area



Aerial Mapping: WA 4821, Photograph 5112. Year 2003

Boundary of Lot 2:

Scale: 1:6000

3.3 JUSTIFICATION AND OBJECTIVES FOR THE DEVELOPMENT

The justification and objectives for this development include the maintaining of the beneficial uses to be protected, outlined in section three, the Environmental Protection (Western Swamp Tortoise) Policy 2002.

This subdivision, when implemented will not only achieve and maintain the environmental quality as outlined in Part 3 – Programme for Protection of the Western Swamp Tortoise Habitat, but in some instances it will assist in improving the present environment in the Policy Area.

Worth noting are objections raised by the EPA related to the setting of precedent on approval of this subdivision this then leading to further applications for subdivision. In implementation of the subdivision as proposed in this Environmental Review, the environmental quality objective of the protection of the beneficial uses will be achieved. Furthermore if the Policy Area is progressively subdivided in the future utilising and fulfilling the Environmental Commitments and Management Practices outlined for Lot 2, the result would be an improvement in the existing environment over most of the Policy Area.

3.3.1 PROPONENTS VIEW ON EPA TREATMENT OF LANDOWNERS WITHIN THE POLICY AREA

Justification for this proposed subdivision is readily available when examination of the treatment of the many landowners in the area from the commencement of the first Draft EPP for the Western Swamp Tortoise Habitat in 1994, to the present, is examined.

It becomes clear that for whatever reason, the EPA are quite prepared to provide for a substantial population increase within one kilometre of the Ellenbrook Nature Reserve, while opposing a comparatively small increase in population density on Lot 2. Apparently the EPA, by their conduct and statements, maintain that the human species, when confined to small lots down to an area of 300.0-400.0 square metres, within 800.0 metres of the Ellenbrook Nature Reserve, will exhibit a much more environmentally acceptable behavioural pattern for the survival of the Western Swamp Tortoise, than those located on a 20,000.0 square metre lot within 350.0 to 700.0 metres of the Twin Swamps Nature Reserve.

Also apparent is that the EPA are accepting that there is no increase in the risk of fire from the increased population in the area of Lot 4, now zoned Urban. Fire in these Reserves is the one factor that can cause severe and lasting damage to the habitat of the Western Swamp Tortoise. The population that will eventually reside in the rezoned area of Lot 4 should be quite capable of exhibiting mobility, sufficient to cause damage through fire or other means to either of the two Nature Reserves in the Policy area.

Examination of the quality of the vegetation in the Ellenbrook Nature Reserve demonstrate that there is little care taken and effort expended in the maintenance of this designated System 6 Area and Bush Forever Site. Fires from Great Northern Highway to the east are a regular occurrence.

3.3.2 CONSULTATION PROCESS, RESIDENTS, EPA, DEP AND WAPC

From the point of view of Mr Hawke and the Landowners Group, their treatment was most unsatisfactory, this being further justification for the proposed development. Most matters in this

area will be forwarded to the State Administrative Tribunal for examination in resolution of Appeal No.55 of 2004.

Evident and of interest is the former Chairman of the EPA in 1994-95 agreeing with the compromise put forward by the Landowners' Group. The former Chairman of the Western Australian Planning Commission, who met later with representatives of the Landowners' Group also agreed with the proposed 2.0 hectare lot sizes.

A consultation process with residents and their representatives was commenced (Appendix 4), Mr Gerry Parlevliet, Agriculture WA, being the person requested by the EPA to conduct that process. This consultative process involving many meetings over one year, finished with a report supporting the proposed 2.0 hectare subdivision as being the best solution to protect the two Nature Reserves involved and this section of the Swan River Catchment.

3.4 PLAN OF SUBDIVISION

The subdivision proposed for Lot 2 is designed to provide eight lots of over 2.0 hectares and a service road of 420.0 metre length by a width of 20.0 metres for the eight lots (Figure 4).

Entrance to proposed Lot 1 will be approximately 20.0 metres to the south of the present entrance to Lot 2 from Ellenbrook Road. All other seven lots will enter and exit the 20.0 metre service road located approximately 90.0 metres south of the boundary of the adjacent Lot 17 to the north to gain access to Ellen Brook Road.

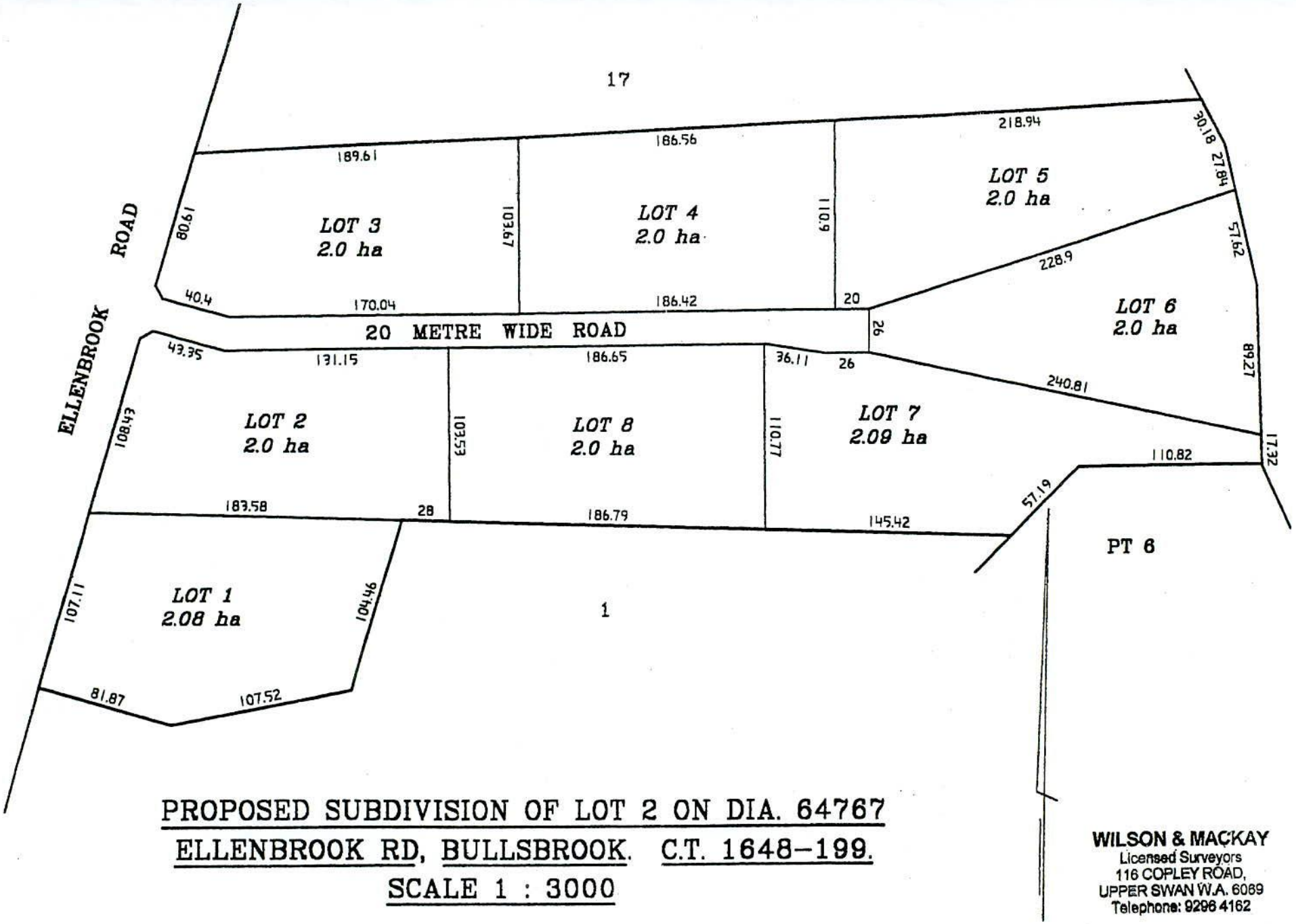
Because the City of Swan and WAPC may require emergency exit in case of fire, these exits, if deemed necessary by the City of Swan, will be constructed to their specifications. It is expected that any requirements will also recognise information outlined in Planning for Bush Fire Protection prepared by the Western Australian Planning Commission and the Fire and Emergency Services Authority of Western Australia. Further information on fire hazards will be outlined in Commitments in section five.

Stephens, 1998 (Appendix 1, p.29) advised that whilst there are environmental constraints to development on the Ellenbrook Road subdivision from soil systems, potential nutrient export and waterlogging, these are not sufficient to exclude some development.

Also Stephens, 1998, advised that lot sizes are more related to site conditions and therefore stocking rates should be determined and allocated on the basis of land capability. It was further stated that provided controls on stocking and clearing are applied to some lots, a 2.0 hectare lot size is appropriate for all areas and could lead to potential reductions in nutrient loadings on the site. The subdivision plan will be further discussed in section four with environmental issues.

3.5 PLANNING FRAMEWORK

The planning framework, which includes existing zoning and the requirement of environmental approvals with the decision-making authorities and agencies involved are outlined.The Town Planning Scheme No.9, Amendment 356, was passed by the Minister for Planning and Infrastructure, being published in the Government Gazette dated 09/08/2002. This rezoned land within the Western Swamp Tortoise Policy Area from General Rural to Special Purpose.



PROPOSED SUBDIVISION OF LOT 2 ON DIA. 64767
ELLENBROOK RD, BULLSBROOK. C.T. 1648–199.
SCALE 1 : 3000

WILSON & MACKAY
Licensed Surveyors
116 COPLEY ROAD,
UPPER SWAN W.A. 6069
Telephone: 9296 4162

Figure 4: Proposed subdivision of Lot 2.

There are matters to be addressed, such as TPS9, Amendments 356 and 362, which included both environmental and planning issues. These may be beyond the guidelines applicable to this Environmental Review. Depending on circumstances, these will be addressed through the State Administrative Tribunal process. Mr Adrian Molloy and Mr Howard Hawke, representing seventeen landowners in the Policy Area were the first submitters to a Legislative Council Standing Committee on Public Administration and Finance in August 2002 into land use matters.

As for the EPA referring to this subdivision, if approved, setting a precedent for others to similarly apply, this is not the case. It is quite clear that the EPA must have set conditions for this Environmental Review, which when addressed and fulfilled, can allow this proposal to be successfully implemented without compromising the sustainability of the Policy Area and assist in the survival of the Western Swamp Tortoise. The view of the proponent is that approval of this application for subdivision cannot be construed as precedent setting. It is also the view of the proponent that the EPA are in error if they provide as a reason for refusal to the Minister, the setting of a precedent, in response to the submitted Environmental Review, as it is irrelevant. It is also the expectation of the proponent that this application for subdivision, through this submitted Environmental Review, should be assessed by the EPA on its environmental merits, which include sustainability, but do not including the setting of precedents.

Furthermore, the EPA made the statement that this application for subdivision with some land degradation issues, will not be likely to impact on the Western Swamp Tortoise to any great degree. What will become evident is that this subdivision as proposed, should not result in any deterioration of water quality or habitat for the Western Swamp Tortoise.

It is the proponent's view that it is disappointing that the actions of the EPA clearly demonstrate that they do not believe that the technical expertise is available to allow subdivision into two hectare lots, whilst maintaining and improving the habitat for the Western Swamp Tortoise.

The application for subdivision is now before the State Administrative Tribunal, with the Minister for the Environment making the decision as to the possible implementation of the proposal by allowing it to proceed through the planning process.

If the Minister provides support to the Environmental Review, this appeal will proceed before the State Administrative Tribunal, with Mr Hawke, the WAPC, Department of Environment and Swan City Council being represented at the Tribunal, either in opposition or support of the application to subdivide.

Commitments outlined in this Environmental Review can be included as conditions of approval for subdivision.

3.6 CONSIDERATION OF ALTERNATIVE OPTIONS

As the proposed lot sizes for this subdivision are all in excess of two hectares, it is considered unlikely that there is any requirement for the consideration of alternatives. This conclusion is drawn from, among other reasons, the support provided by the Land Capability and Environmental Management Ellenbrook Road Structure Plan, Bullsbrook, Stephens, L,1998, (Appendix 1). Also support for this assessment of Stephens, 1998, is provided by Ferguson Kenneison and Associates, who have experience in land use matters related to sustainability, productivity, soil and land degradation and land capability in the agricultural field.

However if the EPA feel that the sustainability of this proposal can be improved, then on behalf of Mr Hawke, any advice provided will be examined and utilised, if the result is an improvement in both sustainability and the environment. Certainly the minimum lot size with an area set at 8.0 hectares minimum for subdivision under TPS9, Amendment 356, without any scientific justification for that "opinion," provides no assistance whatsoever to the long term survival of the Western Swamp Tortoise. It is also extremely disappointing to the concerned residents who constantly strived for a sustainable outcome from 1994 onwards in regard to this Policy Area.

4.0 ENVIRONMENTAL ISSUES

The Environmental Protection Authority request that this section should be structured as a discussion under each identified environmental issue, including the following:

- a description of the environmental issue generally;
- the EPA's objective;
- how the proposal relates to or impacts on the environmental issue; and
- justification of why or how the proposal meets the EPA's objective (as opposed to the EPA Statement of Reasons).

The identified environmental issues are:

1. **Specially Protected (Threatened) Fauna;**
   The EPA's objective is to protect the remaining populations of the critically endangered Western Swamp Tortoise and their habitats, consistent with the objectives of the *Revised Draft Environmental Protection (Western Swamp Tortoise) Policy 2001* and the provisions of the *Wildlife Conservation Act 1950.*
2. **Regionally significant wetlands and watercourse**
   The EPA's objective is to maintain the abundance, integrity, functions and environmental values of regionally significant wetlands and the watercourse of Ellen Brook.
3. **Surface and groundwater quality**
   The EPA's objective is to maintain or improve the quality of surface and ground water to ensure the protection of existing and potential uses, including ecosystem maintenance of the swamps within the Twin Swamps Nature Reserve, the Ellen Brook and the Swan and Canning Rivers, and the proposed Priority 3 Surface Water Control Area.
4. **Soil and groundwater contamination**
   The EPA's objective is to ensure the rehabilitation of the site to an acceptable standard that is compatible with the intended land use and consistent with the appropriate criteria. Investigations should be undertaken to determine the nature and extent of soil and groundwater contamination (lateral and vertical) from previous contaminating land uses, including a piggery, and to implement remedial works, where necessary, to ensure lots created can accommodate future uses. All investigations at the site should be conducted in accordance with the Department of Environmental Protection's Contaminated Sites Management Series.

The above four Environmental Issues will be examined and responded to individually under the above headings. Each section will include how the Environmental Issue meets the EPA's objective as opposed to the EPA Statement of Reasons.

4.1 SPECIALLY PROTECTED (THREATENED) FAUNA

4.1.1 GENERAL DESCRIPTION OF THE ENVIRONMENTAL ISSUE

The Western Swamp Tortoise (*Pseudemydura umbrina*) is close to extinction and is the most endangered tortoise or turtle on earth, also being Australia's most critically endangered vertebrate (EPA 2001). The remaining known wild population of 140 Tortoises, live in the Twin Swamps and Ellen Brook Nature Reserves, Upper Swan. Currently there are less than 30 breeding adults in the wild (EPA 2001 and Appendix 5).

Threats to the survival of the Western Swamp Tortoise in the wild identified by the EPA in the Statement of Reasons for the level of assessment of Proposal Unlikely to be Environmentally Acceptable include:

- impacts on the habitat from intensification of development in the area;
- fire;
- predation;
- changes in water quality and quantity; and
- small amount of habitat available.

4.1.2 EPA OBJECTIVE

The EPA's objective is to protect the remaining populations of the critically endangered Western Swamp Tortoise and their habitats, consistent with the objectives of the *Revised Draft Environmental Protection (Western Swamp Tortoise) Policy 2001* and the provisions of the Wildlife Conservation Act (1950).

4.1.3 IMPACTS OF THE PROPOSAL ON THE WESTERN SWAMP TORTOISE

Threats by the proposed subdivision impacting on the survival of the Western Swamp Tortoise outlined by the EPA and examined in this section are the impacts on the habitat from population growth, fire, predation, weed invasion and the small amount of habitat available.

FIRE

EPA, 2001, state that the habitat of the tortoise is particularly sensitive to fire, especially in summer, this being variable from year to year, due to seasonal droughts and the status of the fuel loads in the Nature Reserves. The increased likelihood of fire outbreaks in the Twin Swamps Nature Reserve, resulting from population growth, is raised as an issue by the EPA against this subdivision application of Mr Hawke to the WAPC.

Also raised as an issue of concern is that landowners adjacent to the Reserve may also apply pressure to the Department of CALM to control burn the Nature Reserve to reduce the risk of bushfire and damage to their properties.

PREDATION

Predation by foxes and cats is also an issue raised by the EPA as having a negative impact on this subdivision proposal. They also maintain that although the Twin Swamps Nature Reserve is currently fenced to prevent access to unwanted predators, the increased density of residents is

likely to threaten the integrity of the habitat, through increasing the likelihood of damage to the fence and providing access for predators to the Reserve, such as dogs and cats.

WEED INVASION OF THE RESERVE

EPA maintain that increasing the density of residents adjacent to the Twin Swamps Nature Reserve is also likely to increase the occurrence of weed invasion into the Reserve by the introduction of plant species in the gardens of residents, not locally native to the area, as crops and also contained in animal feed brought on to the property.

HABITAT AVAILABILITY

The small area of available habitat is also raised as an issue of concern by the EPA against further subdivision to areas of less than eight hectares. Animals require a size of area to survive indefinitely, with the Ellen Brook and Twin Swamps Nature Reserves being a good start, but safer and more suitable habitats are being sought (EPA, 2001 and Department of CALM, Appendix 6). A translocation trial is underway at a Reserve near Mogumber, north of Perth.

4.1.4 PROPOSAL JUSTIFICATION

Following are the reasons justifying how the proposal meets the objective of the EPA as against the Statement of Reasons for the setting the level of assessment at Proposal Unlikely to be Environmentally Acceptable (PUEA). Correspondence from the EPA Service Unit to the Department of CALM and from the Department of CALM, to the WAPC, demonstrate quite clearly the opposition to this proposed subdivision without any scientific evidence for that opposition and support for the eight hectare minimum lot size area (Appendix 6).

FIRE

Following are responses by the proponent to issues raised by the EPA regarding fire. They are:

1. that CALM alone are responsible for maintaining firebreaks within both the Twin Swamps and Ellen Brook Nature Reserves;
2. that CALM are responsible for maintaining the vegetation fuel loading at a safe level in line with the requirements of the Bush Fires Act 1954 and City of Swan, whilst recognising any reqirements of the Fire and Emergency Services Authority of Western Australia;
3. that the risk of fire will be reduced by the extra fire breaks and road on Lot 2;
4. that extra water will be available because eventually seven extra households will be located within the subdivision (LCEM Plan, 1998, Section 4.9, p.27);
5. that the excuse of the EPA of pressure from those residing in the proposed subdivision to burn the Reserves is clear evidence of the lack of understanding by the EPA of issues involving fire, one being outlined in response No.2;
6. that the EPA are totally unrealistic in apparently failing to realise that burning of either or both of the Reserves, or having vegetation loadings reduced by other means, is to protect not only residents of the Policy Area, but others residing a considerable distance from the Reserves and preventing damage to life and property;
7. that the EPA and the Department of CALM should both be aware and note the damage caused by bushfires, where there has been little attempt to reduce fuel loadings over many years;

8. that a Fire Report was misrepresented by the EPA, this not enhancing the veracity of the Statutory Authority, with this matter being brought to the attention of the State Administrative Tribunal;
9. that the EPA in approving Town Planning Scheme 9, Amendment No. 362 as "Scheme Not Assessed" in rezoning the majority of Lot, 800.0 metres to the west of Ellenbrook Nature Reserve from General Rural to Residential Development, which allows up to two hundred and eighty residences in the future, apparently believing that the extra population in that area are different and will have little or no effect on either of the Reserves in respect to the incidence of fire; and
10. that the EPA check on the Standing Orders of the Bullsbrook Volunteer Fire Brigade on both the Ellen Brook and Twin Swamps Nature Reserves, making certain that the Department of CALM make an effort to maintain the fuel levels in the Reserves in line with best management practice to minimise danger to residents in the Policy Area and others likely to be disadvantaged by the escape of fire.

Overall it is the proponent's view that there is evidence of neglect by CALM, particularly in the management of Ellen Brook Nature Reserve. The condition of a large part of that Reserve can only be described as presenting an unnecessary fire hazard for a lengthy period of time throughout the summer. EPA fail in that it is apparent that they expect the Department of CALM will maintain them to suit survival of an animal, with the safety of the human population being of little concern to the EPA. Correspondence between Ferguson, Kenneison and Associates and CALM between 11/02/2003 and 01/07/2003 is enclosed, referring to, among other matters, the issue of fire in the Nature Reserves (Appendix 5). Also enclosed in that Appendix, being relevant to this Environmental Review, are references to resident numbers of the Western Swamp Tortoise and the modified environment of the Twin Swamps Nature Reserve.

PREDATION

Predation by foxes and cats is an issue raised by both the EPA and CALM as negatively impacting on the approval of this proposal. With the location of the proposed subdivision of Lot 2 being to the east of Ellenbrook Road, the distances involved to the two Nature Reserves, with little impact of domestic stock from a subdivided Lot 2 on either Nature Reserve, it is difficult to envisage the problem even occurring as outlined by the EPA, given the procedures to be implemented.

However, all dogs must be licensed and restrained on a leash when off the property of the owner, this conforming with the City of Swan by laws. However the domestic cat is more of a problem, but both Reserves, where there is a resident Western Swamp Tortoise population are well fenced.

Restrictions on the number of domestic cats will be dealt with in a similar manner for the maintenance of Flora and Fauna under a Deed of Covenant (Restrictive Covenant) for the Conservation of Land, pursuant to section 129 BA of the Transfer of Land Act 1983. EPA and the Department of CALM should be more concerned with wild and feral cats and domestic cats dumped by their owners in the area. These are problems that will always be present, regardless of the numbers of extra dwellings constructed on Lot 2.

There was no concern expressed by EPA on their approval of lots for the construction of 280 dwellings, some within the kilometre of the Ellenbrook Reserve.

WEED INVASION OF THE RESERVE

The likelihood of weed invasion of the Twin Swamps Nature Reserve being aggravated and assisted by this subdivision proposal is most unlikely, contrary to assertions promoted by the EPA. At present two of the most prevalent weeds in the area are Paterson's Curse (*Echium plantagineum*) known as Salvation Jane and *Watsonia sp.* prevalent in parts of Ellen Brook.

Subdivision into eight lots, increasing the area under vegetation on each lot to average one third of the area of each by planting of both top and understorey species native to this area, will also assist in reducing the spread of weed species.

One commitment made by the owner Mr Hawke will be the production of a folio of suggested species for purchasers who are interested in further planting of vegetation on their lot. This will be made available to all purchasers, forming part of a package outlining approved methods by the Department of Agriculture and Department of Conservation and Land Management of maintaining and improving the sustainability of each lot by the use of best practice management. Implementation of the commitments made in this document by Mr Hawke will positively impact on Ellen Brook and on surface and ground water quality.

The aim is for the proponent Mr Hawke to raise the vegetated area to average one third of Lot 2 prior to the release for sale. The proposed Lot 4 will have no extra vegetation added. Also this newly planted vegetation will be fenced prior to the sale of the lots.

Increasing the area of vegetation to species indigenous to the area, besides assisting in reducing the spread of weed species, has other major impacts including providing a positive impact on surface and groundwater quality and Ellen Brook.

Again, the fact is emphasised that the EPA in their assessment also made the following statements in their support for the Proposal Unlikely to be Environmentally Acceptable:

1. *while the impacts of a single subdivision may be negligible, the EPA must consider the precedent for other landowners in the area;* and in conclusion
2. *while this proposal in itself would not necessarily contribute highly to the degradation of the environment in the area, it would set an undesirable precedent for subdivision of other rural lots in proximity to the Twin Swamps and Ellen Brook Nature Reserves.*

As mentioned previously, among the functions of the EPA is to assess this proposal for subdivision on its merits, not on the precedence that would be set for other landowners in the area.

Further, the Agencies and the EPA concerned with this matter should also realise and be willing to concede, that it is well within the realms of possibility that there may be methods well superior to those which they have enunciated and agreed to for this Policy Area.

This subdivision proposal, although not a precedent because of its timing, being well prior to the gazettal of the City of Swan TPS Amendment 356 No. 9, will ably demonstrate the lack of technical expertise and negativity within the now Department of Environment, Department of Conservation and Land Management, Department of Planning and Infrastructure and the Environmental Protection Authority. It is evident that the Agencies and the Authority would prefer their stance to be seen as conformation and alignment with the Precautionary Principle, which does not require scientific justification for their opinions.

HABITAT AVAILABILITY

As noted earlier, the small amount of habitat available is utilised as an issue against subdivision into lots with areas of less than eight hectares. There has been, and still is, no scientific support for the minimum lot areas of 8.0 hectares, with the Precautionary Principle being the only reason. This is an indictment on the lack of objectivity of those opposing subdivision, although sustainability and environmental outcomes are achievable.

What is evident is actual bias, this demonstrated against those in the Policy Area by the actions of the EPA, the now Department of Environment, the Department of Conservation and Land Management and the Department of Planning and Infrastructure. This bias is demonstrated by the action of the EPA on Lot 4, TPS No. 9, Amendment 362 with over 200 lots being proposed. This accepted resultant rise in population to the west of Ellen Brook Nature Reserve, apparently without any effect on the Western Swamp Tortoise, is indicative of EPA bias against the owners of land in the Policy Area.

EPA, 2001, note that safer and more suitable habitats are being sought, with a translocation trial being under way at a reserve near Mogumber, north of Perth.

4.2 REGIONALLY SIGNIFICANT WETLANDS AND WATERCOURSE

4.2.1 GENERAL DESCRIPTION OF THE ENVIRONMENTAL ISSUE

EPA, Appendix 2, stated the Government's Bush Forever Policy recognises the Ellen Brook situated to the eastern boundary of the subdivision area, as containing regionally significant remnant vegetation, wetlands and watercourse. Also the Ellen Brook forms part of a regionally significant bushland and wetland linkage from the Swan River north to Bullsbrook and north-west to State forest areas, forming valuable habitat for fauna movement between areas of bush.

Included in this Environmental Issue is the Twin Swamps Nature Reserve, located approximately 400 metres west of the proposed subdivision area and on the eastern side of the Swan Coastal Plain, an area of high floristic diversity, where EPA state that over 97% of the native vegetation has been cleared. The values of the Twin Swamps Reserve has been recognised for many years as part of the System Six area M17 (Department of Conservation and Environment 1983). It is also included in the Governments Bush Forever policy as Site 400.

EPA maintain the proposed subdivision plan does not provide any mechanisms for protecting the Ellen Brook from degradation. Also development of this density is likely to impact on the vegetation and water quality of the watercourse and wetlands associated with Ellen Brook.

It is acknowledged by EPA that the proposed subdivision is unlikely to impact on the floristic biodiversity of the Reserve but the incremental human population pressures of this and other unprecedented subdivisions of this density, as described under the Impacts on the Western Swamp Tortoise, are likely to increase the degrading impacts of weed invasion and fire in particular.

4.2.2 EPA OBJECTIVE

The EPA's objective is to maintain the abundance, integrity functions and environmental values of regionally significant wetlands and the watercourses of Ellen Brook.

4.2.3 IMPACTS OF THE PROPOSAL ON THE WETLANDS AND WATERCOURSE

Threats outlined by the EPA imposed by the proposed subdivision on the regionally significant vegetation, wetlands and watercourses follow. Also noted and included was the relevancy of the Impacts of the Proposal on the Western Swamp Tortoise outlined in Section 4.1.3 to this Section 4.2.3. Included and referred to, but already addressed in Section 4.1.3 is the increase of population pressure on the issues of fire, predation, weed invasion of Twin Swamp Nature Reserve and habitat availability.

Issues to be addressed in this section are the impact of the proposal on wetlands and watercourses and regionally significant vegetation, which includes the riparian vegetation of Ellen Brook.

IMPACT ON FIRE, PREDATION, WEED INVASION OF THE RESERVE AND HABITAT AVAILABILITY

Outlined and addressed in Section 4.1.3.

IMPACT ON REGIONALLY SIGNIFICANT VEGETATION

The regional significance of the riparian vegetation of Ellen Brook was outlined by the EPA as it formed part of a wetland linkage from the Swan River in the south, north to Bullsbrook and north-west to State forest areas, forming valuable habitat for fauna movement between larger areas of bushland.

The EPA raised as an issue the effect of the proposed subdivision on the degradation of Ellen Brook and the requirement to prevent any impact on its riparian vegetation and that of any associated wetlands. The EPA admit that while the proposed subdivision is unlikely to directly impact on the floristic diversity of the Twin Swamps Nature Reserve, the incremental human population pressures of this and other subdivisions of this density are likely to increase the degrading impacts of weed invasion and fire in particular.

4.2.4 PROPOSAL JUSTIFICATION

The negative impact of the subdivision proposal as outlined by the EPA can be altered to a positive impact within the fully implemented subdivision proposal.

The opportunity is available to prevent degradation of the Ellen Brook by the planting of vegetation reflecting the species of native vegetation endemic to the area.

IMPACT ON FIRE, PREDATION, WEED INVASION IN THE RESERVE AND HABITAT AVAILABILITY

Outlined and addressed in section 4.1.4.

IMPACT ON REGIONALLY SIGNIFICANT VEGETATION

This subdivision proposal provides the opportunity to reduce any perceived negative impacts on the riparian vegetation on Ellen Brook and on the wetland area located in the proposed subdivision

to the south west of Lot 8, south east of Lot 2 and north east of Lot 1 and adjacent to Lot 1 of the whole Policy Area.

For the three proposed subdivision lots adjoining the wetland area of Lot 1 in the Policy Area, native vegetation species to forty metres in width in Lots 2, 8 and 1 will be planted to afford protection and improve water quality in the wetland area.

The eastern sectors of proposed subdivision Lots, 5, 6 and 7, out to a distance of forty metres from their boundary with Ellen Brook will be planted with native vegetation species, similar to that located along and to the west of the adjacent watercourse. These areas of vegetation will be fenced as part of the commitments related to this proposal to prevent intrusion by livestock. Firebreaks for protection of the vegetation and property will be constructed and maintained to conform to the requirements of the City of Swan and with the Deed of Agreement, if required, by the WAPC, through the State Administrative Tribunal, for this proposed subdivision.

The EPA have wrongly assumed that this proposed subdivision will have a negative impact on regionally significant vegetation, wetlands and watercourses and on surface and groundwater quality.

The proposed subdivision will have a positive impact on Regionally Significant Vegetation, Wetlands and Watercourses and on Surface and Groundwater quality, not a negative impact as maintained by the EPA. Mr Hawke intends to spread and incorporate into the top 50 millimetres of soil, 2.0 tonnes to the hectare of Zeolite (clinoptilolite) over all areas in the proposed subdivision not replanted to native vegetation or with existing vegetation. This aspect of the proposal will be further explained in section 4.3. The use of Zeolite will also be advantageous in the area around the now unused piggery and effluent disposal ponds requested for examination by the EPA, the response being outlined in section four.

4.3 IMPACTS ON SURFACE AND GROUND WATER QUALITY

4.3.1 GENERAL DESCRIPTION OF THE ENVIRONMENTAL ISSUE

The relationships between groundwater, surface water flows and the swamp systems is not well understood according to the EPA (Appendix 2). The Swamps at Twin Swamps Nature Reserve probably fill in response to the first winter rains from direct rainfall and surface water runoff. Late in the winter the regional water table will rise until the swamps are fed by groundwater.

The EPA, citing from *Townley et al. 1997,* where it is suggested that the rise in the water table near Twin Swamps may be partly due to flow from the east from the Darling Scarp, which passes beneath the Ellen Brook (Appendix 2).

Other issues raised by the EPA include the density of the subdivision, with limited land use controls, nutrient and effluent export from parts of the site through both surface water and groundwater and the contribution the subdivision will make to the nutrient loading of the Swan River, conveyed through Ellen Brook.

At present there is no midge problem in the Twin Swamps Reserve according to the EPA, but the numbers are likely to increase as a result of nutrient enrichment of the wetlands from fertilizer

usage. The use of chemicals for agriculture affecting water quality is also raised as an issue, which would adversely impact on the Western Swamp Tortoise.

4.3.2 EPA OBJECTIVE

The objective of the EPA is to maintain or improve the quality of surface and groundwater to ensure the protection of existing and potential uses, including ecosystem maintenance of the swamps within the Twin Swamps Nature Reserve, Ellen Brook, Swan and Canning Rivers and the proposed priority three Surface Water Control Area.

4.3.3 IMPACTS OF THE PROPOSAL ON SURFACE AND GROUND WATER QUALITY

Threats stated by the EPA to result from the imposition of the proposed subdivision on surface and groundwater quality follow. They are nutrient and effluent export through fertiliser application and from animal production from the site, resulting in additional nutrient loadings to the Swan River, conveyed through Ellen Brook. The use of chemicals for agriculture and their effect on water quality is also raised as an issue.

NUTRIENT AND EFFLUENT EXPORT

EPA, Appendix 2, maintain the subdivision in the density proposed may act to reduce the quality of surface and groundwater exported from the site, through increases in the density of nutrient producing and pollutant causing activities, such as from domestic animals, fertiliser and pesticide application and effluent disposal systems.

MIDGE PROBLEMS

The possibility of future problems with midges and mosquitoes on the human population, although there have been none reported to date, is raised by the EPA as a possible negative impact.

4.3.4 PROPOSAL JUSTIFICATION

The negative impacts outlined above, we argue, will not occur or be negative to those that can and are likely to occur, now and in the future under the existing General Rural Zoning of Lot 2. The EPA acknowledge that the environmental impacts of a single subdivision proposal may be negligible, but also state that they must consider the precedent that approval would set for other landowners in the Policy Area. Again it is anticipated that the EPA assess this Environmental Review, not including precedent that approval of this proposed subdivision may provide to other landowners to apply for subdivision, but on the merits of the case presented on behalf of Mr Hawke.

Furthermore, this subdivision on implementation, will act as an example to others subdividing in mainly cleared areas with similar land capabilities, of how positive impacts can be achieved on any waterways and vegetation, leading to greater sustainability of the land and water resource than is evident and available at present. This sustainability cannot and will not ever be achieved under the present restraints, which lack scientific justification, but nevertheless sanctioned by the EPA, Department of CALM and Department of Environment. The scientifically unjustified restraints

were then followed by the imposition of an agreed 8.0 hectare lot size minimum by the Department of Planning and Infrastructure through the WAPC.

NUTRIENT AND EFFLUENT EXPORT

Reason number five for level of assessment of Proposal Unlikely to be Environmentally Acceptable (PUEA) is relevant to both sections 4.2 and 4.3 of this Environmental Review.

To commence this response on nutrient and effluent export, reason number five follows. *Rural residential subdivision at this density is likely to increase nutrient and effluent export from the site through surface and groundwater and contribute to change in the water quality of the wetlands within the habitat area of the Western Swamp Tortoise.*

The reduction in nutrient and effluent export will be achieved by these methods. They are:

1. the planting of native vegetation indigenous to the area to bring the overall vegetated area on the eight lots derived from Lot 2 to at least one third of the total area, comprising both top and understorey vegetation;
2. the eastern areas of proposed lots 5, 6and 7 extending westward from their boundaries with Ellen Brook will be planted with native vegetation species as outlined in section 4.2.4, Impact on Regionally significant Vegetation, paragraph three;
3. the use of alternative waste water systems on the seven extra lots created by the use of alternative waste water systems using either the Ecomax amended soil system, or self contained aerobic systems (eg Envirocycle, Biocycle), which use irrigation for the dispersal of waste water;
4. the use of Zeolite (clinoptilolite), imported and spread at the rate of 2.0 tonnes to the hectare and incorporated into the top 5.0 centimetres of the soil on all areas that will not be covered by trees and understorey and on the area from the disused piggery to and over the effluent ponds that will be revegetated with species of native vegetation;
5. the extension of revegetation on the southern boundaries of Lots 7 and 8 to then form a vegetated corridor of 30 metres in width between the areas to be planted in proposed Lots 1, 2 and 8 for the protection of the wetland area, thus forming a connecting corridor of nearly 900.0 metres by 30.0 metres width of vegetation from Ellenbrook Road to Ellen Brook;
6. the fencing of all areas revegetated with native vegetation to exclude stock, with firebreaks constructed as required to the specifications of the City of Swan;
7. the stocking rates to be commensurate with Department of Agriculture recommendations (Stephens, L, 1998, LCEM Plan, pp. 21, 22);
8. the soils on Lot 2 mainly have high levels of iron oxides, which in turn have a high capacity to absorb phosphorous, this fact, with the use of Zeolite will ensure a minimum of nutrient transport, both off-site and to the groundwater in the future; and
9. the use of slow release fertilisers for pasture, preferably applied in two dressings per year, conforming to recommendations of the Department of Agriculture for these soils.

The use of Zeolite incorporated into the top 5.0 centimetres of soil in all cleared areas remaining after revegetation, alternative waste water systems for each of the proposed extra seven lots, revegetation as outlined in this Environmental Review, with stocking rates commensurate with the recommendations of the Department of Agriculture, will result in a positive environmental impact on Ellen Brook and adjoining land. Certainly the results from implementation of the proposed subdivision will be far superior to maintaining the status quo as recommended by the EPA. Clearly

evident is that overall, the environmentally and sustainability of Lot 2 will be advanced, with the approval of the proposed subdivision.

MIDGES

Actions implemented by the proponent to contain perceived nutrient and effluent export problems from Lot 2 through this subdivision proposal, will not assist the breeding of midges with their allied problems.

4.4 SOIL AND GROUNDWATER CONTAMINATION

4.4.1 GENERAL DESCRIPTION OF THE ENVIRONMENTAL ISSUE

The proponent is not aware of any other previous land uses that could have a negative impact, other than the now unused piggery enterprise located on the mid-western sector of the property. The sheds are approximately 140.0 metres from Ellenbrook Road, with the effluent disposal ponds being 50.0 metres to the south west of the sheds.

Prior to the piggery operation, apparently poultry farming was conducted from the same sheds for some years, with modifications subsequently being made to the sheds to enable the commencement of the piggery operation.

The Environmental Issue therefore referred to is the operation of a small intensive pork and bacon production enterprise on Lot 2, which was in production when Mr Hawke purchased the property in 1988. Production ceased in 1992, thirteen years ago with the disposal of all pigs.

It is most likely that any contamination will be confined to the western effluent pond, with only minor contamination in the adjacent pond to the east and in the vicinity of one housing shed. It is unlikely that matter cannot be addressed by the removal of a small amount of material, with the disused ponds then being filled and leveled. Zeolite will be utilised for absorption purposes in the areas of the ponds, once any contaminated soil is removed. It will be integrated with the top soil, prior to planting of the native vegetation species over and around the area of the effluent ponds.

The proponent requests permission to undertake this testing and the rectification of any contamination, if required, once the EPA indicate they are satisfied that the other three Environmental Issues can be addressed to their required standards. Alternatively the EPA could consider rectification of any contamination as a condition of the subdivision proposal.

4.4.2 EPA OBJECTIVE

The objective of the EPA is to ensure rehabilitation of the site to an acceptable standard that is compatible with the proposed land use and consistent with the appropriate criteria. Investigations should be undertaken to determine the nature and extent of soil and groundwater contamination, both lateral and vertical from previous contaminating land uses, including a piggery, and to implement remedial works where necessary. This will ensure that the proposed subdivision lots can accommodate future uses. All investigations at the site should be conducted in accordance with the Department of Environment Contaminated Sites Management Series.

4.4.3 RELATIONSHIP OF THE PROPOSAL TO THE PREVIOUS LAND USE

The relationship of the proposal to the previous land use is outlined with the EPA requirement of an assurance that the site has no contamination that will prevent future land uses being sustained by owners of any of the lots that comply with the current City of Swan Town Planning Scheme No.9.

Outlined below and relevant to this Environmental Review are definitions of "contaminated" and an extract from Clause 4(2) of the Contaminated Sites Bill, followed by the definition of "Risk of Harm" and comments on "Risk of Harm" (Department of Environmental Protection, 2001, Management Series April 2001).

The definition of "Contaminated" follows. *Contaminated in relation to land or underground water is defined under Clause 4(1) of the Contaminated Sites Bill as a substance present in, or under that land, or in the underground water, at a concentration that presents, or has the potential to present, a risk of harm to human health or any environmental value.*

Clause 4(2) of the Contaminated Sites Bill recognises that surface water bodies are more appropriately managed through existing environmental statutes and national protocols and states:

"However a site is not contaminated-

(a) merely because in any surface water standing or running on the land a substance is present at a concentration that presents, or has the potential to present, a risk of harm to human health or any environmental value; or

(b) where the regulations so provide."

Therefore, surface water bodies such as evaporative basins and tailing ponds are not identified as contaminated areas merely because of their presence on a site. However they may result in contamination of surrounding soil and groundwater, due to inappropriate use or construction.

For the purposes of the definition of contaminated under the Contaminated Sites Bill "risk of harm" means:

> "it is probable in a certain time-frame that an adverse outcome will occur in a person, a group of people, plants, animals and/or the ecology of a specified area that is exposed to a particular dose or concentration of a substance."

The above definition is based on the definition of risk in the *National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM).*

In a practical sense it refers to the probability of known contamination causing harm to human health or any environmental values because of a combination of the following factors:

(a) the toxicity of the contaminants;
(b) the concentration and location of the contaminants;
(c) the bio-availability of the contaminants; and/or
(d) the exposure pathways of the contaminants for identified receptors (DEP, 2001).

A site that demonstrates or presents a risk of harm, according to this definition, at its current land use setting is required to be reported to the Department of Environment and will be classified as *contaminated – remediation required* site.

A site that would demonstrate or present a risk of harm, according to this definition, in different circumstances of occupation or land use setting, but not the current land use setting, would be considered as having the potential to present a risk of harm. These sites are required to be reported to the Department of Environment and would be classified as *contaminated – restricted use.*

The EPA Objective, 4.4.2 makes it quite clear that they consider that the site is contaminated and requires remediation and rehabilitation, where necessary, conforming with the Department of Environment's Contaminated Sites Management Series.

Further it is evident that the contamination referred to would have resulted from past and present activities that have the potential to contaminate the site, including waste and effluent management, waste storage areas, chemical storage areas and ay above or below ground storage tanks, drum pads and sheds.

4.4.4 PROPOSAL JUSTIFICATION

The EPA require rehabilitation of the site of the piggery, not used in the last thirteen years, which previously housed a poultry farm, to an acceptable standard, compatible with the intended land use, consistent with appropriate criteria to preserve the quality of the surface and groundwater.

As the area, including the sheds and effluent ponds has been unused for thirteen years, it is unlikely that contamination of the site will be sufficient to prevent the allowable land uses associated with this subdivision.

The eastern effluent pond has seen little use. Also the thirteen years without industry means that the potential for contamination is greatly reduced through the passage of time. The construction of the ponds with the soil used being mainly ferricrete, make it unlikely that would have been problems with leakage of sufficient effluent to contaminate the soil and aquifer.

The following procedures will be undertaken to ensure the site is safe and free from contaminants prior to subdivision. They are:

1. that a Preliminary Site Investigation will be implemented;
2. that among the procedures to be followed will be checking of the effluent ponds for any contamination that requires removal because health considerations and its relocation;
3. that sampling of the soil in the vicinity of the sheds and effluent ponds for levels of contamination will form part of the process with that soils relocation if necessary; ande
4. that over the time since pig production has ceased, it is noted that there is and has been no visual evidence of disturbed or affected vegetation or of any spills of chemicals having taken place.

Of interest is that the EPA appear to have already deemed Lot 2 to be a Contaminated Site that requires rehabilitation to an acceptable standard. What becomes evident is that by inference this Contaminated Site, if there was not a proposed subdivision, would not have required assessment.

If there has been contamination of the aquifer by the previous animal production activities, it is difficult to recognise what will be gained by carrying out a comprehensive Contaminated Site Investigation. Our preferred method to resolve the Contaminated Site issue is to undertake the investigation by a preliminary sampling of soils in and under the ponds and shed areas.

If little or no contamination is evident from these samples, then it should be unnecessary to take samples of the aquifer.

Although probably unnecessary, after the checking of the effluent ponds and shed areas, with any soil requiring removal being relocated, the proponent is prepared to replant the area between the sheds and over the leveled ponds with native vegetation, forming a continuous corridor from the subdivision road to Ellen Brook. This corridor would range between 40.0 to 60.0 metres in width, commencing 120.0 metres east from Ellenbrook Road on the subdivision road, thence moving to the south west for 90.0 metres over the leveled effluent pond area. It would meet the proposed vegetation linking Ellenbrook Road in the south west of proposed Lot 1 through to Ellen Brook along the southern boundaries of Lots 2, 8 and 7, then to the north for the width of Lots 6 and 5 along Ellen Brook.

All land that may have been contaminated would be planted to native vegetation, with the overall length of the connecting corridors between the subdivision road, Ellenbrook Road and Ellen Brook being 1050.0-1100.0 metres.

This area of vegetation totaling approximately 4.5 hectares would be fenced with stock proof material and have firebreaks constructed along its boundaries with the proposed Lots 1, 2, 8, 7, 6 and 5.

The aesthetics and landscape value of the area will also be greatly enhanced with this corridor of vegetation located between Ellenbrook Road, Ellen Brook and thence to the north, one hundred and eighty metres along Ellen Brook.

5.0 ENVIRONMENTAL MANAGEMENT

This section includes all measures that will be implemented to manage any environmental impacts identified in section four which will ensure fulfillment of the objectives of the EPA. These environmental management measures, to which the proponent commits in this Environmental Review, will demonstrate that the subdivision presented to the Western Australian Planning Commission (Figure 4), will in general impact positively in fulfilling the outlined objectives of the EPA.

The main environmental issues outlined were the impacts of the subdivision on the Western Swamp Tortoise on its habitat and the environmental values of regionally significant wetlands and the watercourse of Ellen Brook.

Another aim of the EPA is to maintain or improve the quality of surface and ground water to ensure the protection of existing and potential uses including ecosystem maintenance of the Swamps within the Twin Swamps Nature Reserve, Ellen Brook, Swan and Canning Rivers and the proposed Priority 3 Surface Water Control Area.

The EPA expect that the site previously used for poultry farming, followed by use as a piggery, will be rehabilitated to an acceptable standard compatible with the intended land use and conforming with the appropriate criteria outlined in the Department of Environmental Protection's Contaminated Sites Management Series of documents.

In summary the expectation of the EPA is that the impacts on the Western Swamp Tortoise and its habitat through negative changes in water quality will not occur, thus ensuring the ecosystem maintenance of Twin Swamps Nature Reserve, the Ellen Brook, the Swan and Canning Rivers Priority 3 Surface Water Quality Control Area.

Outlined below are the methods by which the water quality will be maintained at its present satisfactory level or further improved as a result of the proposed subdivision. They are:

1. the revegetating of a 40.0 metre corridor on previously cleared land with native vegetation of similar species to that previously located on the land prior to it being cleared, on the eastern sectors of lots 5, 6 and 7, adjacent to Ellen Brook;
2. the revegetating of a 40.0 metre corridor of vegetation on previously cleared land in the north west of lot 1, south west of lot 2 and south west of lot 8, to afford protection to the adjacent dampland in the adjoining property, lot 1;
3. the continuation of the 40.0 metre corridor of native vegetation in the south west of lot 8 to follow along its cleared southern boundary and that of lot 7, which is also cleared, which connects with the northern corridor of native vegetation west of Ellen Brook;
4. the locating and removal of any soil from the site of the previous poultry and piggery industries, with a contamination level above that specified by the Department of Environment, which requires its removal and relocation;
5. the leveling of the effluent pond site in the proposed subdivision lot 2, then its revegetation with native vegetation species. This corridor will vary in width from 40.0-60.0 metres, commencing from a point south and adjoining the proposed subdivision road, then continuing over the leveled site of the effluent ponds, connecting to the corridor of vegetation extending from the north of the dampland at the junction of lots 1 and 2 which then extends to the Ellen Brook;
6. the use of Zeolite at the rate of 2.0 tonnes/hectare on the revegetated area from the subdivision road in the north to the vegetation in the south above the dampland in lot 1;
7. the revegetating to a width of 40.0 metres where necessary, as there is already some vegetation adjacent to the house, in the south of proposed lot 1, to provide a connection from Ellenbrook Road to the revegetated area in lot 1 on the west of the adjacent dampland, this then resulting in a continuous corridor of vegetation approximately 1.2 kilometres long, except for firebreaks through to Ellen Brook, in the north east of lot 5;
8. the on-site effluent disposal will be through the use of alternative waste water systems (AWWS) with amended soils, either by use of those amended soils of a high Phosphate Retention Index (PRI) packed around the leach drain (Ecomax), or self contained aerobic systems (e.g. Envirocycle,Biocycle), which use irrigation for the dispersal of waste water. In either case all the phosphate is absorbed by the amended soil and the nitrates reduced by at least half during normal working conditions (Stephens 1998, LCEM Plan, s4,4, pp20-22);
9. the stocking rates for the land to recognise Department of Agriculture Guidelines and conform with the requirements of the City of Swan Town Planning Scheme No. 9 for this Policy Area;
10. the application of Zeolite at a rate of 2.0 tonnes/hectare over all cleared land will be carried out, with it being incorporated in to the top 5.0 centimetres of soil, this being implemented prior to the release of any lots for sale;
11. the fencing of the boundaries of all lots and all revegetated areas of native vegetation will take place prior to the sale of any lots, with fencing of a standard height using 1.8 metre steel posts, or equivalent height wooden posts, with six line ringlock or equivalent mesh fencing with standard steel gates, where necessary, to allow access to the road and revegetated areas for the owner and also fire fighting equipment, if ever necessary;

12. the firebreaks will conform to the requirements of the City of Swan, being constructed and installed prior to the sale of any lots and located on the perimeter of each lot. Also they will enclose each area of planted native vegetation;
13. the subdivision road drains will be constructed to conform with the City of Swan's specifications, with any necessary defined drain directing the water into a vegetated area, to allow absorption of the excess water from the road;
14. the issue of information for prospective lot holders covering, among other matters, the positive environmental impacts of the use of slow release fertilisers, with applications preferably taking place twice yearly to reduce both transfer of nutrients to water bodies and also use less fertiliser per annum.

6.0 ISSUES FOR BOTH THE ENVIRONMENTAL REVIEW AND THE STATE ADMINISTRATIVE TRIBUNAL

There are items of interest which effectively have been the cause of the Minister for the Environment allowing the Appeal by Mr Hawke against the level of assessment of PUEA, set by the EPA, on his proposal to subdivide Lot 2 into eight two hectare lots.

Most of these will be examined in Appeal No. 55 of 2004 before the State Administrative Tribunal. Notwithstanding this, many environmental issues were at the forefront in decisions made in relation to land use in the Policy Area, but are not examined in the Environmental Review.

Of particular interest are the City of Swan's Town Planning Schemes Amendment 356, applicable to part of the Policy Area and Amendment 362, applicable to Lot 4 Railway Parade, located within 800.0 metres to the west of the Ellen Brook Nature Reserve. The failure to provide a scientific basis to support the setting by the WAPC, supported by the EPA and other Agencies, of the 8.0 hectare minimum allowable lot area resulting from Amendment 356, is also a matter of interest to us and should also be examined by the State Administrative Tribunal.

Another matter applicable to both this Environmental Review and the Appeal to the State Administrative Tribunal, is the claim by the EPA that allowing this subdivision proposal would set a precedent to follow for others wanting to subdivide. Our argument is that this Environmental Review must be assessed by the EPA on the environmental merits of the material presented, not on the setting of precedent. Also this application for subdivision was lodged prior to the passage of the now City of Swan's Town Planning Scheme No.9, Amendment 356, through the legal and planning process required for its implementation.

6.1 CORRESPONDENCE, ABORIGINAL SITES INQUIRY

Appendix 7 includes the information related to the Aboriginal Sites Inquiry obtained from the Register System forwarded by the Department of Indigenous Affairs of the Metropolitan Regional Office, Midland.

Mr Lindsay Stephens in his consultants report stated, Section 2.8, Aboriginal Sites, that no sites were listed for this area when he undertook the Land Capability and Environmental Management, Ellenbrook Road Structure Plan dated 28/03/1998. However Mr Stephens found during his assessment process, five Aboriginal sites throughout the area, one being previously known, but not listed, this being located and marked south of the claypan on Lot 1.

The newly identified sites were reported to the Aboriginal Affairs Department by Mr Stephens.

No indigenous communities have been involved in the development and implementation of earlier editions of this recovery plan and no indigenous community has shown any interest in the conservation of the Western Swamp Tortoise (Burbidge, A, A and Kuchling, G, 2004, p.24). They further stated that should any indigenous community express a wish to be involved, every consideration will be given to facilitating that involvement.

6.2 WESTERN SWAMP TORTOISE RECOVERY PLAN 2004: GUIDE FOR DECISION MAKERS AND RELATED MATTERS

In Related Matters in the Recovery Plan of 2004, Section 3.5, Social and Economic Impacts, the following statements are made. *The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts,* and *All populations are within nature reserves.*

This statement can be well argued against, being supported with information available since 1994, that there have been quite significant social and economic impacts on many landowners in the area with the "blighting" of their land through being unfortunate in owning land located in the Policy Area.

The EPA maintain that they cannot assess social and economic impacts, this being based on a court Ruling in 1996. However a previous member of the Board of the EPA, stated that *the court found that the EPA compromised the environment by considering commercial and political impacts when it gave the go-ahead to sand-shell mining in Cockburn Sound.* But the previous member of the Board said *while these social impacts were irrelevant to the EPA, others were confirmed as relevant. They are the physical, biological and social factors connected to a place where development will occur.*

The ruling confirmed that people's aesthetic, cultural, economic and social surroundings were part of the environment. The above statements which were outlined in the West Australian, Tuesday April 2, 1996, page 26, and should be applicable in the matter of Mr Howard Hawke, other landowners in the Policy Area and all other landowners affected by decisions of the EPA, where social issues are not included in the assessment process.

Burbidge, A, A and Kuchling, G, 2004, outlined possible future actions that may constitute a significant impact on the Western Swamp Tortoise or its habitats, including:

- any action, including changes in land use within catchments, that affected the quantity or quality of water flowing into swamps utilised by the species, including drainage and land-use in the catchments that caused pollution or eutrophication;
- any nearby industrial development that affected air quality to the extent that rainfall quality changed to the extent that water quality in the swamps was lowered;
- subdivision of the land near Twin Swamps and Ellenbrook Reserves to urban or near urban levels, thus increasing people pressure on the habitat and leading to increased risk of frequent fire, increased damage to the fox proof fences, and increased demand that nuisance insects within the reserves be controlled; and/or
- developments or actions that increase the number of rats and ravens in the area of the reserves.

Evident from the above first point is whether EPA condone revegetation on the scale envisaged in this proposal, as that combined with the use of Zeolite, will certainly prevent lower nutrients from entering the groundwater system and lower surface run-off in the area.

Also the Recovery Plan states that subdivision to urban or near urban levels should be opposed because of people pressure, fire risk, damage to fences and demand for control of nuisance insects. Subdivision to 2.0 hectares, as proposed by Mr Howard Hawke, cannot under any circumstances be classified as being to urban or near urban levels.

That statement in the third point was given no consideration whatsoever by those involved with the process, when the now City of Swan TPS 9, Amendment 362 was passed, being acceptable to the EPA and apparently other Agencies, for accepting relatively high density urban development within 800 metres of the Ellen Brook Nature Reserve. The proposal of Mr Hawke for subdivision to 2.0 hectare lots, certainly complies with the outlined requirement in number three above.

7.0 COMMITMENTS BY THE PROPONENT

The following commitments are provided by the proponent for the subdivision of Lot 2, Ellenbrook Road, into eight, approximately two hectare lots, Zoned Special Purpose.

1. Surface and groundwater quality water will be maintained and improved over a period of time by an extensive planting of native vegetation species, including both top storey and under storey species, native to the area, to bring the total vegetated area on Lot 2, Ellenbrook Road to one third of the total area of the land.
2. Included in that vegetation will be plantings providing a continuous 40.0 metre corridor of vegetation including firebreaks, between Ellenbrook Road on the northern boundary of Lot 1, through to the southern boundary of Lots 8 and 7 and northwards adjacent to Ellen Brook, from Lot 7 through Lots 6 and 5.
3. Also included in the revegetation is the area commencing from the subdivision road in the vicinity of the shed, through the leveled pond area, taking in existing vegetation to provide a linkage with the vegetation connecting Ellenbrook Road with Ellen Brook and the forty metre corridor of vegetation on the eastern boundaries of Lots 5, 6 and 7.
4. To reduce nutrient loadings, which could impact on water quality, all lots will require alternative waste water systems (AWWS) with amended soils. These can be either systems in which amended soils of a high Phosphate Retention Index are packed around the leach drain (Ecomax), or self contained aerobic systems (eg Envirocycle, Biocycle), which use irrigation for the dispersal of waste water. In either case all the phosphate is absorbed by amended soil, and the nitrates reduced by at least half during normal working conditions. However there are the presence of brown sands and ferricrete over most of Lot 2, which have high levels of iron oxides, these having a high capacity to absorb phosphorous.
5. Fire breaks will be constructed to conform with the City of Swan requirements. Information will be provided to purchasers on the necessity to keep vegetation clearance around buildings to maximise safety. Because of the corridors of vegetation to be planted, a firebreak should be on the boundary of the lot, with a further area with a firebreak where the vegetation corridor internal boundary is situated in each affected lot. The location of building envelopes are important.
6. Consideration should be given by the City of Swan to make it a requirement for subdivision proposals where scheme water is not available, that in one tank on each lot when the home is built, that at least 10,000.0 litres of water be kept as a minimum in that tank, which will have a universal coupling installed to allow connection to a mobile fire fighting unit or tanker to take water for fire fighting purposes. The City of Swan is being approached to check on the feasibility of whether they agree that there is any merit in this approach.

7. Subdivision road drains will have their water discharged into either planted or existing vegetation in all cases to prevent damage by water erosion, with most of the water being able to be retained on-site.
8. The issue of a booklet of instructions will be available to those purchasing any of the lots. Fertiliser rates and time of application, whether once or twice yearly, stocking rate information and where to obtain information on various matters will be made available to those interested.
9. The application of 2.0 tonnes of Zeolite to the hectare on the cleared land will be implemented, with it being incorporated in the top 5.0 centimetres of soil. This is to assist in nutrient and water retention and will take place prior to the sale of the lots.
10. Fencing of the boundaries of the lots will be undertaken prior to sale, with fencing of a standard height utilising steel or wooden posts, with six line ringlock or equivalent material with two plain wires above, with standard width steel gates to allow access to the road and revegetated areas and also provide entry for the construction of fire breaks.
11. The determination of whether the area where the piggery was located is will be examined for contamination and necessary action to rectify any contamination implemented.

8.0 CONCLUSION

The subdivision as proposed by Mr Howard Hawke has fulfilled the Objectives of the Environmental Review, having examined the proposal in the context of the local, and to a lesser extent the regional environment. In fact there will be a positive outcome for the local environment, with no negative impact on the regional environment and a positive impact for the Western Swamp Tortoise. This will be achieved through the commitments made by Mr Hawke that will be in place through the implementation of this proposal. The subdivision will provide an example of sustainable land use, conforming with the environmental parameters set by the EPA.

All the components of the proposal have been adequately described and commitments made to address the environmental issues raised by the EPA in the Environmental Review. Those components are, specially protected fauna, the Western Swamp Tortoise, regionally significant wetlands and watercourse, surface and groundwater quality, and soil and groundwater contamination.

This proposal conforms in all aspects with the Guide for Decision-Makers, Burbige A, A and Kuchling, G, 2004, addressed in Section 6.2.

The use of Zeolite for assistance with retention of nutrients at the rate of 2.0 tonnes/hectare, will also be of great benefit to the soil and further assist in improving the capacity of the of soil's nutrient retention and water holding capacity.

Ferguson, Kenneison and Associates, in conjunction with Mr Howard Hawke, are prepared to work in conjunction with the Department of Environment in the use of Zeolite in reducing the input of nutrients into the Swan River from Ellen Brook, these entering the drainage system from the farming areas further to the north.

J R Ferguson
for
Ferguson, Kenneison and Associates

Date: 8 July 2005

APPENDIX 1

LAND CAPABILITY AND ENVIRONMENTAL MANAGEMENT

ELLENBROOK ROAD STRUCTURE PLAN

28 March 1998

SEE NOTE ON SECOND CONTENTS PAGE WITH RESPECT TO THE ATTACHED PLANS

12 July 2002

by

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Land Capability and Environmental Management

Ellenbrook Road Structure Plan Bullsbrook

28 March 1998

12 JULY 2002

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FIGURES

ATTACHMENTS

Soil Map
Predicted Maximum Water Table Elevations
Environmental Limitations and land Capability

NOTE

The maps for this land Capability and Environmental Management Assessment were completed in draft and supplied to Broughton Planning. I understand that the plans were redrawn, but as I have not seen those plans the only plans that I can certify are those draft plans attached. The certified plans contain my CV block and are signed by myself.

For a variety of reasons I no longer have the original file. There may have been a Vegetation Map in the original plans.

CONTENTS

1.0 INTRODUCTION

The Ellenbrook Road Structure Plan forms a development proposal for the land bounded by Almeria Parade, Warbrook Road, Ellen Brook and the Ellen brook Nature Reserve in the south.

This land capability study has been completed to identify the quality of the land and the key environmental features that will be used in the design of the structure plan.

Fieldwork was carried out on 15 and 16 January 1998 during which 58 soil auger holes were drilled on the site and all lots included were walked and assessed. In addition aerial photo interpretation and research of published information was used . The geology, geomorphology, vegetation and hydrology were determined during the field work.

1.1 Current Landuse and State of the Environment

The site is almost completely cleared apart from some minor clumps of Banksia Woodland associated with the more elevated sand ridges. Several small drainage channels have been constructed across the site draining east to Ellen Brook.

Ellen Brook Nature Reserve adjoins the eastern part of the southern boundary, and Twin Swamps Reserve adjoins the north western corner. Both of these reserves, A27620 and A27621 are recorded in System 6 as M17, Dept of Cons. and Environ. Oct 1983. They are fenced for the protection of the Rare and Declared Short Necked Turtle. A number of vegetated and small sumpland wetlands are shown on Water and Rivers Commission maps although some of these have been identified from pasture differences using aerial photography and do not accurately reflect their true nature. All farm dams are also classified as basin wetlands possibly on the basis of the proximity to the reserves for the protection of the Short Necked Turtle.

Great Northern Highway lies on the eastern side of Ellen Brook and Pearce Airbase 3 km to the north.

The Ellen Brook Speedway lies in the central south of the site, a poultry operation is located in the centre. The remainder of the site is used for hobby farming with horses the most common occupation. In general the land is under utilised.

Ellen Brook is one of the most nutrient rich water bodies entering the Swan River. The nutrient is believed to be coming from the use of phosphate based fertilisers.

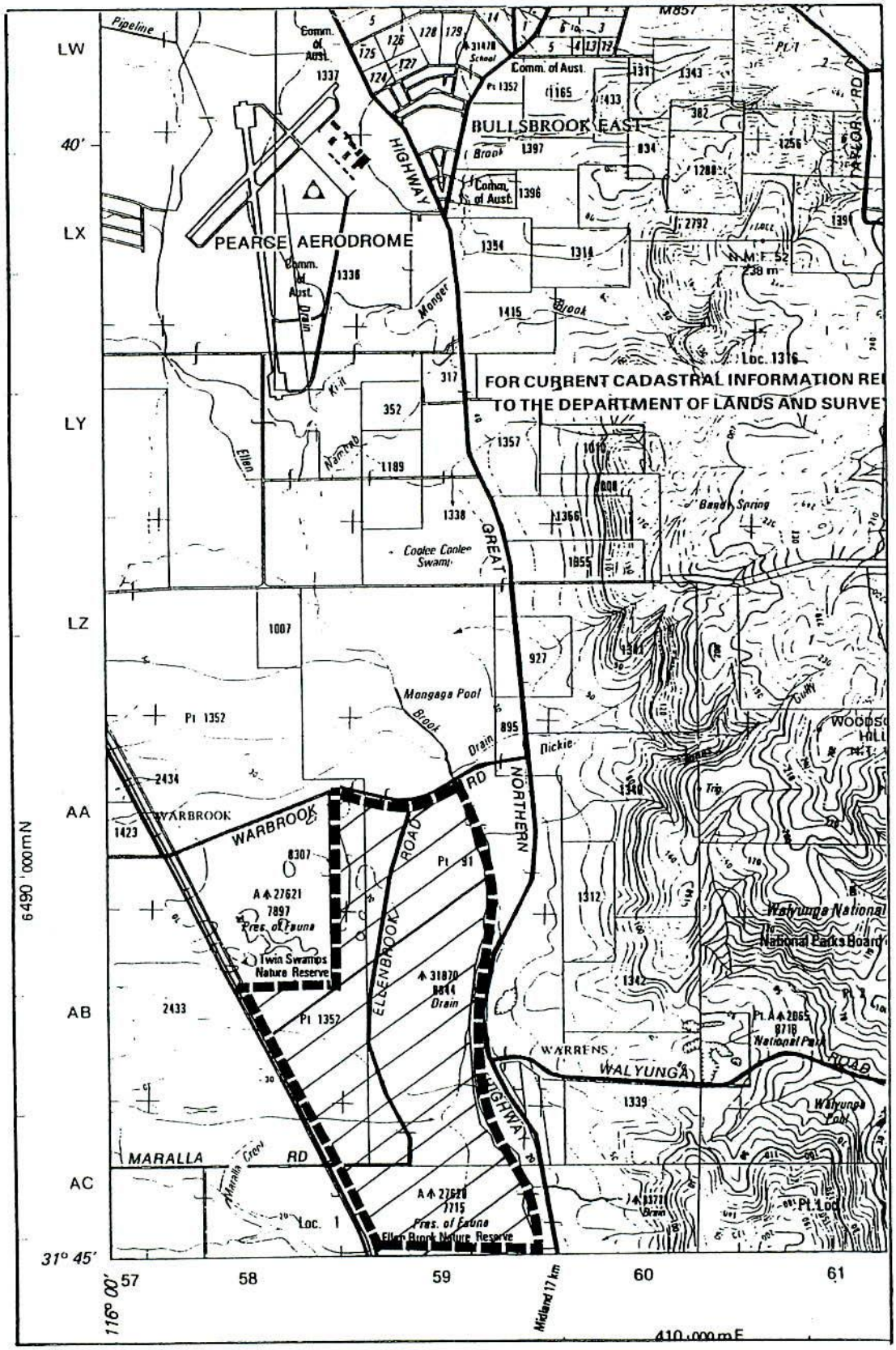
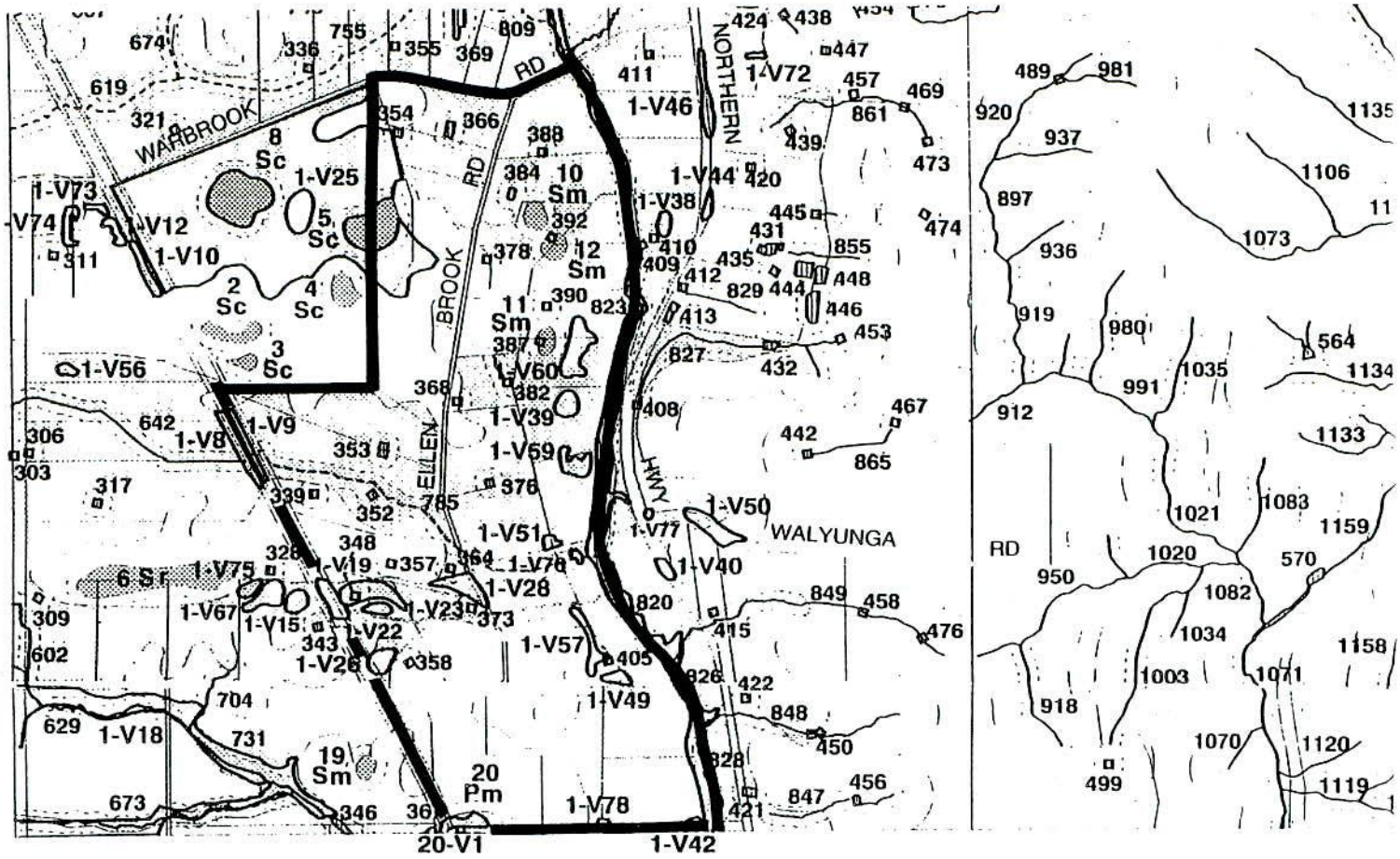


Figure 1 Location Plan



BASIN AND FLAT WETLANDS

- lake (permanently inundated), estuary (permanently inundated)
- sumpland, floodplain (seasonally inundated), estuary (peripheral)
- vegetated section of extensive wetland
- dampland, palusplain (seasonally waterlogged)
- vegetated section of extensive wetland
- other basin wetlands

CHANNEL WETLANDS

- River (permanently inundated)
- Creek (seasonally inundated)
- Artificial channel
- Gravity or Pressure Drainage Pipes (metro area)

WETLAND TYPE

- L Lake
- CR Creek
- S Sumpland
- D Dampland
- AL Artificial Lake
- F Floodplain
- P Palusplain
- R River
- EW Estuary (Waterbody)
- E Estuary (Peripheral)
- PS Paluslope

PRELIMINARY WETLAND MANAGEMENT CATEGORY

- c Conservation
- r Resource Enhanceme
- m Multiple Use
- na Not Assessed

Note: All vegetated sections of wetlands are assigned a Mana Category of Conservation.

ZONES OF INFLUENCE

- Zone of Critical Influence 50 metre boundary
- Zone of Secondary Influence 200 metre bound

Road Boundary

Property Bo

Figure 2 Wetlands

2.0 EXISTING ENVIRONMENT

2.1 Geology and Geomorphology

The land is relatively low lying, associated with flood plains and alluvial terraces of Ellen Brook. The site rises generally from 17 metres in the south east to just over 30 metres on the higher sand ridges in the north west. The majority of the site lies between 20 and 27 metres.

The landform of the site is classified as Bassendean Sand B2, with the wetland in the north west as Vasse 1 (Wells and Hesp, Land Resources of the Mandurah - Murray Region, Agriculture WA). The soils are in general leached and grey sands, interspersed with silty loams and coarser sands both laterally and vertically, indicating alluvial reworking and deposition.

The site was formed from meandering river processes of Ellen Brook with a series of small terraces in alluvial clays and silts of the Guildford Formation that underly the whole site. Below this the site straddles the Darling Fault at depth but is covered by Cretaceous sediments.

Overlying the silts and clay above this is a thin veneer of quartz sand which in several places forms low dunes. These sands are generally poorly drained and frequently water logged with the development of a perched water table during winter. Blowouts have developed on the dunes following the removal of vegetation since settlement of the land.

2.2 Soils

The Atlas of Natural Resources (Dept of Conservation and Environment, 1980) and Agriculture WA (Land Resources of the Mandurah-Murray Region) lists the site as;

Yanga	Poorly drained plain with sandy benches and intervening swamps with areas of marl, solenetzic soils and bog iron ore.
Beermullah	Poorly drained plain, saline and solenetzic soils, bog iron ore and some shallow sands over bog iron ore.

In general the soils of the lower elevations in the eastern parts are ferruginous brown sands over bog iron ore/ferricrete, with wet sand over silt and clay in the north western corner. The remainder of the central and western parts are low wet white sand over silt at depth with intervening sand dunes.

The silts and clays are slightly variable due to their alluvial origins with lenses of sand and silt, both vertically and horizontally. These are exposed on the surface in the north west and in various dams across the site. Adjoining the clays are small areas of sand over clay duplex soils that have many similar management issues to the sits and clays. The main issue in these soils is water logging in winter with a high potential run off of nutrients. Several clay pans occur in the north east.

A quartz sand sheet has been laid over the basal silts in relatively recent times during arid conditions. Movement of the sand appears to have been blown across the site from the north west. The sand is normally 1 - 2 metres deep to over 5 metres on the sand ridges. The lower

sands are wet and leached white. The quartz sands grade, with some minor yellow sands at depth on the ridges, are particularly prone to wind erosion and have low water and nutrient retention.

In the east the sands are brown, being composed of quartz grains that are coated with goethite during leaching and transport through the shallow groundwater to be deposited as a bog-iron /ferricrete layer usually close to the surface. Formation of the bog iron occurred during slightly higher water table regimes. These soils are distinctly brown and overly massive ferricrete duricrust overlying clays. These soils have good nutrient retention but shallow ferricrete duricrust decreases the capability of the soil.

The main soil units are;

- Deep White Sand
- Brown Loam and Ferricrete
- Low wet Sand
- Sand Over Clay Duplex or clay

Typical profiles are shown below;

Deep White Sand
Hole 47 Sand dune in the central west

0 - 100 mm	Grey leached quartz sand
100 - > 2 500 mm	White quartz sand
End of Hole 2 500 mm	Water table at 1 270 mm

Low Wet Sand
Hole 20 Central south of the site

0 - 100 mm	Grey leached quartz sand
290 - 1 850 mm	White quartz sand
1 850 - 2 500 mm	Cream brown silty clay
End of Hole 2 000 mm	

Sand Over Clay
Hole 58 North west of site

0 - 310 mm	Grey white sand
310 - 1 500 mm	Cream slightly mottled clay
End of hole 1 500 mm	

Brown Sand and Ferricrete
Hole 51 Central north of site

0 - 300 mm	Brown to light brown sand
300 - 1 550 mm	Brown ferricrete
1 550 - > 2 500 mm	White-cream clay with minor red brown mottles
End of hole 2 500 mm	

2.3 Climate

Full climatic data is recorded at Bullsbrook which has an overall climate of warm to hot dry summers followed by cool wet winters. Summer maximum temperatures range from over 33 °C in the hottest months down to under 18 °C in the coldest months. Minimum temperatures range from about 18 °C in summer down to near 8 °C in the coldest months.

Rainfall averages 688 mm per year of which 90% falls in the months April to October inclusive.

Wind directions at the Swan Research Station are from the east on 70% of the summer mornings and west-south west for 60% of the afternoons depending on the time of arrival of the sea breeze. Winter winds are lighter and more evenly distributed.

Soil Characteristics	Deep White Sand	Brown Sand and Ferricrete	Low Wet Sand	Sand over Clay Duplex or Clay
Location	On the higher elevations and sand ridges across the site	Lower elevations in the eastern parts of the site	Lower elevations in the western and south eastern pars of the site	Central north of site
Topsoil Texture	Grey quartz sand over white leached quartz sand	Brown quartz sand	Leached grey white sand	Grey sand
Subsoil Texture	White sand with some yellow sand	Ferricrete of variable thickness up to 1200 mm over clay	White sand over silty clay at depths of over 1 metre	White to cream yellow sand with minor mottles and minor ferricrete development at clay interface
Stone	Nil	Stone and massive ferricrete	Nil	Nil
Gravel	Nil	Little apart from broken ferricrete	Nil	Nil
Depth to Bedrock	Very deep	Very deep	Very deep	Very deep
Hardpan	Nil	Ferricrete hard pan	Nil	Clay interface
pH	Neutral to acidic	Acidic	Acidic	Acidic
Soil Salinity	Low	Low apart from claypans	Low	Low
Soil Permeability	High	Moderate to underlying clays	High in surface sand, low in underlying clay	Low
Soil Shrinkage	Nil to low because of the depth of sand	Low	Low	Moderate due to presence of silty clay.

2.4 Hydrology

A significant amount of data on the site is included in the East Gnangara Environmental Water Provisions Plan, Water and Rivers Commission, 1997 because the site lies just the East Gnangara Mound with the eastern boundary of the mound forming the western boundary of the subject land.

The site is part of the alluvial plains associated with Ellen Brook which flows along the eastern margin of the site. Normally water flows in Ellen Brook are small and are confined to the main channel. Following particularly heavy winter rainfall events Ellen Brook rises but does not impact on the subject land because the channel is incised on its western shore.

The main hydrological flows are from precipitation falling on the site and immediately to the west. These flows are from west to east across the site, being directed by small artificial drainage lines to Ellen Brook. Several clay pans occur in the north east. Because of the sand over clay soils these have the potential to quickly transport nutrients to Ellen Brook. In addition the Darling Fault runs north south under the site and some leakage of surface water into the underlying Mesozoic sediments is possible along and to the west of the fault line.

Groundwater levels could have been expected to rise as a result of land clearing due to reductions in evapotranspiration, however, with extraction by bores and wells and reduced rainfall water, levels have fallen. The wetland water levels in Twin Swamps Reserve are artificially maintained from a production bore north of Warbrook Road. Predictions made in the East Gnangara Environmental Water Provisions Plan, Water and Rivers Commission, 1997 show that with predicted extraction from East Gnangara Mound there will be no change to groundwater levels on the site. Under a wetter climate and including extraction, water levels can be expected to be 0.5 m to 0.75 m higher, whereas under a drier climate ground water levels are expected to fall by about 0.75 m.

Current groundwater levels across the site vary with the season, but in January 1998 were 1.5 to 2.5 metres below ground level over most of the site. There is better shallow ground water resource in the south because of the presence of deeper sand over clay base, with the water perched on the sand. In the north the clay soils close to the surface mean that flow rates are slow and thus the water availability is reduced. At least one small farm dam in the central north is artificially maintained by pumping water from the Leederville Formation from a depth of 61 metres.

Shallow groundwater quality is good in the dams with between 110 and 130 mSm across the site, (potable water is < 250 mSm).

Ellen Brook contributes 36% of the phosphorous load of the Swan-Canning Estuary, (Shire of Swan, 1996 Environmental Report p55).

2.5 Vegetation

There is little remnant vegetation across the site apart from remnant Banksia Woodland on the higher sand ridges of the west, scattered clumps of Flooded Gum *Eucalyptus rudis* in the east and fringing Ellen Brook and minor patches of wetland shrubs in the central south.

Banksia Woodland species include *Banksia attenuata*, Banksia Woodland with Jarrah, *Eucalyptus marginata* and *E. todtiana* over *Banksia menziesii*, *B. attenuata*, *B ilicifolia*,

Xylomelum occidentale, Allocasuarina humilis, Nuytsia floribunda, Hibbertia hypericoides, Xanthorrhoea gracilis, Jacksonia densiflora, Haemodorum sp, Macrozamia riedlei, Stirlingia latifolia, Acacia pulchella, Adenanthos cygnorum, Dasypogon bromeliifolius, Calytrix flavescens, Patersonia juncea, Eremaea pauciflora, Petrophile linearis, Scholtzia involucrata, Leucopogon spp, Johnsonia pubescens, Loxocarya flexuosa and *Mesomelaenea stygia*. Marri *Eucalyptus calophylla* occurs on the lower more yellow sands.

Lower wetter sand areas are typified by Flooded Gum, *Eucalyptus rudis* with the Paperbarks *Melaleuca preissiana, M. rhaphiophylla* over *Astartea fascicularis* and *Beaufortia elegans.*

Overall the remnant vegetation is in only fair condition, being grazed, commonly invaded by pasture weeds and suffering tree decline.

Lists of the potential Rare and Priority species are included in East Gnangara Environmental Water Provisions Plan, Water and Rivers Commission, 1997. None was observed during the site visit. Seasonal factors would have prevented annual species from being identified, but all vegetation is grazed and has reduced understorey and significant pasture species.

2.6 Fauna

The site is cleared apart from scattered patches of disturbed remnant vegetation. The number of fauna species will be moderate considering the number of habitats available and will be mainly restricted to amphibians, reptiles and birds. Of note is the presence of the Rare and Declared Short Necked Turtle *Pseudemydura umbrina* which is located in the reserved Twin Swamps and Ellen Brook Nature Reserves but also occurs across the site. At times in the past turtles found on properties have been relocated by CALM.

Bird species may change following a low density development and in fact may increase in number because vegetation planted by the property holders will add to the habitats of the area.

2.7 Wetlands

The site has significant areas of water logged soils however almost all these areas are cleared pasture. Perhaps because of the proximity to reserves nominated for the protection of the Western Swamp Turtle there has been much classification of the wetter parts by Water and Rivers Commission/EPA, in Wetlands of the Swan Coastal Plain Volume 2b. The number of apparent wetlands is misleading.

For example V39, V59 and V60 in the east are clumps of Flooded Gum *Eucalyptus rudis* and 19 nominated wetlands (eg 354, 366 and 388 in the north) are farm dams.

However **it should be made clear that a number of Western Swamp Turtles occur outside the reserves on the subject land and animals may be resident in any water body**, including farm dams. In the past some of these turtles have been collected by CALM and relocated.

In spite of the above, none of the wetlands are listed under EPP Policy The Lakes and the wetlands are listed as Multiple Use.

Ellen Brook Nature Reserve adjoins the eastern part of the southern boundary, and Twin Swamps Reserve adjoins the north western corner. Both of these reserves, A27620, A27621, and Ellen Brook are recorded in System 6 as M17, Dept of Cons. and Environ. Oct 1983. They are fenced for the protection of the Rare and Declared Short Necked Turtle. The fencing of the reserve has incorporated approximately 75 metres of buffer distance. The swamps associated with Twin Swamp Reserve are listed under The Lakes EPP and by CALM.

2.8 Aboriginal Sites

The Ellen Brook/Walyunga area is highly significant in terms of prior aboriginal occupation. Walyunga was one of the largest camping grounds in the south west and the adjoining areas were used for food and camping. A summary of some aspects of the area to the west is included in East Gnangara Environmental Water Provisions Plan, Water and Rivers Commission, 1997.

Records of the Department of Aboriginal Affairs were searched for previously identified sites, in addition sites were noted during the field work. None of the sites was listed as occurring in the study area. The Bullsbrook camp site was listed as within a 10 km radius. However the owner of Lot 1 noted that the clay pan on his property had been identified as an aboriginal site on the basis of several stone artefacts found. This site does not appear to be recorded on Department of Aboriginal Affairs records.

Ellen Brook is listed as an ethnographic site in East Gnangara Environmental Water Provisions Plan, 1997.

In addition four further archaeological sites were noted during the field work. All of these were located in recent deflation hollows in sand dunes following land clearing. At each site the main material was numerous quartz flakes, water worn and worked granite and dolerite cobbles together with some quartzite and gneiss. Included are pieces of chert (Eocene?) which is likely to indicate the sites pre-date the last sea level rise 6 500 years ago. Other archaeological materials can be expected to occur under the dunes but as yet have not been exposed.

The newly identified sites have been reported to the Aboriginal Affairs Department.

3.0 LAND CAPABILITY FOR SMALL RURAL HOLDINGS

The opportunities of the site are:

- Potential reserves of good quality shallow ground water
- The proximity to Ellen Brook.
- Access to Bullsbrook.
- The scattered clumps of remnant vegetation.
- The presence of brown sands under most of the central and north eastern part of the site. which have a high capacity to absorb phosphorous.

The constraints on the site are:

- Deep leached sands and sand over clay which have a high wind erosion potential.
- Ferricrete close to the surface in the north east which will restrict excavation.
- Low nutrient retention of the leached sands, particularly in the south.
- Water logging on lower elevations over much of the site.
- Drainage of surface water to Ellen Brook.
- The presence of the adjoining Ellen Brook and Twin Swamps reserves.
- Ellen Brook Speedway in the south.
- Presence of occasional Short Necked Turtles.
- Poultry farm in the central area.

Land Qualities	Deep White Sand	Brown Sand and Ferricrete	Low Wet Sand	Sand over Clay Duplex or Clay
Slope	Low to moderate	Low	Low	Low
Slope Stability	Moderate, subject to wind erosion	High	High	High
Rock/Gravel	Nil	Common ferricrete	Nil to minor	Nil to minor ferricrete
Wind Erosion Risk	High	Low	Low	Low
Water Erosion Risk	Low	Low	Low	Low
Drainage	Well drained	Low to moderate through surface sand but restricted by underlying clay	Poorly drained Rapid to the sandy clay. Restricted by underlying clays.	Poorly drained, restricted by underlying clays.
Moisture Availability	Low	Low to moderate	Moderate to high	Moderate
Water Logging	Nil	Moderate to high with scattered waterlogged areas.	Moderate to high with scattered waterlogged areas.	High with scattered waterlogged areas.
Wetability	Non wetting	Moderate	Moderate to high non wetting	Low non wetting
Flood Risk	Nil	Low apart from water logged areas and clay pans	Low apart from water logging and drainage lines	Low apart from water logging and drainage lines
Surface Water - Availability/Quality	Nil	Moderate Dams of good quality water (< 150 mSm) but quantity restricted	High Dams of good quality water (< 150 mSm).	High Dams of good quality water (< 150 mSm).
Ground Water - Availability/Quality	Moderate, depending on location. Shallow and deep aquifers have good quality of < 150 mSm	High, depending on location. Shallow and deep aquifers have good quality of < 150 mSm	High, shallow and deep aquifers have good quality of < 150 mSm	High, depending on location. Shallow and deep aquifers have good quality of < 150 mSm
Salinity Risk	Nil	Generally low but high in clay pans	Low	Generally low but high in clay pans
Microbial Purification	Low	Low to very low	Very low	Low
Water Pollution Risk	High	High	High	Low to moderate

Soil Profile; Phosphate absorption	Very low	Moderate to high based on the proportion of iron oxides and distance of lateral movements	Very low	Low depending on speed of run off and degree of leaching
Soil Profile; Nitrogen Removal	Low	Moderate depending on the degree of anoxic conditions	Moderate to high depending on the degree of anoxic conditions and speed of run off	Low to moderate depending on the degree of anoxic conditions and speed of run off
Existing Degradation	Low to moderate, largely disturbed vegetation with some blowouts	Moderate Cleared	Low Cleared	Low Cleared

Development Capability	Deep White Sand	Brown Sand and Ferricrete	Low Wet Sand	Sand over Clay Duplex or Clay
Ease of Excavation	High	Moderate depending on thickness of ferricrete and perched water tables	High but restricted by perched water tables	Moderate, restricted by high water tables and clay depth
Dam Site Construction	Nil	Generally high	High	High
House and Road Construction	High.	Moderate to high	Moderate to high,but restricted by perched water tables	Moderate due to potential water logging and clay.
Foundation Soundness	High AS 2870 Site Class A.	High AS 2870 Site Class A, provided 900 mm sand lies over any clay.	Moderate - high AS 2870 Site Class S, provided 900 mm sand lies over any clay and perched water tables are not a problem.	Moderate when depth of surface sand and fill exceed 900 mm. AS 2870 Site Class S. Site class M if sand is less than 900 mm.
Effluent Disposal	Conventional septic systems low. **Not recommended.** High for alternative systems.	**Conventional septics not acceptable.** Alternative systems may require fill in some locations.	**Conventional septics not acceptable.** Alternative systems may require fill in some locations.	**Conventional septics not acceptable.** Alternative systems may require fill in some locations.
Water Supply	Shallow and deep ground water plus 92 000 litre tanks	Shallow and deep ground water plus 92 000 litre tanks	Shallow and deep ground water plus 92 000 litre tanks	Shallow and deep ground water plus 92 000 litre tanks

Agricultural Capability	Deep White Sand	Brown Sand and Ferricrete	Low Wet Sand	Sand over Clay Duplex or Clay
Soil workability/ trafficability	**Not recommended for agriculture**	Low in places due to ferricrete	High limited by water logging in places	Moderate Limited by water logging
Rooting Conditions	High but not **recommended for agriculture**	Low in places due to ferricrete	High Limited by water logging in places	Moderate Limited by waterlogging and clay sub-soils
Grazing	Very Low unless amended and irrigated	Extended summer pasture but some places potentially water logged in winter	Extended summer pasture but water logged in winter	Extended summer pasture but water logged in winter.
Grain/hay crops	Very Low	Low, due to ferricrete and water logging	Moderate with potential for nutrient export	Moderate to high
Annual Horticulture	Low Limited by potential for nutrient loss soil quality and proximity to wetland. **Not recommended**	Low to moderate Limited by potential for water pollution.	Moderate Limited by potential for nutrient run off.	Moderate, limited by potential for water pollution, water logging and clay sub soils.
Perennial Horticulture	Low to moderate Limited by potential for water pollution, soil quality and proximity to wetlands. **Not recommended**	Moderate to high Limited by potential for nutrient run off.	Moderate Limited by potential for nutrient run off.	Moderate, limited by potential for water pollution, water logging and clay sub soils.
Irrigated Activities	Low to moderate Limited by potential for nutrient export and proximity to wetlands **Not recommended**	Moderate to high Limited by potential for nutrient run off.	Moderate to high Limited by potential for nutrient run off.	Moderate, limited by potential for water pollution, water logging and clay sub soils.

3.1 Recommended Lot Boundaries, Sizes and Building Envelopes

Any developments will need to take account of both the capability of the soils, the potential for flooding and the potential for nutrient export. In addition the existing Ellen Brook Speedway and Poultry farm will impose some restrictions on development because of buffer zones. Development in the buffer zones may have to be postponed until these activities close.

Some form of clustering of building envelopes may be able to be utilised rather than scattered dwellings which will be more difficult to manage in terms of services. Clustering will also enable better buffers from wetlands, drainage lines and allow greater potential for vegetated corridors and wildlife belts. Clustering will help to preserve remnant vegetation.

Restriction will need to be placed on land uses on some lots based on land capability.

No existing remnant vegetation should be cleared or grazed. It should be excluded from building envelopes and restrictions placed on firebreaks through the vegetation. Memorials could be placed on titles to conserve remnant vegetation.

The known aboriginal sites should be fenced and excluded from development.

3.2 Water Availability

Shallow ground water is abundant under the southern part of the site. The quality is good, < 150 mSm total dissolved solids (potable water is < 250 mSm). The northern part of the site where the clay is closer to the surface has less shallow water which leads to the quantity being restricted.

Good quality bore water (<150 mSm) is available from the Leederville Formation at depths of about 30 metres. As the site lies within the North Swan Groundwater area, licensed bores will be required.

Potable water can also be supplied from 92 000 rainwater tanks.

3.3 House and Road Construction

The foundation stability for building and road development is generally high with all areas of deep leached sand having AS 2870 Site Classification of A. The sand over clay duplex and clay have a AS 2870 Site Class S when depth of fill and surface sand exceeds 900 mm. However this site class will be reduced to M if clay is closer to the surface.

The depth of sand can be achieved by adding sand for the sand pad to ensure there is at least one metre of sand above the sandy clay.

3.4 Drainage, Hydrology and Flood Risk

Temporary water logging potentially occurs each winter on much of the lower elevations. Some of these areas are already drained and these could be deepened provided detention and nutrient stripping basins are incorporated into the system. The potential for perched water tables can be reduced by drainage. Upgrading the drainage system would not impact on the nature reserves and the surface water but could be fed through the clay pans, compensating for any wet pasture habitat that would be lost.

The only flood risk is in the drainage lines, particularly the two lines running west-east through the central south of the site.

3.5 Possible Land Uses

The site has a rural character and this should be maintained providing it does not compromise the conservation status of the nature reserves or Ellen Brook.

Even though a poultry farm exists it is small and manure is regularly collected. High nutrient land uses should be phased out. This would include turf farms, piggeries, chicken or egg production and market gardens which produce high levels of nutrients. The poultry farm will close when all subdivisionas are in place. The created lots should essentially be rural living or alternative residential lifestyle with stocking rates according to Agriculture WA. Continued grazing and other uses such as tourist facilities could be developed in a way that is sustainable.

Other land uses could be bush or conservation blocks on remnant vegetation or lightly stocked hobby farms or simply lifestyle blocks.

4.0 ENVIRONMENTAL MANAGEMENT OF POTENTIAL DEVELOPMENTS

Environmental management of any proposed development will fall under the provisions of the Shire of Swan.

4.1 Aesthetics

The landscape involves Ellen Brook, drainage lines and remnant vegetation. The site is set back from Great Northern Highway which lies on the other side of Ellen brook.

	ENVIRONMENTAL ISSUE	MANAGEMENT
4.1.1.	Remnant vegetation	• Development should include preservation of existing vegetation corridors and belts. • Mature trees should be preserved and protected from gazing pressure. • Existing lots along Ellen Brook will not be changed. • Development will be restricted by 30 metre setbacks from drainage lines. • Remnant bushland, in particular adjacent to Twin Swamps and on drainage lines, should be protected by conservation covenant or memorials on the titles.
4.1.2	Ellen Brook	• The existing lots along Ellen Brook will remain at approximately 7 hectares. • Ellen Brook foreshore will be protected by a foreshore reserve 50 metres wide.
4.1.3	Developments	• Building envelopes on lots covering remnant vegetation should be clustered to reduce disturbance of the vegetation. • Cluster developments should be screened from Ellen Brook Road, Warbrook Road and Almeria Parade. • Vegetation belts should be incorporated into the development.
4.1.4	Dwellings, fences and other developments are to be aesthetically compatible with the area.	• Restrictions should be placed on the use of non compatible materials

4.2 Indigenous Flora and Fauna

Remnant indigenous vegetation consists of fringing vegetation along Ellen Brook, clumps of scattered trees and shrubs, and remnant Banksia Woodland. Vegetation provides habitats for indigenous fauna.

It should be made clear that the a number of Western Swamp Turtles occur outside the reserves on the subject land and animals may be resident in any water body, including farm dams.

	ENVIRONMENTAL ISSUE	MANAGEMENT
4.2.1	Flora and fauna corridors	• Mature trees should be preserved where possible. • Additional belts of trees should be incorporated into any development plan particularly by clustering of building envelopes. • The existing lots along Ellen Brook are not changed by the proposed structure plan and thus the foreshore is unaltered.
4.2.2	Remnant vegetation	• Mature trees should be preserved and protected from gazing pressure. • Building envelopes should be excluded from remnant bushland where possible. The number oflot boundaries cutting remnant vegetation should be minimised. • Firebreaks should be strategic and should not be required along lot boundaries through remnant bushland. • Remnant bushland, in particular adjacent to Twin Swamps and on drainage lines, should be protected by conservation covenant or memorials on the titles.
4.2.3	Preservation of indigenous flora communities	• Local species should be used for rehabilitation adjacent to remnant bushland.
4.2.4	Western Swamp Turtle	• Prospective residents should be informed of the importance of the Western Swamp Turtle and instructed to contact CALM if any are noted.
4.2.5	Exotic fauna.	• There will be an increase in the number of dogs and cats in the area. The best approach is to educate the public by making prospective owners aware of the need to protect wild life. This is particularly important with respect to dogs, domestic and feral cats. • Twin Swamps and Ellen brook Reserves are fenced with fox proof fences.

4.3 Aboriginal Sites

The area was extensively used in the past by aboriginal people, and a number of archaeological sites have been noted.

	ENVIRONMENTAL ISSUE	MANAGEMENT
4.3.1	Archaeological sites	• Known archaeological sites have been reported to the Aboriginal Affairs Department. • All known archaeological sites should be fenced, excluded from building envelopes and noted as a conservation covenant on titles.
4.3.2	Ellen Brook	• There will be no change to lots along Ellen Brook.
4.3.3	Potential aboriginal sites	• Aboriginal sites are protected under the Aboriginal Protection Act. • If a site is uncovered during development, work will be stopped pending assessment by an independent archaeological consultant.

4.4 On Site Effluent Disposal - Nutrient Management

Ellen Brook

Ellen Brook contributes 36% of the phosphorous load of the Swan-Canning Estuary, (Shire of Swan, 1996 Environmental Report p55). How much phosphorous is currently contributed from the study are is unclear but is not likely to be as much as some other locations because the land is largely utilised at only low levels of stocking. Much of the nutrient would come from fertiliser application although there is a small poultry operation. Manure from the poultry operation is apparently collected regularly and this would help to reduce potential nutrient export. Significant quantities of water flow across the site in winter from adjoining pasture land to the west, and these may carry nutrients.

Surface Water

Surface water is only present in winter when run off from clay/duplex soils occurs. Several drainage lines run from the west across the site to ultimately enter Ellen Brook. The most notable of these are in the central west where water drains from adjoining properties to the west. These two drainage lines were deepened some years ago and define the path of the flow. The other main drainage system is from Twin Swamps Reserve east towards Ellen Brook.

Effluent Disposal

The main issue with effluent disposal is nitrogenous and phosphate compounds released by stock, contained in domestic effluent or introduced in fertiliser, together with the microbial purification ability of the soils.

Phosphorous is the main nutrient implicated in algal blooms in waterways and therefore it is important to limit its release from the site. Phosphorous is capable of being stored in the basal muddy sediments of water bodies such as the Swan Estuary. From there the phosphates are released over time and provide nutrient to fuel algal blooms. It is already known that Ellen Brook

is a major source of phosphorous contamination of the Swan Estuary and any steps to reduce this input could be important.

The leached sandy soils of the western and southern parts of the site generally have low to very low capability for phosphorous retention. However soils along the eastern and north eastern parts have high levels of iron oxides which have a high capacity to absorb phosphorous. Phosphate loadings can be restricted by the use of alternative effluent disposal systems.

Nitrates are normally removed by soil micro flora under anoxic conditions. Nitrogenous substances are also taken up by vegetation, denitrified by bacteria under anoxic soil conditions or lost through volatilisation of ammonia. They are not generally responsible for algal blooms in freshwater environments, but high levels of nitrogen can affect the health of saline water bodies. The soils on the site are generally subjected to high perched water tables in winter which provide conditions for denitrification. However water draining from pasture properties to the west will have little time for denitrification.

Microbial purification is an important part of effluent disposal to ensure that all fine organic matter and micro-organisms are broken down. When there is insufficient depth to the water table for microbial material to be inactivated by soil micro-organisms, waste water may pose a health risk. This is a potential problem where perched water tables develop in winter due to slow drainage, which is the case on much of the site. Any deficiencies can be overcome by the use of alternative waste water systems.

Only the higher sand ridges are able to meet Health Department Criteria for Conventional Septic Systems. These areas are however leached sands which have low phosphate absorption ability. Therefore all lots will need alternative waste water systems (AWWS) with amended soils. Amended soils waste water systems can either be systems in which amended soils of high Phosphate Retention Index are packed round the leach drain (Ecomax), or self contained aerobic systems (eg Envirocycle, Biocycle) which use irrigation for the dispersal of waste water. In either case all the phosphate is absorbed by amended soil and the nitrates reduced by at least half during normal working conditions.

Effluent disposal areas need to be 500 mm above temporarily water logged areas to comply with Health Department requirements.

Nutrient Loadings and Stocking Rates

Estimations of the actual nutrient input into the ground water can only be made as guesstimates based on denitrification, volatilisation of ammonia, recycling, uptake by vegetation and phosphate absorption by sesqui-oxides. Rather, the best measures of nutrient impact are to compare the current nutrient levels of input and reductions in nutrient input to those which are likely as a result of development.

Nutrient behaviour is summarised in Lantzke, 1997, *Phosphorous and nitrate loss from horticulture on the Swan Coastal Plain*, Agriculture WA where discussions of phosphate retention by ferricrete and coloured sands and denitrification under anoxic conditions are discussed.

The greatest input of phosphorous comes from the keeping of stock, ie a horse, and depends on the fertiliser application regime and the amount of introduced feed. Broad scale fertiliser

applications can be worse than a number of smaller applications applied at slightly different times which would be the case with smaller lot sizes.

A typical family with an ATU releases no phosphate and 9 kg N/ha/year through the alternative waste water system, (based on total phosphate absorption and 50% denitrification). However allowing for six chickens, a dog and cat and a 250 m^2 area of fertilised horticulture, a further loading of 12.3 kg N/year and 5.2 kg P/year can be added for the dwelling area. (Data from Select Committee on Metropolitan Development and Groundwater Supplies, Legislative Assembly 1994 and Nitrate management in the Jandakot UWPCA, Dames and Moore, undated). One horse is estimated at 60 kg/N/year and 11 Kg/P/year.

The current input of nutrients will be predominantly from fertiliser applications, legume pasture species and introduced feed.

With subdivision it is assumed that amended soils are used for waste water disposal areas in soils with low phosphate retention. Other potential sources of nutrient are stock held by the property owners, fertiliser applications, additional areas of horticulture and introduced feed. Reductions in nutrient loadings may follow closure of the poultry farm at some time in the future. The figures used below are for only half the lot owners to have horses or stock which is normally the case on 2 hectare lots. One horse per hectare is compatible with the stocking rate recommended by Agriculture WA soils such as this that have dry pasture, some additional feed and manure management.

Typical nutrient loadings that can be expected from the various soil types

Soil type	Possible lot size and activity	Nitrogen loading per hectare	Phosphorous loading per hectare	Likely nutrient scenario
	Estimated average potential stocking rate 2 DSE to 10 DSE per hectare	11.5 - 57.5 kg/N/ha/year	3.5 - 17.6 kg/P/ha/year	Phosphate export from sandy, clay and duplex soils.
Deep White Sand	2.0 hectare, no stock, ATU waste disposal system	10.7 kg/N/ha/year	2.6 kg/P/ha/year	Little or no nitrogen export, little or no phosphate loss. Similar nutrient loads to current regime.
Low Wet Sand and Sand over Clay Duplex or Clay	2.0 hectare, average one horse property, ATU waste disposal system	40.7 kg/N/ha/year	8.1 kg/P/ha/year	No nitrogen loss. Drainage and nutrient stripping basins required to minimise phosphate loss. Potentially reduced nutrient loads to current regime.
Brown Sand and Ferricrete	2 hectares with an average of one horse per lot. ATU waste disposal system	40.7 kg/N/ha/year	8.1 kg/ha/year	Little or no nitrogen loss, Little or no phosphorous export. Similar nutrient loads to current regime.

The EPA has recently agreed to phosphorous export performance criteria of 0.225 kg P/ha/year for urban development in the Serpentine River coastal plain catchment of the Peel-Harvey Estuary (EPA 1997). How the suggested nutrient loadings relate to nutrient export is difficult to define, however on the basis of data from Lantzke, 1997, *Phosphorous and nitrate loss from horticulture on the Swan Coastal Plain*, Agriculture WA, it is thought that low potential nutrient exports similar to the Serpentine River standards could be achieved with the management controls recommended.

	ENVIRONMENTAL ISSUE	MANAGEMENT
4.4.1	Effluent disposal	• All lots should be required to install alternative waste water systems. • Lot size and clustering should be based on land capability of each location. • There should be no more than one effluent disposal unit per lot. • Alternative waste water system (AWWS) should be set back 50 metres from water bodies.
4.4.2	Land use and stocking	• Land use restrictions and lot sizes in the structure guide plan should be located where they will lead to no increase and preferably to reductions in nutrient loadings. • Intensive agricultural pursuits, such as piggeries and feed lotting should not be permitted. • Stock should not be allowed on lots of less than 1 hectare. • Stocking rates should be to Agriculture WA recommendations. • All properties holding stock are to have a manure management plan. • There should be no stocking in remnant vegetation or Deep White Sands.
4.4.3	Potential water pollutants	• Surface run off from hard surfaces should be fed through detention basins prior to release to a water body. • All drainage systems should have detention and nutrient stripping basins incorporated into their design. • The current poultry farm will close when all approvals are in place and prior to the construction of any new dwellings.
4.4.4	Rubbish or waste products	• Development conditions can address the removal of waste to an approved waste disposal area.

4.5 Ellen Brook and System 6 Reserves

Ellen Brook, and Twin Swamps and Ellen Brook Nature Reserves are listed as M17 in System 6, Dept of Conservation and Environment, Oct 1983. Ellen Brook Nature Reserve adjoins the eastern part of the southern boundary, and Twin Swamps Reserve adjoins the north western corner. The reserves are fenced for the protection of the Rare and Declared Short Necked Turtle and incorporate 75 metre buffers between the swamp and the fence.

The Water and Rivers Commission Guidelines recommend a 50 metre buffer along lakes and streams, (Wetlands of the Swan Coastal Plain, Hill et al, 1996, Water and Rivers Commission). Draft EPA/Ministry for Planning Guidelines, *Defining the extent of buffers for water bodies*, EPA, 1994, suggest buffers for a lake of 50 metres or the equivalent of 1 metre contour above the water level whichever is the largest, and a 30 metre wide buffer for a seasonally flowing water course. However the EPA Draft guidelines also state that the width of the buffer will depend on a number of factors such as land uses within the catchment, intensity of adjacent development and riparian vegetation and wildlife corridors. Whilst the reserves are not lakes the suggested buffers are worth noting.

The management of these areas is largely management of the input of nutrients, stormwater, remnant vegetation and subdivision design.

The closest wetland is in Twin Swamps Reserve 75 metres from the existing fence, and building envelope locations will be used to increase this distance. The existing fence with its firebreak provides separation from the impact of development.

"Guidelines for design of effective buffers for wetlands of the Swan Coastal Plain" Australian Nature Conservation Agency, Draft, 1995 suggest a variety of buffer distances depending on the factor involved. These suggested buffers have not been adopted by the Environmental Protection Authority but give indications of the ideal width of buffers. The proposed buffer fits with all the recommendations but does not comply with the suggested buffer for ground water. The suggested groundwater buffer is not valid in this case because groundwater flow is east away from Twin Swamps Reserve, and does not take into account restrictions on land use and management of the site.

Dwellings, other developments and ATU's are to be placed in building envelopes set back at least 50 metres from the boundary fence. With the existing 75 metre buffer a separation of at least 100 metres will exist between the wetland in Twin Swamps reserve and any development.

Feature	Suggested Buffer Distance	Proposed Buffer/Comment
Carbon flow	20 - 50 m	Exceeds recommended distance
Sediment	100 m	Not applicable because there is little surface flow which moves from the reserve east to Ellen brook.
Nutrients	200 m	ATU units used, which will absorb all phosphate. Groundwater flow is east away from the reserves.
Groundwater	2 000 m	Groundwater flow is east away from the reserves.
Disturbance to vegetation	0 - 400 m	Complies but is not applicable because of existing fencing and buffers.
Water levels		There will be no change to water levels because of restricted/licensed groundwater use.
Temperature	20 m	Exceeds recommended distance.
Heavy Metals	100 - 200 m	Not applicable because of land use restrictions and ground water flow directions
Aesthetics	variable	Complies with 100 m vegetated buffer of natural vegetation, restrictions on land use and development.
Birds	50 m	Exceeds recommended distance.
Weeds	10 - 20 m	Exceeds the recommended buffer with at least 100 m from wetland plus a fence and firebreak.

Table 1 Buffer Guidelines for lakes, Australian Nature Conservation Agency, 1995

	ENVIRONMENTAL ISSUE	MANAGEMENT
4.5.1	Remnant vegetation	• Development should include preservation of all remnant vegetation corridors. • Mature trees should be preserved and protected from gazing pressure. • There will be no change to the existing lots fronting Ellen Brook. • Where possible building envelopes should be excluded from remnant bushland. The number of boundaries running through remnants should be minimised. • Water tables are artificially maintained in Twin Swamps Reserve.
4.5.2	Vegetation along Ellen Brook	• Foreshore/floodway will be protected by a foreshore reserve.
4.5.3	Buffers	• There will be no change to the existing lots fronting Ellen Brook. • Any development adjacent to Ellen Brook can be restricted by setbacks from Ellen Brook and drainage lines. The recommended distance is 50 metres for the drainage lines. • Building envelopes should be set back at least 50 metres from the boundary fence. With the existing 75 metre buffer a separation of at least 100 metres will exist between the wetland in Twin Swamps reserve and any development.
4.5.4	Water tables	• Water tables are artificially maintained in Twin Swamps. • Restriction and licensing of bores should control groundwater usage and protect water table elevations.

4.6 Noise

The main source of noise is from the Ellen Brook Speedway and Pearce Airbase. The 25 dB ANEF level only affects two lots, with an extension across portion of Lots 4 and 49 in the north west corner.

Ellen Brook Speedway is still used and a noise study will be conducted of the speedway to determine the buffer distances required.

	ENVIRONMENTAL ISSUE	MANAGEMENT
4.6.1	Pearce Airbase	• The 25 dB ANEF only affects part of Lots 4 and 49 in the north western corner
4.6.2	Ellenbrook Speedway	• An independent noise study will be commissioned to determine the require buffer distances.

4.7 Wetlands

The site has significant areas of water logged soils however almost all these areas are cleared pasture. Perhaps, because of the proximity to reserves nominated for the protection of the Western Swamp Turtle, there has been substantial classification of the wetter parts of the site by Water and Rivers Commission/EPA, in Wetlands of the Swan Coastal Plain Volume 2b.

However the number of apparent wetlands is misleading. For example V39, V59 and V60 in the east are clumps of Flooded Gum *Eucalyptus rudis*, and 19 nominated wetlands (eg 354, 366 and 388 in the north) are farm dams.

It should be made clear that a number of Western Swamp Turtles occur outside the reserves on the subject land and animals may be resident in any water body, including farm dams. In the past some of these turtles have been collected by CALM and relocated.

In spite of the above, none of the wetlands on the site are listed under EPP Policy The Lakes. All wetlands are nominate by Water and Rivers Commission as Palusplain, Multiple Use which lists them as "may warrant special land and water planning or management practices".

	ENVIRONMENTAL ISSUE	MANAGEMENT
4.7.1	Remnant vegetation	• See Indigenous Flora and Fauna 4.2
4.7.2	Wetlands	• Wetlands on the site are Palusplain, classified as Multiple Use by Water and Rivers Commission. • A large proportion of the listed wetlands are farm dams. • All remnant vegetation and thus vegetated wetlands will be preserved • See Indigenous Flora and Fauna 4.2, Ellen Brook and System 6 Reserves 4.5 and On Site Effluent Disposal-Nutrient Management 4.4.

4.8 Wind and Water Erosion

The main risk of wind erosion is on the sand ridges on Deep White Sand. There is little or no potential for water erosion. Wind erosion will be managed by clearing restrictions, lot sizes, location of building envelopes and stocking rates.

	ENVIRONMENTAL ISSUE	MANAGEMENT
4.8.1.	Wind erosion	• See Land use and stocking 4.4.2

4.9 Fire Control

Fire Control falls under the Bush Fires Control Act (as amended) and the Shire of Swan.

The management of remnant vegetation presents a potential fire hazard but this should be off set by the location of building envelopes, strategic firebreaks, better access and increased water supplies. A fire break running along the edge of Twin Swamps and Ellen Brook Reserves will provide a hard edge to assist the management of weeds.

	ENVIRONMENTAL ISSUE	MANAGEMENT
1.	Fire Risk	• Increased access and water points will assist fire reduction risk. • Location of building envelopes and strategic fire breaks. • A fire break will be maintained along the fenced edge of Twin Swamps and Ellen Brook Reserves.

4.10 Weeds

Weeds and exotic species have the potential to affect the existing vegetation communities. Property owners should be made aware and responsible for weeds and exotic species introduced to their properties that have the potential to escape and affect indigenous vegetation.

A fire break running along the edge of Twin Swamps and Ellen Brook Reserves will provide a hard edge to assist the management of weeds.

	ENVIRONMENTAL ISSUE	MANAGEMENT
1.	Potential weed introductions and management	• Declared weeds should be eradicated if they establish on the site. • A fire break running along the edge of Twin Swamps and Ellen Brook Reserves will provide a hard edge to assist the management of weeds.

4.11 Dieback Disease/ Tree Decline

There is some decline of trees and shrubs in the remnant vegetation, although this could be due to grazing and weed pressure. The number of deaths in the north western corner adjacent to Twin Swamps Reserve has the appearance of Dieback Disease but could be related to reductions in the level of water tables which are recorded over the past years.

Dieback disease (*Phytophthora spp*) is a risk to a significant proportion of the flora, particularly of the Twin Swamps and Ellen Brook Reserves. There is really no easy control because control relies so much on each land holder. An information pamphlet or a pamphlet produced by the Department of Conservation and Land Management could be available through the Shire of Murray.

All gravel and bases for road construction should be taken from a dieback disease free area.

	ENVIRONMENTAL ISSUE	MANAGEMENT
4.11.1	Dieback disease	• Road making materials should be free of dieback. • A "Friends Group" and public education campaign are suitable avenues for raising community awareness. • Restriction and licensing of bores should control groundwater usage and protect water table elevations. • Water tables are artificially maintained in Twin Swamps.

5.0 CONCLUSIONS

Whilst there are environmental constraints to development on the Ellenbrook Road subdivision from soil systems, potential nutrient export and potential waterlogging, these are not sufficient to exclude some development.

Over the majority of the site the use of a normal sand pad will provide satisfactory conditions for effluent disposal through alternative waste water systems.

It is recommended that some form of clustering of building envelopes will be the most appropriate form of development in order to minimise the impact on remnant vegetation, wetlands and adjacent reserves.

Lot sizes are more related to site conditions and stocking rates and should be allocated on the basis of land capability. However provided some controls on stocking and clearing are applied to some lots 2.0 hectares is appropriate for all areas and could lead to potential reductions in nutrient loading on the site.

Lindsay Stephens

Ellen038.doc

Environmental Constraints and Land Capability

Deep Leached Coloured Sand	Brown Loam over Sand	Sand Over Clay Duplex
II f*	**IV** fpnio*	**III** finp*
III fp*	**IV** fpnioz*	**IV** fpino*
	X z	

LAND CAPABILITY FOR DWELLINGS IN CLUSTERS OF 0.5 TO 1.0 ha LOTS

I Very high capability with few physical limitations.

II High capability with some physical limitations that can be overcome by planning and minor site modifications.

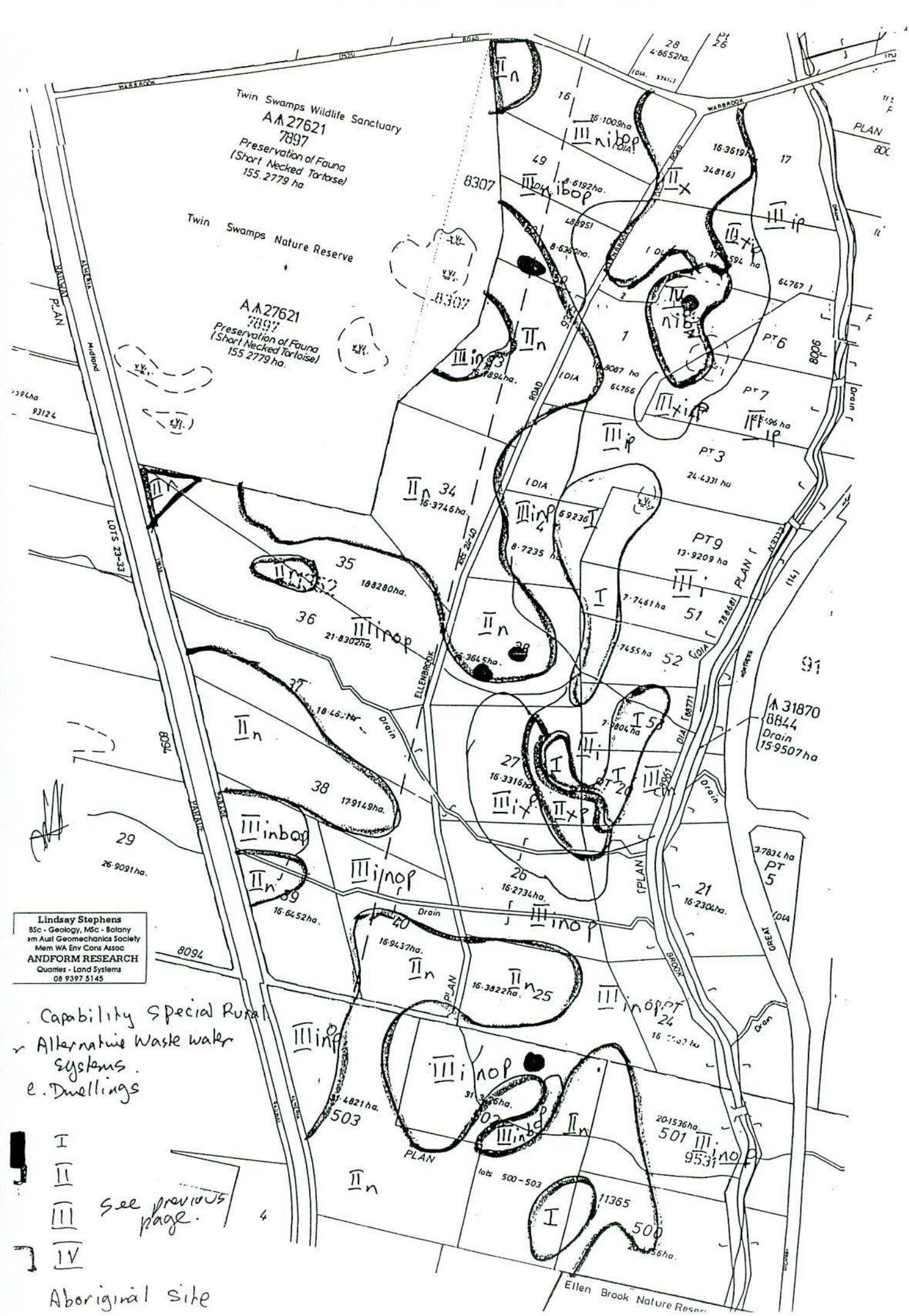
III Fair capability with moderate physical limitations which may affect development. Careful planning and site modifications may be required.

IV Low capability with many physical limitations.

V Very low capability with severe physical limitations.

X Development not acceptable because of severe limitations or Government Policy.

	CONSTRAINT	MANAGEMENT STRATEGY
n	Low nutrient retention ability	• Dwellings will be required to have alternative waste water disposal units. • Lot sizes of 1 to 2 ha or cluster developments. • Appropriate setbacks from water bodies • Stormwater drainage and retention • Reduced nutrient loading with development
i	Subject to water logging risk	• Lot sizes of 1 to 2 ha or cluster developments • Alternative waste water treatment units • Appropriate setbacks from water bodies • Appropriate drainage • Areas adjacent to streams and rivers excluded from development
o	Water pollution risk by overland flow	• Alternative waste water systems required • Appropriate setbacks from water bodies • Appropriate drainage • Larger lot sizes • Stormwater drainage and retention
p	Requires fill to meet AWWS guidelines or Potentially low microbial purification	• Appropriate setbacks from water bodies • Alternative waste water systems
f	Potential for flooding by Murray and Serpentine Rivers	• Fill of building envelope to 0.5 m above 1 : 100 year flood level
z	Remnant vegetation and conservation	• Excluded from development • Appropriate buffers and corridors retained • Tree preservation policies
b	Potential foundation instability	• Fill can be used to improve the foundation stability from AS 2870 Site Class M to Site Class S
*	AWWS	• Land capability rating based on using alternative waste water disposal unit


Twin Swamps Wildlife Sanctuary
A 27621
7897
Preservation of Fauna
(Short Necked Tortoise)
155.2779 ha
Twin Swamps Nature Reserve
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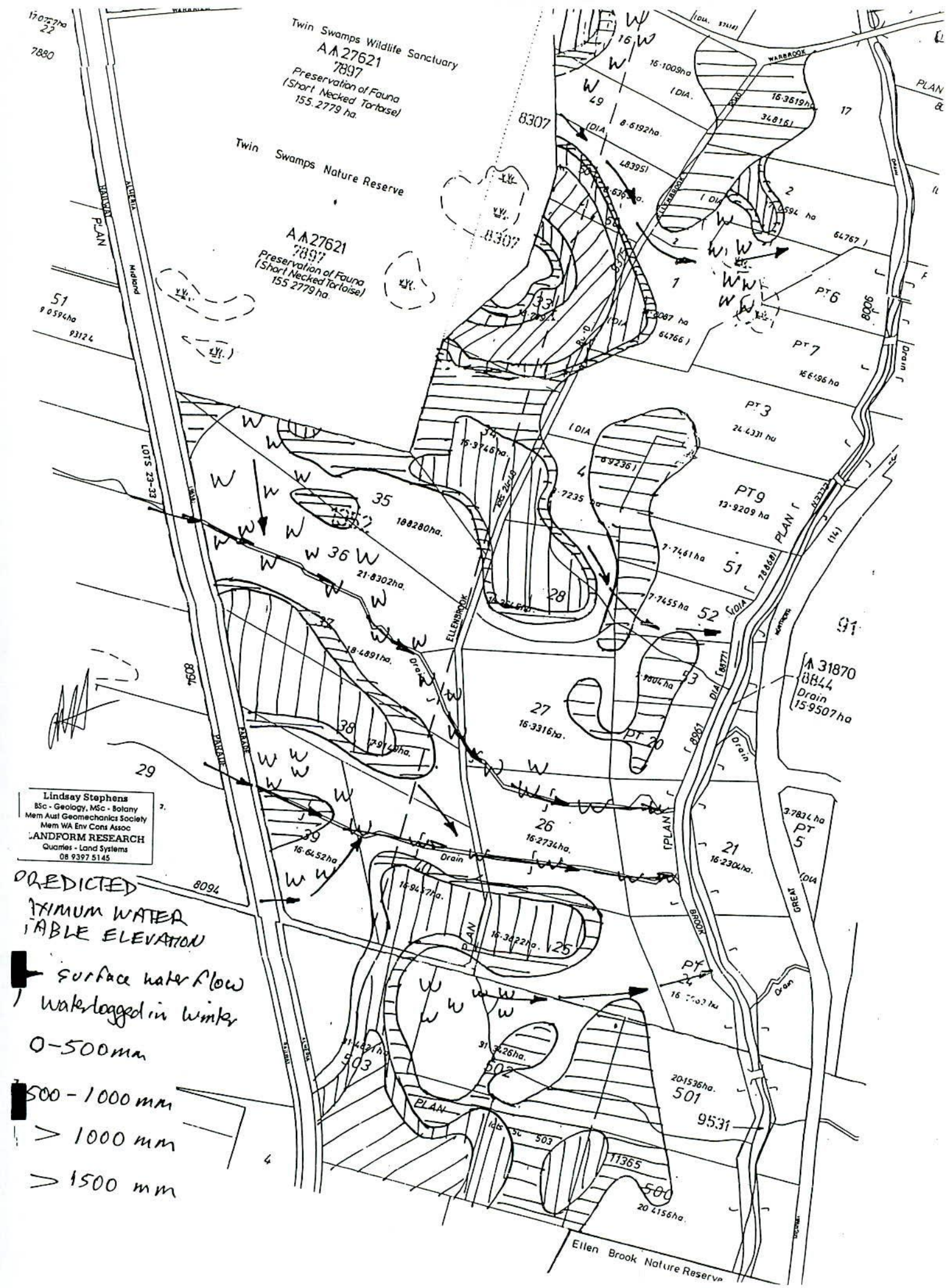
ANDFORM RESEARCH
Quarries - Land Systems
08 9397 5145
Capability Special Rural
Alternative Waste water systems.
Dwellings
I
II
III
IV
See previous page.
Aboriginal site
Ellen Brook Nature Reserve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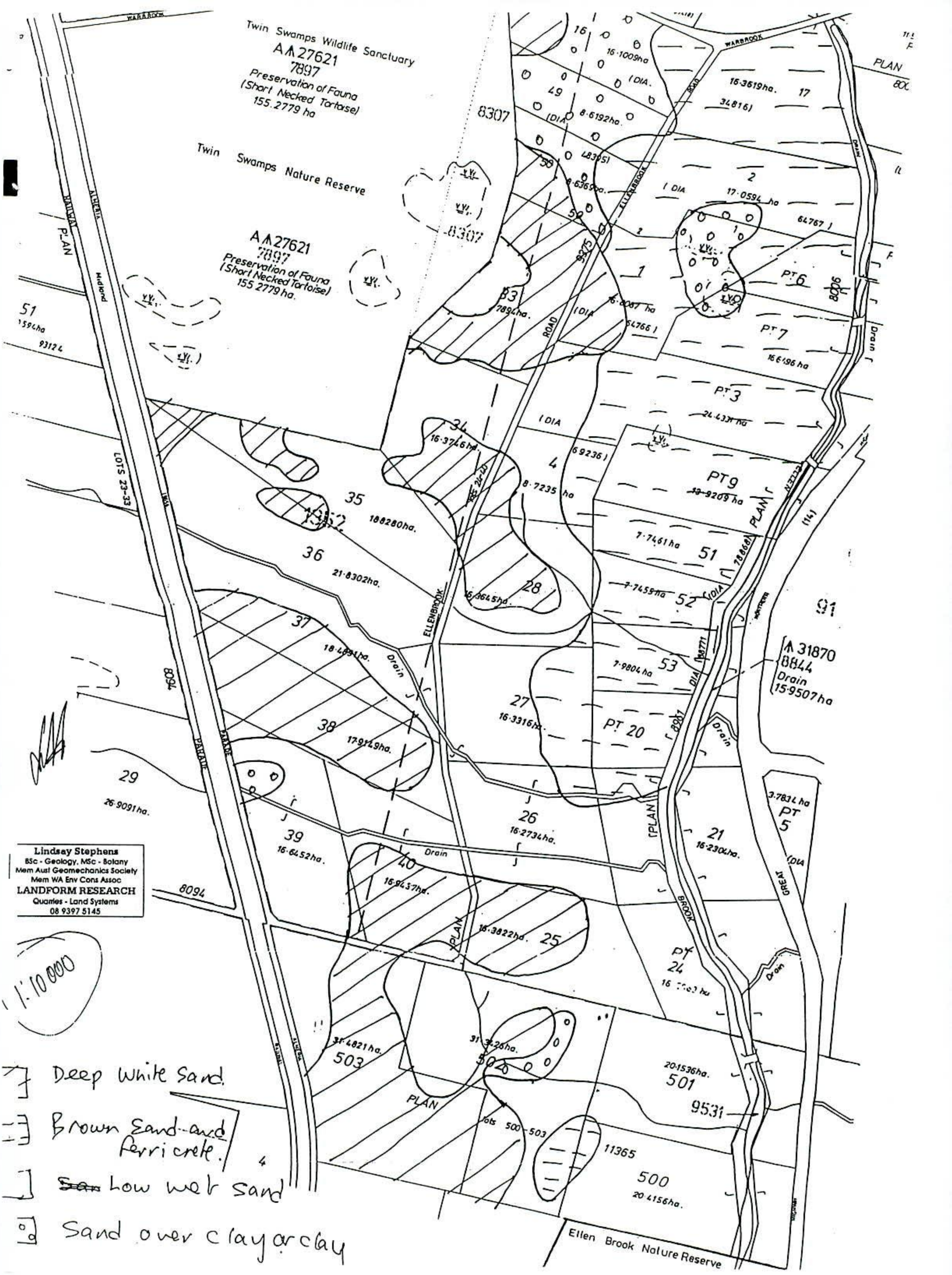
PREDICTED
MAXIMUM WATER
TABLE ELEVATION
Surface water flow
Waterlogged in winter
0-500mm
500 - 1000 mm
> 1000 mm
> 1500 mm
Ellen Brook Nature Reserve



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WARBROOK
ELLENBROOK ROAD
GREAT NORTHERN HIGHWAY
Midland RAILWAY
ALGERIA PARADE
LOTS 23-33
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Drain
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Ellen Brook Nature Reserve
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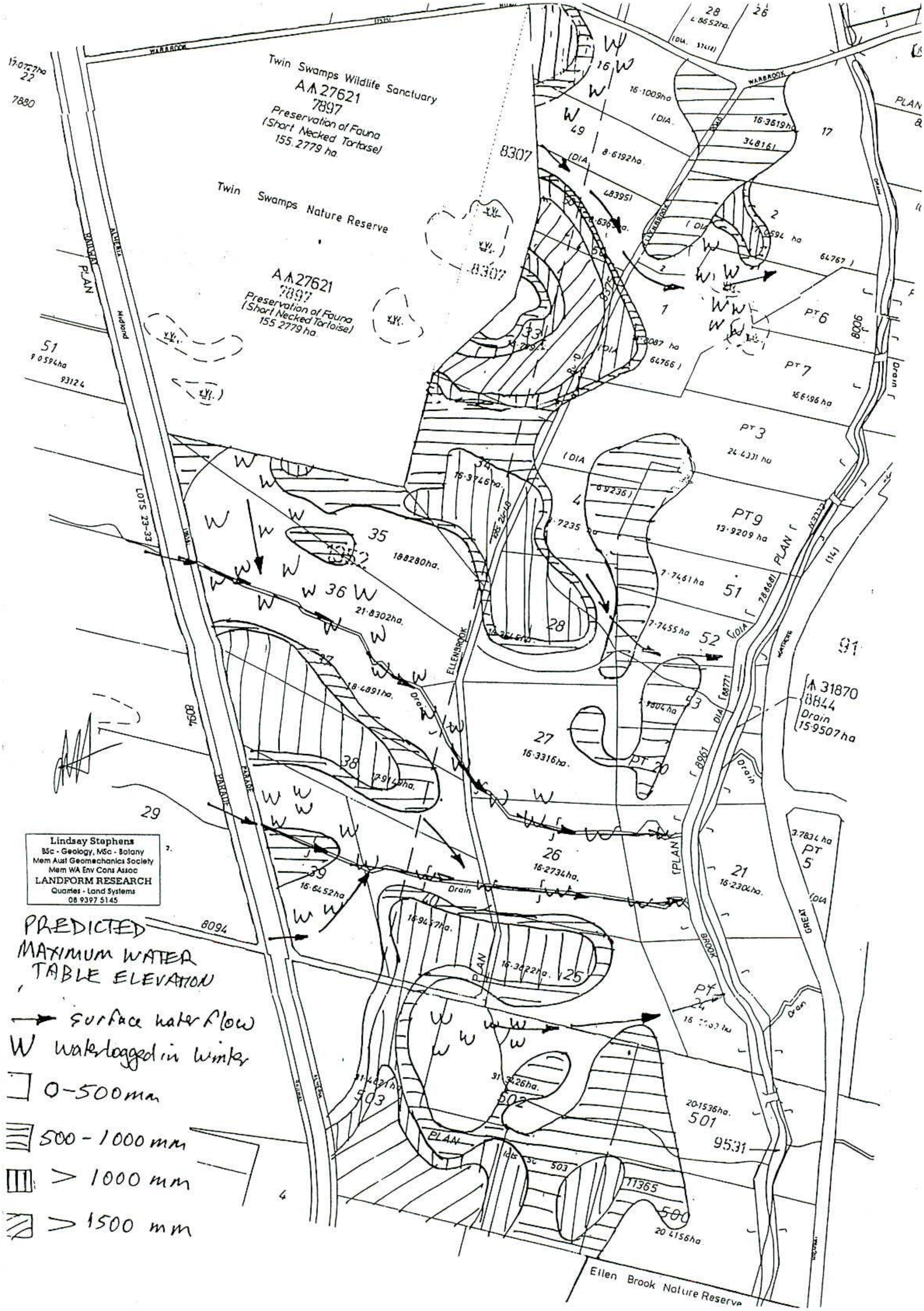

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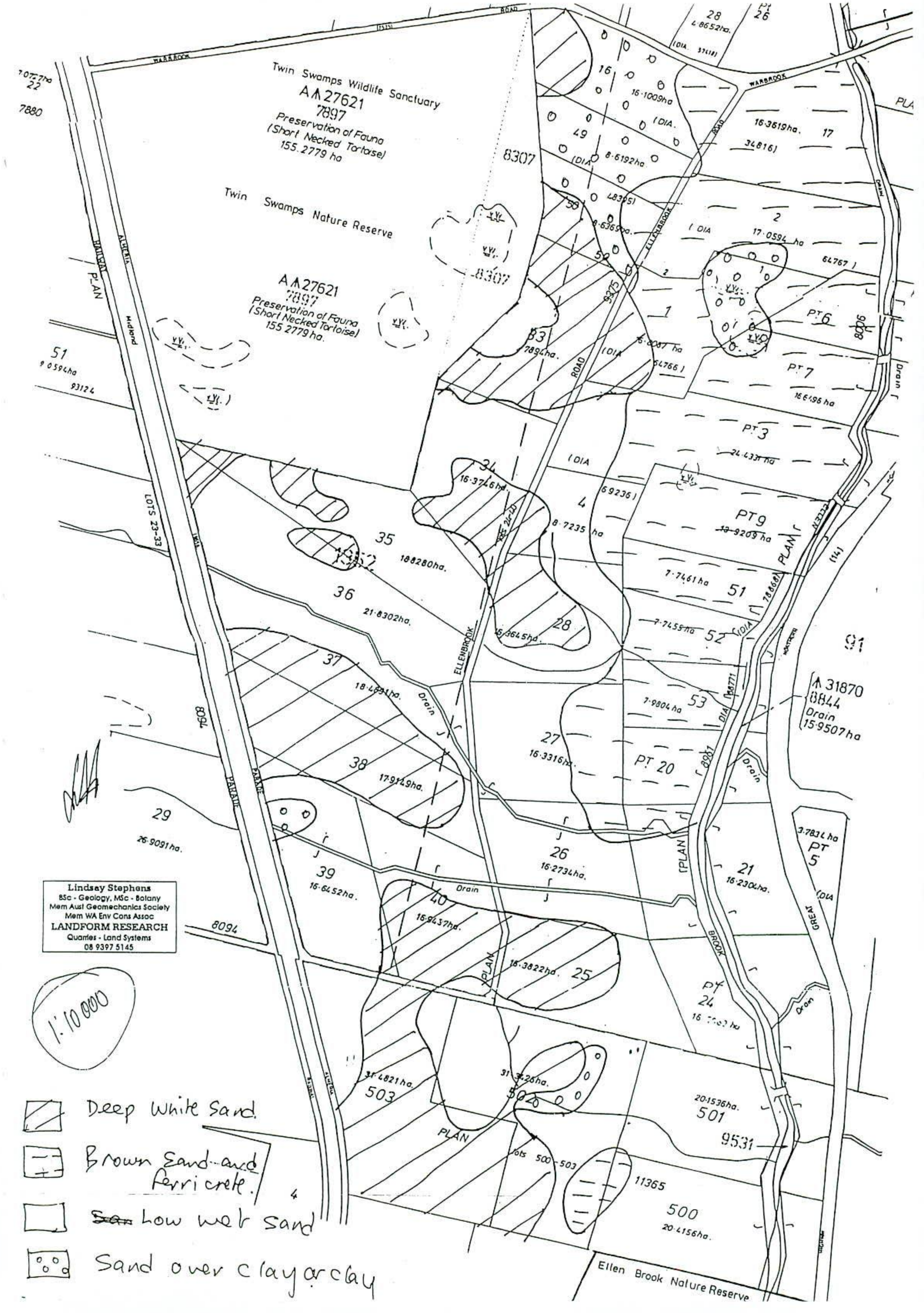
PREDICTED MAXIMUM WATER TABLE ELEVATION
surface water flow
W waterlogged in winter
0-500mm
500 - 1000 mm
> 1000 mm
> 1500 mm



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LOTS 23-33
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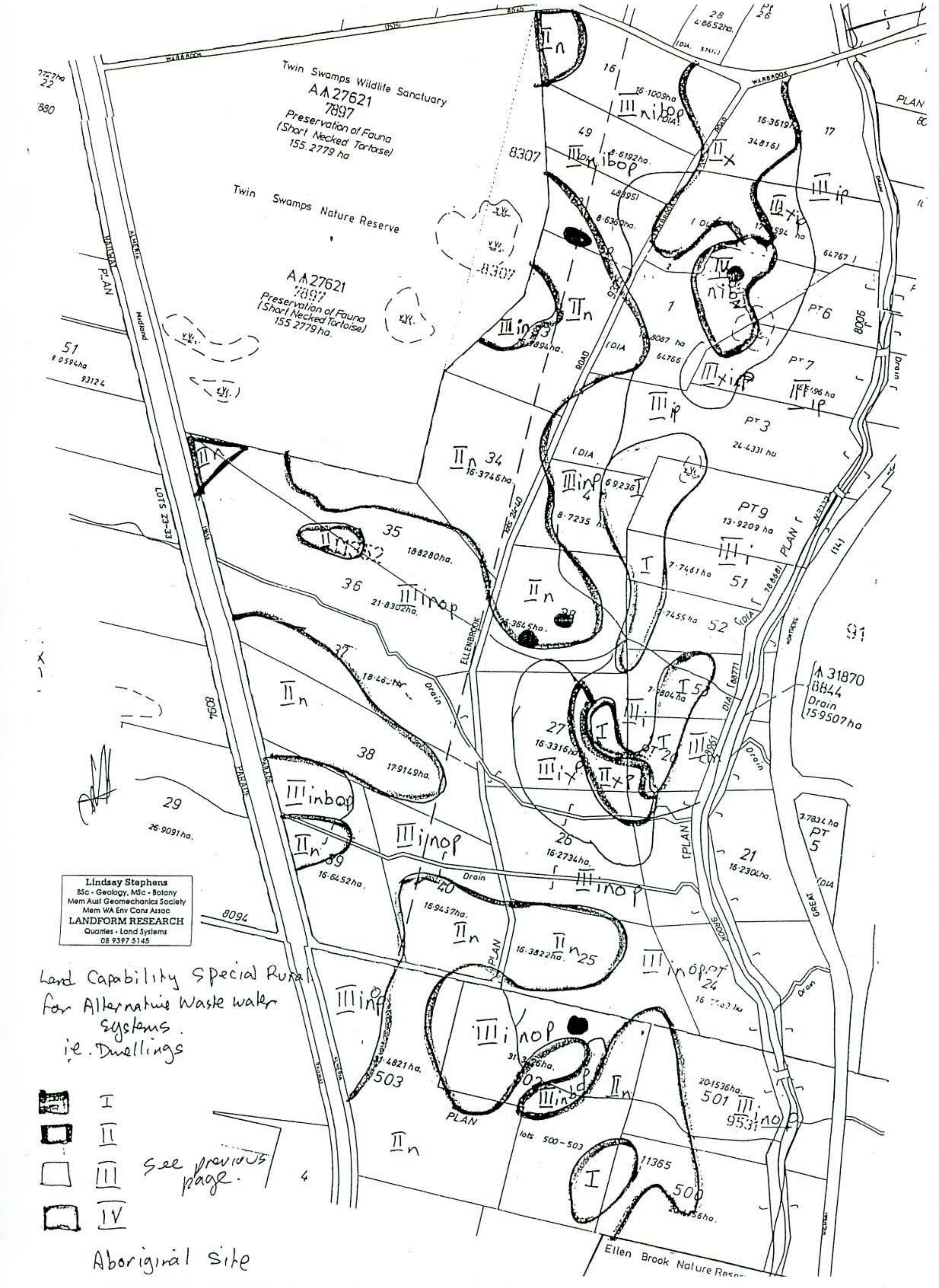
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systems
i.e. Dwellings
I
II
III
IV
See previous page.
Aboriginal site

7. Subdivision road drains will have their water discharged into either planted or existing vegetation in all cases to prevent damage by water erosion, with most of the water being able to be retained on-site.
8. The issue of a booklet of instructions will be available to those purchasing any of the lots. Fertiliser rates and time of application, whether once or twice yearly, stocking rate information and where to obtain information on various matters will be made available to those interested.
9. The application of 2.0 tonnes of Zeolite to the hectare on the cleared land will be implemented, with it being incorporated in the top 5.0 centimetres of soil. This is to assist in nutrient and water retention and will take place prior to the sale of the lots.
10. Fencing of the boundaries of the lots will be undertaken prior to sale, with fencing of a standard height utilising steel or wooden posts, with six line ringlock or equivalent material with two plain wires above, with standard width steel gates to allow access to the road and revegetated areas and also provide entry for the construction of fire breaks.
11. The determination of whether the area where the piggery was located is to be examined for contamination and necessary action to rectify any contamination implemented.

8.0 CONCLUSION

The subdivision as proposed by Mr Howard Hawke has fulfilled the Objectives of the Environmental Review, having examined the proposal in the context of the local, and to a lesser extent the regional environment. In fact there will be a positive outcome for the local environment, with no negative impact on the regional environment and a positive impact for the Western Swamp Tortoise. This will be achieved through the commitments made by Mr Hawke that will be in place through the implementation of this proposal. The subdivision will provide an example of sustainable land use, conforming with the environmental parameters set by the EPA.

All the components of the proposal have been adequately described and commitments made to address the environmental issues raised by the EPA in the Environmental Review. Those components are, specially protected fauna, the Western Swamp Tortoise, regionally significant wetlands and watercourse, surface and groundwater quality, and soil and groundwater contamination.

This proposal conforms in all aspects with the Guide for Decision-Makers, Burbige A, A and Kuchling, G, 2004, addressed in Section 6.2.

The use of Zeolite for assistance with retention of nutrients at the rate of 2.0 tonnes/hectare, will also be of great benefit to the soil and further assist in improving the capacity of the of soil's nutrient retention and water holding capacity.

Ferguson, Kenneison and Associates, in conjunction with Mr Howard Hawke, are prepared to work in conjunction with the Department of Environment in the use of Zeolite in reducing the input of nutrients into the Swan River from Ellen Brook, these entering the drainage system from the farming areas further to the north.

J.R. Ferguson.....
J R Ferguson
for
Ferguson, Kenneison and Associates

Date: 8 July 2005

7. Subdivision road drains will have their water discharged into either planted or existing vegetation in all cases to prevent damage by water erosion, with most of the water being able to be retained on-site.
8. The issue of a booklet of instructions will be available to those purchasing any of the lots. Fertiliser rates and time of application, whether once or twice yearly, stocking rate information and where to obtain information on various matters will be made available to those interested.
9. The application of 2.0 tonnes of Zeolite to the hectare on the cleared land will be implemented, with it being incorporated in the top 5.0 centimetres of soil. This is to assist in nutrient and water retention and will take place prior to the sale of the lots.
10. Fencing of the boundaries of the lots will be undertaken prior to sale, with fencing of a standard height utilising steel or wooden posts, with six line ringlock or equivalent material with two plain wires above, with standard width steel gates to allow access to the road and revegetated areas and also provide entry for the construction of fire breaks.
11. The determination of whether the area where the piggery was located is to be examined for contamination and necessary action to rectify any contamination implemented.

8.0 CONCLUSION

The subdivision as proposed by Mr Howard Hawke has fulfilled the Objectives of the Environmental Review, having examined the proposal in the context of the local, and to a lesser extent the regional environment. In fact there will be a positive outcome for the local environment, with no negative impact on the regional environment and a positive impact for the Western Swamp Tortoise. This will be achieved through the commitments made by Mr Hawke that will be in place through the implementation of this proposal. The subdivision will provide an example of sustainable land use, conforming with the environmental parameters set by the EPA.

All the components of the proposal have been adequately described and commitments made to address the environmental issues raised by the EPA in the Environmental Review. Those components are, specially protected fauna, the Western Swamp Tortoise, regionally significant wetlands and watercourse, surface and groundwater quality, and soil and groundwater contamination.

This proposal conforms in all aspects with the Guide for Decision-Makers, Burbige A, A and Kuchling, G, 2004, addressed in Section 6.2.

The use of Zeolite for assistance with retention of nutrients at the rate of 2.0 tonnes/hectare, will also be of great benefit to the soil and further assist in improving the capacity of the of soil's nutrient retention and water holding capacity.

Ferguson, Kenneison and Associates, in conjunction with Mr Howard Hawke, are prepared to work in conjunction with the Department of Environment in the use of Zeolite in reducing the input of nutrients into the Swan River from Ellen Brook, these entering the drainage system from the farming areas further to the north.

.....
J R Ferguson
for
Ferguson, Kenneison and Associates

Date: 8 July 2005

APPENDIX 2

Correspondence EPA to H Hawke
on
Proposal Unlikely to be Environmentally Acceptable

Date: 21 January 2002

Environmental Protection Authority

Mr H J Hawke
61 Ellenbrook Road
BULLSBROOK WA 6084

Our Ref 175370
Enquiries Natalie Thorning

Dear Mr Hawke

PROPOSAL: **Rural/residential subdivision**
LOCATION: **Lot 2 Ellenbrook Road**
LOCALITY: **Bullsbrook**
PROPONENT: **Mr H J Hawke**
ASSESSMENT: **Proposal Unlikely to be Environmentally Acceptable (PUEA)**

This letter is to formally advise you that the Environmental Protection Authority (EPA) has considered the above proposal and has concluded that it is incapable of meeting the EPA's environmental objectives. The Authority has therefore set the level of assessment at Proposal Unlikely to be Environmentally Acceptable (PUEA). A brief statement of reasons for this decision is attached for your information.

This level of assessment will be advertised in 'The West Australian' newspaper on Monday, 21/01/2002 and the EPA's Statement of Reasons for its decision (as attached) will be made publicly available from that date.

If you as the proponent, or anyone else, disagrees with the EPA's decision on the level of assessment, there is a 14 day appeal period, closing on Monday 04/02/2002 when the Minister for Environment and Heritage can be asked to direct the EPA to assess the proposal more fully and more publicly as either a Public Environmental Review (PER) or Environmental Review and Management Programme (ERMP).

You will be notified if the outcome of any appeals on level of assessment determines that the proposal needs to be assessed more fully and more publicly as a PER or ERMP. Should you wish to further discuss any of the above matters please contact Natalie Thorning at the Department of Environmental Protection on telephone number 9222 7079 in the first instance.

The *Environmental Protection Act 1986* requires that no decision should be made to allow or implement this proposal until the Environmental Protection Authority has reported to the Minister for the Environment and Heritage, and the Minister has authorised implementation or otherwise.

Yours sincerely

Bernard Bowen.

Bernard Bowen
CHAIRMAN

21 January 2002

Enc.

Environmental Protection Authority

Statement of Reasons for level of assessment

Proposal Unlikely to be Environmentally Acceptable

Proposal: Proposed Rural Residential Subdivision

Location: Lot 2 Ellenbrook Road, Bullsbrook (City of Swan)

Proponent: Landowner, Mr HJ Hawke

Description of proposal, location and planning context

The proponent and landowner, Mr HJ Hawke, proposes to subdivide his 17 hectare property, Lot 2 Ellenbrook Road, Bullsbrook into eight rural residential lots of 2 hectares each.

The property is located less than 400 metres east of the Twin Swamps Nature Reserve and immediately west of the Ellen Brook. The land is zoned Rural under the Metropolitan Region Scheme and General Rural in the City of Swan Town Planning Scheme (TPS) No. 9. There are limited planning controls under the City of Swan TPS No. 9 for the General Rural zone to manage land use associated with the proposed subdivision (Attachment 1).

The property is, however, within the area of the proposed City of Swan TPS No. 9 Amendment No. 356, which has recently been approved by the Minister for Planning and Infrastructure, subject to modifications, and is yet to be gazetted. This Amendment rezones approximately 375 hectares of land east and south of the Twin Swamps Nature Reserve from 'General Rural' to 'Special Purpose – Ellenbrook Road' with the intention to cease land uses that presently impact on the Western Swamp Tortoise habitat and the Ellen Brook, and to limit the subdivision of the effected land to meet habitat protection and water quality objectives. Scheme provisions associated with the 'Special Purpose – Ellenbrook Road' zone provide for the requirement of an Outline Development Plan to address a range of environmental and planning uses prior to subdivision.

The proposed subdivision is inconsistent with the proposed Amendment due to the absence of an approved outline development plan for the area addressing environmental and planning issues, as well as not meeting the minimum lot size of 8 hectares required by the Minister for Planning and Infrastructure in modifications to the proposed Amendment.

Correspondence to the Department for Planning and Infrastructure (DPI) indicate that neither the Department of Conservation and Land Management (CALM) nor the City of Swan support the proposed subdivision.

Impacts on the Western Swamp Tortoise

The subdivision area is situated less than 400 metres east of the Twin Swamps Nature Reserve, one of only two remaining habitats for the critically endangered Western Swamp Tortoise.

The Western Swamp Tortoise is the most endangered tortoise or turtle in the world with the wild population of only 140 individuals living in the claypan swamps within the Twin Swamps Nature Reserve and Ellen Brook Nature Reserve, managed by CALM. Although the Perth Zoo is successfully breeding the tortoises for reintroduction into the wild, breeding is made difficult by the low numbers of adult females available; young hatchlings taking 10 to 15 years to reach sexual maturity; the females only producing up to 5 eggs per year; and their breeding history being not well known (State of Western Australia 2000).

Threats to the survival of the Western Swamp Tortoise in the wild include:

- Impacts on the habitat from intensification of development in the area;
- Fire;
- Predation;
- Changes in water quality and quantity; and
- Small amount of habitat available.

In recognising these constraints and sensitivities of the species, the Environmental Protection Authority (EPA) has initiated the development of an Environmental Protection Policy to provide statutory protection of the habitat of the Western Swamp Tortoise. The *Revised Draft Environmental Protection (Western Swamp Tortoise) Policy 2001* (EPA 2001) has recently been advertised for public comment, closing on 30 November 2001, and the Minister for the Environment is currently considering submissions prior to finalisation of the Policy.

Increasing the density of human populations near the reserves is likely to lead to a range of incremental pressures on the habitat of the Western Swamp Tortoise which may threaten the viability of the existing wild population. These pressures include an increase in the risk of fire within the nearby Twin Swamps Nature Reserve by accidental ignition and spread of fires. Landowners adjacent to the Nature Reserve may also apply pressure to CALM to control burn the Nature Reserve to reduce the risk of bushfire and damage to their properties.

Increasing the density of residents adjacent to the Twin Swamps Nature Reserve is also likely to increase the occurrence of weed invasion into the reserve by the introduction of plant species not locally native to the area in residents' gardens, as crops and in animal feed. Weeds in the Twin Swamps Nature Reserve replace native bushland and reduce the habitat of the Western Swamp Tortoise and the condition of regionally significant vegetation (see 'Regionally significant vegetation, wetlands and watercourses' below).

Although the Twin Swamps Nature Reserve is currently fenced to prevent access of unwanted predators, the increased density of residents is likely to threaten the integrity of the habitat through increasing the likelihood of damage to the fence, providing access for predators, such as dogs and cats, to the reserve. Domestic animals will also

add to the nutrient loadings of the site and may contribute to a reduction in water quality within the Twin Swamps Nature Reserve.

It is also expected that the density of the proposed subdivision is likely to have detrimental impacts on the quality of water within the habitat swamps. This is further explained below under the title of 'Impacts on surface and ground water quality'.

As a number of the threats to the remaining populations are related to human population pressures, such as fire, weeds, domestic animals, there is a need for management of subdivision of land surrounding the habitat reserves. While the environmental impacts of a single subdivision proposal may be negligible, the EPA must consider the precedent this would set for other landowners in the area. There is a direct relationship between subdivision minimum lot size, increased density and therefore the potential increase of impacts on the habitat areas. An 8 hectare minimum lot size has been determined in consultation between the Department of Environmental Protection, CALM and the DPI as a compromise to allow subdivision for a number of land owners provided environmental safeguards are incorporated into the development.

Impacts on regionally significant vegetation, wetlands and watercourses

The Government's *Bush Forever* policy recognises the Ellen Brook, situated adjacent to the eastern boundary of the subdivision area, as containing regionally significant remnant vegetation, wetlands and watercourse (Site No. 296, State of Western Australia 2000). The Ellen Brook forms part of a regionally significant bushland and wetland linkage from the Swan River north to Bullsbrook and north-west to state forest areas and forms valuable habitat for fauna movement between larger areas of bushland.

The proposed subdivision plan does not propose any mechanisms for protecting the Ellen Brook from degradation. Development of this density is likely to impact on the riparian vegetation and water quality of the watercourse and the wetlands associated with the Ellen Brook.

The Twin Swamps Nature Reserve, located approximately 400 metres west of the subdivision area, occurs on the eastern side of the Swan Coastal Plain, an area of high floristic biodiversity where most (>97%) of the native vegetation has been cleared. The values of the Twin Swamps Nature Reserve has been recognised for many years as part of System Six area M17 (Department of Conservation and Environment 1983). The Government's *Bush Forever* policy recognises the reserve as Site 400.

While the proposed subdivision is unlikely to directly impact the floristic biodiversity of the Reserve, the incremental human population pressures of this and other unprecedented subdivisions of this density, as described under the heading 'Impacts on the Western Swamp Tortoise' above, are likely to increase the degrading impacts of weed invasion and fire in particular.

Impacts on surface and ground water quality

While the relationship between groundwater, surface water flows and the swamp systems is not well understood, it is thought that the wetlands within the Twin Swamps Nature Reserve are fed by surface water inflows from the west of the railway line and by rising groundwater (Townley *et al.* 1997).

It is understood that the swamps at Twin Swamps probably fill in response to the first winter rains from direct rainfall and surface water runoff. Late in the winter, the regional water table will rise until the swamps are fed by groundwater. It is suggested that the rise in the water table near Twin Swamps may be at least partly due to flow from the east, from the Darling Scarp, which passes beneath the Ellen Brook (Townley *et al.* 1997).

Subdivision at this density, with limited land use controls under the General Rural zone, is likely to increase nutrient and effluent export from parts of the site through surface and groundwater. This may lead to reductions in water quality within the seasonal wetlands of the habitat area, potentially threatening the viability of the wild population of the Western Swamp Tortoise.

In addition to the impacts of water quality on the Western Swamp Tortoise, the subdivision area is within the catchment of the Swan and Canning Rivers, the subject of the *Environmental Protection (Swan and Canning Rivers) Policy 1998.* The Ellen Brook catchment is currently the highest contributing catchment of nutrients to the Swan and Canning Rivers. The Ellen Brook is immediately adjacent to the property and will collect surface water and shallow groundwater from parts of the property.

Rural subdivision of the density proposed may act to reduce the quality of surface and ground water exported from the site through increases in the density of nutrient producing and pollutant causing activities such as domestic animals, fertiliser and pesticide application, effluent disposal systems and the like.

Residents in proximity to wetland environments, such as that within the Twin Swamps Nature Reserve, are often exposed to nuisance midge and mosquito swarms. While the area does not have a current midge problem, numbers are likely to increase as a result of nutrient enrichment of the wetlands from fertilizers usage. Control of midge and mosquitos is generally by chemical spray. Chemicals may also be used to treat pests on grown produce such as an orchard or vegetable crops which may be associated with the proposed subdivision. Application of chemicals could effect water quality which would adversely impact on the Western Swamp Tortoise population, as described above.

Conclusion

The EPA is of the opinion that the density of the proposed subdivision is undesirable in an area of high environmental sensitivity in terms of protection of habitat of the critically endangered Western Swamp Tortoise, protection of reserves featuring high biodiversity in an otherwise highly cleared landscape, and the objectives of the *Environmental Protection (Swan and Canning Rivers) Policy 1998* to reduce nutrient export into the Swan River.

While this proposal in itself would not necessarily contribute highly to the degradation of the environment in the area, it would set an undesirable precedent for subdivision of other rural lots in proximity to the Twin Swamps and Ellen Brook Nature Reserves.

An 8 hectare minimum lot size has been determined in consultation between the Department of Environmental Protection, CALM and the DPI as a compromise to allow subdivision for a number of land owners provided environmental safeguards are incorporated into the development while limiting the overall increase in population density within the Policy area. This is demonstrated below for the Amendment area of the City of Swan TPS No. 5 Amendment No. 356:

Minimum Lot size (ha)	Maximum No. Lot (Increased Density)	Population (average 3 persons per lot)	Number of Lots that can subdivide
Existing situation	22	66	0
10	28 (27%)	84	4 (18%)
8	44 (100%)	132	19 (86%)
5	68 (209%)	204	19 (86%)
2	186 (745%)	558	22 (100%)

The EPA therefore considers that the proposed rural residential subdivision of Lot 2 Ellenbrook Road, Bullsbrook, does not meet the environmental objectives for protection of the Western Swamp Tortoise, regionally significant vegetation, wetlands and watercourses, and surface and ground water quality.

APPENDIX 3

APPEALS REPORT

Proposed Rural Residential Subdivision
Lot 2 Ellenbrook Road, Bullsbrook
Appeal Against Level of Assessment
Set at Proposal Unlikely to be Environmentally Acceptable

Date: 29 April 2002

APPEALS REPORT

PROPOSED RURAL RESIDENTIAL SUBDIVISION LOT 2 ELLENBROOK ROAD, BULLSBROOK APPEAL AGAINST EPA LEVEL OF ASSESSMENT SET AT "PROPOSAL UNLIKELY TO BE ENVIRONMENTALLY ACCEPTABLE"

Background

Mr HJ Hawke proposes to subdivide his 17 hectare property, Lot 2 Ellenbrook Road, Bullsbrook into eight lots of 2 hectares each. The proposed subdivision plan is included as Figure 1. Lot 2 is located less than 400 metres east of the Twin Swamps Nature Reserve and immediately west of the Ellen Brook, one of only two remaining habitats for the critically endangered Western Swamp Tortoise. The Western Swamp Tortoise is the most endangered tortoise or turtle on Earth, with the wild population of only 140 individuals living in the claypan swamps within the Twin Swamps Nature Reserve and the Ellen Brook Nature Reserve, managed by the Department of Conservation and Land Management.

The subject land is zoned Rural under the Metropolitan Region Scheme and General Rural in the City of Swan Town Planning Scheme (TPS) No 9. There are currently limited planning controls under the City of Swan TPS No 9 for the General Rural zone to manage land use associated with the proposed subdivision.

The property is, however, within the area of the proposed City of Swan TPS No. 9 Amendment No. 356, for which the Minister for Planning and Infrastructure has sought modifications (including a minimum lot size requirement), and is yet to be gazetted. The Environmental Protection Authority (EPA) advised that this Amendment rezones approximately 375 hectares of land east and south of the Twin Swamps Nature Reserve from 'General Rural' to 'Special Purpose – Ellenbrook Road' with the intention to cease land uses that presently impact on the Western Swamp Tortoise habitat and the Ellen Brook, and to limit the subdivision of the affected land to meet habitat protection and water quality objectives. Scheme provisions associated with the 'Special Purpose – Ellenbrook Road' zone provide for the requirement of an Outline Development Plan to address a range of environmental and planning uses prior to subdivision.

The Department of Environmental Protection (DEP) met with the proponent to explain the EPA's environmental concerns regarding the proposal, and discuss alternatives. The EPA, in recognising the high environmental sensitivity of its location encouraged the landowner to reconsider the proposal. However, the proponent did not modify the proposal.

As the proposal appeared unlikely to meet the EPA's environmental objectives, the EPA set the level of assessment at Proposal is Unlikely to be Environmentally Acceptable (PUEA) in January 2002. At that time a brief statement of reasons for the PUEA level of assessment was made publicly available as set out in the EPA's Administrative Procedures for Environmental Impact Assessment.

The EPA's reasons for the PUEA level of assessment for the proposed subdivision of Lot 2 Ellenbrook Road are summarised as follows:

- incremental pressures from increased development of the subdivision area on wild populations of the Western Swamp Tortoise in the nearby Twin Swamps Nature Reserve;
- the current General Rural zoning of the land providing limited land use planning controls over the proposed smaller lots;
- the proposed subdivision being inconsistent with the proposed scheme provisions for the 'Special Purpose – Ellenbrook Road' zone;
- the Ellen Brook, adjacent to the subdivision area, is a conservation category wetland and has been identified in Bush Forever;
- rural residential subdivision of the proposed density likely to contribute to a change in the water quality of the wetlands within the habitat area of the Western Swamp Tortoise;
- location of the subdivision area within the catchment of the Swan and Canning Rivers which is the subject of the Swan and Canning Rivers Environmental Protection Policy (EPP); and
- the subdivision proposal being inconsistent with the desired environmental planning objectives for the area and would set an undesirable precedent for other landowners with rural properties in proximity to the Twin Swamps Nature Reserve and Ellen Brook Nature Reserve.

Appeals

One appeal was received from the proponent, Mr H Hawke, against the EPA decision on level of assessment.

Appeal Investigations

Meetings and/or discussions were held with the following:

Mr Hawke
EPA Service Unit officers
City of Swan planning officers
Department of Conservation and Land Management officers
Department for Planning and Infrastructure officers

The EPA provided section 106(1)(a) advice on the appeal.

Appeal Grounds

The premise of the appeal is that the EPA has insufficient scientific evidence to support its decision that intensification of development in the area will impact on the Western Swamp Tortoise or its habitat within the Twin Swamps Nature Reserve.

The appeal refers to an environmental study by landowners in the area. This is understood to be a land capability and environmental assessment study completed as part of a proposed rezoning and Outline Development Plan for Ellenbrook Road, Bullsbrook (May 1998).

In discussion with Mr Hawke, he also referred to the City of Swan's support for Town Planning Scheme 9 Amendment 356 to rezone land between Twin Swamps Sanctuary and Ellen Brook

Nature Reserve from General Rural to Special Purpose – Ellenbrook Road. Further, that the EPA had set level of assessment for the Amendment as "Scheme Not Assessed – Advice Given". Under delegation from the EPA, the DEP provided advice on the Scheme Amendment in which it made no comment about lot sizes. On the basis that the DEP advice on Amendment 356 states that under the provisions of Section 48A(a) of the *Environmental Protection Act (1986)* the Scheme Amendment was deemed assessed by the EPA (8th October 1999), Mr Hawke questioned whether the EPA was able to assess the proposed subdivision of Lot 2 or indeed to comment on the matter of lot sizes in the area.

In discussion, Mr Hawke also referred to approvals for more intensive subdivision of land to the west of the Amendment 356 area and questioned why those subdivisions had been given approval when there are likely to be environmental issues similar to that for the area included in Amendment 356, including Lot 2 Ellenbrook Road.

Discussion of Key Issues

Administrative Procedures for Proposals assessed as "Proposal Unlikely to be Environmentally Acceptable"

PUEA is a level of assessment which was introduced in 1999 into the *Environmental Impact Assessment Administrative Procedures*. The intent of this level of assessment is to give the proponent early notice of the EPA's current thinking on the issue, given the available information, in order for the proponent to avoid expensive assessment which may not ultimately result in a positive recommendation from the EPA. In the interests of natural justice, the proponent has the choice to request that the EPA does conduct a full formal assessment.

Section 6 of the *Environmental Impact Assessment Administrative Procedures Amendment 1999* (gazetted 23 July 1999) states that there are two options for decisions with regard to appeals lodged against the EPA decision to assess a proposal as Proposal Unlikely to be Environmentally Acceptable:

(a) If an appeal on level of assessment is upheld by the Minister for the Environment, it would be referred back to the EPA by the Minister as required under Section 43 of the Environmental Protection Act to be assessed more fully or more publicly. In order to comply with the request to assess more fully or more publicly the EPA would require a PER or ERMP level of assessment and the proposal could not proceed to an expedited assessment.
(b) If the appeals on level of assessment are dismissed the EPA would provide its Report under section 44 to the Minister for the Environment. The proponent or any other person could appeal on the contents of or any recommendations in the EPA's Report.

Option (a) would require the proponent to prepare a Public Environmental Review document (or Environmental Review and Management Programme) to be available for public review for a period of four to ten weeks as determined by the EPA. Following the receipt of public submissions and the proponent's response to these comments, the EPA undertakes its assessment and reports to the Minister on the proposal.

In this case, it is noted that the proponent considers that the necessary environmental documentation has already been provided through the land capability and environmental assessment prepared as part of a proposed rezoning and Outline Development Plan for the area included in Amendment 356.

EPA Consideration of the proposed subdivision of Lot 2 Ellenbrook Road

Mr Hawke asserted that the EPA has no scientific evidence to support its decision that intensification of development in the area will impact on the Western Swamp Tortoise or its habitat within the Twin Swamps Nature Reserve.

In its advice on the appeal, the EPA reported that the property is located less than 400 metres east of the Twin Swamps Nature Reserve and immediately west of the Ellen Brook, one of only two remaining habitats for the critically endangered Western Swamp Tortoise. The EPA considered that increasing the density of human population surrounding the reserve is likely to lead to a range of incremental pressures on the habitat of the Western Swamp Tortoise which may threaten the viability of the existing wild population. The EPA considered that these pressures include an increase in the risk of fire and pressure to control burn the reserve, weed invasion and thus habitat degradation, reduction of water quality of the habitat swamps, damage to protective fencing and introduction of predators.

The EPA further advised that, in recognising the sensitivities of the species, the EPA has initiated the development of an Environmental Protection Policy to provide statutory protection of the habitat of the Western Swamp Tortoise. The *Revised Draft Environmental Protection (Western Swamp Tortoise) Policy 2001* (EPA, September 2001) was advertised for public comment and the submissions are currently before the Minister prior to finalisation of the Policy. Lot 2 Ellenbrook Road is included in the proposed EPP boundary. The revised draft EPP seeks (in part) to achieve protection of the Western Swamp Tortoise habitat through the development of statutory land planning strategies, policies and plans, and where appropriate the EPA conducting environmental impact assessments of plans, policies, strategies, schemes and proposals likely to adversely affect the beneficial uses. It does not specify minimum lot sizes for land within the area of the proposed policy boundary.

The EPA advised that the proposed subdivision is inconsistent with the proposed Amendment 356 due to the absence of an approved Outline Development Plan for the area addressing environmental and planning issues, as well as not meeting the minimum lot size of 8 hectares required by the Minister for Planning and Infrastructure in modifications to the proposed Amendment.

The EPA referred to correspondence received by the Department for Planning and Infrastructure which indicates that neither the Department of Conservation and Land Management nor the City of Swan support the proposed subdivision.

The EPA and the Western Australian Planning Commission have taken the approach that subdivision within the area of the remaining habitats of the Western Swamp Tortoise should be low density. A minimum lot size of 8 hectares has been suggested in consultation with the Departments for Planning and Infrastructure and Conservation and Land Management as an appropriate minimum lot size with land use controls for land in the vicinity of the habitat reserves. A significant change in the density of development, human population and therefore incremental pressures on the Western Swamp Tortoise would be associated with a decreasing minimum lot size, as demonstrated by the table below for the area the subject of the City of Swan TPS No. 9 Amendment 356:-

Minimum Lot size (ha)	Maximum No. Lot (Increased Density)	Population (average 3 persons per lot)	Number of Lots that can subdivide
Existing situation	22	66	0
10	28 (27%)	84	4 (18%)
8	44 (100%)	132	19 (86%)
5	68 (209%)	204	19 (86%)
2	186 (745%)	558	22 (100%)

The EPA has also received advice from the Department of Conservation and Land Management regarding these issues and this proposed subdivision, and which supports the EPA's approach in relation to the proposal. The current General Rural zoning of the property also provides for limited land use controls. Considering the rarity of the Western Swamp Tortoise species, the EPA considered that a precautionary approach is warranted.

The EPA concluded that while this proposal in itself would not necessarily contribute highly to the degradation of the environment in the area, it would set an undesirable precedent for subdivision of other rural lots in proximity to the Twin Swamps and Ellen Brook Nature Reserves. If approved, the EPA considered it is likely to lead to significant pressure for development of similar densities throughout the Policy area, which is considered to compromise the long term viability of the two habitat reserves.

EPA Assessment of City of Swan Town Planning Scheme 9 Amendment 356

In September 1999, the City of Swan referred to the EPA Town Planning Scheme 9 Amendment 356 to rezone the area bounded by Ellenbrook Road, Maralla Road, Warbrook Road, Bullsbrook from General Rural to 'Special Purpose - Ellenbrook Road'. This area includes Lot 2 Ellenbrook Road.

The EPA decided that the overall environmental impact of the Scheme Amendment was not severe enough to warrant assessment under Part IV of the *Environmental Protection Act (1986)*, the preparation of an Environmental Review and the subsequent setting of Ministerial conditions. Although there was no formal assessment of the Scheme Amendment, under delegation from the EPA, the DEP provided advice on the Scheme's key environmental factors. The DEP did not identify protection of Western Swamp Tortoise habitat as a key environmental factor and provided no advice with respect to minimum lot size for the Amendment area. Under the provisions of section 48A(a) of the *Environmental Protection Act (1986)* the Scheme Amendment was deemed assessed by the EPA.

Subsequent to the above advice on Amendment 356, the DEP provided the then Ministry for Planning with an interpretation of the recommendations of the original Draft Environmental

Protection (Western Swamp Tortoise Habitat) Policy (EPP, July 1994) which equated to an average lot size of 10 hectares for land within the EPP area. The DEP also supported the Western Australian Planning Commission recommendation of an eight hectare minimum lot size. Advice was provided to the Ministry for Planning to assist the Western Australian Planning Commission in considering the Amendment. The DEP considered that this did not contradict the provisions of section 48A(a) of the *Environmental Protection Act (1986)* as no further assessment was undertaken. The DEP considered it appropriate for the planning agencies to seek further advice on environmental issues relating to town planning scheme amendments as these are relevant considerations in making planning decisions.

The 'Vestern Australian Planning Commission advised the City in July 2001 that the Minister for Planning and Infrastructure had decided not to approve the Amendment until various modifications had been effected. These changes included a requirement for a stipulated minimum lot size of eight hectares. The City modified the Amendment documents and in returning the documentation to the Minister, the City advised of Council's continued support for the Amendment as originally submitted for final approval.

It is unfortunate that in the DEP advice on Amendment 356 that it made no reference to protection of the Western Swamp Tortoise habitat as a key environmental factor but subsequently provided advice to the Western Australian Planning Commission on lot sizes. Given the environmental advice on the Amendment, it is understandable that landowners considered that proposed subdivisions and the matter of lot sizes was to be dealt with through the planning process and that the EPA had no further role to comment on such matters. However, in the case of Lot 2 Ellenbrook Road located in the proposed Scheme Amendment 356, the Amendment has still to be gazetted and the EPA did not assess the current Rural zoning of the property.

The Amendment as originally adopted by Council did not include a minimum lot size. The issue of appropriate lot sizes would be determined through the Outline Development Plan process. The Minister for Planning's decision of requiring an eight hectare minimum lot size does not negate the need for the overall planning through the Outline Development Plan.

Other Issues

City of Swan's recommendation on the proposed subdivision

The City of Swan provided the following advice (24 December 2001) to the Western Australian Planning Commission with regard to the proposed subdivision of Lot 2 Ellenbrook Road, Bullsbrook.

The City of Swan (Council) has resolved not to support the proposed subdivision for the following reasons:

1. The subject land is located in an area subject to Amendment 356, which proposes to rezone the land between Twin Swamps Sanctuary and Ellen Brook Nature Reserve to "Special Purpose – Ellenbrook Road". This Amendment is yet to be finalised and, therefore, subdivision is considered to be premature. This Amendment requires the preparation and adoption of an Outline Development plan for the whole area covered by this Amendment to ensure the co-ordinated subdivision and development of the land. In the absence of an approved Outline Development Plan addressing the planning, environmental, fire and road network requirements specified in Amendment 356, the proposed subdivision is considered premature and ad-hoc.

In its advice on the proposed subdivision, Council re-iterated its original support of Amendment 356 as resolved at its meeting held on 23 February 2000. This Amendment sought to introduce a rational approach to determination of lot sizes in the area through an assessment process as part of an Outline Development Plan, as opposed to prescribed minimum lot size. Council still contends that this is the most appropriate approach to determination of lot sizes for this Amendment area.

Conclusions

In regard to the issues raised in the appeal and in consideration of advice from the EPA it is concluded that:

1. Mr HJ Hawke proposes to subdivide Lot 2 Ellenbrook Road, Bullsbrook into eight lots of 2 hectares each. Lot 2 is located less than 400 metres east of the Twin Swamps Nature Reserve and immediately west of the Ellen Brook, one of only two remaining habitats for the critically endangered Western Swamp Tortoise. Lot 2 Ellenbrook Road is included in the revised draft Western Swamp Tortoise EPP boundary which seeks protection of the Western Swamp Tortoise habitat through the planning process and EPA assessment of proposals which could impact on the habitat.

2. Lot 2 is zoned Rural under the Metropolitan Region Scheme and General Rural in the City of Swan Town Planning Scheme (TPS) No 9. There are currently limited planning controls under the City of Swan TPS No 9 for the General Rural zone to manage land use associated with the proposed subdivision. The property is within the area of the proposed City of Swan TPS No. 9 Amendment No. 356, for which the Minister for Planning and Infrastructure has recently sought modifications (including a minimum lot size of eight hectares), and is yet to be gazetted. The EPA did not formally assess Amendment 356, and the Western Swamp Tortoise habitat was not identified as a key environmental factor in DEP advice on the Amendment.

3. The EPA, in recognising the high environmental sensitivity of the property location encouraged the landowner to reconsider the proposal. The DEP met with the proponent to explain the EPA's environmental concerns regarding the proposal, and discuss alternatives. However, the proponent did not modify the proposal.

4. The EPA set the level of assessment at PUEA in January 2002. At that time a brief statement of reasons for the PUEA level of assessment was made publicly available as set out in the EPA's Administrative Procedures for Environmental Impact Assessment.

5. The proponent appealed the level of assessment set by the EPA on the basis that the EPA has insufficient scientific evidence to support its decision that intensification of development in the area will impact on the Western Swamp Tortoise or its habitat within the Twin Swamps Nature Reserve. In discussion, the proponent also questioned the ability of the EPA to assess the proposed subdivision of Lot 2 Ellenbrook Road given that it had previously assessed Amendment 356.

6. The appeal determination to be made at this stage is restricted to a decision on the appropriate level of environmental assessment for the proposal. The appeal decision does not extend to whether or not the proposed subdivision is environmentally acceptable and should be allowed to be implemented.

7. In the interests of natural justice, it would be appropriate to allow the appeal such that the EPA allows Mr Hawke to undertake an environmental review pursuant to section 40(2)(b) of the *Environmental Protection Act (1986)*. Mr Hawke would then have a further opportunity to demonstrate that his proposal can be made to be environmentally acceptable in the knowledge of the EPA's current thinking, or if necessary, to modify his proposal during the assessment such that it meets the EPA's environmental objectives.

8. The means by which the EPA's environmental objectives for the Western Swamp Tortoise habitat are met is most appropriately addressed through the planning process. The process by which the planning and environmental agencies have determined a minimum lot size after the EPA decided not to assess Amendment 356 is a matter of concern which should be raised with the EPA. That the Department of Environmental Protection (DEP) advice on the Amendment did not address protection of the Western Swamp Tortoise habitat as an environmental factor early in the planning process is also of concern.

Recommendations

It is recommended that the Minister for the Environment and Heritage:

1. Allow the appeal such that the EPA is required to undertake a full formal assessment of the proposal;

2. Advise the EPA that the process by which the planning and environmental agencies have determined a minimum lot size after the EPA decided not to assess Amendment 356 is a matter of concern. Further, that it is also a matter of concern that the Department of Environmental Protection (DEP) advice on the Amendment did not address protection of the Western Swamp Tortoise habitat as an environmental factor early in the planning process; and

3. Advise the Minister for Planning and Infrastructure of the above, and that further justification needs to be provided for a minimum lot size of eight hectares in Amendment area 356 and the Amendment needs to be finalised as soon as possible.

Fiona Keating
APPEALS ASSESSOR

Derek Carew-Hopkins
APPEALS CONVENOR

29th April 2002

APPENDIX 4

WESTERN SWAMP TORTOISE

Ellen Brook – Western Swamp Tortoise Reserves

Land Management Planning on a Local Area Basis

by

Gerry Parlevliet
Senior Development Officer
Department of Agriculture
3 Baron-Hay Court
South Perth WA 6151

Date: 1997

Howard-Rasinta

From: "Parlevliet, Gerry"
To: "'Hawke, Howard'" <hhawke@iinet.net.au>
Sent: Friday, August 10, 2001 4:48 AM
Attach: WSTLMP2.DOC
Subject: Western Swamp Tortoise

Howard

The notes as requested

<<WSTLMP2.DOC>>

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Agriculture Western Australia
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Western Swamp Tortoise

Ellen Brook -Western Swamp Tortoise Reserves

Land Management Planning on a Local Area Basis

History

- Development of Environmental Protection Policy for Western Swamp Tortoise Habitat
- Community Committee formed to preserve rights of Landholders
- EPA asks Gerry Parlevliet of Agriculture Western Australia to handle community development of land management plan
- Environmental Protection Authority agrees to try the development of a land management planning process which involves the community.
- Collection of maps and satellite images.
- Committee carry out survey of landholders to determine their attitude and wishes.
- Landholders brought together to start process.
- Landholders briefed
- Landholders discuss options.
- *Landholders document their preferred plans and document natural resource information.*
- *Information collected from landholders*
- Individual contact with range of landholders
- *Information collated and digitised*
- *On going landholder development of individual property plans*
- *Collation of constraints to planning (ie Pearce, Roads, soil capability.*
- *Discussions with Planners Shire, Ministry Planning*
- Development of Land Management Plan (Text and base maps)

Aims

- Community develops a land management plan for the area.
- Have the plan accepted by the EPA and Swan Council as basis for future planning decisions.
- Have individual plans for future management of individual properties.
- CALM wants to protect habitat
- EPP is mechanism to ensure agencies take aspects into account.
- develop a plan to protect the tortoise to satisfy EPA

Constraints

- Environmental Objectives of protecting swamps from degradation
- Land capability constraints determine what it can be used for.
- Planning constraints (ie Roads, Pearce Airbase, Transmitters.)
- Individual preferences, attitudes.
- Political
- Interest in WST in population at large
- People out of area have opinion
- perceived future loss - speculation

Community Involvement in management of Reserves

- ie Friends of the WST,
- helpful, saves dollars,
- PR, better understanding
- Very important to have neighbours on side
- Skills and resources available
- CALM not adverse to community involvement

Concerns

- There is a scientific answer why not just follow it and not allow development pressures to prevail.
- will political pressure from developers prevail over the need of the environment.
- how costly is developing the plan
- how about cost to implement plan
- dealing with lack of consensus - what if one or two people don't want to be part of it?
- definitely do not wish to be dictated to but appear keen to use services offered by Agriculture Western Australia to develop own plans
- while they own their land they should be able to do as they please.
- some want to keep farming
- don't want restrictions.
- co-exist with the tortoise but still have right to manage their own land
- real fear of urban development taking over ie "rated out" by urban encroachment.
- What is area zoned, MRS, LRS, hydrogeological info, ground and surface

by normal planning process to be consistent are there alternative ways to reduce insect movement to nearby housing.

21. **Fire,** use bylaws in shire
    - Develop a local area strategic fire management plan with Shire
    - better fire breaks
    - prescribed burns
    - mosaic of strategic firebreaks
    - small blocks could control fire better
    - strategic fire retardant treeplanting belts
    - role of more lawns on small blocks etc
    - more roads more fire protection
    - local fire control facilities increase with population (Vol Fire Brig)
    - large population would see more readily the malicious fire starters
    - likely increase in accidental fires but smaller blocks could compensate
    - what is relevance to higher population at Vines, Ellen Brook Estate, Upper Swan. These are increasing local population.
    - development of network of firebreaks.
22. Need to look for alternative landuses
23. For subdivision they want options.
24. Base subdivision on land suitability, variable size to match land. Consider cluster development.
25. Option to **divert water** away from Swamps
26. Adequate **management plan inside reserves**
27. **Investigate option of deepening swamps to reduce reliance on ground water pumping**
28. **Investigate use of gambesi and other biological options to control mosquitos and midges.**

Mechanism

1. Cross subsidisation, higher cost to people who subdivide to smaller area, ie bond/cost to finance general to buy vital conservation land, what conditions
2. Environmental repair option nutrient strip on own or communal, ie Serpentine Jarrahdale.
3. Variable size subdivisions ie clusters
4. That any subdivision is designed with future urban in mind (schematic only) Block is large enough for some streets and blocks and public open space. Ie keep road reserves wide enough for urban/plus services.
5. Overlay with very long term possibilities.
6. restrict building on wet/flood and allow more subdivision in better land to compensate - clusters.
7. If land required for green belt then developers could design accordingly ie special residential with tree planting requirement/ no stock
8. if all required for green belt then compensate with other land.
9. What is area around two swamps 2000 or 4000 ha how many people is current 100 houses, what is appropriate
10. Stay away from arbitrary figures if satisfy all conditions, other constraints still apply.
11. Differential rating for non subdivision areas, how does valuer general deal with this.
12. Some subdivision near reserve done with negotiated access in exchange for protection of wet land.

Assess Long term WST survival in this situation.

Future Action

The next stage of the land management planning process is to consolidate the map information and potential landuse options and then have discussions in detail with the land planners form council and Ministry for Planning during the first half of 1996.

If the EPA decides it wants to go ahead with the EPP now, the form it will take will benefit from the experience gained from this process. Provide a suggested revised EPP to take into account many of the above comments. To take into account the option of using more positive approach in words in EPP. For example say what can be done in area first and then follow by constraints. An edited version can be provided.

- Letter, newsletter with invite to be involved to land holders after EPA briefing

Notes re Needs of WST

Population of WST has been determined by two intensive surveys. 15 plus have been found/reported outside of reserves ie Sproctor., some trying to get in into fenced area

The Scientists have some idea of what makes the WST tick.

- WST eat live food ie invertebrates (insects, tadpoles food needs to move).
- Don't obey rules
    - Males are bigger
    - Use front feet
    - aestivate over summer
    - eggs don't hatch under constant temperature need variable decreasing temperature
    - Eggs in underground nests
    - Lay in Spring, hatch in autumn in underground tunnel
    - prefer sandy soil but will go into loam

- They move in autumn and spring, dangerous in spring when swamp dry.
- Winter water temperature low - they swim slow
- feed mainly in winter and spring, as water in swamp shrinks, bio food decreases.
- In Nov/Dec swamps dry, they come out and prepare for aestivation.
- Find sites from previous aestivations, rabbit holes, or dig new.
- When digging new they start in depression
- In clay soils they aestivate under leaf litter logs etc. (may need artificial tunnels to help breeding)
- Aestivation could be from Mid Sept to April if dry.
- Is a true aestivation.
- In Autumn they emerge and go to temporary sites till swamps fill.
- Predators Fox, cat stopped by fences
- 1st year of life critical. attack from Heron, Ibis, Goanna
- Mortality if poor winter, reduced capacity, also effects fertility
- Egg growth starts in aestivation.
- Urine excreted as uric acid.
- If conditions in Spring poor then they may not ovulate, ditto in poor conditions.
- Age sexual maturity about 14 years.
- Long lived they learn, they get very old

Habitat

Other sites not suitable ie Sproctor
Twin Swamps under leaf litter or underground.
some suggestions of building artificial burrows.

- Artificial breeding good results.
- zoo conditions
- increased survival
- growing season longer
- better food
- but adults sexually immature
- breeding from wild adults.
- wild juveniles in better nick
- re introduce animals into swamps -results won't show til later

Water Quality

- Ellen Brook swamp needs more area and then isolate from surrounds.
- Have identified land uses nearby
- some drainage diversions and levees to isolate brick clay mining.
- drainage players, DEP, CALM, MRD, Brickworks, some landholders.
- MRD Freeman
- Nutrient P and N eutrophication/filamental algae
- Ellen Brook still relatively pristine - want to keep algae out.

Other considerations

1. Rare water species
2. Good example of clay Pan Swamp
3. Low level of P/N not pre-requisite for WST

Food Source

- algae effect on invertebrate population
- only in ephemeral brooks then rich in food
- swamps need to dry out
- even if long term full need very long term to change
- swamp dries too early

water contour - do community have this info.
- what are the implications of the EPP
- metro brick have plans to co-exist with the environment but put on hold by EPP until the system is sorted out.
- recognition that they must begin to address the issues or EPA or someone will take them to task
- currently EPA only concerned about surface water, if ground water also became an issue many more people would be affected.
- query on underground water under swamps and their link to pollution.
- seems to be general view that the tortoise are secondary, major thrust for some at least is to maintain control to do as they please on their land.
- They were interested in working with the Agriculture Western Australia to develop a land management plan.
- need to get objectives right
- Small survey by telephone indicate low 'P' usage by landholders.
- Expansion plans for Chicken Sheds
- Prefer subdivision - not restriction arbitrarily on EPP.
- Predators are an internal problem
- Fire breaks internal a big issue.
- impact of reserve on population ie escaping fire from reserves.
- object to arbitrary no house restriction above a x number. - this should be a planning issue.
- Some people suggest that if there is not the right to subdivide there is opposition to EPP

Clarification

EPA needs to indicate if urban zoning acceptable in the area to allow rezoning or will it only allow larger lots.

Option One Do Nothing

- People want to stay in green belt, no action ok
- However people want to subdivide.
- Degree of interest by locals is a strength
- Rights of the Farmer.

Existing landuse

- Intensive industries (option for them is when forced to move due to increased urbanisation subdivision compensates
- There are horticulture and nursery activities
- These may all change depending on circumstance.

Possible solutions

1. Possible **nutrient stripping facilities** (dam, vegetation), ie Government project with some contribution from land holders. Ie bulldozer available as comprehensive managed project to create compensation basins and rework banks.
2. Willing to fence creek and wetlands
3. Solutions include tree belts, bunds
4. **Plant trees** up and down Ellen Brook as comprehensive cooperative activity, have grants available for fencing (shared cost) Including drainage lines and swamps into WST area.
5. **Red mud** or lime amendment of light soils used for agriculture/ nutrient risk activity.
6. **Alternative septic** systems for new housing in sands and wet areas.(Biocycles)
7. Strict controls on subdivisions
8. Education by relevant agencies on proper **fertiliser use**
9. Sulphur story
10. Fertiliser applications depend on soil
11. Restriction of use of land by evaluating **well licence as control**
12. No issue of control if special contracts apply ie condition of special fertiliser regime for soil type
13. Agree not a total rejection of subdivision, but a right, conditional.
14. **Differential rating** should be encouraged to retain larger areas (what is mechanism)
15. Suggested **horse stocking average 1 per 5 acres** any more need stable.
16. Stables need to be managed to **reduce manure run off** (ie cart away/compost etc)
17. Other animals by relative DSE (use table)
18. **Intensive operations** (ie Poultry) use Codes of Practice and normal EPA involvement.
19. Voluntary agreements with existing intensive operators to minimize applications or maximize stripping
20. Other planning considerations ie **impact of insects** from swamps **on human population**

Ellen Brook Swamp

- Swamps overflow into Brook
- Stable from year to year
- dries of earlier - option to dig swamp deeper
- WST not territorial, can be aggressive during winter
- Wants extending
- What is subsurface water story, likely effect on salinity
- Rain quality - don't aggravate pollution keep industry and chance of acid rain away.
- **Fire**
    - No problem persay
    - frequency is significant on long term ie roots
    - there is no fire control in reserve
    - Fire breaks around outside and inside fence
    - impact of increased population
    - Frequency real problem increase if deliberate.
    - every couple of years could degrade swamp, even every five years.
    - fire could give nutrients and effect on food source

- Fence keeps out dog, cats, fox, kids
- interference to fences is of concern if increase population (include accidental by car.
- What is connection between Ellen Brook and outside water., does it need hydraulic pressure to stay full
- Cd toxic to aquatic invertebrates (Source superphosphate) What level?
- Herbicides have oestrogen effect
- Herbicides used (Glyphosate, Fusilade, Atrazine, wetting agents.

Twin Swamps

- Bassendean sand, in depressions clay
- lens of clay
- Hydrologists think there is a connection between swamps., overflow period of ground water, takes lot of rain to fill swamp
- WAWA are not indicating a problem
- CALM bore into Leederville aquifer
- Contact WAWA on effect of draw down locally
- Catchment to West important to fill swamp
- P 5mg in swamp
- Don't need P and N but need water
- Swamp coloured helps prevent problem
- aquatic fauna different
- aestivation in fire prone areas trees, shallow not tunnels., therefore more fire prone
- no natural predators of adults
- Twin Swamps needs above average rainfall to get good habitat then it is habitat, in dry years poorer.
- population may have been more mobile in natural situation, using different swamps in poor and good years
- May need artificial tunnels for aestivation
- fire increase due to people
- prescribed burn is possible but it needs to be cold and slow
- avoid fire at wrong time

APPENDIX 5

CORRESPONDENCE
FROM
THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Date: 2 April 2003 and 1 July 2003

RESPONSE TO QUESTIONS
FROM
FERGUSON KENNEISON AND ASSOCIATES

Date: 11 February 2003 and 27 April 2003

Your Ref:
Our Ref: 1988F001257
Enquires: Lyndon Mutter
Phone: (08) 9405 0700
Fax: (08) 9405 0777
Email: lyndonmw@calm.wa.gov.au

DEPARTMENT OF
Conservation
AND LAND MANAGEMENT
Conserving the nature of WA

Mr JR Ferguson
Ferguson, Kenneison and Associates
Environmental Consultants
113 Brazier Road
YANCHEP WA 6035

Dear Mr Ferguson

WESTERN SWAMP TORTOISE INFORMATION

I refer to your letter of 11 February 2003 regarding management of Ellen Brook and Twin Swamps Nature Reserves for the protection of the Western Swamp Tortoise.

Fire Management (Questions 1, 2, 3, 4 and 5)

There are Departmental Interim Management Guidelines that cover fire management for both Twin Swamps and Ellen Brook Nature Reserves. In addition, there is a "Fire Management Information Kit" developed by the Department for both reserves that is provided to the local brigades and FESA describing fire response procedures. These procedures are discussed with all agencies on an annual basis.

There have been several wildfires on the reserves in the past 30 years. Our records over the past decade indicate a wildfire on Twin Swamps Nature Reserve of approximately 3 hectares in the late 1980's caused by the crash of an RAAF jet. Since 2000 there have been a number of suspicious wildfires on and adjoining Ellen Brook Nature Reserve that are part of an ongoing investigation by the Police Arson Squad. The Department has records of five separate fires on the reserve in 2000-2001 ranging in size from 0.1 hectares on a road verge to two larger wildfires of 4.2 hectares and 20.4 hectares. City of Swan brigades and Departmental fire fighters extinguished these wildfires.

The Department carried out prescribed burns on Twin Swamps Nature Reserve in 1998 (11 hectares) and 2002 (14.5 hectares) to protect neighbours and to ensure the whole reserve does not burn at one time. A prescribed burn was carried out on Ellen Brook Nature Reserve in 1998 (3 hectares) and this, in conjunction with the wildfires in 2000-2001, provides good buffers to adjoining properties.

For Departmental insurance cover to be considered, liability would have to be indicated. Amongst other criteria, compliance with the applicable legislation, having and implementing a management plan or guidelines, maintenance of a fire detection system, a well-trained and equipped fire suppression capability and sound working arrangements with local brigades will all have a bearing. This Department has a track record of providing protection to private property values in this area.

Tortoise Population Information (Questions 10 and 13)

The figures for animals introduced from the Perth Zoo captive breeding colony to each reserve and estimates of numbers of animals on each reserve are given in Attachment 1.

Water Management (Questions 8 and 11)

The bore on Twin Springs Nature Reserve was established in 1994 under license from the Water and Rivers Commission. A replacement bore was developed in 2002. Our records of water usage indicate 8,000 to 13,000 kilolitres a year have been used over the period 1994-2000 with slightly less in 2001-2002 due to problems with the initial bore.

Water samples have been taken annually from several sites on both Ellen Brook and Twin Swamps Nature Reserves over a number of years. They are analyzed for both salinity and a range of nutrients.

Planning Policy and Departmental Comment (All remaining Questions)

The Department of Conservation and Land Management takes a very active interest in all planning decisions that may impact on the Western Swamp Tortoise's habitat and the Ellen Brook and Twin Swamps Nature Reserves. Therefore, the Department does provide written comment to the relevant agency when requested and/or under statutory planning or environmental protection processes. The Department has provided strong support for the establishment of the Environmental Protection Policy to protect the habitat of the Western Swamp Tortoise. It has also supported complementary planning mechanisms by the City of Swan and Department for Planning and Infrastructure.

Departmental advice to other agencies is made recognizing that statutory decision making processes will usually include inputs from other interested parties. Whilst copies of our submissions can be made available to you subject to Freedom of Information procedures, may I suggest that you approach either the City of Swan or the Western Australian Planning Commission as that will provide you with a more complete picture of all submissions.

I apologise for the delay in responding to your initial request. I trust that this response provides the information you require.

Yours sincerely

Keiran McNamara
ACTING EXECUTIVE DIRECTOR

2 April 2003
GW:JK LETTERS:WESTERN SWAMP TORTOISE JR FERGUSON

Att.

cc: Chief Executive Officer, City of Swan

Attachment 1: The figures for Western Swamp Tortoise introduced from the Perth Zoo captive breeding colony to each nature reserve and estimates of numbers of animals on each reserve.

	Twin Swamps		Ellen Brook	
	Population Estimate	Captive Animals Released	Population Estimate	Captive Animals Released
1991	6		33	
1991	6		34	
1993	5		40	
1994	16	10	47	
1995	46	18	35	
1996	36	7	29	
1997	46	25	25	
1998	43	18	34	
1998	64	40	46	11
2000	60	21	46	8
2001	30	9	37	12
2002			45	12

Your Ref:
Our Ref: 1998F001257 / 19502
Enquires: Paul Brown
Phone: (08) 9405 1222
Fax: (08) 9405 0777
Email: gordonw@calm.wa.gov.au

DEPARTMENT OF
Conservation
AND LAND MANAGEMENT
Conserving the nature of WA

Mr J.R. Ferguson
Ferguson, Kenneison and Associates
Environmental Consultants
113 Brazier Road
YANCHEP WA 6035

Dear Mr Ferguson

RESPONSE AND QUESTIONS TO DCLM CORRESPONDENCE 02/04/2003 MANAGEMENT OF ELLEN BROOK AND TWIN SWAMPS NATURE RESERVES

In reference to your follow up letter of 27 April 2003 regarding management of Ellen Brook and Twin Swamps Nature Reserves for the protection of the Western Swamp Tortoise, I provide the following information, in the order of the questions as numbered in your correspondence.

Question 1: Ellen Brook Nature Reserve

The values of Ellen Brook Nature Reserve are reported in Bush Forever as Site 301. The seven criteria for the selection of regionally significant bushland areas (Bush Forever sites) were provided on pages 4-5 of Volume 1 of the Bush Forever report. Ellen Brook Nature Reserve meets most of these criteria as outlined in Volume 2 of the Bush Forever Report. A copy of the relevant pages is attached for your information (Site 301, p134-135) and a summary of the criteria met is provided below:

- Representation of ecological communities. The Reserve contains vegetation representative of the very poorly reserved Guildford and Yanga Complexes. Assessment undertaken within the EPA Guidance for the Assessment of Environmental Factors No 10 indicates that only 0.2% of the original extent of the Guildford Complex and 1.0% of the original extent of the Yanga Complex are in secure reserves.
- Diversity. High flora and plant community diversity.
- Rarity. Two species of Declared Rare Flora, eight species of priority flora, contains plant communities representative of the eastern side of the Swan Coastal Plain, two Threatened Ecological Communities, and the critically endangered Western Swamp Tortoise.
- Scientific or evolutionary importance.
- General criteria for the protection of wetland, and streamline fringing vegetation.

The wetland contained within the reserve is also in the Directory of Important Wetlands in Australia and entered in the Register of the National Estate. It is subject to protection under the *Commonwealth Environment Protection and Biodiversity Conservation Act* 1999.

As this summary shows, the Ellen Brook Nature Reserve is clearly of the highest conservation value and meets the criteria for being an extremely important Bush Forever site. This does not mean however that it has not been subject to degradation, as outlined in the Bush Forever report page 134 stating the "*vegetation condition: >50% very Good to Excellent, <50% Good to Degraded, with areas of severe localised disturbance*". However, with only 7% of the eastern side of the Swan Coastal Plain native vegetation remaining, Ellen Brook Nature Reserve remains an important representative example of these vegetation complexes.

Question 2: Field Visit to the Reserves

I would be happy for you to visit the reserves with one of our officers. Please note that vehicle access within the habitat areas is restricted, so access will be by foot. Please contact Lyndon Mutter or District Manager Paul Brown at the Wanneroo office on 9405 0700 to arrange a suitable time.

Question 3, 4, 5, & 6: Areas to the East of Twin Swamp NR and Ellen Brook NR

The following comments by the Department are our officers' understanding of the decision by the Environmental Protection Authority to determine the boundary for the Western Swamp Tortoise Habitat Environmental Protection Policy (EPP). The EPA should have all the information in relation to the decision on the EPP boundary and I recommend that you contact the EPA for a full briefing on this matter.

The areas to the east of the Ellen Brook itself between the northern boundary of the Western Swamp Tortoise Habitat EPP area and the northern boundary of Ellen Brook Nature Reserve were not included in the EPP area. The reason for this in the northern part of the EPP area was that the subsurface groundwater and surface water flowing through and under Twin Swamps Nature Reserve flows **towards** the Ellen Brook through interconnecting wet areas in the reserve with those on private property to the south and east of the reserve (but west of the Ellen Brook creek line). Therefore, the subsurface groundwater and surface water originating from east of the Ellen Brook (including that flowing off the Great Eastern Highway) do not impact on the shallow groundwater and surface water in Twin Swamps Nature Reserve. Thus it does not impact the water quality or quantity on Twin Swamps Nature Reserve.

I understand that your client Mr Howard Hawke's property is between Twin Swamps Nature Reserve and the Ellen Brook in an area where a number of Western Swamp Tortoises were located in the past 15 years. The seasonally wet areas are connected to Twin Swamps Nature Reserve in wet seasons. As discussed above, the area is also thought to be connected to the shallow watertable in and around Twin Swamps Nature Reserve.

The Western Swamp Tortoise Habitat on Ellen Brook Nature Reserve is on the eastern side of the Ellen Brook stream bed and the situation is more complex. The decision to locate the EPP boundary on the eastern boundary of Ellen Brook Nature Reserve was made by the (then) Department of Environmental Protection and the EPA in the early to mid-1990s. As

indicated above, my officers do not have all the background to that decision and request that you gain clarification from the EPA (which should have full and complete records).

However, in terms of water quality management within the Western Swamp Tortoise habitat on Ellen Brook Nature Reserve there was an understanding that:

- The presence of a large stormwater drain between the tortoise habitat on Ellen Brook Nature Reserve and the Great Eastern Highway means that the surface water from the east of the tortoise habitat is drained away from the reserve and into the Ellen Brook stream bed.
- The Ellen Brook flows through an open Marri Woodland vegetation type on the Ellen Brook Nature Reserve and does not flow directly through the clay swamp habitat of the Western Swamp Tortoise. Therefore, water in the Ellen Brook creek bed and the tortoise habitat is separated. The swamp habitat used by the tortoises on Ellen Brook Nature Reserve is perched on top of a thick clay layer and so is not connected to the water table linked to the brook itself or the lands to the east of the Nature Reserve.

In relation to your statements in your letter dated 27 April 2003 under Question 6, the Government does have great concerns about the "*concentrations and loads of wastewater, nutrients, sediment, pesticides and other materials that materials that could have an adverse effect on the tortoise...*". The management of water quality into and surrounding the habitat of the Western Swamp Tortoise is a critical component the management of Twin Swamps and Ellen Brook Nature Reserves. The water quality issue is one value directly connected to the Western Swamp Tortoise Habitat EPP declaration and many of the recovery actions in the Western Swamp Tortoise Recovery Plan.

Question 7: Twin Swamps Nature Reserve as Tortoise Habitat

A wild population of tortoises has been monitored on the reserve from the 1960s. The nature reserve was created in 1962 because it was habitat for the Western Swamp Tortoise. The decision to declare the Twin Swamps Nature Reserve was made by the then Fisheries and Wildlife Department, the Department of Land Administration and the Government of the day knowing that the area was Western Swamp Tortoise habitat.

Data from Twin Swamps suggest that the population dropped from a high of over 100 (perhaps as many as 200) in the mid 1960s, to about 50 in the early 1970s. By 1985, the population at Twin Swamps was nearly extinct, although a few animals (less than 10) remained in the area.

The swamps on this Nature Reserve are suitable to enable females to produce eggs and hatchlings to gain adequate weight in average and above average years of rainfall. Whilst conditions are marginal for hatchling survival and for egg production in dry years, it does not mean the habitat is unsuitable for the Western Swamp Tortoise. Hatchling survival is naturally low in wild tortoise populations, and the tortoise has a long reproductive life to compensate for this. Consequently, as animals live for many years they have an opportunity to breed in those average and above average rainfall years.

Question 8: Release of Western Swamp Tortoise to Twin Swamps Nature Reserve

The translocation of captive-bred tortoises to Twin Swamps Nature Reserve was a key strategy in the Western Swamp Tortoise Recovery Plan (1994). The Recovery Plan was prepared by Dr Andrew Burbidge and Dr Gerald Kuchling and endorsed by the Western Swamp Tortoise Recovery Team. The Recovery Team comprised representatives of the Department of Conservation and Land Management, The University of Western Australia, Perth Zoo, Curtin University, the World Wide Fund for Nature, and the Australian National Parks and Wildlife Service. The Plan was approved by the Executive Director of the Department of Conservation and Land Management, the National Parks and Nature Conservation Authority, and the Minister for the Environment.

The first releases of the Western Swamp Tortoise to Twin Swamps Nature Reserve were in 1994 as per the Recovery Plan (1994).

Question 9 and 10: Population Estimates of Tortoises on Reserves

The population estimates provided to you previously are derived by field sampling and mathematical calculations that depend on the recapture rate in any one year. The calculations are scientifically sound but the table of animal numbers presented to you can be confusing. The "KTBA" estimate is the number of animals known to be alive, and as such, it underestimates the actual number in the population. Over time the additional years capture rate corrects the population estimates. Experience has shown that the actual population is higher than the KTBA estimate. There is considerable variation in the capture rate from year to year depending on different conditions and behaviour of animals. The KTBA figure is significantly lower than the actual for at least the most recent 5 years because of low sample size. The figures for these years are not a reliable estimate of actual population size. A realistic estimate of numbers is 40 to 45 animals in total at Ellen Brook (excluding hatchlings), 20 to 25 of which are breeding adults. At Twin Swamps, the population is estimated to be about 60, the oldest of which are now reaching breeding age.

Question 11: Departmental Comments on the Vines Development

The submission will be sent to you separately.

Question 12: Advice to DEP and EPA on Mr Hawkes Subdivision proposal

The Department did provide a submission to the DEP/EPA on Mr Howard Hawke's original development proposal to subdivide his property within the then proposed Western Swamp Tortoise EPP area. The Department seeks to provide submissions on all development proposals close to Twin Swamps or Ellen Brook Nature Reserves.

Question 13: Definition of Threatened Species

As described in the 1994 Recovery Plan (page 4 section 1.5), the Western Swamp Tortoise was and still is declared as 'rare or likely to become extinct' under the State *Wildlife Conservation Act 1950* and has been ranked as being critically endangered by the WA Threatened Species Scientific Committee. This declaration is and has been publicly available through the Government Gazette.

The Western Swamp Tortoise is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and as Critically Endangered in the IUCN 2000 Red List of threatened animals. The Western Swamp Tortoise clearly meets IUCN (2000) criteria A2c and D for Critically Endangered, having a total effective population (number of breeding adults) of less than 50 and having a greater than 50% decline in numbers in the last generation.

A third IUCN (2000) criterion (E) for being Critically Endangered is a 50% probability of extinction in two generations if conditions remain unchanged over that time (in the case of the Western Swamp Tortoise a generation is estimated at 20-25 years). This was touched upon in the 1994 Recovery Plan document.

It is clear that the Western Australian Government has improved the management of the critically endangered Western Swamp Tortoise, its habitat and its threats in the past 20 years. Actions include the protection of existing populations from feral predators, the establishment of a captive breeding colony, extensive research on its biology, reintroduction of juvenile captive bred animals to increase the population at Twin Swamps, and the development of a third population at Mogumber. Nevertheless, because of very low numbers, a long period to reach maturity and very long generation times the Western Swamp Tortoise still fits IUCN (2000) criteria A2c and D for being Critically Endangered.

Clarification of Previous Correspondence

In relation to your final comment regarding questions 16, 17, and 18 from your letter of 11 February 2003, as you requested, our advice was that the most useful course of action was to seek this information from the assessing agencies (Shire of Swan, Western Australian Planning Commission, and Environmental Protection Authority). This approach would enable you not only to see this Department's submissions, but also submissions from other agencies and interested parties, as well as information on how those submissions were treated by the assessing agency.

It was not the Department's intention to be obstructive in any way, but to enable you to access a more complete picture at minimal effort on your behalf.

I hope these responses answer your questions. If you need further clarification, I anticipate that this can be provided by Department officers during the proposed field visit to the site.

Yours sincerely

Keiran McNamara
A/EXECUTIVE DIRECTOR

1 July 2003
GW:KD KEIRAN/LETTERS/19502 - WST FERGUSON

cc: Chief Executive Officer, City of Swan, PO Box 196, Midland, WA, 6939
Chair, Environmental Protection Authority

ELLENBROOK NATURE RESERVE AND ADJACENT BUSHLAND, UPPER SWAN

Boundary Definition: protected area/bushland (part taken to cadastre) boundary (Areas of bushland within the boundaries of the Site are not accurately mapped. The boundary has been drawn to include any unmapped bushland; Boundary adjusted from that in draft *Perth's Bushplan*.)

SECTION 1: LOCATION INFORMATION

Bush Forever Site no. 301 **Area (ha):** bushland 63.6
Map no. 32 **Map sheet series ref. no.** 2134–III NW, 2134–IV SW
Other Names: J and B Martyn Reserve, part Location 95 (Keighery, BJ, and Trudgen 1992)
Local Authorities (Suburb): Shire of Swan (Upper Swan)
Includes CALM Managed Land: Reserve A27620 (Preservation of Fauna: Short - Necked Tortoise)
System 6 (1983): Part M17 area of bushland goes beyond System area boundaries, all bushland described

SECTION 2: REGIONAL INFORMATION

LANDFORMS AND SOILS

Pinjarra Plain
Guildford Formation (Qpa: Mgs1, S11)
Wetlands (within the Pinjarra Plain)
Holocene Swamp Deposits (Qhw: Cps)

VEGETATION AND FLORA

Vegetation Complexes
Pinjarra Plain
Guildford Complex
Yanga Complex (in area of southern limit)
Floristic Community Types
Supergroup 1: Foothills/Pinjarra Plain
3c *Eucalyptus calophylla — Xanthorrhoea preissii* woodlands and shrublands
Supergroup 2: Seasonal Wetlands
6 Weed dominated wetlands on heavy soils
8 Herb-rich shrublands in clay pans

WETLANDS

Wetland Types: floodplain, palusplain, creek (Ellen Brook), river
Natural Wetland Groups
Swan Coastal Plain Rivers
Ellen Brook (R.3)
Wetland Management Objectives: Conservation (38.4ha), Resource Enhancement, Multiple Use
Swan Coastal Plain Lakes EPP: none identified

THREATENED ECOLOGICAL COMMUNITIES

Not assessed, Critically Endangered (floristic community type 3c), Vulnerable (floristic community type 8)

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: vegetated wetland, creek, vegetated uplands
Vegetation and Flora: limited survey (part Site — DEP 1999, Gibson *et al.* 1994 (Ellen 01–07) (Ellenbrook Nature Reserve), Keighery, BJ, and Trudgen 1992); detailed survey (part Site — Keighery, BJ, 1996 (Ellenbrook Nature Reserve))
Structural Units: mapping (Keighery, BJ, and Trudgen 1992)
Uplands: *Eucalyptus calophylla* Open Forest to Woodland
Wetlands: *Eucalyptus calophylla* Open Forest to Woodland; *Eucalyptus rudis* Open Forest; *Viminaria juncea* and *Acacia saligna* Tall Open Scrub; *Kunzea* aff. *recurva* (GJK 12828) and *Verticordia densiflora Open* Low Heath, sometimes with scattered emergent *Eucalyptus rudis*; *Melaleuca lateritia* Shrubland; Herbland dominated by *Borya scirpoidea*, *Tribonanthes australis*, Asteraceae and Stylidiaceae species and combinations of these; *Neurachne alopecuroidea* Open Grassland; Sedgelands dominated by *Meeboldinia cana*, *Chorizandra enodis*, *Cyathochaeta avenacea*; mixed Sedgeland
Scattered Native Plants: *Eucalyptus rudis* Woodland — regionally significant vegetation recognised as being included in the area of Site in need of protection
Vegetation Condition: >50% Very Good to Excellent, <50% Good to Degraded, with areas of severe localised disturbance

T l Flora: 236 native taxa (Keighery, BJ, 1996) (estimated >60% expected flora)
S ificant Flora: *Eleocharis keigheryi* (R), *Hydatella dioica* (R); *Stylidium longitubum* (1), *Eryngium* p arifidum subsp. *palustre* ms (2), *Schoenus capillifolius* (2), *Chamaescilla gibsonii* (3), *Myriocephalus* a ndiculatus (3) (southern limit of range), *Rhodanthe pyrethrum* (3), *Stylidium mimeticum* (3), *Hydrocotyle* le oides (4); *Pimelea imbricata* var. *major*
Faur limited survey. Significant reptile species: Western Swamp Tortoise (*Pseudemydura umbrina*) (one of two
rema ng areas for this threatened species (Burbidge and Kuchling 1994)). Significant mammal species: Quenda (L.
Mutt pers. comm. 1998)
Link e: adjacent bushland to the north (Site 296) and west (Site 300); part of Greenway 44 (Tingay, Alan &
Asso tes 1998a); part of a regionally significant fragmented bushland/wetland linkage (Part A, Map 7)
Oth Special Attributes: see Fauna; contains plant communities representative of the eastern side of the Swan
Coas Plain; contains 1046m of regionally significant river (WRC 1996a GIS)

SE ION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Dire ry of Important Wetlands in Australia; Entered in the Register of the National Estate; subject to protection
unde e Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

SE ION 5: SELECTION CRITERIA AND RECOMMENDATIONS

Crit a: Representation of ecological communities, Diversity, Rarity, Scientific or evolutionary importance,
Gen l criteria for the protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation
Rec mendation: Part A: Site with Some Existing Protection; the existing purpose, care, control and
man ment of Reserve A27620 is endorsed. Part B: Rural Complementary Mechanism (see Table 3, Volume 1).

TOODYAY ROAD BUSHLAND, RED HILL

Bou dary Definition: bushland (part taken to cadastre) boundary (Areas of bushland within the boundaries of the
Site ve been recently cleared. The boundary has been drawn to include cleared bushland.)

SE TION 1: LOCATION INFORMATION

Bus Forever Site no. 42 — Area (ha): bushland 3.9
Maj no. 38 — Map sheet series ref. no. 2134–III NW
Oth Names: not known
Loc Authorities (Suburb): Shire of Swan (Red Hill)

SE TION 2: REGIONAL INFORMATION

LA DFORMS AND SOILS
Dar g Plateau (Darling Range)/Darling Scarp
Eve rained Granite (Ae, Aes: M3)
Fo hills
Col ial Deposits (Qc: Smg)
VE ETATION AND FLORA
Ve ation Complexes
oothills
restfield Complex (Ridge Hill Shelf, Darling Plateau)
Flo tic Community Types: *not sampled, type inferred
pergroup 1: Foothills/Pinjarra Plain
Eucalyptus calophylla — Xanthorrhoea preissii woodlands and shrublands
WI LANDS
We nd Types: creek
Na al Wetland Groups
arling Plateau
alyunga (D.1)
W nd Management Objectives: Resource Enhancement
Sw Coastal Plain Lakes EPP: none identified
TE EATENED ECOLOGICAL COMMUNITIES
Cri ally Endangered (floristic community type 3c)

SE TION 3: SPECIFIC SITE DETAIL

La dscape Features: creek, vegetated uplands

APPENDIX 6

CORRESPONDENCE
FROM
PAUL BROWN

OF

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
TO
THE WESTERN AUSTRALIAN PLANNING COMMISSION

Date: 13 November 2001

Your Ref: 119427
Our Ref: 81/04/1-8
Enquiries: Paul Brown
Phone: 9474 7031
Fax: 9368 4299
Email: paulbr@calm.wa.gov.au

DEPARTMENT OF Conservation AND LAND MANAGEMENT

Copy: Perth District
Att: L. Mutter.

Emma Bamforth
Western Australian Planning Commission
Albert Facey House
469 Wellington Street
PERTH WA 6000

November 13, 2001

LOT 2 ELLENBROOK ROAD, BULLSBROOK – BF SITE 296 & 400

I refer to the application for subdivision for ~~Lot 2 Ellenbrook Road in Bullsbrook~~ which has been recently lodged with the DPI Statutory Planning Branch and faxed to this Department on 5 November 2001. The Department of Conservation and Land Management is greatly concerned over this proposed subdivision, with regards to its potential impacts on both the States biodiversity and conservation reserve values. A similar subdivision proposal by GM & CM White for Lot 5 Lexia Avenue, Upper Swan has been recently assessed by the EPA as "Proposal Unlikely to be Environmentally Acceptable".

Biodiversity and Conservation Reserve Values

This property is just to the east of the Twin Swamps Nature Reserve, one of the two remaining sites for the critically endangered Western Swamp Tortoise (the most endangered tortoise or turtle in the world). The reserve is fenced to stop access by stock and the swampy area is fenced to stop predation by foxes and cats. The Twin Swamps Nature Reserve (Bush Forever Site 400) occurs on the eastern side of the Swan Coastal Plain where most of the native vegetation has been already cleared (Guildford Complex 6% vegetation remains and 1.6% protected on reserves). It contains wetlands on heavy soils and some *Banksia attenuata* woodlands on small sandy rises, with the latter Threatened Ecological Community (type 15) being Vulnerable. The nature reserve is on the Register of the National Estate and on the Directory of Important Wetlands in Australia.

The claypan swamps in and adjacent to Ellen Brook and Twin Swamps Nature Reserves protect the only remaining Western Swamp Tortoise (*Pseudemydura umbrina*) populations. A translocation trial is being undertaken to establish a third population on land near Mogumber; however, the success of this trial is not assured. The species is listed by the State, Commonwealth and by CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) as critically endangered and its habitat is protected under Commonwealth legislation. The Western Swamp Tortoise is the only member of the genus and has no close relatives. The Tortoise inhabits shallow, ephemeral winter-wet swamps on clay or sand over clay soils with nearby suitable aestivation refuges.

Biodiversity Values on the Lot 2 Ellenbrook Road

The Ellen Brook (Bush Forever Site 296) runs along the eastern boundary of Lot 2. Lot 2 appears to be completely cleared for many years and there is little remnant vegetation still remaining on it. A number of Western Swamp Tortoises have been recovered from adjoining properties (Lots 33, 1, 6

Doc 3

and 7) and transferred to Twin Swamp Nature Reserve after it was fenced, although no tortoises now remain on these properties.

Planning Implications

The tortoise habitat in and adjoining these reserves requires planning protection from inappropriate development on neighbouring properties. This is becoming crucial due to the mounting pressure for subdivision and development proposals within the north-east urban corridor. The planning implications for these reserves have been known and recognised by Government for many years (going back to the System Six Red Book in the 1980s). The EPA and CALM have been working on an Environmental Protection Policy (EPP) for the tortoise habitat on Ellen Brook and Twin Swamps Nature Reserves for some years. Recently the Government has sent the third draft of the Environmental Protection (Western Swamp Tortoise Habitat) Policy 2001 out for public comment with continued significant local landholder opposition.

There are several planning issues for the greater area surrounding Ellen Brook and Twin Swamps Nature Reserves that impact on this current subdivision application:

- An acceptable minimal lot size for the properties adjoining Ellen Brook and Twin Swamps Nature Reserves rural zone needs to be determined and agreed upon by the State and local planning agencies, and CALM/EPA. CALM would oppose lot sizes below 8 ha for this property as has been recommended in the City of Swan Town Planning Scheme No.9 Amendment 356.
- Water and Rivers Commission to determine an appropriate buffer to the tortoise reserves for groundwater extraction and guidelines on the numbers and use of bores in this area. Although the relationship between groundwater and surface water in the swamps is poorly understood the precautionary principle should prevail. Added subdivision and/or intensive agriculture may put added pressure on the groundwater resource. The property is down slope of Twin Swamps Nature Reserve in terms of surface water catchment.
- Uses that may threaten the groundwater, surface water and protection of the tortoise habitat should disallowed.
- Increased incidence of fire as a result of increased population adjoining the reserve potentially damaging tortoise habitat, the fox proof fence and infrastructure. There may be an increased threat to residences from fire off Great Northern Highway, placing additional pressure on CALM, FESA and local authority fire fighting resources.

Conclusion

The protection of the regional, State, national and international biodiversity values of Ellen Brook Nature Reserve is a major priority. The Department of Conservation and Land Management opposes the current application for subdivision of Lot 2 Ellenbrook Road, Bullsbrook to approximately 2 ha lots as it considers the proposed density is too great.

A new application with larger lot sizes and significant environmental and water quality/quantity conditions may be reconsidered for support by this Department and the Conservation Commission of Western Australia, depending on the provisions of the proposed EPP.

Sincerely,

Paul Hepburn Brown
ESTATE MANAGER, SWAN REGION
paulbr@calm.wa.gov.au
9474 7031

APPENDIX 7

ABORIGINAL SITES INQUIRY

INFORMATION
FROM
THE REGISTER SYSTEM

Date: 5 September 2003

Department of Indigenous Affairs
Government of Western Australia

OUR REF: ~~G0848~~ 60501-10

YOUR REF:

DATE: 5/09/2003

JR Ferguson
Ferguson, Kenneison and Associates
Environmental Consultants
113 Brazier Road
YANCHEP WA 6035

Dear Sir/Madam

RE: REQUEST FOR INFORMATION FROM THE REGISTER SYSTEM LOT 2, ELLENBROOK ROAD, CITY OF SWAN.

Thank you for your letter of 13/08/2003, requesting information on Aboriginal sites in the above area. A search of our Register System has been undertaken, the results of the site search is attached.

It is possible that there are sites that have not yet been entered on the Aboriginal Sites Register. The *Aboriginal Heritage Act 1972* (the Act) protects all Aboriginal sites in Western Australia whether they are known to this Department or not.

The provision of this information is not to be considered as a clearance (as it is not the role of the Department to give approvals, but rather to ensure that all the heritage issues have been addressed). The procedures to enable all relevant parties to follow the requirements of the Act are outlined below.

Prior to any proposed development/activity, so that no site is damaged or altered (which would result in a breach of Section 17 of the Act) it is recommended that suitably qualified consultants are engaged to conduct ethnographic and archaeological surveys of the area. This should ensure that all Aboriginal interest groups are consulted so that all sites on the designated land are avoided or identified. Such a survey would involve archival research, consultations and on the ground inspections. This Department is not able to recommend individual consultants, however contact details of the professional associations whose members do conduct surveys are enclosed. A survey should also ensure that the provisions of the Act are met.

Metropolitan/Wheatbelt Regional Office:
Ground Floor, South Node, DOLA Building
Old Great Northern Highway, Midland
Western Australia 6056
PO Box 1696, Midland WA 6936
Telephone (08) 9274 4288
Facsimile (08) 9274 1865
www.dia.wa.gov.au

Armadale Office:
Unit 1, 36-40 Commerce Ave
Armadale
Western Australia 6112
Telephone (08) 9399 9243
Facsimile (08) 9399 9324
www.dia.wa.gov.au

Northam Office:
125a Fitzgerald Street
Northam
Western Australia 6401
Telephone (08) 9621 2154
Facsimile (08) 9621 2100
www.dia.wa.gov.au

Merredin Office:
Tenancy 5 Newfields Shopping Centre
11 Mitchell Street, Merredin
Western Australia 6415
Telephone (08) 9041 5729
Facsimile (08) 9041 5734
www.dia.wa.gov.au

It is our preference that any development plans are modified to avoid damaging or altering any site. If this is not possible and in order to avoid a breach of the Act, the land owner should submit a Notice in writing under Section 18 of the Act to the Aboriginal Cultural Material Committee, c/o Department of Indigenous Affairs, seeking the Minister for Indigenous Affairs' prior written consent to use the land. A form to lodge a Notice under Section 18 is available from the Department.

Please do not hesitate to contact Mr Brian Blurton, of our Midland office, if we can be of further assistance.

Yours sincerely

Brian Blurton

For JOHN BRINKMAN
A/Regional Manager
5/09/2003

att: Professional Anthropological and Archaeological Organisations in WA.
Register of Aboriginal Sites report.

cc Richard Riordan, Team Leader Heritage Information, Department of Indigenous Affairs, PO BOX 7770, CLOISTERS SQ, PERTH, WA 6850
Phone: (08) 9235 8000

DEPARTMENT OF INDIGENOUS AFFAIRS

ANTHROPOLOGICAL AND ARCHAEOLOGICAL ORGANISATIONS IN WA
- for advice on consultants to undertake Aboriginal Heritage Assessment Surveys.
[DIA does not accept any responsibility for the choice of consultant or outcomes.]
[Revised April 2002]

[Note: For advice on the conduct of surveys, including legislative requirements, contact the Department of Indigenous Affairs or refer to the web page at www.dia.wa.gov.au]

Anthropological Society of Western Australia Inc. - Professional Section

CONTACT: Mr Wayne Glendenning
C/- Department of Anthropology
University of Western Australia
NEDLANDS WA 6907
Ph: (08) 9470 6329
Fax: (08) 9470 6329
Mob: 0412 722 967

Australian Association of Consulting Archaeologists Inc. - WA Chapter

CONTACT: Dr Bruce Veitch
C/- Archae-Aus Pty Ltd
PO Box 177
SOUTH FREMANTLE WA 6162
Ph: (08) 9331 4600
Fax: (08) 9331 4700
Mob: 0438 940 044

Australasian Association of Professional and Consulting Anthropologists and Archaeologists Inc.

CONTACTS: Ms Jacqueline Hárris
26 Camelia Street
NORTH PERTH WA 6006
Ph: (08) 9328 7973
Fax: (08) 9328 7973

DEPARTMENT OF INDIGENOUS AFFAIRS

Register of Aboriginal Sites

RPGSR V1.57

Report run onSeptember 5, 2003 11:44 AM

Reference No: IQ-RPGSR-4725

Selection Criteria	Legend			
Registered Site Query Site Id: 3525 Site Number:S02516 - Site Name: ELLEN BROOK: UPPER SWAN Status: Permanent Register - Access Type: Closed Site Attributes: M	**Status** I Interim Register P Permanent Register S Stored Data **Restriction** F Female Access Only M Male Access Only N No Gender Restrictions	**Access** C Closed O Open V Vulnerable **Reliability** R Reliable U Unreliable	**Site Types** C Ceremonial RP Repository / cache S Man-Made Structure T Modified Tree E Engraving ART Artefact HIST Historical	M Mythological BUR Skeletal material/Burial F Fish Trap P Painting Q Quarry MD Midden / Scatter G Grinding patches / grooves

Map coordinates (Latitude / Easting & Longitude / Northing) are based on the GDA94 datum. Coordinates are indicative locations and may not necessarily represent the true centre of sites, especially if access to specific site information is tagged as "Closed" or "Vulnerable". The metric grid on Site Search Maps are for a specific MGA zone, and does not cater for MGA metric coordinates for a different MGA zone.

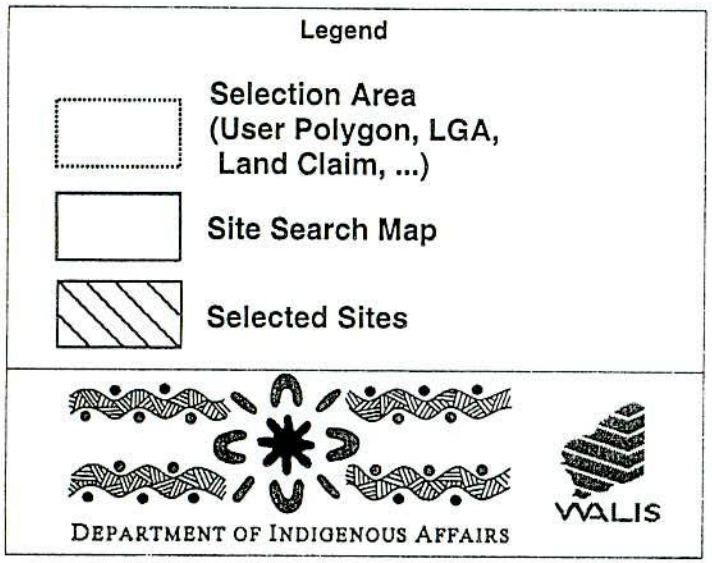
Site Id	Status	Access	Restriction	Latitude/ Easting	Longitude/ Northing	Reliability	Site Type	Site Name	Informants	Site No.
3525	P	C	N	31°42'56"S	116°1'27"E	R	M	ELLEN BROOK: UPPER SWAN	Date: 10/02/1999 Primary: [**Contact details have been suppressed**]	S02516
		MGA Zone	50	407553 mE	6490691 mN					

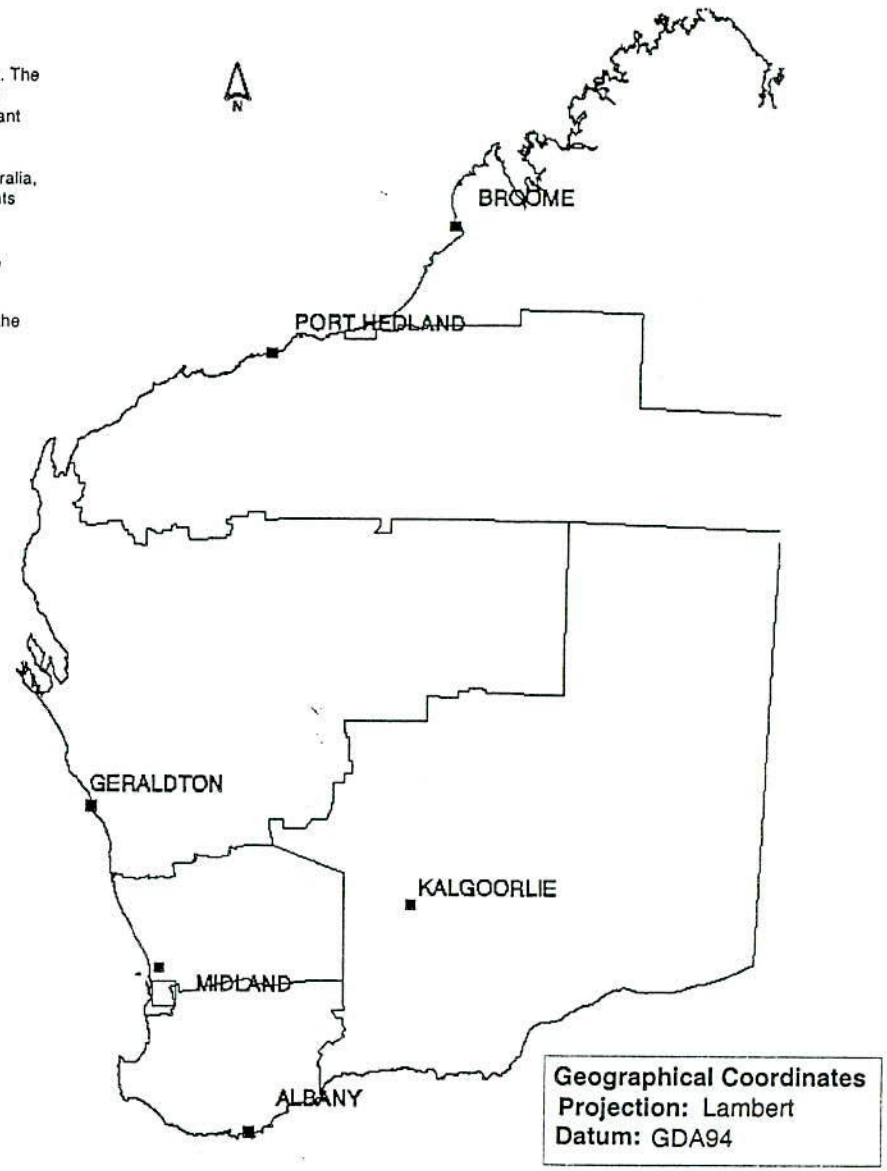
WESTERN AUSTRALIA

Aboriginal Sites Register

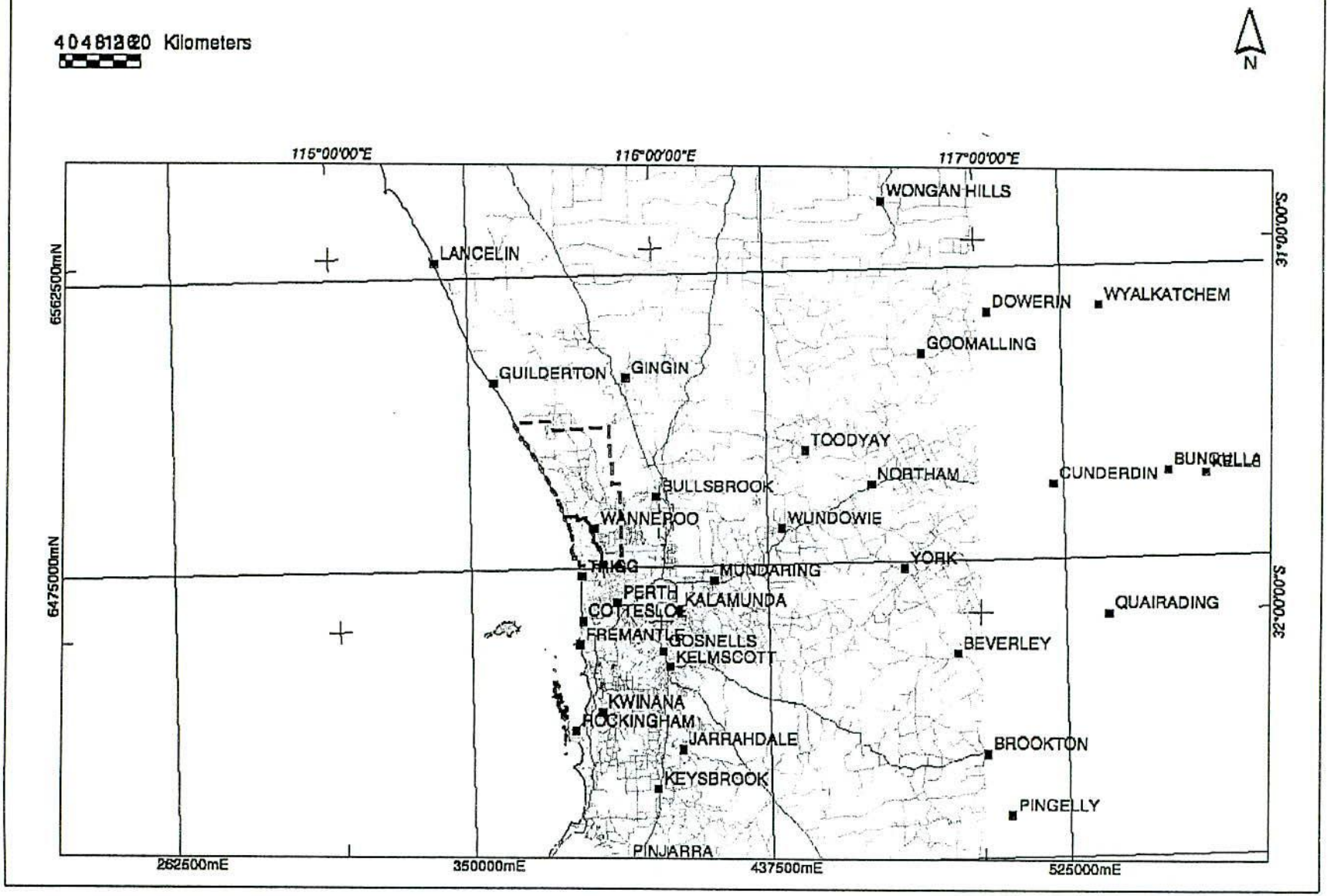
Site Search Overview Ma

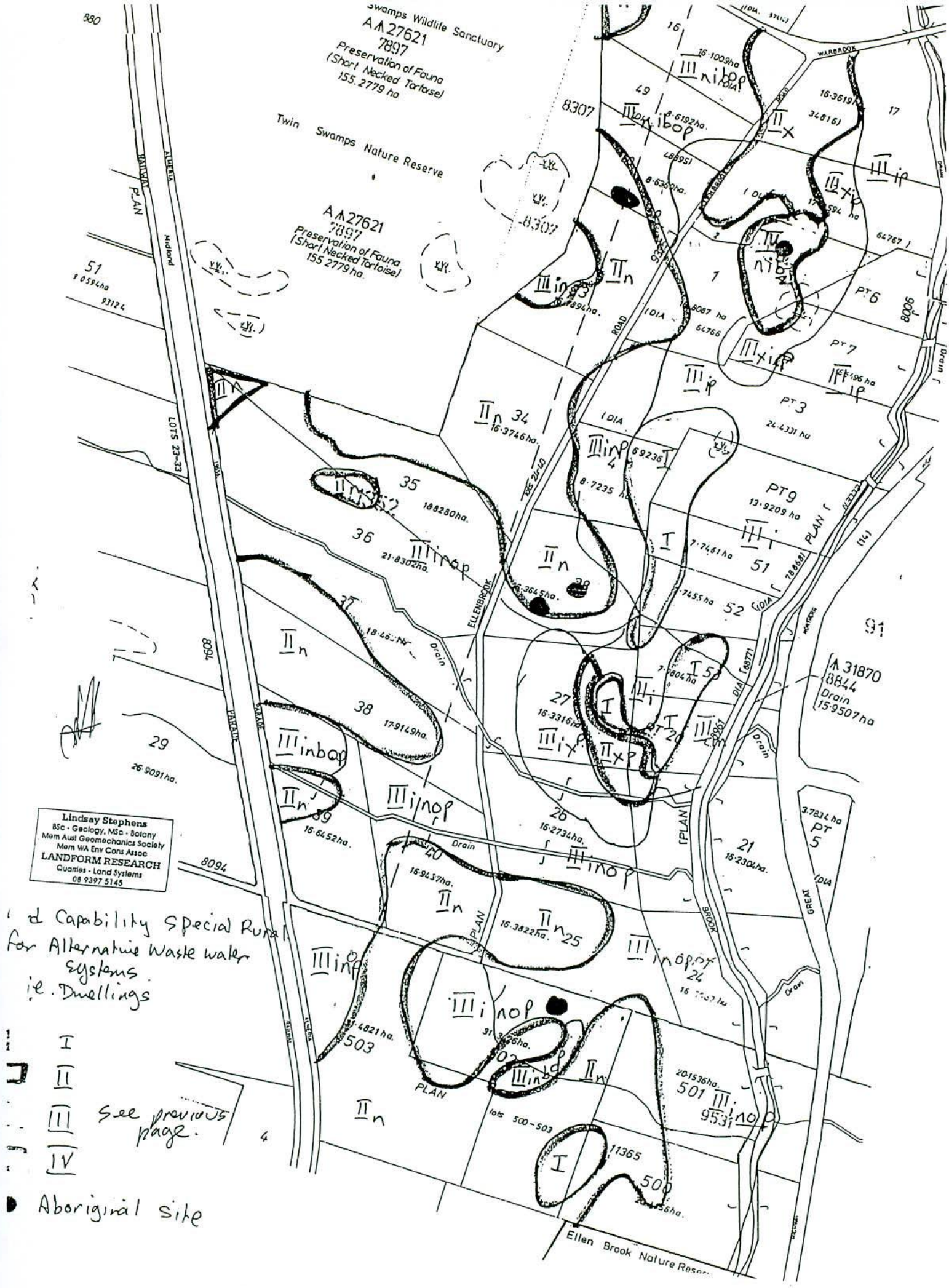
Sites may exist that are not yet entered into the Register system, or are on the Register and no longer exist. The Aboriginal Heritage Act 1972 protects all Aboriginal site in Western Australia whether they are known to the Dept of Indigenous Affairs / Aboriginal Cultural Material Committee or not. On-going consultation with relevant Aboriginal communities is required to identify any additional sites that may exist.

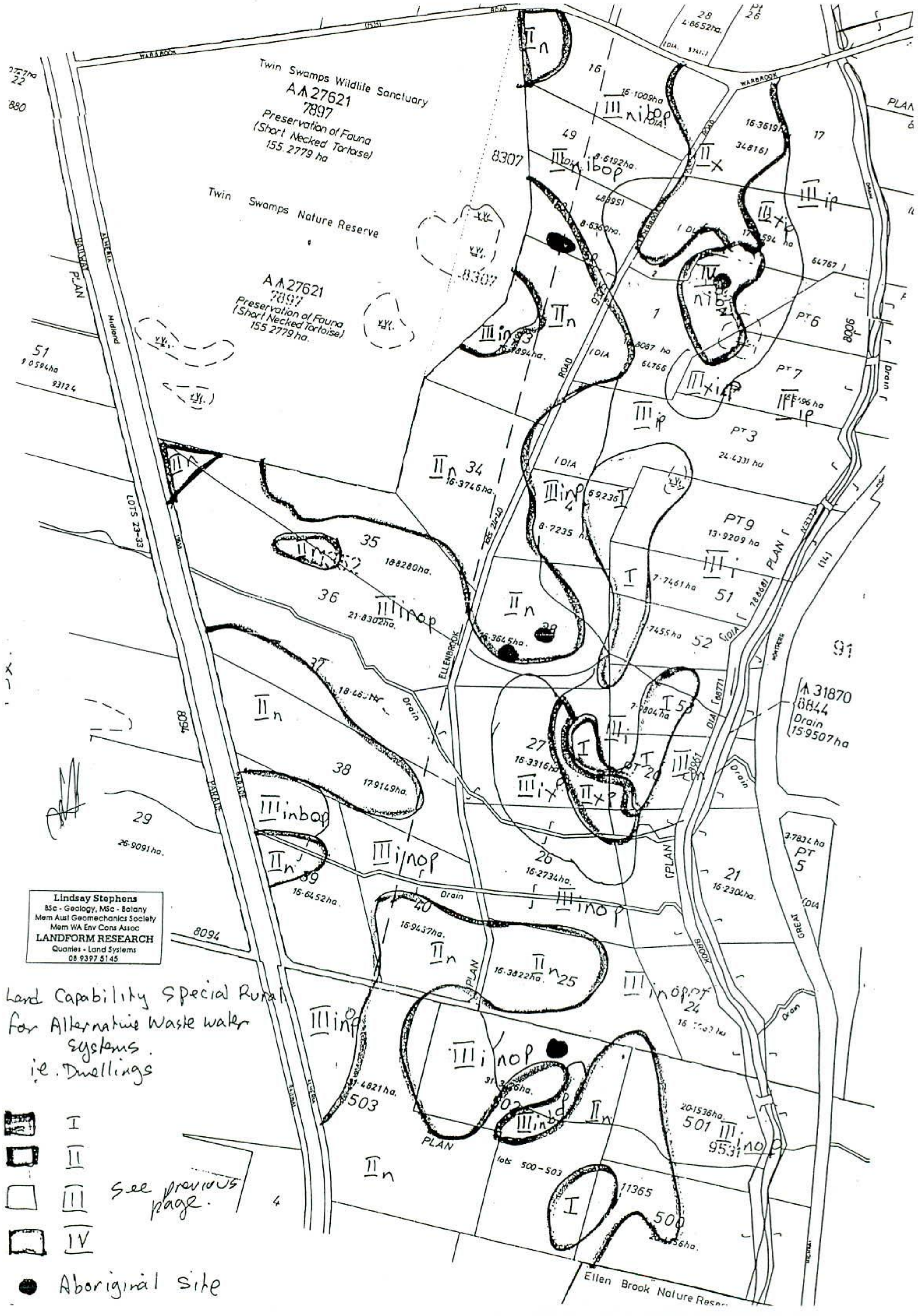




Site Search Map




Swamps Wildlife Sanctuary
A 27621
7897
Preservation of Fauna
(Short Necked Tortoise)
155.2779 ha
Twin Swamps Nature Reserve
A 27621
7897
Preservation of Fauna
(Short Necked Tortoise)
155.2779 ha.
Lindsay Stephens
BSc - Geology, MSc - Botany
Mem Aust Geomechanics Society
Mem WA Env Cons Assoc
LANDFORM RESEARCH
Quarries - Land Systems
08 9397 5145
Capability Special Rural
for Alternative Waste water
systems.
ie. Dwellings
I
II
III
IV
See previous page.
Aboriginal site
Ellen Brook Nature Reserve



Twin Swamps Wildlife Sanctuary
A 27621
7897
Preservation of Fauna
(Short Necked Tortoise)
155.2779 ha
Twin Swamps Nature Reserve
WARBROOK
ROAD
Midland
RAILWAY
LOTS 23-33
PARADE
ELLENBROOK
Drain
GREAT
BROOK
ELLEN
A 31870
8844
Drain
15.9507 ha
Ellen Brook Nature Reserve
PLAN
lots 500 – 503
Lindsay Stephens
BSc - Geology, MSc - Botany
Mem Aust Geomechanics Society
Mem WA Env Cons Assoc
LANDFORM RESEARCH
Quarries - Land Systems
08 9397 5145
Land Capability Special Rural for Alternative Waste water systems i.e. Dwellings
I
II
III
IV
See previous page.
Aboriginal site