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FINAL REPORT

to the
Western Australian Department of Conservation
and Land Management

**Nomination of
additional Ramsar wetlands
in Western Australia**

by

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Nomination of additional Ramsar wetlands in Western Australia

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Nomination of additional Ramsar wetlands in Western Australia

THE GOVERNMENT OF WESTERN AUSTRALIA
 DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
 WESTERN AUSTRALIA

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Executive Summary

In 1990 the Government of Western Australia nominated nine wetlands to the List of Wetlands of International Importance of the Ramsar Convention on Wetlands. The present report documents the process used and the data produced for nomination of additional Ramsar Sites, and extensions to existing Ramsar Sites, for Western Australia. The work was funded by Environment Australia and was conducted for the Western Australian Department of Conservation and Land Management (CALM) by Wetlands International - Oceania.

The principal expectations of the Convention in regard to new nominations are that Sites meet at least one of the 13 Ramsar criteria for identifying Wetlands of International Importance and that the Information Sheet for Ramsar Wetlands be completed and a description and map of the Site boundary be provided with each nomination. Seven of the criteria could not be confidently applied for Western Australia due to problems with interpretation of the criteria and/or lack of an adequate framework for systematic assessment.

The Western Australian chapter of the Directory of Important Wetlands in Australia was used as the primary data source for identifying potential candidate wetlands/systems. The Directory provides details on the existing Ramsar listed wetlands and an additional 101 wetlands/systems in Western Australia. The information in these wetland accounts was tested against the Ramsar criteria and an additional 38 candidate wetlands/systems were identified as meeting the criteria. Many of the candidates are in or include CALM-managed land. Consultation with staff of each CALM Region in the State was undertaken: this led to identification of candidate wetlands suitable to be nominated in the short term and of extensions that could be made to existing Ramsar Sites. The report includes Information Sheets and maps for these wetlands as well as documentation of the consultations with CALM staff.

The report recommends extensions to four of the existing Ramsar Sites. Eight wetlands/systems are recommended for nomination as new Ramsar Sites. Six are located in south-western Australia and two are in the arid zone. The eight include the first Ramsar Sites proposed for the Pilbara, Midwest and Southern Forest CALM Regions.

Values represented in the nominations include unique wetland types (e.g. Becher Point Wetlands: inter-dunal wetlands of geomorphological importance), threatened and endemic species (e.g. Spearwood Creek Wetlands: the only known populations of the orange-bellied frog *Geocrinia vitellina*), moulting and breeding sites for waterbirds (e.g. Muir-Byenup System: moulting of Australian Shelduck *Tadorna tadornoides*), and sites that are important with respect to populations of wetland species (e.g. Lake Gore: supports one third of the world population of Hooded Plover *Thinornis rubricollis*).

The total area of land included in the proposed new nominations is approximately 106,000 ha: together with the total area of proposed extensions (to four existing Sites), this potentially will increase the area of Ramsar Sites in Western Australia by 130,000 ha to about 587,000 ha. The largest of the proposed new nominations are Cape Range Subterranean Waterways (ca. 51,000 ha) and (part of) Lake MacLeod (37,000 ha).

It is recommended that CALM inform the Commonwealth of the proposed new nominations and extensions by May 1999 and that the process used and data generated in this project be revisited with a view to nomination of additional Ramsar Sites from time to time. It is also recommended that wetland mapping and classification for Western Australia be progressed or completed, and that clarification on application of several criteria be obtained, to facilitate future efforts to nominate Ramsar Sites.

1. Introduction and objectives

1.1 The Ramsar Convention and Ramsar Sites.

The Convention on Wetlands of International Importance was established at Ramsar, Iran, in 1971 and thus is commonly known as the Ramsar Convention on Wetlands (or "Ramsar Convention"). When a country joins the Convention it is obliged to nominate at least one wetland to the Convention's List of Wetlands of International Importance ("Ramsar Sites"), importance being defined in relation to the criteria for nomination (see 3.2 and 4.1 below). Contracting Parties may nominate additional Ramsar Sites at any time.

As at 13 November 1998 the Convention had 113 Contracting Parties and 956 Ramsar Sites. Australia was the first Contracting Party and has nominated 49 Ramsar Sites.

1.2 Rationale for nominating additional Ramsar Sites in Western Australia.

Nine Ramsar Sites were nominated by the State of Western Australia, through the Commonwealth, to the Convention secretariat in 1990 (CALM 1990; and see 2.1 below). This generated some public interest in the Ramsar Sites and in possible additional Ramsar Sites, resulting in submissions on this matter from the community to the State Government (see 4.5 below).

Subsequently, in the Coalition Environment Policy (December 1996) released immediately before a State election, the present State Government made the following commitment:

"Consideration will be given to the nomination of additional wetlands such as the Lake Muir complex under the Ramsar Convention and all Ramsar listed wetlands will be given priority for the completion of management plans and conservation strategies".

Funding for a project to identify candidate wetlands and develop nominations was sought by the Western Australian Department of Conservation and Land Management (CALM) from the Commonwealth's National Wetlands Program via the Natural Heritage Trust and was approved in 1997. Wetlands International - Oceania was contracted by CALM in 1998 to implement the project.

It is a common practice for Contracting Parties to work towards completion of new nominations shortly before the triennial Conferences of Contracting Parties to the Convention. The next Conference is scheduled to be held in May 1999 in Costa Rica. Therefore the Commonwealth Government has encouraged States and Territories to provide new nominations with that timeframe in mind.

1.3 Objectives of the project and report.

The main objective of the project was:

“to undertake work necessary for the WA Government to be in a position to consider and propose designation of additional wetlands as Ramsar Sites prior to the May 1999 Conference of Parties to the Convention.” (NHT proposal)

In view of the need to enhance the management of existing Ramsar Sites and in recognition of community submissions, consideration also is to be given to creating extensions to existing Ramsar Sites.

The purpose of the present report is to describe the methods used to identify candidate wetlands and select those that are recommended for nomination by May 1999 and to provide the documentation required for the nominations.

2. Existing Ramsar Sites in Western Australia

2.1 The current situation in Western Australia.

At present nine wetlands and wetland systems in Western Australia are Ramsar Sites. The name, area, date when nominated, location (IBRA region) and information on wetland type (marine, non-marine) for each Ramsar Site are given in Table 1.

Noteworthy features (only some of which are presented in Table 1) are:

- existing Ramsar Sites are restricted to the north and the south-west of the State; there are none in the remainder of the State;
- all of the Sites are on Crown Land (government reserves; Vacant Crown Land; one Site includes pastoral leasehold land);
- whereas much of the wetland area is protected (e.g. nature reserves), substantial areas (mainly marine and estuarine waters) are unprotected;
- about half of the Ramsar Sites include marine wetlands (i.e. wetlands subject to tidal influence);
- area of Site ranges from several hundred to more than 100,000 hectares; and
- only one set of nominations has been put forward (1990).

2.2 Comparison with situation in other Australian States and Territories.

A summary of the situation in Western Australia compared with the situation in the other States/Territories is given in Table 2. The distribution of the 49 existing Ramsar Sites in Australia is shown in Figure 1. The salient points are:

- Western Australia has the third highest number of Ramsar Sites;
- Western Australia has the fourth largest area of Sites; and
- area of Site in Australia ranges from less than 1 ha to nearly 2,000,000 hectares.

In comparing areas it should be noted that some Ramsar Sites in Australia comprise dry land as well as wetland, for example because the Site boundary is the boundary of the protected/gazetted area in which the wetland occurs. This applies to several larger Sites, notably Kakadu (Commonwealth land in the Northern Territory) and Coongie Lakes (South Australia). Thus comparisons of wetland area may not be valid if the area of the nominated Ramsar Site is the only measure used.

2.3 Comparison with other Contracting Parties

A comparison of the number and total area of Ramsar Sites and the year when the country became a Contracting Party to the Convention is given for Australia and other countries in Table 3. The information is arranged to show the top 20 countries ranked by number of Sites and, separately, the top 20 countries ranked by total area of Sites.

Table 1. The name, area, date when nominated, location (IBRA region) and wetland type (marine or non-marine) for each existing Ramsar Site in Western Australia. Source: WADCALM 1990. Wetlands nominated by the Government of Western Australia for inclusion on the List of Wetlands of International Importance (Ramsar Convention). Western Australian Department of Conservation and Land Management.

<i>Site name</i>	<i>area (ha)</i>	<i>date nom.</i>	<i>location (IBRA bio-region*)</i>	<i>marine (M); non- marine (NM)</i>
Ord River Floodplain	102,000	1990	Victoria Bonaparte	M, NM
Lakes Argyle & Kununurra	150,000	1990	Victoria Bonaparte	NM
Roebuck Bay	55,000	1990	Dampierland	M
Eighty-mile Beach	125,000	1990	Dampierland & Great Sandy Desert	M, NM
Forrestdale & Thomsons Lakes	754	1990	Swan Coastal Plain	NM
Peel-Yalgorup System	21,000	1990	Swan Coastal Plain	M, NM
Lake Toolibin	437	1990	Avon Wheatbelt	NM
Vasse-Wonnerup System	740	1990	Swan Coastal Plain	NM
Lake Warden System	2300	1990	Esperance Plains	NM

* Thackway, R. and Cresswell, I.D. eds. (1995). An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves, Version 4.0. Australian Nature Conservation Agency, Canberra.

Table 2. The number, total area and range of areas of Ramsar Sites in Western Australia compared with the number, total area and range of areas of Ramsar Sites in the other States/Territories of Australia. Source: Data held by Environment Australia, 13 Nov. 1998 (includes all extensions as at 13/11/98).

1. Ranked by number of Sites:

<i>State or Territory</i>	<i>number of Ramsar Sites</i>	<i>total area* (ha) of Ramsar Sites</i>	<i>range of areas of Ramsar Sites (ha)</i>
Victoria	10	306,844	955 to 67,186
Tasmania	10	19,445	70 to 4580
Western Australia	9	457,231	437 to 150,000
New South Wales	6	22,834	258 to 18,143
South Australia	4	2,154,300	3200 to 1,980,000
Queensland**	4	539,214	35,500 to 239,100
Northern Territory**	3	1,596,640	220,700 to 692,940
External Territories**	2	123	<1 to 122
Australian Capital Territory	1	125	125
totals***	49	5,096,756	<1 to 1,980,000

2. Ranked by total area of Sites:

<i>State or Territory</i>	<i>total area* (ha) of Ramsar Sites</i>	<i>number of Ramsar Sites</i>	<i>range of areas of Ramsar Sites (ha)</i>
South Australia	2,154,300	4	3200 to 1,980,000
Northern Territory**	1,596,640	3	220,700 to 692,940
Queensland**	539,214	4	35,500 to 239,100
Western Australia	457,231	9	437 to 150,000
Victoria	306,844	10	955 to 67,186
New South Wales	22,834	6	258 to 18,143
Tasmania	19,445	10	70 to 4580
Australian Capital Territory	125	1	125
External Territories**	123	2	<1 to 122
totals***	5,096,756	49	< 1 to 1,980,000

Notes:

* Area refers to the listed area, which may be much larger than the area of wetland within the Site. Some Sites comprise surrounding (dryland) catchment, which in some cases is the protected area within which the wetland occurs.

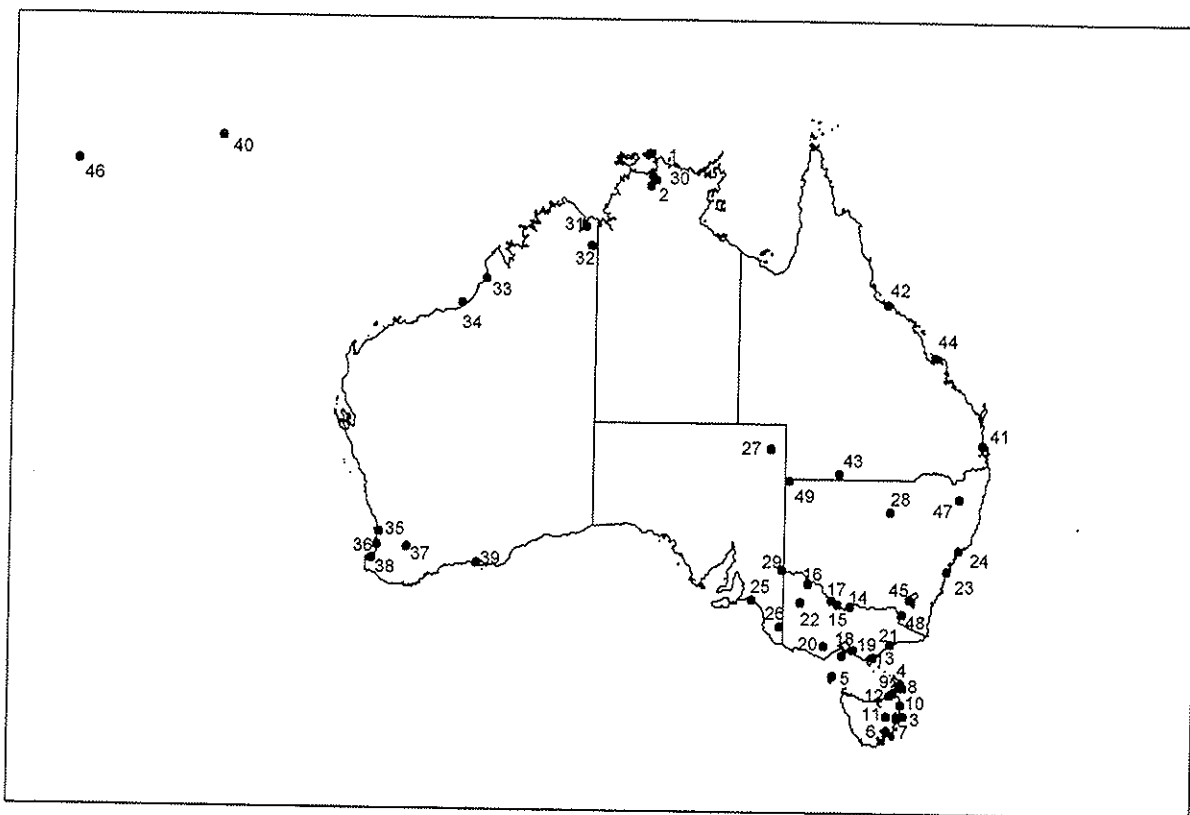
** Includes Commonwealth property.

*** Total area is 56,837 ha greater than that (5,039,919 ha) in the Ramsar Convention database as at 13 November 1998, apparently due to certain Site extensions not yet processed by the Ramsar Convention Bureau.

Figure 1. Location of existing Ramsar Sites in Australia.



WETLANDS DESIGNATED BY AUSTRALIA TO THE LIST OF WETLANDS OF INTERNATIONAL IMPORTANCE (THE RAMSAR CONVENTION ON WETLANDS)



Location Site	Hectares		
1. Cobourg Peninsula Aboriginal Land & Wildlife Sanctuary	220,700	24. Kooragang Nature Reserve	2,926
2. Kakadu National Park Stage I (including wetlands components of Stage III)	683,000	25. Coorong and Lakes Alexandrina and Albert	140,500
3. Moulting Lagoon Game Reserve	4,580	26. Bool and Hacks Lagoon	3,200
4. Logan Lagoon Wildlife Sanctuary	2,320	27. Coongie Lakes	1,980,000
5. Lavinia Nature Reserve	1,730	28. Macquarie Marshes Nature Reserve	18,143
6. Pittwater-Orielton Lagoon	3,175	29. 'Riverland'	30,600
7. Apsley Marshes	940	30. Kakadu National Park Stage II	692,940
8. East-Coast Cape Barren Island Lagoons	4,370	31. Ord River Floodplain	102,000
9. Flood Plain Lower Ringarooma River	1,650	32. Lakes Argyle and Kununurra	150,000
10. Jocks Lagoon	70	33. Roebuck Bay	55,000
11. Interlaken Lakeside Reserve	520	34. Eighty-mile Beach	125,000
12. Little Waterhouse Lake	90	35. Forrestdale and Thomsons Lakes	754
13. Corner Inlet	67,186	36. Peel-Yalgorup System	21,000
14. Barmah Forest	28,515	37. Lake Toolibin	437
15. Gunbower Forest	19,931	38. Vasse-Wonnerup System	740
16. Hattah-Kulkyne Lakes	955	39. Lake Warden System	2,300
17. Kerang Wetlands	9,419	40. Hosnie's Spring	<1
18. Port Phillip Bay (Western Shoreline) & Bellarine Peninsula	22,897	41. Moreton Bay	113,314
19. Western Port	59,297	42. Bowling Green Bay	35,500
20. Western District Lakes	32,898	43. Currawinya Lakes	151,300
21. Gippsland Lakes	60,015	44. Shoalwater and Corio Bays	239,100
22. Lake Albacutya	5,731	45. Ginini Flats Subalpine Bog Complex	125
23. Towra Point Nature Reserve	386.5	46. Pulu Keeling National Park	228
		47. Little Llangothlin Lagoon	258
		48. Blue Lake	320
		49. Lake Pinaroo	800
		TOTAL AREA	5,096,755.5

Table 3. The number and total area of Ramsar Sites and the year when the Convention came into force, for Australia and other countries. Source: Ramsar Convention database, 13 November 1998.

1. The top 20 countries ranked by number of Sites:

<i>country</i>	<i>Ramsar region</i>	<i>number of Sites</i>	<i>total area of Sites (ha)</i>	<i>year in which the Convention came into force</i>
United Kingdom	Western Europe	118	487,659	1976
Australia	Oceania	49	5,039,919	1975
Italy	Western Europe	46	56,950	1977
Ireland	Western Europe	45	66,994	1985
Denmark	Western Europe	38	2,283,013	1978
Spain	Western Europe	38	158,216	1982
Canada	North America	36	13,050,360	1981
Russian Federation	Eastern Europe	35	10,323,767	1977
Germany	Western Europe	31	672,852	1976
Sweden	Western Europe	30	382,750	1975
Netherlands	Western Europe	24	326,928	1980
Norway	Western Europe	23	70,150	1975
Ukraine	Eastern Europe	22	716,250	1991
Hungary	Eastern Europe	19	149,841	1979
Iran, Islamic Rep.	Asia	18	1,357,150	1975
France	Western Europe	18	795,085	1986
United States USA	North America	17	1,172,835	1987
South Africa	Africa	16	489,998	1975
Finland	Western Europe	11	101,343	1975
Slovak Republic	Eastern Europe	11	37,090	1993

Table 3. continued. The number and total area of Ramsar Sites and the year when the Convention came into force, for Australia and selected other countries.

Source: Ramsar Convention database, 13 November 1998.

2. The top 20 countries ranked by total area of Sites:

<i>country</i>	<i>Ramsar region</i>	<i>total area of Sites (ha)</i>	<i>number of Sites</i>	<i>year in which the Convention came into force</i>
Canada	North America	13,050,360	36	1981
Russian Federation	Eastern Europe	10,323,767	35	1977
Botswana	Africa	6,864,000	1	1997
Australia	Oceania	5,039,919	49	1975
Brazil	Neotropics	4,536,623	5	1993
Peru	Neotropics	2,932,059	7	1992
Denmark	Western Europe	2,283,013	38	1978
Iran, Islamic Rep.	Asia	1,357,150	18	1975
Mauritania	Africa	1,188,600	2	1983
United States USA	North America	1,172,835	17	1987
Mexico	Neotropics	1,095,414	6+	1986
Gabon	Africa	1,080,000	3	1987
Congo, Dem. Rep.	Africa	866,000	2	1996
Bolivia	Neotropics	805,240	1+	1990
France	Western Europe	795,085	18	1986
Paraguay	Neotropics	775,000	4	1995
Ukraine	Eastern Europe	716,250	22	1991
Germany	Western Europe	672,852	31	1976
Romania	Eastern Europe	647,000	1	1991
Namibia	Africa	629,600	4	1995

At 13 November 1998, global totals were 113 Contracting Parties, 956 Ramsar Sites and total area of Ramsar Sites 70.4 million ha.

Noteworthy features of this comparison are:

- Australia has the second largest number of Ramsar Sites;
- Australia has the fourth largest total area of Ramsar Sites;
- number of Sites is not necessarily directly proportional to area of country (e.g. UK, Ireland and Denmark are relatively small countries but are in the top 5 by number of Sites); and
- total area of Sites is not necessarily directly proportional to area of country (e.g. Denmark and Gabon are small countries but area of Sites in each case exceeds 1 million ha), though total area of Sites may be strongly influenced by area of country (most of the top 5 by total area of Sites are large countries).

The world's largest Ramsar Site (Okavango Delta, Botswana) has an area of nearly 6.9 million ha.

2.4 Summary of how Western Australia compares

In summary, Australia compares favourably with other Contracting Parties in terms of both number and area of Ramsar Sites, but some comparisons show that Western Australia lags behind some other States/Territories and that Australia lags behind some other Contracting Parties. Potentially these "gaps" may be widened because other States/Territories and Contracting Parties, possibly including those with more Sites and/or area of Sites, can be expected to nominate additional Sites in the near future.

Thus, assuming there are potential new Ramsar Sites in Western Australia, it may be necessary for Western Australia to nominate additional Sites if its present favourable comparisons are to be maintained.

There is no other obvious existing 'yardstick' against which the present situation in Western Australia readily can be measured. The Ramsar Convention Bureau is developing a "vision for Ramsar Sites" (Ramsar Convention Bureau in prep.) for presentation to the 7th Conference of Contracting Parties in May 1999 and it is anticipated that this will provide Parties with guidelines on, among other things, "adequate representation" of a country's wetlands in the List of Wetlands of International Importance.

3. New Ramsar Sites and extensions to existing Sites: current requirements and expectations

3.1 New nominations.

Requirements of the Ramsar Convention

The only requirements for new nominations to the List of Wetlands of International Importance which are binding on the Contracting Parties are those cited in the Text of the Convention (Annex 1). They are as follows:

- “The **boundaries** of the nominated Site shall be precisely described and also delimited on a map....” (Article 2.1);
- “Wetlands should be selected for the List on account of their international **significance** in terms of ecology, botany, zoology, limnology or hydrology.” (Article 2.2); and
- “Each Contracting Party shall consider its international responsibilities for the **conservation, management and wise use of migratory stocks of waterfowl**.....when designating entries for the List” (Article 2.6).

Any proposed new requirement would necessitate an amendment to the Text of the Convention. Amendments can only be made, following adequate notice, at a meeting of the Contracting Parties and require adoption by a two-thirds majority of the Parties present and voting (Article 10 bis: see Annex 1).

Parties should be aware of the general requirements of Contracting Parties in regard to planning for conservation and wise use of wetlands (Article 3.1) and to establishment and wardening of nature reserves (Article 4.1) when developing nominations. However there are no specific requirements in regard to these matters with respect to particular Sites being considered for nomination. For example there is no requirement under the Convention for a management plan to be in place or for the Site to be declared as a protected area, before nomination may be accepted.

Requirements of the Commonwealth Government

Accession to the Convention is open to members of the United Nations (Article 9.2). Thus the Commonwealth Government is the body responsible for establishing a process for developing nominations for Australia.

Correspondence with the Director of the Wetlands Section of Environment Australia in July 1998 has confirmed that the Commonwealth's current requirements are no greater than the requirements described above, except that **approval of the State/Territory Government** for a new nomination is expected (B. Edgar pers. comm.).

The Commonwealth Government at present **does not require management plans** to be in place **before nomination**. However, proposed new legislation (Commonwealth of Australia 1998) would result in the following changes in this regard:

Designation of a wetland under the [Ramsar] Convention may proceed only if the Commonwealth has used its best endeavours to reach agreement with the State and/or any private landholders on the designation of the wetland and management arrangements for the wetland. (Paraphrase of Section 326.)

This legislation is currently in Senate Committee, is likely to be subject (generally) to amendments and is some way off becoming law.

Expectations under Resolutions and Recommendations of Conferences of Parties

At each Conference of Parties to the Convention, the Parties may agree to Resolutions and Recommendations (Text of the Convention, Article 6 paragraph 2(d), 2(f): see Annex 1). Initially the Conferences only put forward Recommendations. From the Third Conference (1987) onwards, Resolutions generally have been used for matters related to the internal functioning of the Convention whereas Recommendations have been used mainly for matters related to wetland types and sites, relationships with other organisations, wetland initiatives and the like.

The Resolutions and Recommendations are **not binding** on the Contracting Parties: thus they may be regarded as **expectations**. In this regard Article 6.3 states:

“The Contracting Parties shall ensure that those responsible at all levels for wetlands management **shall be informed of, and take into consideration, recommendations of such Conferences** concerning the conservation, management and wise use of wetlands and their flora and fauna.”

Resolutions and Recommendations relevant to the nomination of new Ramsar Sites or extension of existing Sites, are described in Annex 2 and summarised in Table 4 of this report. Most importantly, Contracting Parties are expected to:

- **ensure that each candidate Site meets at least one of the 13 Criteria** for Wetlands of International Importance (Recommendation 4.2 and Resolution VI.2), thereby ensuring also that Sites meet the Convention requirement (Article 2.2) to be selected for the List on account of their international significance;
- **complete an “Information Sheet on Ramsar Wetlands”** for the Site, in order (especially) to document the present ecological character of the Site;
- describe and **map the boundaries** of the Site.

A number of Resolutions and Recommendations, particularly from the Sixth Conference of Parties, encourage Parties to especially give attention to certain criteria or to nominate Ramsar Sites that include certain wetland types. These are intended to encourage Parties to ensure the specified criteria or types are considered; they are not intended to divert Parties from equal consideration of all criteria and types. It is likely that some arose in response to the Convention’s evolution from an initial emphasis on waterbirds to the present, more holistic, approach to wetland conservation.

Table 4. Summary of requirements and expectations with respect to new Ramsar Site nominations and extensions to existing Ramsar Sites.

REQUIREMENTS - New Nominations

- description and map of Site boundary.
- Site must be internationally significant in terms of ecology, botany, zoology, limnology or hydrology.
- responsibilities for conservation of migratory waterbirds shall be considered.
- State/Territory Government approval of nomination (Commonwealth Government requirement).

REQUIREMENTS - Extensions

- State/Territory Government approval of extension (Commonwealth Government requirement).

EXPECTATIONS - New Nominations

- letter to Ramsar Bureau from Administrative Authority of Contracting Party proposing the nomination.
- Site must meet at least one of the 13 Ramsar criteria.
- complete an "Information Sheet for Ramsar Wetlands" for the Site.
- take a systematic approach: if possible use wetland inventories.
- ensure consideration is given to:
 - using the waterbird & fish criteria;
 - achieving a representative range of wetland types;
 - inclusion of under-represented and "special interest" wetland types (karst, peatlands, coral reefs, mangroves, seagrass beds);
 - transfrontier wetlands; and
 - unprotected wetlands.
- endeavour to consult wetland experts, NGOs and local people.

EXPECTATIONS - Extensions

- letter to Ramsar Bureau from Administrative Authority of Contracting Party proposing the extension.
- map showing new and old boundaries.
- complete a new (updated) Information Sheet for the Ramsar Site.

Other expectations under Ramsar

Correspondence with technical officers of the Ramsar Convention Bureau in July 1998 (T. Jones pers. comm.) confirmed that the Bureau has no expectations additional to the requirements and expectations described above other than that a **letter** from the Administrative Authority (i.e. the Commonwealth Government agency "Environment Australia") be sent to the Bureau proposing the nomination. It was confirmed that all new nominations must meet at least one of the Ramsar criteria and be accompanied by a boundary map and completed Information Sheet.

The Convention on Wetlands Strategic Plan 1997-2002 (adopted at the Sixth Conference under Resolution VI.14) has two Operational Objectives and several Actions that are relevant to expectations in regard to new nominations:

- Operational Objective 6.1: "To identify those wetlands that meet the Ramsar criteria, and to give due consideration to their designation for the list".
There are no expectations here which are not covered under the Conference Resolutions and Recommendations.
- Operational Objective 6.2: "To increase the area of wetland designated for the List of Wetlands of International Importance, especially for wetland types that are under-represented either at global or national level".

Action 6.2.1 under this Objective encourages the listing of a **representative range of wetland types** in each country. (For action by Contracting Parties and others.)

Action 6.2.3 states:

"Give priority attention to the designation of new sites from wetland types currently under-represented on the Ramsar List, and in particular, when appropriate, coral reefs, **mangroves**, **sea-grass beds** and peatlands." (For action by Contracting Parties.)

Action 6.2.4 states:

"Pay particular attention to designation of new sites currently enjoying **no special conservation status** at national level, as a first step towards developing measures for their conservation and wise use." (For action by Contracting Parties.)

Thus there are several expectations (in bold above) in the Strategic Plan which are additional to expectations revealed in the Conference Resolutions and Recommendations.

The requirements and expectations for new nominations are summarised in Table 4.

3.2 Extensions to existing Ramsar Sites.

Requirements under the Text of the Convention

As shown above, the Convention text allocates to Contracting Parties the right to extend the boundaries of existing Ramsar Sites. There are **no specific requirements** stated in regard to extensions though the reader of the Text may conclude (from Article 2.1) that the Bureau must be provided with a description and map of the revised Site boundary.

Requirements of the Commonwealth Government

Correspondence with the Director of the Wetlands Section of Environment Australia in July 1998 has confirmed that the Commonwealth's current requirements are no greater than the requirements described above, except that **approval of the State/Territory Government** for an extension is expected (B. Edgar pers. comm.).

Expectations under the Convention

Correspondence with technical officers of the Ramsar Convention Bureau in July 1998 has confirmed that the Bureau's expectations essentially are no greater than the requirements and expectations described above.

The correspondence indicates that the Bureau expects the following in regard to extensions:

- a **letter** from the Administrative Authority (i.e. the Commonwealth Government agency "Environment Australia");
- a **map showing the new boundary**, ideally revealing at a glance how it differs from the old boundary; and
- a **new Ramsar Information Sheet** for the entire Site, even if most of the data are unchanged (words to that effect will suffice), drawing attention to any additional wetland types, additional natural or socio-economic values, additional criteria met, or additional conservation 'issues' covered by the extension.

The requirements and expectations for extensions are summarised in Table 4.

4. Identification of wetlands in Western Australia which meet the criteria for nomination as a Ramsar Site

4.1 Interpretation and application of the Ramsar criteria in the current Western Australian context.

The current criteria for identifying wetlands that may be nominated to the List of Wetlands of International Importance (Ramsar Sites) are included in Annex 3.

In order to apply these criteria to wetlands in Western Australia, it was necessary to interpret the meaning of each statement (i.e. to set definitions) and determine if sufficient data existed (i.e. identify frameworks). This would ensure that there would be no ambiguity, that others would clearly see how the criteria were applied for the present project and that the criteria could be applied consistently in the future. The result of this work is shown in Table 5, with explanation as follows.

- Criterion 1 (representative or unique wetlands).

Definitions.

In regard to criterion 1, a definition of “biogeographical region” needed to be adopted for use in the present project. For a national perspective (e.g. for the Directory of Important Wetlands in Australia (ANCA 1996)), the Interim Biogeographical Regionalisation for Australia (“IBRA”: Thackway and Cresswell 1995) is appropriate. However, for the purpose of identifying wetlands of international importance it was decided that larger regions should be used. In practice this decision was reaffirmed due to (often) lack of sufficient data on wetland characteristics at the scale of the IBRA regions.

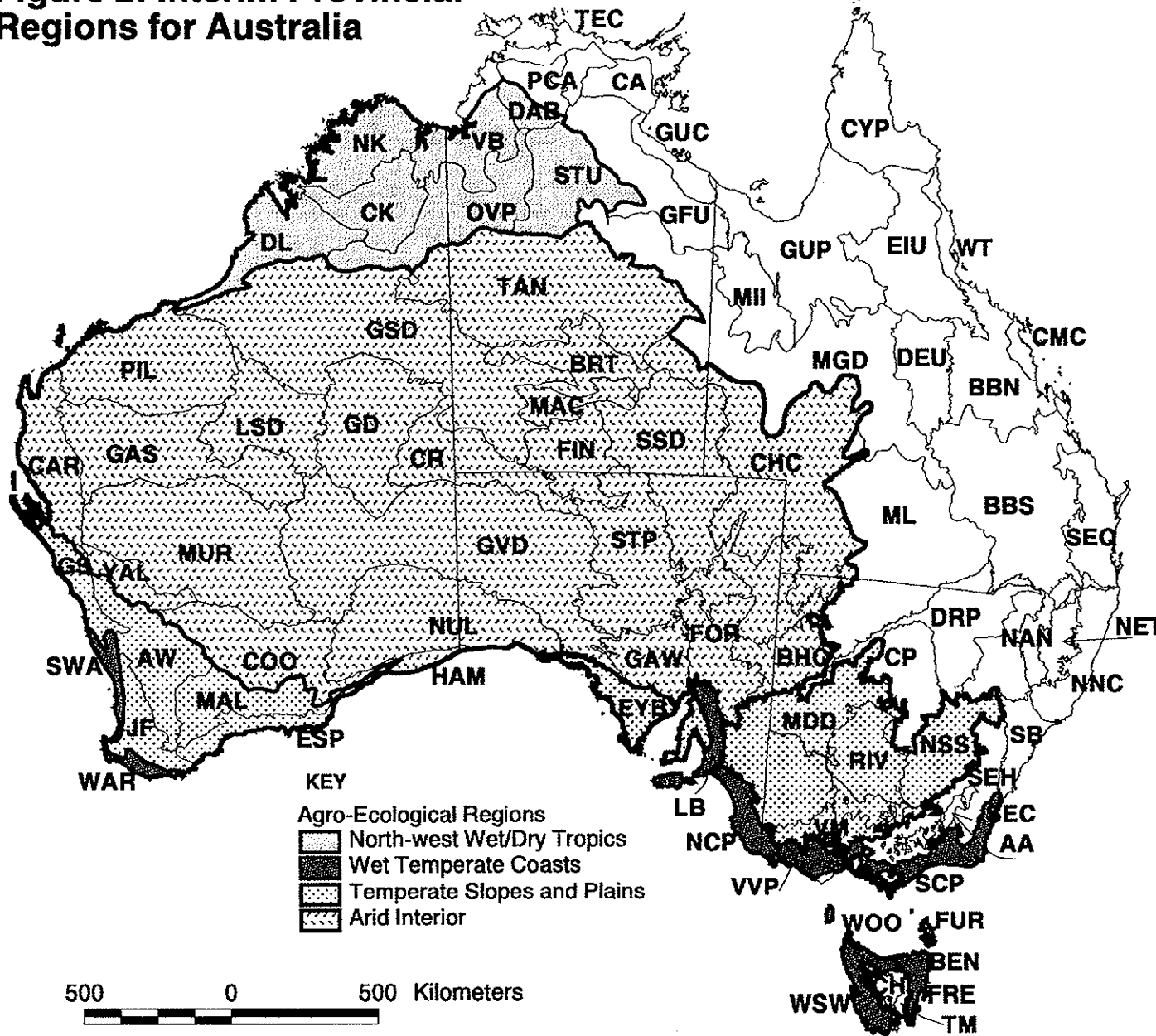
As far as the authors are aware, a global biogeographical regionalisation suitable for the present project does not exist. However, it was decided that the “Interim Provincial Regions” developed by Environment Australia (1998) from grouping of IBRA regions by Agro-Ecological Zones, would provide a suitable basis for development of the definition of biogeographical region for Western Australia in the present project (Figure 2). The Interim Provincial Regions are based on the coincidence of the 11 Agro-Ecological Regions with the 80 IBRA (version 4.0) boundaries. Some of the Interim Provincial Regions that occur in Western Australia also occur in other States. Consequently, the authors used the Interim Provincial Regions to derive three biogeographical regions as follows:

- **South-Western Australia:** the Western Australian parts of the “wet temperate coasts” and “temperate slopes and plains” Interim Provincial Regions, comprising seven IBRA regions:
Warren, Swan Coastal Plain, Jarrah Forest, Esperance Plains, Mallee, Avon Wheatbelt and Geraldton Sandplains.

Table 5. Application of the Ramsar Criteria in Western Australia under present circumstances

The current Ramsar Criteria (see Annex 3)	Interpretation for systematic assessment in WA
1. Representative or unique wetlands	
(a) it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region; or	NOT APPLIED, FRAMEWORK NOT ADEQUATE
(b) it is a particularly good representative example of a natural or near-natural wetland, common to more than one biogeographical region; or	NOT APPLIED, FRAMEWORK NOT ADEQUATE
(c) it is a particularly good representative example of a wetland which plays a substantial hydrological, biological or ecological role in the natural functioning of an major river basin or coastal system, especially where it is located in a trans-border p	NOT APPLIED, FRAMEWORK NOT ADEQUATE AND DEFINITION NEEDS FURTHER DEVELOPMENT FOR USE IN WA.
(d) it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region.	It is an example of a type of natural or near natural wetland that is rare or unusual in the region (Interim Provincial Region: EA 1998).
2. General criteria based on plants or animals	
(a) it supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species; or	It supports appreciable populations of native plant or animal taxa which are considered endangered or vulnerable at the national level (Endangered Species Protection Act 1992).
(b) it is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna; or	NOT APPLIED, FRAMEWORK NOT ADEQUATE AND DEFINITION NEEDS FURTHER DEVELOPMENT FOR USE IN WA.
(c) it is of special value as the habitat of plants or animals at a critical stage of their biological cycle; or	It is an <u>important</u> site for animal taxa at a vulnerable stage in their life cycle (one of the most important breeding, moulting, drought refuge (used by 1% of population or 20,000 birds), or (internationally important) migration staging sites.
(d) it is of special value for one or more endemic plant or animal species or communities.	It contains a plant or animal species that is endemic to the site.
3. Specific criteria based on waterfowl	
(a) it regularly supports 20,000 waterfowl; or	It has supported at least 20,000 waterbirds (in one count, or as the sum of highest numbers counted of each species) in several of the past 25 years and there is no evidence of recent decline to < 20,000.
(b) it regularly supports substantial numbers of individuals from particular groups of waterfowl, indicative of wetland values, productivity or diversity; or	NOT APPLIED, CRITERION REQUIRES FURTHER DEVELOPMENT AND DEMONSTRATION OF USE BY THE RAMSAR BUREAU.
(c) where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl.	It has supported 1% of the population (as documented by Rose & Scott 1997) of a waterbird in several of the past 25 years and there is no evidence of recent decline in % supported. Note: 1% thresholds are available for shorebirds and a few other species.
4. Specific criteria based on fish	
(a) it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biologicala	NOT APPLIED, CRITERION REQUIRES FURTHER DEVELOPMENT AND DEMONSTRATION OF USE BY THE RAMSAR BUREAU. Note that endemism is covered under 2(d).
(b) it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.	NOT APPLIED, FRAMEWORK NOT ADEQUATE

Figure 2: Interim Provincial Regions for Australia



BACKGROUND

This map combines the boundaries of the Interim Biogeographic Regionalisation for Australia (IBRA), comprising 80 regions, with the Provincial IBRA boundaries for Australia, comprising 11 regions. The Provincial boundaries were derived by grouping the IBRA regions by the 11 Agro-Ecological Regions for Australia.

CAVEAT

The Provincial regions are based on a "best fit" of the Agro-Ecological Regions. The accuracy of the spatial relationships between the 11 Provincial IBRA regions and the 80 IBRA regions has not been verified.

SOURCES

Environment Australia Biodiversity Group (1995) "IBRA digital data set" Environment Australia Biodiversity Group

(1996) "Interim Provincial Regions for Australia (IBRA Regions group by Agro-Ecological Regions)"

Scale: 1:34,000,000
 Projection: Albers Equal Area
 Standard Parallels: 18 & 32 deg. South
 Central Meridian: 132 deg. East
 Australian Spheroid

Produced by ERIN Biodiversity
 14 December 1998
 Graphic file: ib-aereg-a41.ps
 wetlands.apr



Department of the Environment

- **North-Western Australia:** the “north-west wet/dry tropics” Interim Provincial Region, comprising (within Western Australia) five IBRA regions:
Dampierland, Central Kimberley, North Kimberley, Victoria Bonaparte and Ord-Victoria Plains.
- **Arid Interior:** the “arid interior” Interim Provincial Region, comprising the remaining 14 IBRA regions within Western Australia.

Frameworks.

There is no bioregion-wide framework for systematic assessment of representativeness in Western Australia. Thus **criteria 1(a), 1(b) and 1(c) cannot be confidently applied** at present. Geomorphological classification and mapping of wetlands has been conducted over part of South-Western Australia, notably the Swan Coastal Plain, and is being undertaken over other parts (e.g. Semeniuk 1987). Eventually this and other work may permit a framework for assessing representativeness to be developed.

However it was concluded that sufficient research and survey work had been done to enable some rare or unusual (unique) wetlands to be identified. Thus **criterion 1(d) can be confidently applied.**

- Criterion 2 (general criteria based on plants or animals).

Definitions.

For criterion 2 (b), there is no readily apparent explanation or definition of “quality and peculiarities” of a wetland’s flora and fauna. The criterion is considered too vague.

For criterion 2 (c), the term “critical stage” was interpreted to imply vulnerability and to include breeding, moulting, drought refuge or migration staging sites for animals, especially waterbirds.

For criterion 2 (d), the term “endemic” was interpreted to mean that a species is endemic to the wetland.

Frameworks.

The Commonwealth’s Endangered Species Protection Act 1992 has systematically derived schedules for endangered taxa and for vulnerable taxa and thus provides a suitable framework that enables **criterion 2 (a) to be confidently applied**. Note that it was considered that if a taxon was gazetted as rare or threatened at State level but not at national level, then criterion 2 (a) was not met.

In addition to problems with definition, also there is no adequate framework for systematic application of **criterion 2(b)**, which therefore **cannot be confidently applied** at present.

There is sufficient information (e.g. Jaensch *et al.* 1988, Lane *et al.* 1996, Watkins 1993) to enable the most important breeding, moulting, drought refuge and migration staging sites in Western Australia to be identified for many waterbird species. **Thus criterion 2(c) can be confidently applied.** It was decided that, in the context of the appropriate bioregion, the 2-3 most important sites for breeding or moulting of a species, drought refuge sites used by 20,000 waterbirds or 1% of the population of a species (see below), and migration staging sites for shorebirds which are recognised as internationally important (i.e. supporting 1% of the Flyway population: Watkins 1993), would clearly meet the criterion.

Collectively there is sufficient information in existence for **criterion 2(d) to be applied confidently** with respect to certain geographically restricted species that have been extensively and systematically surveyed. However, where it was considered that further or improved surveys will probably reveal that the species occurs at other wetlands, the criterion was not considered to have been met.

- Criterion 3 (specific criteria based on waterfowl).

Definitions.

It is considered that the Ramsar Convention needs to undertake further development of criterion 3(b) and provide demonstration of how it may be applied. Thus **criterion 3(b) was not applied.**

Frameworks.

There is sufficient information on waterbird usage of wetlands in Western Australia (e.g. Jaensch *et al.* 1988, Storey *et al.* 1993, Watkins 1993, Lane *et al.* 1996) to provide the frameworks for systematic and **confident application of criteria 3 (a) and 3 (c).**

In regard to criterion 3 (a), the existence of reliable counts of 20,000 waterbirds, or highest counts (during one year) of individual species which sum to 20,000 waterbirds, in at least several of the past 25 years and with no clear evidence of recent decline in numbers, was considered an adequate basis for criterion 3(a) to be met. Where few surveys had been conducted at the site but there was evidence of recurrence in at least several of the past 25 years of the wetland conditions that had on at least one occasion supported 20,000 waterbirds, the criterion was considered met (especially if the highest numbers were well in excess of 20,000 waterbirds, e.g. 100,000).

For criterion 3 (c), and consistent with Resolution VI.4 of the Sixth Conference of Parties, the Wetlands International publication "Waterfowl Population

Estimates" (Rose and Scott 1997) provided a framework for testing whether or not waterbird numbers were at least 1% of a recognised population of a species. In testing against this criterion, it was decided that there should be no clear evidence of recent decline in numbers to below the 1% level.

For Australia, population estimates currently exist only for shorebirds and for a few other waterbirds such as Australasian Bittern *Botaurus poiciloptilus*. There are no formally recognised populations estimates for other groups that include abundant species, notably grebes, pelicans, cormorants, ducks and allies, coots, and gulls and terns.

- Criterion 4 (specific criteria based on fish).

Definitions.

Despite the existence of detailed guidelines in regard to **criterion 4 (a)** (see Annex 3), difficulties with interpretation remain. It is considered that the Ramsar Convention needs to undertake further development of criterion 4(a) and provide demonstration of how it may be applied (it was adopted only recently, in 1996). This would then give tangible guidance to the Parties on how to apply this criterion. For the time being it **cannot be applied confidently**.

Frameworks.

As far as the authors are aware there is no existing State-wide, comprehensive database on the distributions and nursery sites of (especially freshwater) fish species by IBRA bioregion or by Interim Provincial Region. Thus there is insufficient information for a framework and **criteria 4(a) and 4(b) cannot be applied confidently**. Endemism of fishes is covered under criterion 2(d).

In summary, it is considered that **six** of the 13 criteria can be confidently applied in Western Australia at present: 1(d), 2(a), 2(c), 2(d), 3(a) and 3(c).

4.2 Process for identifying candidate wetlands for new nominations.

The Western Australian chapter (Lane *et al.* 1996) in "A Directory of Important Wetlands in Australia" (ANCA 1996) provides detailed information on 110 wetlands and wetland systems considered to be nationally important. Inclusion of wetlands in the Directory is dependent on the wetlands meeting criteria that are largely derived from the Ramsar criteria but that indicate national rather than international importance. The Directory is the only document of this type and scope for Australian wetlands and it covers all three bioregions of the State as defined for this project in section 4.1 (above).

Consequently the Directory was chosen as the primary source document for identifying candidate (internationally important) wetlands for new nominations. Each wetland or wetland system in the Western Australian chapter of the Directory was tested against the Ramsar criteria (Annex 3) in order to determine if the wetland/system is internationally

important. In some cases wetlands that were described separately in the Directory but that were hydrologically connected and/or in the same protected area, were tested as one wetland system.

Further editions of the Directory are planned and it is anticipated that additional Western Australian wetlands will be included (J. Lane pers. comm.). Assuming that further opportunities to develop new nominations of Ramsar Sites will occur, additional wetlands therefore may be considered at such a time. It is suggested that possible future development of new nominations also should be based on the Directory.

During the course of the project, new information was obtained on some wetlands that are in the Directory. Such data were in most cases provided by CALM staff during consultations (see 5.2 below). Where the data added substantially to the known conservation values of the wetland, they were considered together with the Directory data during testing of wetlands against the Ramsar criteria.

4.3 Process for identifying candidate extensions to existing Ramsar Sites.

In order to identify existing Ramsar Sites for which extensions to the boundaries could be proposed, it was decided that the focus should be on opportunities to include contiguous Crown land with appropriate vesting. Extension would be appropriate where it could be expected to either enhance the conservation values or functioning of the wetland in the Ramsar Site, or enhance the capacity of the land managers to maintain the conservation values of the Site.

As a principle, it was decided that nearby wetland that was not hydrologically connected to the existing Site would not be considered as part of an extension unless it was part of Crown land contiguous with the existing Site.

Subsequently, each existing Ramsar Site was evaluated using current cadastral maps and information and in discussion with CALM staff who have responsibility and/or knowledge of the Site (see 5.1 and 5.2 below and Annex 4).

4.4 Potential candidate Sites and extensions.

The result of testing the 110 wetlands/systems in the Directory against the six Ramsar criteria that could be confidently applied (see 4.1 above) is shown in Table 6.

Thirty-eight wetlands or wetland systems that are not already Ramsar Sites each met at least one criterion and thus may be considered **internationally important** and therefore candidates for new nominations. Of these, 22 are in South-Western Australia, 11 in the Arid Interior and 5 in North-Western Australia (see 4.1 for definition of these regions).

Table 6. Wetlands in Western Australia which meet at least one Ramsar criterion (candidates for new nominations)

Wetland Name (as used in the Directory) (*wetlands combined where contiguous or in the same reserve)	Int. Prov. Reg.	CALM Region (Regional Office)	Tenure(C = CALM land)	# Criteria	1d	2a	2c	2d	3a	3c	comments on application of the criteria
Balicup Lake System	SWA	South Coast (Albany)	C	1						y	Banded Stilt
Becher Point Wetlands	SWA	Swan (Kelmescott)	C	1	y						geomorphology
Benger Swamp	SWA	Central Forests (Bunbury)	C	1						y	Australasian Bittern
Blackwood River (Lower Reaches) and Tributaries	SWA	Central Forests (Bunbury)	C	2		y		y			endemic/endangered <i>Geocrinia</i>
Booragoon Lake	SWA	Swan (Kelmescott)		1			y				breeding colonies: cormorants
Brixton Street Swamps	SWA	Swan (Kelmescott)		1		y					vulnerable wetland plants
Camballin Floodplain (Le Lievre Swamp System)	NWA	Kimberley (Kununurra)		1						y	shorebirds
Cape Range Subterranean Waterways	AI	Pilbara (Karratha)	C	2	y			y			subterranean type; endemic fishes
Chandala Swamp	SWA	Swan (Kelmescott)	C	1			y				breeding colonies: ibises
Culham Inlet System	SWA	South Coast (Albany)	C	2					y	y	Banded Stilt
Drysdale River	NWA	Kimberley (Kununurra)	C	1				y			endemic fishes
Dumbleyung Lake	SWA	Wheatbelt (Narrogin)	C	2					y	y	drought refuge; Banded Stilt
Ellen Brook Swamps System	SWA	Swan (Kelmescott)	C	2		y		y			endangered/endemic tortoise
Exmouth Gulf East	AI	Pilbara (Karratha)		1			y				major dugong feeding area
Fortescue Marshes	AI	Pilbara (Karratha)		1	y						terminal floodplain of arid-zone river
Guraga Lake	SWA	Midwest (Geraldton)	C	1			y				moulting shelducks
Lake Ballard	AI	Goldfields (Kalgoorlie)		3			y		y	y	Banded Stilt: breeding, numbers
Lake Barlee	AI	Goldfields (Kalgoorlie)		3			y		y	y	Banded Stilt: breeding, numbers
Lake Gore System	SWA	South Coast (Albany)	C	4		y	y		y	y	Hooded Plover; moulting; B. Stilt
Lake Grace System	SWA	Wheatbelt (Narrogin)	C	1						y	Banded Stilt
Lake Gregory System	AI	Kimberley (Kununurra)		4	y		y		y	y	breeding colonies; shorebirds; etc.
Lake Logue/Indoon System	SWA	Midwest (Geraldton)	C	1		y					vulnerable wetland plants
Lake MacLeod	AI	Midwest (Geraldton)		4	y		y		y	y	inland mangroves; shorebirds; etc.
Lake Marmion	AI	Goldfields (Kalgoorlie)		1			y				Banded Stilt: breeding
Lake Muir - Byenup Lagoon System *	SWA	Southern Forest (Manjimup)	C	4		y	y		y	y	w/l plants; moulting; Aust. Bittern
Lake Pleasant View System	SWA	South Coast (Albany)	C	1						y	Australasian Bittern
Lake Thetis	SWA	Midwest (Geraldton)		1	y						includes microbialites
Leslie (Port Hedland) Saltfields System	AI	Pilbara (Karratha)		4		y	y		y	y	Little Tern; shorebirds; etc.
Loch McNess System	SWA	Swan (Kelmescott)	C	1				y			endemic stygofauna
Millstream Pools	AI	Pilbara (Karratha)	C	2	y			y			type (peat); endemic palm, inverts.
Mitchell River System	NWA	Kimberley (Kununurra)		1				y			endemic fish
Moates Lake System	SWA	South Coast (Albany)	C	1						y	Australasian Bittern
Owingup Swamp System	SWA	Southern Forest (Manjimup)	C	2		y				y	wland plants; Australasian Bittern
Prince Regent River System	NWA	Kimberley (Kununurra)	C	2			y	y			crocodile breeding; endemic fishes
Roebuck Plains System	NWA	Kimberley (Kununurra)		3			y		y	y	shorebirds (Little Curlew)
Rottneest Island Lakes	SWA	Swan (Kelmescott)		2	y					y	unusual hydrology; Banded Stilt
Shark Bay East - Hamelin Pool *	AI	Midwest (Geraldton)	C	5	y	y	y		y	y	stromatolites; dugong; shorebirds
Swan-Canning Estuary	SWA	Swan (Kelmescott)	C	1						y	Red-neck. Stint, Red-cap. Plover

Interim Provincial Regions: SWA = South-Western Australia; AI = Arid Interior; NWA = North-Western Australia. C = wetland includes CALM-managed land.

Eighteen of the candidate wetlands/systems each met more than one criterion; six of these each met 4 or 5 criteria. Nine of the candidate wetlands/systems each met criterion 1(d) (based on unique wetlands); 25 met criterion 2(a), 2(c) or 2(d) (general criteria based on plants and animals) and 20 met criterion 3(a) or 3(c) (specific criteria based on waterfowl).

Results of the process of identifying potential extensions to existing Ramsar Sites are presented in Table 7. **Four existing Sites that potentially could be extended**, were identified. Three of these are in South-Western Australia and one in North-Western Australia (see 4.1 for definition of these regions). In three cases the protected area(s) that defined the boundary of the original Site had been enlarged since nomination in 1990. The potential extensions will result in a match of current reserve and Ramsar Site boundaries.

4.5 Comparison with submissions made to the State Government.

Relevant information from submissions made by conservation organisations to CALM regarding potential new Ramsar Sites and extensions to existing Sites, is summarised in Table 8. The table also includes wetlands/systems in Western Australia proposed as potential new Ramsar Sites by the Australian Wetlands Alliance (a network of more than 30 Australian NGOs involved in wetland conservation) to the Sixth Conference of Parties to the Ramsar Convention (Wright 1996).

Proposed new Ramsar Sites.

A comparison of data in Tables 6 and 8 reveals that **each of the 10** new Ramsar Sites proposed by the peak, non-government, State conservation body, the Conservation Council of Western Australia (CCWA), **is in the list** of 38 candidate wetlands for potential new Ramsar Sites. (Also see Table 10 and Annex 4.)

Proposed extensions to existing Ramsar Sites.

Limited information was provided in the submission by CCWA to CALM in regard to proposed extensions (Table 8). Regardless, the following comparisons and conclusions have been made (also refer to datasheets in Annex 4):

- **Ord River Floodplain:**
The potential extension identified by the authors (Table 7) and confirmed following consultation with CALM Regional staff, **possibly matches** or partly matches the proposal of CCWA for this Site.
- **Forrestdale and Thomsons Lakes:**
Kogolup Lake is hydrologically connected by surface water to Thomsons Lake but is not at present on CALM-managed land contiguous with Thomsons Lake Nature Reserve. Thus **more time is needed** to consult with the managers of Kogolup Lake regarding possible addition to the Ramsar Site (see Annex 4).

Table 7. Existing Ramsar Sites in Western Australia which potentially could be extended.

<i>name of Ramsar Site</i>	<i>CALM Region</i>	<i>Prov. Region*</i>	<i>potential extension</i>
Toolibin Lake	Wheatbelt	South-Western Australia	CALM-managed land on the western side.
Vasse-Wonnerup System	Central Forest	South-Western Australia	3 areas of CALM-managed land adjoining the Site.
Peel-Yalgorup System	Swan	South-Western Australia	6 areas of CALM-managed land adjoining the Site.
Ord River Floodplain	Kimberley	North-Western Australia	1 area of CALM-managed land adjoining the Site.

* Interim Provincial Region (Environment Australia 1998), modified for this project (see section 4.1).

Table 8. Potential candidate Ramsar Sites proposed in correspondence from community conservation organisations to CALM.

1. New nominations.

<i>wetland name</i>	<i>source of proposal*</i>	<i>reasons given for the proposed nomination</i>
Becher Wetlands (Pt Kennedy)	CCWA, AWA.	geomorphology, flora.
Lake Gregory	CCWA	waterbirds.
Lake MacLeod	CCWA, AWA.	waterbirds.
Lake Barlee	CCWA, AWA.	unusual type of wetland.
Lake Muir System	CCWA, AWA.	wilderness quality, biodiversity.
Lake Guraga	CCWA, AWA.	waterbirds, good buffer, type.
Lake Dumbleyung.	CCWA, AWA.	waterbirds.
Shark Bay.	CCWA, AWA.	stromatolites, dugongs.
Leslie Saltworks	CCWA, AWA.	waterbirds, migration site.
Ellen Brook and Twin Swamps.	CCWA, AWA.	rare tortoise.
55 wetlands identified by Watkins (1993)	BA	sites of national or international importance for shorebirds

2. Extensions to existing Ramsar Sites.

<i>name of Ramsar Site</i>	<i>source of proposal*</i>	<i>description of the extension</i>
Ord River Floodplain	CCWA	parts of Parry Floodplain.
Forrestdale and Thomsons Lakes	CCWA	Kogolup and Banganup Lakes.
Peel-Yalgorup System	CCWA, AWA	Creery wetlands and southern Harvey Estuary
Vasse-Wonnerup System	CCWA	The Broadwater.
Lake Warden System.	CCWA	Pink Lake.

* Sources:

CCWA = Conservation Council of WA (31 July 1995).

AWA = Australian Wetlands Alliance (Suppl. to *Habitat*, Wright 1996).

BA = Birds Australia (formerly RAOU)(21 April 1995).

Watkins, D. (1993). A national plan for shorebird conservation in Australia.

Australasian Wader Studies Group, Royal Australasian Ornithologists
Union and World Wide Fund for Nature, RAOU Report No. 90.

Banganup Lake is in a Nature Reserve contiguous with Thomsons Lake Nature Reserve but is used by the University of Western Australia for research purposes. Thus **more time is needed** to consult with the University regarding possible addition to the Ramsar Site.

- **Peel-Yalgorup System:**

The conservation value of the "Creery Marshes" (salt marsh immediately north of Creery Island) has been recognised and under zoning and development approval processes currently underway the wetlands of the Creery Marshes will be reserved for conservation. When future tenure and precise boundaries have been determined the area is **proposed** to be added to the Ramsar Site. Southern Harvey Estuary is **already included** in the Ramsar Site.

- **Vasse-Wonnerup System:**

The Broadwater is hydrologically connected by surface water to Vasse-Wonnerup System. However, intervening areas are not CALM-managed land and part of The Broadwater is not CALM-managed land. Thus, **more time is needed** to consult with the relevant land managers and (numerous) stakeholders regarding possible addition to the Ramsar Site. The Broadwater is not included on its own merits, nor as part of Vasse-Wonnerup System, in the Directory of Important Wetlands in Australia (ANCA 1996). Thus, to be consistent with the process followed for this project (see section 4.2 above), it **could not be considered** as a candidate wetland for separate Ramsar listing. However, The Broadwater does have significant conservation values (e.g. Jaensch *et al.* 1988) and could be included in future editions of the Directory as a step towards consideration for Ramsar listing or extension to Vasse-Wonnerup System.

- **Lake Warden System:**

Pink Lake is not at present on CALM-managed land contiguous with the Lake Warden Nature Reserve: it is covered by several cadastral components and one part is used for commercial salt extraction. Neither is Pink Lake hydrologically connected by surface water to Lake Warden. Furthermore, the draft plan of management for the Esperance Lakes does not recommend Ramsar listing for Pink Lake and there were no public submissions that called for Ramsar listing (see Annex 4). Thus Pink Lake is **considered unsuitable** as an extension to the existing Ramsar Site.

5. Selection of nominations and extensions potentially to be put forward by May 1999

5.1 Process for assessment of opportunities and constraints.

Many (61 %) of the candidate wetlands/systems (Table 6) include or comprise land managed by CALM: thus CALM is the major stakeholder. Also, CALM Regional staff are knowledgeable about tenure, management, opportunities and constraints with respect to other candidate wetlands/systems.

Through consultation with the CALM Project Supervisor it was therefore decided that each of the 38 candidate new nominations (Table 6) and the potential for extensions should be discussed with the relevant CALM Regional Manager and/or CALM staff with substantial knowledge of the wetland. This process would reveal opportunities and constraints for new nominations and extensions and thereby provide a prioritisation with respect to the May 1999 timeframe.

Specifically, the following questions would be addressed during the consultations:

- (1) have the criteria been accurately applied in light of published and other current knowledge of the wetland and its conservation values?
- (2) are the conservation values (the ecological character) of the wetland likely to be maintained, either with or without intervention, or are they expected to be reduced or lost due to unmanageable processes (i.e. is the nomination/extension viable)?
- (3) is the potential nomination/extension likely to be supported by the land managers responsible for the wetland?
- (4) which other organisations or individuals are major stakeholders that would need to be consulted before developing a nomination/extension proposal for the wetland?
- (5) is there other information that might be relevant to a nomination/extension proposal?
- (6) does it seem feasible to complete the nomination/extension by May 1999?

The CALM Project Supervisor and Wetlands International further agreed that where this initial round of consultations revealed that consultations with other stakeholders would be advisable, it would be the decision of CALM as to when and how such consultations should be made, and by whom. For the present project, given the short timeframe, the consultant would be asked to develop draft nominations only for those wetlands where limited further consultation was needed. Wetlands that met the Ramsar criteria but for which substantial further consultation effort would be needed could be considered at a later stage. That is, subject to requirements being met, they could be considered for the Eighth (2002) Conference of Parties or later.

5.2 Schedule and strategy for consultations with CALM staff.

The potential new nominations and extensions (Tables 6 & 7) were located in nine CALM Regions. Wetlands International arranged meetings with CALM Regional Managers and/or other Regional staff during the period 31 August to 17 September (Table 9). Additional meetings were held with staff of CALM Science Division who had specialist knowledge on particular wetlands, wetland species or wetland communities.

The CALM Project Supervisor participated in most of the meetings, providing an introduction to the project and description of its goals, methods, timeframe and anticipated outcomes. The representative of Wetlands International explained how each candidate wetland met the criteria for a Ramsar Site and ensured that the main questions (5.1 above) were answered. Information was recorded on standard datasheets (see 5.3 below and Annex 4).

5.3 Report on each wetland, following the consultations.

A report following the consultations with CALM staff, comprising datasheets for each potential new nomination and extension, was compiled by Wetlands International and is shown at Annex 4. In addition to information gained from the consultations, some data from the Directory (Lane *et al.* 1996) have been included to facilitate interpretation and "stand alone" readability.

5.4 Summary of conclusions from the consultations.

Application of the Ramsar criteria.

- Some Regional Managers mentioned particular wetlands that they considered to be "good representative examples" of wetland types and thus suitable for consideration new nominations. The reason for not including good representative examples in this project (**criteria 1(a)**: see section 4.1) was explained.
- Some Managers and staff expressed interest in nomination of wetlands that supported wetland-dependent ecological communities that they considered to be threatened. However, **criteria 2(a)** is not being used in regard to threatened ecological communities as none have yet been declared threatened at the national level - though this may occur during the next year.
- In regard to the question of whether/not a species was truly endemic to a particular wetland (**criteria 2(d)**), CALM staff (and other specialists consulted) advised that, as the result of intensive surveys, stygofauna and fishes typically had proved to be endemic to particular wetlands/systems whereas few wetland plants had proved endemic to particular wetlands.
- Further biological surveys are needed at some wetlands before they can be properly assessed against the criteria. This applies in particular to some of the large and remote wetlands of the Arid Interior, e.g. Exmouth Gulf East.

Table 9. Schedule of meetings with CALM staff.

<i>date</i>	<i>venue</i>	<i>CALM Region represented</i>	<i>staff present</i>
31 Aug 98	Busselton *	Central Forest	- Manager, South West Capes District. - Conservation Program Leader, Central Forest Region. - Forest Ranger, Collie.
31 Aug 98	Busselton *	South Coast	- Conservation Program Leader, South Coast Region.
1 Sep 98	Manjimup *	Southern Forest	- Manager, Southern Forest Region. - Conservation Program Leader, Southern Forest Region.
1-2 Sep 98	Albany *	South Coast	- Manager, South Coast Region.
2 Sep 98	Narrogin *	Wheatbelt	- Manager, Wheatbelt Region. - Project Officer, Toolibin Lake Recovery Plan.
3 Sep 98	Kelmscott *	Swan	- Manager, Swan Region. - Conservation Program Leader, Swan Region.
4 Sep 98	Woodvale *	CALM Science Division	- Director, WATSC Unit. - Scientific Advisor, WATSC Unit. - Senior Research Scientist.
9 Sep 98	Crawley *	Pilbara	- Operations Officer, Pilbara Region.
9 Sep 98	Crawley *	Goldfields	- Conservation Program Leader, Goldfields Region.
10 Sep 98	Como *	Midwest	- Manager, Midwest Region.
10 Sep 98	Como *	Herbarium	- Principal Botanist. - Technical Officer, WATSC Unit.
15 Sep 98	Broome	Kimberley	- Manager, West Kimberley District. - Regional Ecologist, Kimberley Region.
17 Sep 98	Karratha	Pilbara	- Manager, Pilbara Region. - Regional Ecologist, Pilbara Region. - Senior Research Scientist, Pilbara Region.

* The Project Supervisor also was present at these meetings.

Tenure and boundaries.

- Setting boundaries for new nominations and extensions was more problematic where a system of wetlands was being considered or where other valuable wetlands existed in the vicinity of the candidate wetland. An approach was developed by the CALM Project Supervisor and Wetlands International whereby:
 - initial focus was on whether or not the wetland, as described in the Directory, met at least one Ramsar criterion;
 - wetland that was hydrologically connected to the wetland that met the Ramsar criteria would be considered for inclusion in the same Ramsar Site; of these wetlands priority would be given to wetland that would add substantially to the conservation value of the Site and wetland that was in Crown land with appropriate vesting and purpose.
- This approach was also seen as providing a solution to the situation in the Perth metropolitan area and some other areas where many wetlands occur and several individually meet the Ramsar criteria (as discussed in 4.1 above). In these situations, many wetlands scattered over a wide geographic area potentially could be included in a single Ramsar Site if biological connection (movement of wetland fauna between those wetlands and the wetland that did meet the criteria) was a basis for inclusion. This would be counter to the Convention's aim of recognising the importance of individual wetlands. Other mechanisms, such as the East Asian-Australasian Shorebird Reserve Network, are available for highlighting the existence of networks of wetlands used by migratory waterbirds.
- To be consistent with the above approach, it was decided that the existing Forrestdale and Thomsons Lakes Ramsar Site would be reviewed since the two lakes were nominated as one Site primarily because of movement of fauna. In fact, each lake individually meets criteria for Ramsar listing. It is therefore proposed that the existing single Site be divided into two Sites at an appropriate time.

Stakeholders and further consultations.

- For wetlands located in South-Western Australia, the Water and Rivers Commission and Department of Minerals and Energy were in many cases identified as stakeholders that needed to be consulted.
- The need for further consultation was greatest in the Arid Interior and North-Western Australia, where many candidate wetlands were not in CALM land and/or were subject to Native Title claims, pastoral/agricultural activity or mining interests.

Potential to maintain the wetland's values.

- Viability of the potential Ramsar Site was considered a serious issue in several cases, notably:
 - Booragoon Lake (concern regarding limited regeneration of wetland trees);
 - Brixton Street Swamps (concern regarding impacts of drainage);
 - Camballin Floodplain (concern regarding future water supply if dam is built);
 - Millstream Pools (complex issues regarding hydrology); and
 - Swan-Canning Estuary (apparent decline in shorebird numbers).

Other issues (management).

- There are four existing Ramsar Sites in the CALM Kimberley Region and additional resources are needed in order to secure appropriate vesting and to adequately plan for and implement site management at these wetlands. Addition of new Ramsar Sites in the Kimberley therefore will be problematic unless a substantial injection of new resources is provided.

Timeframe.

- see section 5.5 below.

5.5 Determination of a short-list of nominations and extensions potentially to be put forward by May 1999.**Determination of a short-list.**

The Project Supervisor and Wetlands International considered the outcomes of the prioritisation following consultation with CALM staff and identified eight wetlands/systems for which new nominations would be prepared and four Ramsar Sites for which extensions would be prepared, by May 1999 (Tables 10 and 11; Figure 3). This also seemed a reasonable target to achieve in the context of the terms of the consultancy services.

Features of the nominations and extensions potentially to be put forward by May 1999.

Six of the proposed new nominations are located in South-Western Australia and two are in (coastal parts of) the Arid Interior (Table 11) (see 4.1 for definition of these regions).

The proposed new nominations are located among the CALM Regions as follows: Pilbara (1), Midwest (1), Swan (3), Central Forest (1), Southern Forest (1) and South Coast (1). Only Swan and South Coast Regions have existing Ramsar Sites. If the proposed new nominations all become Ramsar Sites, only Goldfields Region will not have a Ramsar Site (but see below).

The proposed new nominations include the first proposed Ramsar Sites for the Carnarvon (1), Jarrah Forest (2) and Warren (1) IBRA regions (Thackway and Cresswell 1995).

The total area of land included in the proposed new nominations is approximately 106,000 ha (Table 11). The largest proposed new nomination (Cape Range) covers 51,000 ha whereas the smallest (Chandala Swamp) covers 134 ha. The total area of proposed extensions is approximately 24,000 ha.

Table 10. Timeframe for nomination of candidate wetlands (N), extensions (E) and split (S) and wetlands that are unsuitable or for which more data are needed (X).

<i>wetland</i> (<i>bold = existing RS</i>)	<i>suggested timeframe for action:</i>		
	<i>by</i> <i>May 1999</i>	<i>at a later</i> <i>stage</i>	<i>unsuitable, or</i> <i>need more data</i>
Balicup Lake System		N	
Becher Point Wetlands *	N		
Benger Swamp		N	
Blackwood R. Lower Reaches & Tributaries *	N		
Booragoon Lake		N	
Brixton Street Swamps		N	
Camballin Floodplain		N	
Cape Range Subterranean Waterways *	N		
Chandala Swamp	N		
Culham Inlet System			X
Drysdale River		N	
Dumbleyung Lake		N	
Ellen Brook Swamps	N		
Exmouth Gulf East			X
Forrestdale & Thomsons Lakes		S	
Fortescue Marshes		N	
Guraga Lake		N	
Lake Ballard		N	
Lake Barlee		N	
Lake Gore *	N		
Lake Grace System		N	
Lake Gregory System		N	
Lake Logue/Indoon System		N	
Lake MacLeod *	N		
Lake Marmion		N	
Lake Muir & Byenup Lagoon System *	N		
Lake Pleasant View System		N	
Lake Thetis		N	
Lake Toolibin	E		
Lake Warden System			X (E)
Leslie (Port Hedland) Saltfields		N	
Loch McNess System		N	
Millstream Pools		N	
Mitchell River System		N	
Moates Lake System		N	
Ord River Floodplain	E		
Owingup Swamp System		N	
Peel-Yalgurup System	E		
Prince Regent River System		N	
Roebuck Plains System		N	
Rottnest Island Lakes		N	
Shark Bay East and Hamelin Pool		N	
Swan-Canning Estuary *		N	
Vasse-Wonnerup System	E		
<i>totals</i>	12	29	3

* Not all of the wetland system described in the Directory (ANCA 1996) is to be nominated.

Table 11. New Ramsar Sites and extensions to existing Ramsar Sites proposed for nomination by May 1999.

<i>wetland name</i>	<i>Provincial Region*</i>	<i>tenure of Site/extension</i>	<i>CALM Region</i>	<i>approx. area (ha)</i>
<u>NEW RAMSAR SITES:</u>				
Becher Point Wetlands	SWA	Nature Reserve	Swan	672
Cape Range Subterranean Waterways	AI	National Park; & Commonw'th land	Pilbara	51,000
Chandala Swamp	SWA	Nature Reserve	Swan	134
Ellen Brook Swamps Syst.	SWA	Nature Reserve	Swan	228
Lake Gore	SWA	Nature Reserve	South Coast	3500
Lake MacLeod	AI	VCL, mining lease	Midwest	37,000
Muir-Byenup System	SWA	Nature Reserve	Southern Forest	12,136
Spearwood Creek Wetlands	SWA	State Forest	Central Forest	1612
total area (ha)				106,282
<u>EXTENSIONS:</u>				
Ord River Floodplain	NWA	Nature Reserve	Kimberley	20,000
Peel-Yalgorup System	SWA	Nature Reserve; & National Park	Swan	3000
Toolibin Lake	SWA	Nature Reserve	Wheatbelt	56
Vasse-Wonnerup System	SWA	Nature Reserve; & National Park	Central Forest	710
total area (ha)				23,766

* Interim Provincial Region (Environment Australia 1998), modified for this project (see section 4.1).
SWA = South-Western Australia; AI = Arid Interior; NWA = North-Western Australia.

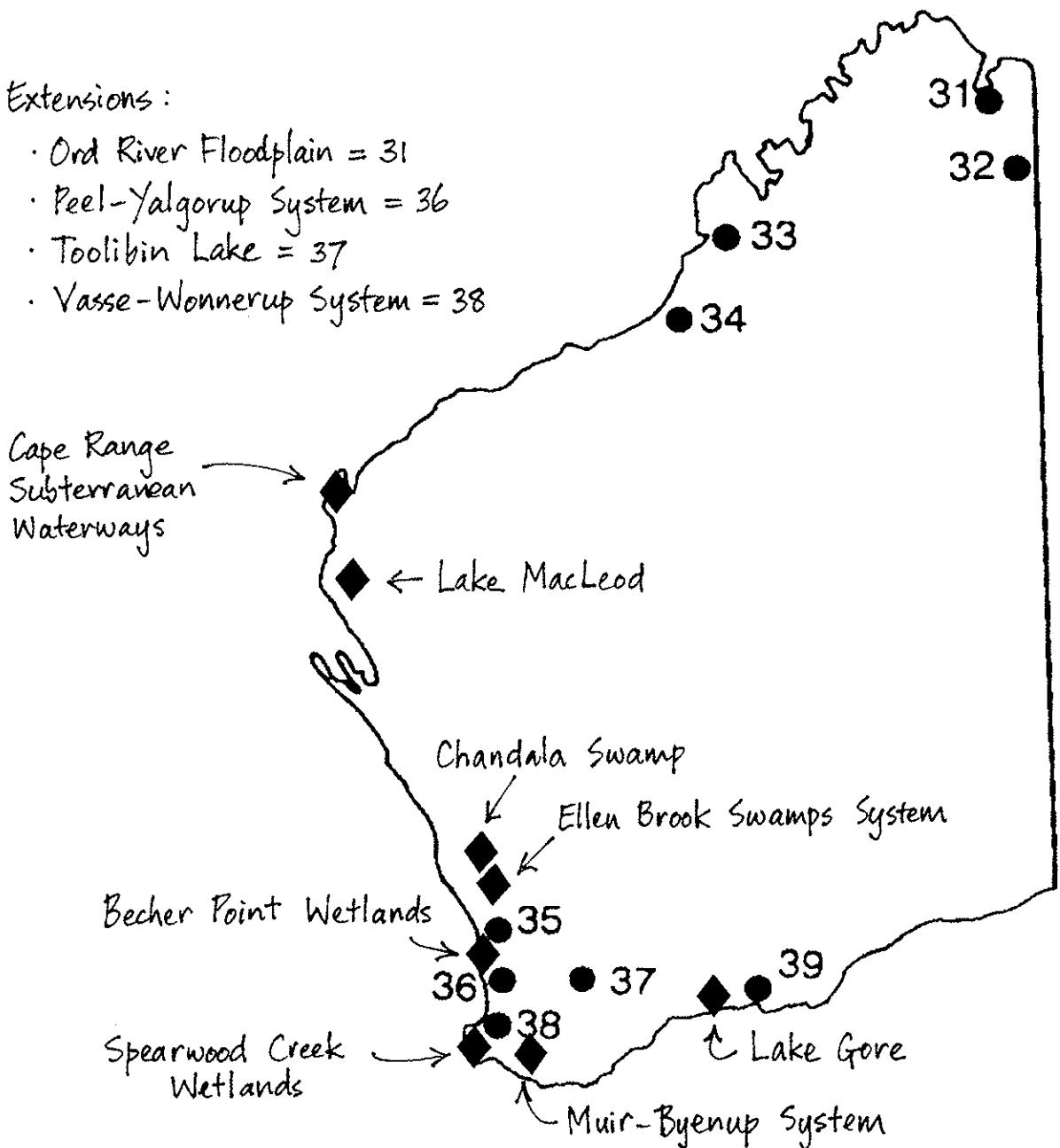
Figure 3. Location of the proposed new Ramsar Site nominations and extensions to existing Sites in Western Australia.

● Existing Ramsar Sites in WA

◆ Proposed New Nominations

Extensions :

- Ord River Floodplain = 31
- Peel-Yalgorup System = 36
- Toolibin Lake = 37
- Vasse-Wonnerup System = 38



Extensions Proposed to: 31, 36, 37 & 38.

If all of the 12 nominations/extensions are achieved, the total area of Ramsar Sites in Western Australia therefore will increase by 130,000 ha to about 587,000 ha. Dependent on the proposals of other States and Territories, potentially Western Australia could move up to third rank in terms of total area of Ramsar Sites (cf. Table 2). It may also move up to first rank in terms of number of Ramsar Sites.

Strategy for other candidate wetlands.

Candidate wetlands that would not be nominated by May 1999 were deemed either (a) to be considered for nomination at a later stage or (b) unsuitable for nomination (Table 10).

Some of these wetlands in Crown land (VCL or reserve), such as Lakes Barlee and Ballard (CALM Goldfields Region) and Drysdale and Prince Regent Rivers (CALM Kimberley Region), would require a recommendation by the CALM Region as to which was most suitable for nomination, taking into account the needs for resolution of stakeholder interests and/or resources for management. Potentially they could then be considered for nomination, e.g. before the Eighth Conference of Parties in 2002.

Others not in Crown land, such as Lake Gregory (CALM Kimberley Region) and Leslie Saltfields (CALM Pilbara Region), would - among other things - require cooperative agreements with the land owners/managers. This could take some time to achieve. In some cases, alternative and less binding forms of international recognition such as inclusion in the East Asian-Australasian Shorebird Reserve Network may prove more appropriate than Ramsar listing.

Thus, whereas all of the category (a) wetlands are considered internationally important and so are appropriate to consider further with respect to Ramsar listing, for some of these wetlands substantial impediments to listing exist (and mentioned above and see Annex 4) and it is likely that not all will eventually become Ramsar Sites.

In the cases of two candidate wetlands for new nominations, Culham Inlet and Exmouth Bay East, initially a criterion was considered met but subsequent investigation revealed that the data were inadequate to support this conclusion. Hence they have been deemed unsuitable for nomination on present evidence (Table 10 and Annex 4). Further surveys may provide the data that supports a Ramsar nomination, particularly in the case of Exmouth Bay East, a large and diverse tropical wetland that has potential to support nationally or internationally important populations of marine fauna and migratory shorebirds.

6. Documentation for nominations and extensions potentially to be put forward by May 1999

6.1 Draft documentation for the nominations and extensions potentially to be put forward by May 1999.

Information Sheets.

In order to nominate the eight proposed new Ramsar Sites and formalise the four extensions to existing Sites, an Information Sheet on Ramsar Wetlands (Annex 3) and map had to be completed for each (cf. section 3 and Table 4).

Wetlands International collated data for the Information Sheets from the relevant Directory accounts (Lane *et al.* 1996) and added new information from the consultations with CALM Regional staff (Annex 4) and other experts, and from the recent literature.

For extensions, reference was made on the Information Sheet to the original Site documentation where this was unchanged. Where new information needed to be provided, notably description of boundaries of extensions and any new criteria met or new wetland types included, this was done.

Maps.

Current cadastral maps and information on tenure were obtained from the Department of Land Administration and the Mapping Branch of CALM for the purpose of preparing maps to accompany the Information Sheets. The maps were prepared to a standard sufficient for unambiguous interpretation in anticipation that maps (particularly artwork) of a higher technical standard would be prepared by CALM for any nomination or extension that would be submitted to the Ramsar Convention Bureau.

6.2 Review of draft documentation.

Drafts of the completed Information Sheets and maps for proposed nominations/extensions were circulated to relevant CALM Regional and other staff for comment. This provided opportunity for improvement, correction and insertion of additional data, e.g. names of wetland species, conservation measures proposed. Additional input was provided by the Project Supervisor.

The finalised proposed nominations and extensions are presented in Annex 5.

7. Recommendations

7.1 Nominations and extensions recommended to be put forward by May 1999.

Recommendation 1. It is recommended that the Government of Western Australia inform the Australian Commonwealth Government that it wishes to nominate the following eight wetlands and wetland systems (not listed in order of priority), as defined in the Information Sheets for Ramsar Wetlands and accompanying maps in Annex 5 of this report, as new Ramsar Sites for Western Australia:

- Becher Point Wetlands
- Cape Range Subterranean Waterways
- Chandala Swamp
- Ellen Brook Swamps System
- Lake Gore
- Lake MacLeod
- Muir-Byenup System
- Spearwood Creek Wetlands

Recommendation 2. It is recommended that the Government of Western Australia inform the Commonwealth that it wishes to extend the boundaries of the following four existing Ramsar Sites in Western Australia, as defined in the revised Information Sheets for Ramsar Wetlands and accompanying maps in Annex 5 of this report:

- Ord River Floodplain
- Peel-Yalgorup System
- Toolibin Lake
- Vasse-Wonnerup System

Recommendation 3. It is recommended that the Government of Western Australia and the Commonwealth work together to ensure that the eight Ramsar Site nominations and four extensions to existing Sites be concluded by May 1999 so that they can be announced at or before the Seventh Conference of Parties to the Ramsar Convention (Costa Rica, May 1999).

7.2 Potential nominations and extensions for consideration at a later stage and actions required in regard to these Sites.

Recommendation 4. It is recommended that the Government of Western Australia give further consideration to possible Ramsar nomination, at the eighth (year 2002) and ninth (year 2005) Conferences of Parties, of wetlands from among the 28 internationally important wetlands that are identified in Table 10 of this report but which are not recommended for nomination by May 1999,

particularly where the candidate wetland meets several of the Ramsar criteria for nomination.

Recommendation 5. It is recommended that the Government of Western Australia give further consideration to possible further extensions to existing (and proposed new) Ramsar Sites from time to time and at least every three years, particularly where hydrologically connected wetlands or contiguous dry land become Crown land such as through gazettal of new Nature Reserves.

Recommendation 6. It is recommended that CALM Regional staff take note of and where possible act on the recommended follow-up actions at candidate wetlands as documented in Annex 4 of this report, particularly at wetlands in the CALM-managed estate. Special attention should be given to gazettal of existing Vacant Crown Land as conservation reserve vested in the National Parks and Nature Conservation Authority where this would facilitate a successful new Ramsar nomination or enable extension of an existing or (herein) proposed Ramsar Site, e.g. Lake Gore.

7.3 Other recommendations.

Recommendation 7. It is recommended that the Government of Western Australia undertake investigation of the conservation values of wetlands in regions of the State in which thus far there are few or no Ramsar Sites, that any nationally important wetlands discovered from such an investigation be documented in the Western Australian section of updated editions of the Directory of Important Wetlands in Australia, and that identification of internationally important wetlands (and thus potential new candidate wetlands for Ramsar nomination) be undertaken from time to time using data in the latest edition of the Directory.

Recommendation 8. It is recommended that the Government of Western Australia promote and support the completion of mapping, classification and evaluation of wetlands in South-Western Australia and eventually the entire State, to enable the Ramsar criteria for identifying wetlands of international importance which are based on representative examples of wetland types, to be systematically applied to candidate wetlands for Ramsar nomination at a future time.

Recommendation 9. It is recommended that the Government of Western Australia collaborate with the Commonwealth to seek guidance from the Ramsar Convention Bureau in regard to application of those Ramsar criteria for identifying wetlands of international importance (notably 1(c), 2(b), 3(b) and 4(a)) which could not be confidently applied in the course of the present project due to problems of interpretation.

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Annex 1. Text of the Convention.

The following is a copy of the official version of the latest edition of the Text of the Convention. Parts of Articles of special relevance to the present project are in bold.

Convention on Wetlands of International Importance especially as Waterfowl Habitat

Ramsar, 2.2.1971
as amended by the Protocol of 3.12.1982
and the Amendments of 28.5.1987

Certified copy

Paris
Director, Office of International Standards and Legal Affairs
United Nations Educational, Scientific and Cultural Organization (UNESCO)

Convention on Wetlands of International Importance especially as Waterfowl Habitat

Ramsar, 2.2.1971
as amended by the Paris Protocol of 3.12.1982
and the Regina Amendments of 28.5.1987

The Contracting Parties,

Recognizing the interdependence of Man and his environment;

Considering the fundamental ecological functions of wetlands as regulators of water regimes and as habitats supporting a characteristic flora and fauna, especially waterfowl;

Being convinced that wetlands constitute a resource of great economic, cultural, scientific, and recreational value, the loss of which would be irreparable;

Desiring to stem the progressive encroachment on and loss of wetlands now and in the future;

Recognizing that waterfowl in their seasonal migrations may transcend frontiers and so should be regarded as an international resource;

Being confident that the conservation of wetlands and their flora and fauna can be ensured by combining far-sighted national policies with co-ordinated international action;

Have agreed as follows:

Article 1

1. For the purpose of this Convention wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.

2. For the purpose of this Convention waterfowl are birds ecologically dependent on wetlands.
-

Article 2

1. Each Contracting Party shall designate suitable wetlands within its territory for inclusion in a List of Wetlands of International Importance, hereinafter referred to as "the List" which is maintained by the bureau established under Article 8. **The boundaries of each wetland shall be precisely described and also delimited on a map** and they may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands, especially where these have importance as waterfowl habitat.

2. **Wetlands should be selected for the List on account of their international significance in terms of ecology, botany, zoology, limnology or hydrology.** In the first instance wetlands of international importance to waterfowl at any season should be included.

3. The inclusion of a wetland in the List does not prejudice the exclusive sovereign rights of the Contracting Party in whose territory the wetland is situated.

4. Each Contracting Party shall designate at least one wetland to be included in the List when signing this Convention or when depositing its instrument of ratification or accession, as provided in Article 9.

5. Any Contracting Party **shall have the right** to add to the List further wetlands situated within its territory, **to extend the boundaries of those wetlands already included by it in the List**, or, because of its urgent national interests, to delete or restrict the boundaries of wetlands already included by it in the List and shall, at the earliest possible time, inform the organization or government responsible for the continuing bureau duties specified in Article 8 of any such changes.

6. Each Contracting Party shall consider its international responsibilities for the **conservation, management and wise use of migratory stocks of waterfowl**, both when designating entries for the List and when exercising its right to change entries in the List relating to wetlands within its territory.

Article 3

1. The Contracting Parties shall formulate and implement their planning so as to promote the conservation of the wetlands included in the List, and as far as possible the wise use of wetlands in their territory.

2. Each Contracting Party shall arrange to be informed at the earliest possible time if the ecological character of any wetland in its territory and included in the List has changed, is changing or is likely to change as the result of technological developments, pollution or other human interference. Information on such changes shall be passed without delay to the organization or government responsible for the continuing bureau duties specified in Article 8.

Article 4

1. Each Contracting Party shall promote the conservation of wetlands and waterfowl by establishing nature reserves on wetlands, whether they are included in the List or not, and provide adequately for their wardening.

2. Where a Contracting Party in its urgent national interest, deletes or restricts the boundaries of a wetland included in the List, it should as far as possible compensate for any loss of wetland resources, and in particular it should create additional nature reserves for waterfowl and for the protection, either in the same area or elsewhere, of an adequate portion of the original habitat.

3. The Contracting Parties shall encourage research and the exchange of data and publications regarding wetlands and their flora and fauna.
 4. The Contracting Parties shall endeavour through management to increase waterfowl populations on appropriate wetlands.
 5. The Contracting Parties shall promote the training of personnel competent in the fields of wetland research, management and wardening.
-

Article 5

The Contracting Parties shall consult with each other about implementing obligations arising from the Convention especially in the case of a wetland extending over the territories of more than one Contracting Party or where a water system is shared by Contracting Parties. They shall at the same time endeavour to co-ordinate and support present and future policies and regulations concerning the conservation of wetlands and their flora and fauna.

Article 6

1. There shall be established a Conference of the Contracting Parties to review and promote the implementation of this Convention. The Bureau referred to in Article 8, paragraph 1, shall convene ordinary meetings of the Conference of the Contracting Parties at intervals of not more than three years, unless the Conference decides otherwise, and extraordinary meetings at the written requests of at least one third of the Contracting Parties. Each ordinary meeting of the Conference of the Contracting Parties shall determine the time and venue of the next ordinary meeting.
2. The Conference of the Contracting Parties shall be competent:
 - (a) to discuss the implementation of this Convention;
 - (b) to discuss additions to and changes in the List;
 - (c) to consider information regarding changes in the ecological character of wetlands included in the List provided in accordance with paragraph 2 of Article 3;
 - (d) to make general or specific recommendations to the Contracting Parties regarding the conservation, management and wise use of wetlands and their flora and fauna;
 - (e) to request relevant international bodies to prepare reports and statistics on matters which are essentially international in character affecting wetlands;
 - (f) to adopt other recommendations, or resolutions, to promote the functioning of this Convention.
3. The Contracting Parties shall ensure that those responsible at all levels for wetlands management shall be informed of, and take into consideration, recommendations of such Conferences concerning the conservation, management and wise use of wetlands and their flora and fauna.
4. The Conference of the Contracting Parties shall adopt rules of procedure for each of its meetings.
5. The Conference of the Contracting Parties shall establish and keep under review the financial regulations of this Convention. At each of its ordinary meetings, it shall adopt the budget for the next financial period by a two-third majority of Contracting Parties present and voting.

6. Each Contracting Party shall contribute to the budget according to a scale of contributions adopted by unanimity of the Contracting Parties present and voting at a meeting of the ordinary Conference of the Contracting Parties.

Article 7

1. The representatives of the Contracting Parties at such Conferences should include persons who are experts on wetlands or waterfowl by reason of knowledge and experience gained in scientific, administrative or other appropriate capacities.

2. Each of the Contracting Parties represented at a Conference shall have one vote, recommendations, resolutions and decisions being adopted by a simple majority of the Contracting Parties present and voting, unless otherwise provided for in this Convention.

Article 8

1. The International Union for Conservation of Nature and Natural Resources shall perform the continuing bureau duties under this Convention until such time as another organization or government is appointed by a majority of two-thirds of all Contracting Parties.

2. The continuing bureau duties shall be, inter alia:

(a) to assist in the convening and organizing of Conferences specified in Article 6;

(b) to maintain the List of Wetlands of International Importance and to be informed by the Contracting Parties of any additions, extensions, deletions or restrictions concerning wetlands included in the List provided in accordance with paragraph 5 of Article 2;

(c) to be informed by the Contracting Parties of any changes in the ecological character of wetlands included in the List provided in accordance with paragraph 2 of Article 3;

(d) to forward notification of any alterations to the List, or changes in character of wetlands included therein, to all Contracting Parties and to arrange for these matters to be discussed at the next Conference;

(e) to make known to the Contracting Party concerned, the recommendations of the Conferences in respect of such alterations to the List or of changes in the character of wetlands included therein.

Article 9

1. This Convention shall remain open for signature indefinitely.

2. Any member of the United Nations or of one of the Specialized Agencies or of the International Atomic Energy Agency or Party to the Statute of the International Court of Justice may become a Party to this Convention by:

(a) signature without reservation as to ratification;

(b) signature subject to ratification followed by ratification;

(c) accession.

3. Ratification or accession shall be effected by the deposit of an instrument of ratification or accession with the Director-General of the United Nations Educational, Scientific and Cultural Organization (hereinafter referred to as "the Depository").

Article 10

1. This Convention shall enter into force four months after seven States have become Parties to this Convention in accordance with paragraph 2 of Article 9.

2. Thereafter this Convention shall enter into force for each Contracting Party four months after the day of its signature without reservation as to ratification, or its deposit of an instrument of ratification or accession.

Article 10 bis

1. This Convention may be amended at a meeting of the Contracting Parties convened for that purpose in accordance with this article.

2. Proposals for amendment may be made by any Contracting Party.

3. The text of any proposed amendment and the reasons for it shall be communicated to the organization or government performing the continuing bureau duties under the Convention (hereinafter referred to as "the Bureau") and shall promptly be communicated by the Bureau to all Contracting Parties. Any comments on the text by the Contracting Parties shall be communicated to the Bureau within three months of the date on which the amendments were communicated to the Contracting Parties by the Bureau. The Bureau shall, immediately after the last day for submission of comments, communicate to the Contracting Parties all comments submitted by that day.

4. A meeting of Contracting Parties to consider an amendment communicated in accordance with paragraph 3 shall be convened by the Bureau upon the written request of one third of the Contracting Parties. The Bureau shall consult the Parties concerning the time and venue of the meeting.

5. Amendments shall be adopted by a two-thirds majority of the Contracting Parties present and voting.

6. An amendment adopted shall enter into force for the Contracting Parties which have accepted it on the first day of the fourth month following the date on which two thirds of the Contracting Parties have deposited an instrument of acceptance with the Depository. For each Contracting Party which deposits an instrument of acceptance after the date on which two thirds of the Contracting Parties have deposited an instrument of acceptance, the amendment shall enter into force on the first day of the fourth month following the date of the deposit of its instrument of acceptance.

Article 11

1. This Convention shall continue in force for an indefinite period.

2. Any Contracting Party may denounce this Convention after a period of five years from the date on which it entered into force for that party by giving written notice thereof to the Depository. Denunciation shall take effect four months after the day on which notice thereof is received by the Depository.

Article 12

1. The Depositary shall inform all States that have signed and acceded to this Convention as soon as possible of:

- (a) signatures to the Convention;
- (b) deposits of instruments of ratification of this Convention;
- (c) deposits of instruments of accession to this Convention;
- (d) the date of entry into force of this Convention;
- (e) notifications of denunciation of this Convention.

2. When this Convention has entered into force, the Depositary shall have it registered with the Secretariat of the United Nations in accordance with Article 102 of the Charter.

IN WITNESS WHEREOF, the undersigned, being duly authorized to that effect, have signed this Convention.

DONE at Ramsar this 2nd day of February 1971, in a single original in the English, French, German and Russian languages, all texts being equally authentic* which shall be deposited with the Depositary which shall send true copies thereof to all Contracting Parties.

* Pursuant to the Final Act of the Conference to conclude the Protocol, the Depositary provided the second Conference of the Contracting Parties with official versions of the Convention in the Arabic, Chinese and Spanish languages, prepared in consultation with interested Governments and with the assistance of the Bureau.

Annex 2. Resolutions and Recommendations of Conferences of Contracting Parties: expectations in regard to new nominations or extensions of Ramsar Sites.

At each Conference of Parties to the Convention, the Parties may agree to Resolutions and Recommendations (Text of the Convention, Article 6 paragraph 2(d), 2(f): see Annex 1). Initially the Conferences only put forward Recommendations. From the Third Conference (1987) onwards, Resolutions generally have been used for matters related to the internal functioning of the Convention whereas Recommendations have been used mainly for matters related to wetland types and sites, relationships with other organisations, wetland initiatives and the like.

The following Recommendations and Resolutions¹² are considered relevant to expectations in regard to new nominations or extensions of Ramsar Sites:

FIRST CONFERENCE, CAGLIARI, 1980.

Recommendation 1.3 - "Increasing the number of sites on the List of Wetlands of International Importance".

- calls on Parties to increase the number of Ramsar Sites outside the western Palearctic (Europe) and to list wetland types poorly represented in the western Palearctic.

¹ Resolutions and Recommendations are numbered according to the sequence of Conventions and order of adoption, e.g. Resolution 3.2 was the second Resolution adopted at the Third Conference. Roman numerals were introduced for Resolutions at the Sixth Conference.

² Titles of Resolutions and Recommendations are as quoted in The Ramsar Convention Manual (Ramsar Convention Bureau 1997. *The Ramsar Convention Manual: a Guide to the Convention on Wetlands (Ramsar, Iran, 1971), 2nd edition*. Ramsar Convention Bureau, Gland, Switzerland. 79-83). Dot points are synthesised from the text of the Resolution or Recommendation as recorded at the Ramsar Website (Ramsar Convention Bureau 1998. Key Documents of the Ramsar Convention on Wetlands. [Online], <http://iucn.org/themes/ramsar>.) The Website's draft "Key Concept Index to Ramsar Decisions and the Strategic Plan" is especially helpful in that it provides entry points to the various Resolutions and Recommendations consolidated according to subject.

FOURTH CONFERENCE, MONTREUX, 1990.**Recommendation 4.2 - "Criteria for identifying wetlands of international importance".**

- Rec. 4.2 supersedes Rec. 1.4 and Rec. 3.1.
- Rec. 4.2 provides details of 11 criteria that the Parties are expected to use for identification of potential Ramsar Sites.
- guidelines for application of the Criteria were provided in Res. 5.9 (Fifth Conf.).
- two criteria based on fish were added at the Sixth Conference (Res. VI.2).
- The complete Criteria and guidelines are provided in Annex 3 of this report.

Recommendation 4.7 - "Mechanisms for improved application of the Ramsar Convention".

- recommends that the datasheet and the classification system for wetland type, which were developed for the description of Ramsar Sites, be used by Contracting Parties in presenting information for the Ramsar database, i.e. for designating new Sites.
- texts of the datasheet and classification system were appended to Rec. 4.7 but have since been developed further (see Annex 3).

FIFTH CONFERENCE, KUSHIRO, 1993.**Resolution 5.3 - "Procedure for initial designation of sites for the List of Wetlands of International Importance".**

- new Sites should meet one or more of the criteria established under Rec 4.2.
- a map should be submitted showing definitive Site boundaries.
- a completed Ramsar datasheet (the "Information Sheet on Ramsar Wetlands" of Rec. 4.7) should be submitted for the Site, giving particular attention to items on conservation measures, functions and values and criteria for inclusion.
- Parties are urged to consult regional wetland inventories and relevant expert bodies including NGOs to assist in identification of potential Ramsar Sites if no National Scientific Inventory is available.

SIXTH CONFERENCE, BRISBANE, 1996.**Resolution VI.1 - "Working definitions of ecological character, guidelines for describing and maintaining the ecological character of listed sites and operation of the Montreux Record".**

- Res. VI.1 supersedes Rec. 3.9 and Rec. 5.2.

- Annex: 2.1 of Res. VI.1 states that it is essential that the ecological character of a Site be described by the Party at the time of designation for the Ramsar List, by completion of an Information Sheet on Ramsar Wetlands (as adopted by Rec. 4.7).
- Annex: 2.9.3 of Res. VI.1 states that all new listed Sites should be described according to the revisions to the Guidelines for completion of an Information Sheet on Ramsar Wetlands. These revisions facilitate provision of data on the ecological character of the Site by the listing Party.

Resolution VI.4 - "Adoption of population estimates for operation of the specific criteria based on waterfowl".

- Parties are called on to use the waterbird population estimates (and 1% thresholds) published by Wetlands International³ as a basis for designating new Ramsar Sites.

Resolution VI.5 - "Inclusion of subterranean karst wetlands as a wetland type under the Ramsar classification system".

- Parties are urged to consider designation of karst and cave wetland systems as Ramsar Sites. Karst wetland systems are those developed particularly in the extensive subterranean fissures and caves of limestone country.

Resolution VI.12 - "National Wetland Inventories and candidate sites for listing".

- notes "the value of recognition of those sites which may be regarded as candidates for listing under the Convention".
- urges each Party "to recognise officially" its identified [candidate] sites meeting the [Ramsar] criteria" (see Rec. 4.2).

Resolution VI.13 - "Submission of information on sites designated for the Ramsar List of Wetlands of International Importance".

- Parties are urged to revise the data (the "Information Sheet on Ramsar Wetlands") provided for Ramsar Sites, at least every six years.

Resolution VI.16 - "Accession procedures".

- "the boundaries of each additional [Ramsar] site....shall be precisely described and also delimited on a map".

³ Rose, P.M. and Scott, D.A. 1997. Waterfowl population estimates. Second edition. Wetlands International Publication 44, Wageningen, The Netherlands.

Recommendation 6.1 - "Conservation of peatlands".

- Parties are called upon to nominate [additional] peatland ecosystems as Ramsar Sites.

Recommendation 6.3 - "Involving local and indigenous people in the management of Ramsar wetlands".

- Parties are called upon to involve/consult local and indigenous people in management of Ramsar Sites. Specific mention of this in regard to new nominations is not made but may be implied.

Recommendation 6.7 - "Conservation and wise use of coral reefs and associated ecosystems".

- Parties are urged to designate suitable areas of their coral reefs and associated ecosystems as Ramsar Sites.

Annex 3: The Information Sheet on Ramsar Wetlands (incorporating the guidelines for use, the classification of wetland types and the criteria for identifying wetlands of international importance).

Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

FOR OFFICE USE ONLY.

DD MM YY

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Designation date

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Site Reference Number

2. Country:

3. Name of wetland:

4. Geographical coordinates:

5. Altitude: (average and/or max. & min.)

6. Area: (in hectares)

7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

8. Wetland Type (please circle the applicable codes for wetland types as listed in Annex I of the *Explanatory Note and Guidelines* document.)

marine-coastal: A . B . C . D . E . F . G . H . I
. J . K

inland: L . M . N . O . P . Q . R . Sp . Ss
Tp . Ts . U . Va . Vt . W . Xf . Xp . Y
Zg . Zk

man-made: 1 . 2 . 3 . 4 . 5 . 6 . 7 . 8 . 9

Please now rank these wetland types by listing them from the most to the least dominant:

9. Ramsar Criteria: (please circle the applicable criteria; see point 12, next page.)

1a . 1b . 1c . 1d ☒ 2a . 2b . 2c . 2d ☒ 3a . 3b . 3c ☒ 4a .
4b

Please specify the most significant criterion applicable to the site: _____

10. Map of site included? Please tick **yes** -or- **no**

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

11. Name and address of the compiler of this form:

Please provide additional information on each of the following categories by attaching extra pages (please limit extra pages to no more than 10):

12. Justification of the criteria selected under point 9, on previous page.
(Please refer to Annex II in the *Explanatory Note and Guidelines* document).**13. General location:** (include the nearest large town and its administrative region)**14. Physical features:** (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)**15. Hydrological values:** (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)**16. Ecological features:** (main habitats and vegetation types)**17. Noteworthy flora:** (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)**18. Noteworthy fauna:** (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)**19. Social and cultural values:** (e.g. fisheries production, forestry, religious importance, archaeological site etc.)**20. Land tenure/ownership of:** (a) site (b) surrounding area**21. Current land use:** (a) site (b) surroundings/catchment**22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects:** (a) at the site (b) around the site**23. Conservation measures taken:** (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)**24. Conservation measures proposed but not yet implemented:** (e.g. management plan in preparation; officially proposed as a protected area etc.)**25. Current scientific research and facilities:** (e.g. details of current projects; existence of field station etc.)**26. Current conservation education:** (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

29. Management authority: (name and address of local body directly responsible for managing the wetland)

30. Bibliographical references: (scientific/technical only)

Please return to: **Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 GLAND, Switzerland**

Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: ramsar@hq.iucn.org

Explanatory Note and Guidelines
for the
Information Sheet on Ramsar Wetlands

Recommendation 4.7 of the Conference of Contracting Parties established that the "data sheet developed for the description of Ramsar sites . . . be used by Contracting Parties and the Bureau in presenting information for the Ramsar database". The recommendation listed the information categories covered by the "data sheet". Furthermore, Resolution 5.3 reaffirmed that a **completed** "Ramsar datasheet" and site map should be provided upon designation of a wetland to the Ramsar List. This was subsequently reiterated in Resolutions VI.13 and VI.16. The data sheet, which is formally entitled the *Information Sheet on Ramsar Wetlands*, provides a standardized format for recording Ramsar site data. Resolution 5.3 underscored that information concerning **conservation measures, the functions and values** (hydrological, biophysical, floral, faunal, social and cultural) of the site, and **criteria for inclusion** (i.e., Ramsar criteria) were particularly important categories. This resolution also restated the value of using the Ramsar classification for wetland type when completing the data sheet.

In the case of a wetland which has been well-studied and well-documented, or which is the subject of special field investigations, far more information may be available than can be accommodated on the Information Sheet (including the maximum 10-page annex of additional attachment sheets). Whenever possible, copies of published papers or photocopied reports on the site should be appended to the Information Sheet. Slides or photographs of the wetland are also especially valuable. It is essential that the source providing any such additional information be noted.

In the case of very large and complex wetland systems, two levels of approach may be advisable: a broad approach for the system as a whole, and a more detailed approach for key localities within the system. Thus for a particularly large wetland complex it may be appropriate to complete an Information Sheet for the site as a whole and a series of Information Sheets for key areas within the complex.

Resolution VI.1 highlights the importance of monitoring of wetlands to help maintain their ecological character. The annex to the resolution notes that there is a need to increase the value of the information collected for describing and assessing ecological character of listed sites, and that emphasis must be given to:

- establishing a baseline by describing the functions, products and attributes of the site that give it benefits and values of international importance (necessary because the existing Ramsar criteria do not cover the full range of wetland benefits and values which should be considered when assessing the possible impact of changes at a site); sections 12, 14, 15, 16, 17, and 18 below apply.

- providing information on human-induced factors that have affected or could significantly affect the benefits and values of international importance; section 22 below applies.
- providing information on monitoring and survey methods in place (or planned) at the site; sections 23 and 24 below apply.
- providing information on the natural variability and amplitude of seasonal and/or long-term "natural" changes (e.g., vegetation succession, episodic/catastrophic ecological events such as hurricanes) that have affected or could affect the ecological character of the site. Sections 16 and 22 below apply.

The following notes relate to the individual sections of the Ramsar Information Sheet.

1. Date: The date on which the Information Sheet was completed (or updated).
2. Country: The name of the country.
3. Name of wetland: The name of the designated site in one of the 3 official languages (English, French or Spanish) of the Convention (alternative names should be given in brackets).
4. Geographical coordinates: The geographical coordinates (latitude and longitude) of the approximate centre of the wetland, expressed in degrees and minutes. If the site consists of two or more discrete units, the coordinates of the centres of each of these units should be given.
5. Altitude: The average and/or minimum and maximum elevation of the wetland in metres above mean sea level.
6. Area: The area of the designated site, in hectares.
7. Overview: A brief summary of the wetland (limited to not more than three sentences), mentioning principal physical and ecological features, and most significant values and benefits provided.
8. Wetland Type: Please first specify the position of the Ramsar site as a **Marine or coastal wetland** and/or an **Inland wetland**. Also note if the site includes or is a **Man-made wetland**. Circle the codes representing all of the wetland habitat types which are present within the site. Refer to the Ramsar Classification of "Wetland Type" in Annex I. Then list the selected wetland types from the most to the least dominant. It is recognised that this may be difficult for large sites with a variety of habitats, but a general indication of dominance is important for properly managing information on the site.

9. Reasons for inclusion: Circle the Ramsar criteria for identifying wetlands of international importance, as adopted by the Conference of the Parties, which are applicable to the site. Refer to Annex II for the list of Ramsar criteria and associated guidelines for their use. Note the criterion which most significantly characterizes the site's international importance. (See also point 12 below).
10. Outline map of site: The most detailed and up-to-date map of the wetland available should be appended to the Information Sheet. Indicate whether or not a map accompanies the Information Sheet by ticking the appropriate *yes* or *no* box.

The "ideal" Ramsar site map will clearly show the area boundaries of the Ramsar site, scale, latitude, longitude and compass bearing, administrative boundaries (e.g., province, district, etc.), and display basic topographical information, the distribution of the main wetland habitat types and notable hydrological features. It will also show major landmarks (towns, roads, etc.). Indications of land use activities are especially useful.

Experience has shown that even moderately-opaque hand-drawn site boundaries or cross-hatching (to indicate zonation) often obscure other map features. While coloured annotations may appear distinguishable from the underlying map features on the map on which they were applied, it is important to remember that most colours cannot be differentiated in black & white photocopies. These potential drawbacks to otherwise useful annotations should be avoided.

The optimum scale for a map depends on the actual area of the site depicted. Generally the map should have a 1:25,000 or 1:50,000 scale for areas up to 10,000 ha; 1:100,000 scale for larger areas up to 100,000 ha; 1:250,000 for areas exceeding 100,000 ha. In simplest terms, the site should be depicted in some detail. For moderate to larger sites, it is often difficult to show detail on an A4 or 8.5" x 11" sheet at the desired scale, so generally a sheet larger than this is more appropriate. While an original map is not absolutely necessary, a very clear image is highly desirable. A map exhibiting the above attributes will be easier to scan for computerization, should this aspiration prove feasible.

11. Name and address of compiler: The full name, address and institution/agency of the person who compiled the Information Sheet, together with any telephone, fax, telex and e-mail numbers.

Information on the categories listed on the following pages is to be supplied by attaching extra pages (please limit extra pages to no more than 10).

12. Justification of criteria: Criteria codes (point 9 above) alone do not convey information on the precise way in which the criteria apply to a given site. It is

therefore imperative that detailed written text in support of the circled Ramsar criteria be supplied, in addition to the criteria codes.

13. General Location: A description of the general location of the wetland. This should include the site's distance (in a straight line) and compass bearing from the nearest "provincial", "district" or other significant administrative centre, town or city. The population of the listed centre and its administrative region should also be stated.
14. Physical features: A short description of the principal physical characteristics of the site, covering the following points where relevant:
 - geology and geomorphology
 - origins (natural or artificial)
 - hydrology (including seasonal water balance, inflow and outflow)
 - soil type and chemistry
 - water quality (physico-chemical characteristics)
 - depth, fluctuations and permanence of water
 - tidal variations
 - catchment area
 - downstream area (especially in the case of wetlands that are important in flood control)
 - climate (only the most significant climatic features, e.g., annual rainfall and average temperature range, distinct seasons, and any other major factors affecting the wetland).
15. Hydrological values: A description of the principal hydrological values of the wetland, e.g., its role in the recharge and discharge of groundwater, flood control, sediment trapping, prevention of coastal erosion, and maintenance of water quality.
16. Ecological features: A description of the main habitats and vegetation types, listing the dominant plant communities and species, and describing any zonation, seasonal variations and long-term changes. Mention plant species that have been introduced (accidentally or on purpose) and species which are invasive. Include a brief note on the native natural plant communities in adjacent areas, as well as the present plant communities (including cultivation) if different from the native vegetation. Information on food chains should be included in this section.
17. Noteworthy flora: Information on any plant species or communities for which the wetland is particularly important (e.g., endemic species, threatened species or particularly good examples of native plant communities). **Be sure to specify why each species listed is noteworthy.**
18. Noteworthy fauna: A general account of the noteworthy fauna of the wetland, with details of population sizes whenever possible. Particular emphasis should be given to endemic and threatened species, economically important species and

- species occurring in internationally significant numbers. Be sure to specify *why* each species listed is noteworthy. Lists of species and/or census data should not be quoted in full as part of the Information Sheet, but should be appended to this form when available.
19. Social and cultural values: An account (more detail can be given in sections 25-27 below) of the principal social values (e.g., tourism, outdoor recreation, education and scientific research, agricultural production, grazing, water supply, fisheries production) and cultural values (e.g., historical associations and religious significance). Whenever possible, indicate which of these values are consistent with the maintenance of natural wetland processes and ecological character, and which values are derived from non-sustainable exploitation or which result in detrimental ecological changes.
 20. Land tenure/ownership: Details of ownership of the wetland and ownership of surrounding areas (e.g., state, provincial, private, etc). Explain terms which have a special meaning in the country or region concerned.
 21. Current land use: Principal human activities in (a) the Ramsar site itself and (b) in the surroundings and catchment. Give information on the human population in the area, with a description of the principal human activities and main forms of land use at the wetland, e.g., water supply for domestic and industrial use, irrigation, agriculture, livestock grazing, forestry, fishing, aquaculture and hunting. Some indication of the relative importance of each form of land use should be given whenever possible. In section (b) summarize land use in the catchment which might have a direct bearing on the wetland, and land use in any downstream areas likely to be affected by the wetland.
 22. Adverse factors affecting the ecological character of the site: This could include changes in activities, land uses and major development projects at the site or in the catchment or elsewhere which have had, are having, or may have a detrimental effect on the natural ecological character of the wetland (e.g., diversion of water supplies, siltation, drainage, reclamation, pollution, overgrazing, excessive human disturbance, and excessive hunting and fishing). When reporting on pollution, special notice should be taken of toxic chemical pollutants and their sources. These should include industrial and agricultural-based chemical effluents and other emissions. Natural events including vegetative succession which have had, are having or are likely to have an impact on the ecological character of the site should be detailed, so as to facilitate monitoring. Please distinguish between potential and existing adverse factors and where possible, between adverse factors occurring in the site and those external to, but (possibly) affecting, the site. List introduced exotic species and give information on why and how they were introduced. In all cases, where such data exist, supply measurable/quantifiable information to enable more precise monitoring of ecological character.
 23. Conservation measures taken: Details of any protected areas established at or around the wetland, and any other conservation measures taken at the site, such

as restrictions on development, management practices beneficial to wildlife, closures of hunting, etc. Include information on any monitoring and survey methods and regimens in place at the site. Describe any application of the Ramsar wise use guidelines (Recommendation 4.2) and additional guidance on wise use (Resolution 5.6) at the site. If a reserve has been established, please give the date of establishment and size of the protected area. State whether a management plan exists, if it is officially approved and whether it has been implemented. (The Conference of the Parties has called for the development of management plans for all Ramsar sites). Any application of "catchment" integrated site management principles, or in a coastal site, of integrated coastal zone management, should be noted. If only a part of the wetland is included within a protected area, the area of wetland habitat which is protected should be noted. An assessment of the enforcement of legislation and effectiveness of any protected areas should be given whenever possible. Involvement of local communities and indigenous people in the management of the site should also be described. Details of inclusion on the Montreux Record and/or visits under the Ramsar Management Guidance Procedure should be described.

24. Conservation measures proposed but not yet implemented: Details of any conservation measures which have been proposed for the site, including any proposals for legislation, protection and management. Summarize the history of any long-standing proposals which have not yet been implemented, and make a clear distinction between those proposals which have already been officially submitted to the appropriate government authorities, and those proposals which have not as yet received official government endorsement, e.g., recommendations in published reports and resolutions from specialist meetings. Also mention any management plan which exists (or is in preparation) but has not yet been implemented.
25. Current scientific research and facilities: Details of any current scientific research and information on any special facilities for research.
26. Current conservation education: Details of any existing programmes and facilities for conservation education and training and comments on the educational potential of the wetland.
27. Current recreation and tourism: Details of the present use of the wetland for recreation and tourism, with details of existing or planned facilities. Please state the annual number of tourists. Indicate if tourism is seasonal, and of what type.
28. Jurisdiction: The name of the government authority with a) *territorial jurisdiction* over the wetland, e.g., state, region or municipality, etc., and the name of the authority with b) *functional jurisdiction* for conservation purposes, e.g., Department of Environment, Department of Fisheries, etc.
29. Management authority: The name and address of the body responsible for the direct *local* conservation and management of the wetland.

30. References: A list of key references relevant to the wetland, including management plans, major scientific reports and bibliographies. When a large body of published material is available on the site, only the most important references need be cited, with priority being given to recent literature containing extensive bibliographies. Reprints or copies of the most important literature should be appended whenever possible.

Questions concerning use of this document and the Information Sheet on Ramsar Wetlands (as well as completed Information Sheets), should be sent to:

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ANNEX IRAMSAR WETLAND TYPE

The codes are based upon the Ramsar Classification System for "Wetland Type" as approved by Recommendation 4.7 and amended by Resolution VI.5 of the Conference of the Contracting Parties. The categories listed herein are intended to provide only a very broad framework to aid rapid identification of the main wetland habitats represented at each site.

RAMSAR WETLAND TYPE**Marine/Coastal**

- A -- Permanent shallow marine waters less than six metres deep at low tide; includes sea bays and straits.
- B -- Marine subtidal aquatic beds; includes kelp beds, sea-grass beds, tropical marine meadows.
- C -- Coral reefs.
- D -- Rocky marine shores; includes rocky offshore islands, sea cliffs.
- E -- Sand, shingle or pebble shores; includes sand bars, spits and sandy islets; includes dune systems.
- F -- Estuarine waters; permanent water of estuaries and estuarine systems of deltas.
- G -- Intertidal mud, sand or salt flats.
- H -- Intertidal marshes; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes.
- I -- Intertidal forested wetlands; includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.
- J -- Coastal brackish/saline lagoons; brackish to saline lagoons with at least one relatively narrow connection to the sea.
- K -- Coastal freshwater lagoons; includes freshwater delta lagoons.

Inland Wetlands

- L -- Permanent inland deltas.
- M -- Permanent rivers/streams/creeks; includes waterfalls.
- N -- Seasonal/intermittent/irregular rivers/streams/creeks.
- O -- Permanent freshwater lakes (over 8 ha); includes large oxbow lakes.
- P -- Seasonal/intermittent freshwater lakes (over 8 ha); includes floodplain lakes.
- Q -- Permanent saline/brackish/alkaline lakes.
- R -- Seasonal/intermittent saline/brackish/alkaline lakes and flats.
- Sp -- Permanent saline/brackish/alkaline marshes/pools.
- Ss -- Seasonal/intermittent saline/brackish/alkaline marshes/pools.
- Tp -- Permanent freshwater marshes/pools; ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.

- Ts -- **Seasonal/intermittent freshwater marshes/pools** on inorganic soil; includes sloughs, potholes, seasonally flooded meadows, sedge marshes.
- U -- **Non-forested peatlands**; includes shrub or open bogs, swamps, fens.
- Va -- **Alpine wetlands**; includes alpine meadows, temporary waters from snowmelt.
- Vt -- **Tundra wetlands**; includes tundra pools, temporary waters from snowmelt.
- W -- **Shrub-dominated wetlands**; Shrub swamps, shrub-dominated freshwater marsh, shrub carr, alder thicket; on inorganic soils.
- Xf -- **Freshwater, tree-dominated wetlands**; includes freshwater swamp forest, seasonally flooded forest, wooded swamps; on inorganic soils.
- Xp -- **Forested peatlands**; peat swamp forest.
- Y -- **Freshwater springs; oases.**
- Zg -- **Geothermal wetlands**
- Zk -- **Subterranean karst and cave hydrological systems.**

Note : "floodplain" is a broad term used to refer to one or more wetland types, which may include examples from the R, Ss, Ts, W, Xf, Xp, or other wetland types. Some examples of floodplain wetlands are seasonally inundated grassland (including natural wet meadows), shrublands, woodlands and forest. Floodplain wetlands are not listed as a specific wetland type herein.

"Man-made" wetlands

- 1 -- **Aquaculture (e.g., fish/shrimp) ponds**
- 2 -- **Ponds**; includes farm ponds, stock ponds, small tanks; (generally below 8 ha).
- 3 -- **Irrigated land**; includes irrigation channels and rice fields.
- 4 -- **Seasonally flooded agricultural land.***
- 5 -- **Salt exploitation sites**; salt pans, salines, etc.
- 6 -- **Water storage areas**; reservoirs/barrages/dams/impoundments; (generally over 8 ha).
- 7 -- **Excavations**; gravel/brick/clay pits; borrow pits, mining pools.
- 8 -- **Wastewater treatment areas**; sewage farms, settling ponds, oxidation basins, etc.
- 9 -- **Canals and drainage channels, ditches.**

* To include intensively managed or grazed wet meadow or pasture.

ANNEX II

Criteria for Identifying Wetlands of International Importance

as adopted by the 4th and 6th Meetings of the Conference of the Contracting Parties to the Convention on Wetlands (Ramsar, Iran, 1971) to guide implementation of Article 2.1 on designation of Ramsar sites .

Annexes to Recommendation 4.2, Montreux, Switzerland, 1990, and Resolution VI.2, Brisbane, Australia, 1996

A wetland is identified as being of international importance if it meets at least one of the criteria set out below:

1. Criteria for representative or unique wetlands

A wetland should be considered internationally important if:

- (a) it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region;
- or (b) it is a particularly good representative example of a natural or near-natural wetland, common to more than one biogeographical region;
- or (c) it is a particularly good representative example of a wetland which plays a substantial hydrological, biological or ecological role in the natural functioning of a major river basin or coastal system, especially where it is located in a trans-border position;
- or (d) it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region.

2. General criteria based on plants or animals

A wetland should be considered internationally important if:

- (a) it supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species;
- or (b) it is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna;
- or (c) it is of special value as the habitat of plants or animals at a critical stage of their biological cycle;
- or (d) it is of special value for one or more endemic plant or animal species or communities.

3. Specific criteria based on waterfowl

A wetland should be considered internationally important if:

- (a) it regularly supports 20,000 waterfowl;
- or (b) it regularly supports substantial numbers of individuals from particular groups of waterfowl, indicative of wetland values, productivity or diversity;
- or (c) where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl.

4. Specific criteria based on fish

A wetland should be considered internationally important if:

- (a) it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity;
- or
- (b) it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.
-

Guidelines for Application of the Criteria

To assist Contracting Parties in assessing the suitability of wetlands for inclusion on the List of Wetlands of International Importance, the Conference of the Contracting Parties has formulated the following guidelines for application of the Criteria:

- (a) A wetland could be considered of international importance under Criterion 1 if, because of its outstanding role in natural, biological, ecological or hydrological systems, it is of substantial value in supporting human communities dependent on the wetland. In this context, such support would include:
 - provision of food, fibre or fuel;
 - or maintenance of cultural values;
 - or support of food chains, water quality, flood control or climatic stability.

The support, in all its aspects, should remain within the framework of sustainable use and habitat conservation, and should not change the ecological character of the wetland.
- or (b) A wetland could be considered of international importance under Criterion 1, 2 or 3 if it conforms to additional guidelines developed at regional (e.g., Scandinavian or West African) or national level. Elaboration of such regional or national guidelines may be especially appropriate:
 - where particular groups of animals (other than waterfowl) or plants are considered more suitable as a basis for evaluation;
 - or where waterfowl and other animals do not occur in large concentrations (particularly in northern latitudes);
 - or where collection of data is difficult (particularly in very large countries).
- or (c) The "particular groups of waterfowl, indicative of wetland values, productivity or diversity" in Criterion 3(b) include any of the following:
 - loons or divers: Gaviidae;
 - grebes: Podicipedidae;
 - cormorants: Phalacrocoracidae
 - pelicans: Pelecanidae
 - herons, bitterns, storks, ibises and spoonbills: Ciconiiformes;
 - swans, geese and ducks (wildfowl): Anatidae;
 - wetland related raptors: Accipitriformes and Falconiformes
 - cranes: Gruidae
 - shorebirds or waders: Charadriidae; and
 - terns: Sternidae.

- or (d) The specific criteria based on waterfowl numbers will apply to wetlands of varying size in different Contracting Parties. While it is impossible to give precise guidance on the size of an area in which these numbers may occur, wetlands identified as being of international importance under Criterion 3 should form an ecological unit, and may thus be made up of one big area or a group of smaller wetlands. Consideration may also be given to turnover of waterfowl at migration periods, so that a cumulative total is reached, if such data are available.

Guidelines for the application of Criterion 4(a)

- 1.1 Fishes are the most abundant vertebrates associated with wetlands. Worldwide, over 18,000 species of fishes are resident for all or part of their life cycles in wetlands as defined by the Ramsar Convention.
- 1.2 The importance of Criterion 4(a) is that a wetland can be designated as internationally important if it has a high diversity of fishes and shellfishes even if it does not fulfil the requirements of the other criteria. Furthermore, this criterion emphasizes the different forms that diversity might take, including the number of subspecies, species and families, different life-history stages, species interactions, and the complexity of interactions between the above taxa and the external environment. Fish diversity therefore includes diversity within species, between species and between ecosystems. It also includes the diversity of genetically similar intraspecific ecological units, for instance, salmon runs or the different geographical races of marine fishes that have been identified in many regional seas around the world. Species counts alone are not sufficient to assess the importance of a particular wetland.
- 1.3 In addition, the concept of the "niche" needs to be considered, i.e., the different ecological roles that species may play at different stages in their life cycles. This point is especially relevant to animals that have a marked metamorphosis in their life cycle, such as corals, barnacles, many aquatic insects, amphibians, fishes with larvae or leptocephali and birds with naked young, e.g., passerines, some birds of prey, and egrets.
- 1.4 Implicit in this understanding of diversity is the importance of high levels of endemism and of biodiversity. "Endemic species" are species that are unique to one region, often within one country or continent, and are found nowhere else. Many wetlands are characterized by the highly endemic nature of their fish fauna.
- 1.5 Some measure of the level of endemism should be used to distinguish sites of international importance. If at least 10% of the ichthyofauna is endemic to a wetland, or to wetlands in a natural grouping, that site should be recognized as internationally important, but the absence of endemic fishes from a site should not disqualify it if it has other qualifying characteristics. In some wetlands, such as the African Great Lakes, Lake Baikal in Russia, Lake Titicaca, sinkholes and cave lakes in arid regions, and lakes on islands, endemism levels as high as 90-100% may be reached, but 10% is a practical figure for worldwide application. In areas with no endemic fish species, the endemism of genetically-distinct intraspecific categories, such as geographical races, should be used.
- 1.6 Over 977 species of fishes are threatened with extinction worldwide and at least 28 fish species have recently become extinct. The occurrence of rare or threatened fish species in a wetland is an important attribute but is catered for in Criterion 2 of the Ramsar Convention.
- 1.7 The concepts of indicator, flagship and keystone species are also important. The presence of "indicator" species is a useful measure of good wetland quality. "Flagship" species have high symbolic value in the conservation movement (e.g., Siberian crane, flamingo, desert pupfish, sturgeon) whereas "keystone" species play vital ecological roles. The recognition of the important ecological role of keystone species, which are often abundant and widespread, and the need for their conservation, is perhaps foreign to the traditional conservation ethic, but

deserve serious consideration. Wetlands with significant populations of indicator, flagship and/or keystone species would merit consideration as sites of international importance.

- 1.8 An important component of biodiversity is biodisparity, i.e., the range of morphologies and reproductive styles in a community. The biodisparity of a wetland community will be determined by the diversity and predictability of its habitats in time and space, i.e., the more heterogeneous and unpredictable the habitats, the greater the biodisparity of the fish fauna.
- 1.9 For example, Lake Malawi, a stable, ancient lake, has over 600 fish species of which 92% are maternal mouthbrooding cichlids, but only a few fish families. In contrast, the Okavango Swamps, a palustrine floodplain that fluctuates between wet and dry phases, has only 60 fish species but a wider variety of morphologies and reproductive styles, and many fish families, and therefore has a greater biodisparity.
- 1.10 Measures of both biodiversity and biodisparity should be used to assess the international importance of a wetland.
- 1.11 The problem of invasive aquatic animals also needs to be considered. Fishes (finfishes and shellfishes) have been widely distributed, accidentally or purposely, by humankind from one catchment, ocean or continent to another, with sometimes disastrous consequences for the local fauna and ecology. In some cases, as in the Laurentian Great Lakes in North America, the indigenous fauna of the lakes has been dramatically altered even though the total species count has not declined significantly. In Suisun Marsh in the Sacramento-San Joaquin estuary in the USA, the introduction of alien species has doubled the species count in the wetland. In other cases, as in Lake Victoria in Africa, alien species, combined with overfishing and pollution, have caused a major decline in the diversity of indigenous species. Measures of biodiversity and biodisparity should only take into account representative assemblages of indigenous species, if the true intrinsic worth of the system is to be measured.
- 1.12 The situation is not simple, however, as many high altitude lakes that formed since the last glaciation contain only introduced fish species. Throughout the world important commercial, recreational and subsistence fisheries are based on introduced species, especially trout, carp, salmon, bass and tilapia. Furthermore, some alien species, for instance those used for biological control, have had beneficial effects on wetlands. In general, the introduction of alien species of fishes and shellfishes which may have adverse impacts on the diversity of indigenous species or for which there are insufficient data available to make a reliable judgement should be discouraged.

Guidelines for the application of Criterion 4(b)

- 2.1 Many fishes (including shellfishes) have complex life histories, with spawning, nursery and feeding grounds widely separated and long migrations necessary between them. It is important to conserve all those areas that are essential for the completion of a fish's life cycle if the fish species or stock is to be maintained. The productive, shallow habitats offered by coastal wetlands (including coastal lagoons, estuaries, salt marshes, inshore rocky reefs and sandy slopes) are extensively used as feeding and spawning grounds and nurseries by fishes with openwater adult stages. These wetlands therefore support essential ecological processes for fish stocks, even if they do not necessarily harbour large adult fish populations themselves.
- 2.2 Furthermore, many fishes in rivers, swamps or lakes spawn in one part of the ecosystem but spend their adult lives in another inland water or in the sea. It is common for fishes in lakes to migrate up rivers to spawn, or fishes in rivers to migrate downstream to a lake or estuary, or beyond the estuary to the sea, to spawn. Many swamp fishes migrate from deeper, more permanent waters to shallow, temporarily inundated areas for spawning. Wetlands, even apparently insignificant ones in one part of a river system, may therefore be vital for the proper functioning of extensive river reaches up- or downstream of the wetland.

- 2.3 The adoption of this criterion for the identification of wetlands of international importance is for guidance only and does not interfere with the rights of Contracting Parties to regulate fisheries within specific wetlands and/or elsewhere.

Definitions

Catchment: The area drained by a river and all its tributaries; a drainage basin or watershed.

Endemic species: A species that is unique to one region, i.e. it is found nowhere else in the world. A group of fishes may be indigenous to a subcontinent with some species endemic to a part of that subcontinent.

Family: An assemblage of genera and species that have a common phylogenetic origin, e.g., pilchards, sardines and herrings in the family Clupeidae.

Fish: Any finfish, including jawless fishes (hagfishes and lampreys), cartilaginous fishes (sharks, rays, skates and their allies, Chondrichthyes) and bony fishes (Osteichthyes) as well as certain shellfish or other aquatic invertebrates, as listed below.

Fish orders that typically inhabit wetlands (as defined by the Ramsar Convention) and which are indicative of wetland benefits, values, productivity or diversity, include:

Jawless fishes - Agnatha

- hagfishes (Myxiniiformes)
- lampreys (Petromyzontiformes)

Cartilaginous fishes - Chondrichthyes

- dogfishes, sharks and allies (Squaliformes)
- skates (Rajiformes)
- stingrays and allies (Myliobatiformes)

Bony fishes - Osteichthyes

- Australian lungfish (Ceratodontiformes)
- South American and African lungfishes (Lepidosireniformes)
- bichirs (Polypteriformes)
- sturgeons and allies (Acipenseriformes)
- gars (Lepisosteiformes)
- bowfins (Amiiformes)
- bonytongues, elephant fishes and allies (Osteoglossiformes)
- tarpons, bonefishes and allies (Elopiformes)
- eels (Anguilliformes)
- pilchards, sardines and herrings (Clupeiformes)
- milkfishes (Gonorhynchiformes)
- carps, minnows and allies (Cypriniformes)
- characins and allies (Characiformes)
- catfishes and knifefishes (Siluriformes)
- pikes, smelts, salmon and allies (Salmoniformes)
- mullets (Mugiliformes)
- silversides (Atheriniformes)
- halfbeaks (Beloniformes)
- killifishes and allies (Cyprinodontiformes)
- sticklebacks and allies (Gasterosteiformes)
- pipefishes and allies (Syngnathiformes)
- cichlids, perches and allies (Perciformes)
- flatfishes (Pleuronectiformes)

Several groups of shellfishes:

- shrimps, lobsters, freshwater crayfishes, prawns and crabs (Crustacea)
- mussels, oysters, pencil baits, razor shells, limpets, winkles, whelks, scallops, cockles, clams, abalone, octopus, squid and cuttlefish (Mollusca)

Certain other aquatic invertebrates:

- sponges (Porifera)
- hard corals (Cnidaria)
- lugworms and ragworms (Annelida)
- sea urchins and sea cucumbers (Echinodermata)
- sea squirts (Ascidiacea)

Fish stock: The potentially exploitable component of a fish population.

Fishes: "Fishes" is used as the plural of "fish" when more than one species is involved.

Indigenous species: A species that originates and occurs naturally in a particular place.

Life-history stage: A stage in the development of a finfish or shellfish, e.g., egg, embryo, larva, leptocephalus, zoea, zooplankton stage, juvenile, adult, post-adult.

Migration path: The route along which fishes, such as salmon and eels, swim when moving to or from a spawning or feeding ground or nursery. Migration paths often cross international boundaries or boundaries between intranational management zones.

Nursery: That part of a wetland used by fishes for providing shelter, oxygen and food for the early developmental stages of their young. In some fishes, e.g., nest-guarding tilapias, the parent/s remain at the nursery to protect the young whereas in others the young are not protected by the parent/s except by virtue of the shelter provided by the habitat in which they are deposited, e.g., non-guarding catfishes.

The ability of wetlands to act as nurseries depends on the extent to which their natural cycles of inundation, tidal exchange, water temperature fluctuation and/or nutrient pulses are retained; Welcomme (1979) showed that 92% of the variation in catch from a wetland-recruited fishery could be explained by the recent flood history of the wetland.

Population: A group of fishes comprising members of the same species. A wetland community would comprise all the species of plants and animals that live in that wetland.

Significant proportion: In polar biogeographical regions a "significant proportion" may be 3-8 subspecies, species, families, life-history stages or species interactions; in temperate zones 15-20 subspecies, species, families, etc.; and in tropical areas 40 or more subspecies, species, families, etc, but these figures will vary between regions. A "significant proportion" of species includes all species and is not limited to those of economic interest. Some wetlands with a "significant proportion" of species may be marginal habitats for fish and may only contain a few fish species, even in tropical areas, e.g., the backwaters of mangrove swamps, cave lakes, the highly saline marginal pools of the Dead Sea. The potential of a degraded wetland to support a "significant proportion" of species if it were to be restored also needs to be taken into account. In areas where fish diversity is naturally low, e.g., at high latitudes, in recently glaciated areas or in marginal fish habitats, genetically-distinct infraspecific groups of fishes could also be counted.

Spawning ground: That part of a wetland used by fishes for courting, mating, gamete release, gamete fertilization and/or the release of the fertilized eggs, e.g., herring, shad, flounder, cockles, and many fishes in freshwater wetlands. The spawning ground may be part of a river course, a stream bed, inshore or deep water zone of a lake, floodplain, mangrove, saltmarsh, reed bed,

estuary or the shallow edge of the sea. The freshwater outflow from a river may provide suitable spawning conditions on the adjacent marine coast.

Species: Naturally occurring populations of fishes that interbreed, or are capable of interbreeding, in the wild.

Species interaction: Exchanges of information or energy between species that are of particular interest or significance, e.g., symbiosis, commensalism, mutual resource defence, communal brooding, cuckoo behaviour, advanced parental care, social hunting, unusual predator-prey relationships, parasitism and hyperparasitism. Species interactions occur in all ecosystems but are particularly developed in species-rich climax communities, such as coral reefs and ancient lakes, where they are an important component of biodiversity.

Wetland benefits: The services that wetlands provide to people, e.g., water purification, supplies of potable water, fishes, plants, building materials and water for livestock, outdoor recreation and education.

Wetland values: The roles that wetlands play in natural ecosystem functioning, e.g., flood attenuation and control, maintenance of underground and surface water supplies, sediment trapping, erosion control, pollution abatement and provision of habitat.

For further information, please contact:

[dcp c:\criteria]

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ANNEX 4

REPORT FOLLOWING CONSULTATIONS WITH CALM STAFF

CONCERNING POSSIBLE NEW NOMINATIONS OF RAMSAR SITES AND EXTENSIONS TO EXISTING SITES

prepared by
Roger Jaensch and Doug Watkins
Wetlands International - Oceania

September 1998

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- Becher Point Wetlands
- Benger Swamp
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- Ord River Floodplain
- Owingup Swamp System
- Peel-Yalgorup System
- Prince Regent River System
- Roebuck Plains System
- Rottnest Island Lakes
- Shark Bay East - Hamelin Pool
- Swan-Canning Estuary
- Vasse-Wonnerup System

SUMMARY

Timeframe for nomination of candidate wetlands (N), extensions (E) and split (S) and wetlands that are unsuitable or for which more data are needed (X).

<i>wetland</i> (<i>bold = existing RS</i>)	<i>suggested timeframe for action:</i>		
	<i>by</i> <i>May 1999</i>	<i>at a later</i> <i>stage</i>	<i>unsuitable, or</i> <i>need more data</i>
Balicup Lake System		N	
Becher Point Wetlands *	N		
Benger Swamp		N	
Blackwood R. Lower Reaches & Tributaries *	N		
Booragoon Lake		N	
Brixton Street Swamps		N	
Camballin Floodplain		N	
Cape Range Subterranean Waterways *	N		
Chandala Swamp	N		
Culham Inlet System			X
Drysdale River		N	
Dumbleyung Lake		N	
Ellen Brook Swamps	N		
Exmouth Gulf East			X
Forrestdale & Thomsons Lakes		S	
Fortescue Marshes		N	
Guraga Lake		N	
Lake Ballard		N	
Lake Barlee		N	
Lake Gore *	N		
Lake Grace System		N	
Lake Gregory System		N	
Lake Logue/Indoon System		N	
Lake MacLeod *	N		
Lake Marmion		N	
Lake Muir & Byenup Lagoon System *	N		
Lake Pleasant View System		N	
Lake Thetis		N	
Lake Toolibin	E		
Lake Warden System			X (E)
Leslie (Port Hedland) Saltfields		N	
Loch McNess System		N	
Millstream Pools		N	
Mitchell River System		N	
Moates Lake System		N	
Ord River Floodplain	E		
Owingup Swamp System		N	
Peel-Yalgorup System	E		
Prince Regent River System		N	
Roebuck Plains System		N	
Rottne Island Lakes		N	
Shark Bay East and Hamelin Pool		N	
Swan-Canning Estuary *		N	
Vasse-Wonnerup System	E		
<i>totals</i>	12	29	3

* Not all of the wetland system described in the Directory (ANCA 1996) is to be nominated.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Balicup Lake System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Balicup Lake System - ESP001WA - page 801.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Telephone call on 4/9/98 with John Watson (Manager, South Coast Region).

Ramsar criteria and how met:

3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). The 1% criterion is met for Banded Stilt: counts of up to 2824 have been recorded.

New information on application of the criteria to the wetland:

Existing data may not be sufficient to confirm frequent use by 1% (2100) of the Banded Stilt population, but water and salinity data and the considerable area of suitable habitat suggest that regular use (several times in a 25 year period) by 1% of the population does occur. Note also that Hooded Plover (a nationally vulnerable species) occurs at four of the lakes in Balicup Lake System and breeds in the wetlands; however it occurs only in small numbers (up to 12 counted) and thus there is not a strong case for criterion 2a being satisfied.

Tenure and extent of the potential new nomination:

The System comprises several NPNCA-vested Nature Reserves. However, there is no surface hydrological connection between the wetlands/ reserves and thus the composition of a potential Ramsar Site requires further consideration.

Major stakeholders other than CALM:

Not discussed.

Potential to maintain the wetland's values (viability of the potential new nomination):

There are serious issues regarding farmland salinity in the lake catchments but the lakes have always been saline.

Other wetland management considerations:

Not discussed.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Further consideration needs to be given to the composition of a potential Ramsar Site based on the Balicup Lake System. Consideration also to the System's relative importance compared with other saline lake systems in South-Western Australia may reveal priorities for nomination.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 16 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Becher Point Wetlands

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Becher Point Wetlands - SWA002WA - page 872

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meetings at Kelmscott on 3/9/98 with Jim Lane (Principal Research Scientist, Science Division), Bruce Harvey (Manager, Swan Region) and David Mitchell (Nature Conservation Program Leader, Swan Region), and at Woodvale on 4/9/98 with John Blyth (Scientific Advisor, WATSC Unit).

Ramsar criteria and how met:

Id (it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region). The Becher Point Wetlands are an example of shrub swamps and seasonal marshes that have formed in an extensive sequence of inter-dunal depressions that have arisen from seaward retreat of the coastline over recent millennia. This type of wetland system is rare in South-Western Australia.

New information on application of the criteria to the wetland:

We need to be confident of the "global significance" of the site with respect to geomorphology. Apparently there is no substantial dissent to the value of the site as expressed particularly by Vic Semeniuk *et al.*, but it would be preferable to identify a paper that specifies and defends the significance, which is published in a refereed scientific journal of high repute.

Tenure and extent of the potential new nomination:

The potential Ramsar nomination would comprise all of NPNCA nature reserves 44077 and 45041.

Major stakeholders other than CALM:

None that must be consulted immediately. The site is within the Port Kennedy Scientific Park and Rockingham Lakes Regional Park system. At present there are tens of neighbours but hundreds will occur in the future as surrounding urban development progresses.

Potential to maintain the wetland's values (viability of the potential new nomination):

The wetlands are considered viable as a Ramsar site. Groundwater is extracted in the vicinity, to maintain the adjacent golf course, but there is ongoing monitoring of the impact as required under WA Ministerial conditions of development approval. Strong community support exists for conservation of the wetlands. A substantial proportion of the total wetland area and the dune sequence is captured in the proposed Ramsar site. There is potential to extend the Ramsar site in the future, to adjoining parts of the Regional Park (immediately east, also in the Cooalongup Lake area): this would capture later stages in the Holocene dune/wetland development.

Other wetland management considerations:

Preparation of a management plan for the wetlands will begin this financial year.

Other information on conservation values:

There are no nationally endangered/vulnerable flora known from the wetlands: the wetlands are dominated by several common sedge and tree/shrub species. However, the wetland includes a plant community that may eventually be designated as nationally threatened.

References (additional to those in the Directory):

Tingay, A and Associates 1997. Proposed Port Kennedy Scientific Park and Rockingham Regional Park Management Framework.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

None, with respect to the two Nature Reserves.

Additional contiguous areas of land containing the dunes/wetlands should be added as they become vested in the NPNCA, or (for non-NPNCA land) with agreement of the Regional Park managers.

Suggested timeframe for nomination:

It is recommended that a Ramsar Site comprising the two Nature Reserves be nominated by May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 29 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Benger Swamp

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Benger Swamp - SWA003WA - page 873

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Busselton on 31/8/98 with Jim Lane (Principal Research Scientist, Science Division), Rob Brazell (Forest Ranger, Collie District) and Kim Williams (Conservation Program Leader, Central Forest Region).

Ramsar criteria and how met:

3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). Benger Swamp regularly supports at least 1% of the South-Western Australian population of Australasian Bittern *Botaurus poiciloptilus* (1% level = 3 birds: this number has been recorded in at least several of the past 25 years) and up to 8 birds have been counted (the highest count from any wetland in South-Western Australia).

New information on application of the criteria to the wetland:

Wetlands International is confident that the 1% level for Australasian Bittern (Rose & Scott 1997, which is the official source of population data for this criterion) is met.

Tenure and extent of the potential new nomination:

Nearly all of the remaining wetland at Benger Swamp is in a C Class Nature Reserve. Five lots (9, 23, 41, 42, 65) within the central parts of the Reserve remain in freehold tenure: one is probably owned by the Water and Rivers Commission, the others by three private landowners. Shire road reserves occur throughout the wetland and divide the Reserve into many compartments. The areas surrounding the wetland are owned by about 6-8 private landowners.

The ideal Ramsar Site would comprise all of Benger Swamp and thus optimise the potential to effectively maintain the wetland's conservation values.

Major stakeholders other than CALM:

Major stakeholders include the four owners of land surrounded by the Nature Reserve, and South-West Irrigation which is an organisation of uncertain status which has interests in water supply (supply of water to the Swamp is artificially managed). The Bunbury Naturalists Club makes twice-annual birdwatching visits.

Potential to maintain the wetland's values (viability of the potential new nomination):

Benger Swamp is a highly modified wetland subject to ongoing habitat management work, especially with respect to control of water levels and *Typha orientalis*. Due to the potential for enhanced wetland

management that this situation provides, there is high potential to enhance use of the wetland by Australasian Bitterns. Salinisation probably is not a major issue due to the depth at which the groundwater occurs and the apparent lack of change in water salinity over the last 20 years. The Shire road reserves permit access by the public, which continues to result in some illegal cutting of "sticks" from *Melaleuca* thickets in the Reserve (though this does not affect the wetland meeting Ramsar criterion 3c).

Other wetland management considerations:

During the meeting on 31/8/98 it was suggested that Ramsar listing could enhance community recognition of why this former major potato growing area was protected in the first place and would strengthen the CALM District's ability to sustain the recently-revived management work. A management plan for Bengier Swamp was developed more than 10 years ago.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

Rose, P.M. and Scott, D.A. 1997. Waterfowl population estimates. Second edition. Wetlands International Publication 44, Wageningen, The Netherlands.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Consultation with the stakeholders is recommended: this may result in support for nomination of the existing Nature Reserve (excluding the freehold land and road reserves). Completion of purchase of freehold land within the reserve and closure of road reserves would however be desirable. Reconvening of the Bengier Swamp Management Committee, which has not met for several years and normally includes a Shire representative, could enhance the reaching of those goals.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 15 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Blackwood River (Lower Reaches) and Tributaries

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Blackwood River (Lower Reaches) and Tributaries - WAR001WA - page 921

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Busselton on 31/8/98 with Jim Lane (Principal Research Scientist, Science Division), Roger Banks (Manager, South West Capes District), Kim Williams (Nature Conservation Program Leader, Central Forest Region).

Ramsar criteria and how met:

- 2a (it supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species). The wetland system includes the entire known population of the nationally endangered yellow-bellied frog *Geocrinia vitellina* and most of the known populations of the nationally vulnerable white-bellied frog *G. alba*, both of which are wetland-dependent species.
- 2d (it is of special value for one or more endemic plant or animal species or communities). *Geocrinia vitellina* is endemic to the creeks that are included in the wetland system.

New information on application of the criteria to the wetland:

The Ramsar criteria apply only to the creek components of WAR001WA because both frogs are dependent on and occur only in wetland habitat on the permanently waterlogged or seasonally inundated creek flats. A review of the endangered/vulnerable status of the frogs at national level is being considered but any changes are unlikely to be made for at least two years. (*G. alba* may be rated as at greater risk: 30% of populations have become extinct.) Note that *G. vitellina* has the smallest geographic range and area of occupancy of any vertebrate, including the western swamp tortoise, in all of mainland Australia (A A Burbidge pers. comm.).

Tenure and extent of the potential new nomination:

Intensive searching for *G. vitellina* has occurred within the last 10 years and most of the known populations are within CALM land (State Forest) vested in the Land and Forests Commission. The other populations are in the adjoining narrow Blackwood River reserve (VCL). All populations occur within a proposed "no-logging area" corridor along the Blackwood River valley, rather than in forest earmarked for production purposes. The separation between populations of *G. vitellina* and *G. alba* is about 15 km. A Ramsar Site that includes most or all of the populations of *G. vitellina* thus is feasible.

Most of the known populations of *G. alba* are in freehold tenure except for some (perhaps 10-15 % in total) in Boranup National Park, in State Forest earmarked for conservation, and in VCL. The largest aggregation of *G. alba* populations is in land immediately south of Chapman Brook (Location 83), which is subject to negotiations between CALM and a land developer. A separate Ramsar Site would be the most appropriate strategy for *G. alba* but would be difficult to establish due to the scattered populations of *G. alba*, within various land tenures.

Major stakeholders other than CALM:

None for the *G. vitellina* wetlands other than the Species Recovery Team, which should be supportive of Ramsar listing, though it may be wise to check with DOME.

DOME and BHP/CRA (coal interests over northern populations; mineral sands nearer the River) and private landholders (approx. 17, not all supportive of frog conservation) are stakeholders for the *G. alba* wetlands.

Potential to maintain the wetland's values (viability of the potential new nomination):

No major viability concerns for the *G. vitellina* wetlands; lesser concerns (controlling public access, excessive wildfire, dieback, pigs) should be resolved through existing or proposed actions. But note that the species does not seem to withstand high intensity fires and populations take 10 years to recover from cool fires (A A Burbidge pers. comm.). There are plans to trans-locate some *G. vitellina* to suitable creeks immediately to the east and south.

For *G. alba*, major concerns include loss of habitat and loss of water supply due to new farm dams.

Other wetland management considerations:

Both frogs are subject to Species Recovery Plans, with ongoing funding.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

This applies to the wetland as described in the Directory but also individually to the *G. vitellina* and *G. alba* wetlands.

Issues that must first be resolved before nomination can proceed:

None with respect to the *G. vitellina* wetlands.

For the *G. alba* wetlands, consultations are needed with major stakeholders in regard to identifying a separate Ramsar Site that would capture a substantial portion of the *G. alba* known population. The best option may be an area extending from the National Park through freehold land to the State Forest and the important habitat south of Chapman River.

Suggested timeframe for nomination:

The *G. vitellina* wetlands may be nominated by May 1999. A minimum Ramsar Site would be defined by Denny Road in the north, the Blackwood River in the south, and un-named forest tracks in the west and east which would capture all known populations and include some land proposed for frog translocations. The preferred boundaries would include all of Spearwood Creek catchment and possibly also translocated populations south of the River; due to possible concerns over loss of forest production this would require consultation leading to possible extension of the Site at a later stage.

Subject to resolution of the abovementioned issues, the *G. alba* wetlands may be nominated after May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 14 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Booragoon Lake

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Booragoon Lake - SWA004WA - page 874.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Kelmscott on 3/9/98 with Jim Lane (Principal Research Scientist, Science Division), Bruce Harvey (Manager, Swan Region) and David Mitchell (Nature Conservation Program Leader, Swan Region).

Ramsar criteria and how met:

2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle).
Booragoon Lake supports the largest breeding colony of Great Cormorant in WA, and the second largest (and one of the most regular) breeding colony of Little Black Cormorant in South-Western Australia.

New information on application of the criteria to the wetland:

Data on importance for waterbird breeding should be checked and if possible the current status assessed, e.g. in case the use for breeding has decreased markedly.

Tenure and extent of the potential new nomination:

The potential nomination would comprise the Reserve that includes all or most of Booragoon Lake. It is a recreation and drainage Reserve, apparently vested in or managed by the City of Melville, and is not proposed for NPNCA vesting. It is part of the Beeliam Regional Park. There is potential for extension of the proposed Ramsar Site to include Piney Lakes Reserve, on the opposite side of Leach Highway (the Reserves are contiguous apart from the Highway), which supports a Darter breeding colony. However, values, management and proposed uses of Piney Lakes Reserve first need to be clarified. Booragoon Lake should not be Ramsar listed as part of any proposed Ramsar Site that includes the Swan-Canning Estuary.

Major stakeholders other than CALM:

The lake is situated within the Perth metropolitan area and is fronted by houses (many tens of immediate neighbours) on three sides.

Potential to maintain the wetland's values (viability of the potential new nomination):

The viability of the Swamp's paperbark trees is questionable given the artificial maintenance of high water levels, occurrence of some tree deaths in the Lake and apparent absence or scarcity of regenerating paperbarks.

Other wetland management considerations:

There is a management plan for the wetland (prepared for the City of Melville).

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

The potential of the wetland to be a Ramsar site should be brought to the attention of the City of Melville and questions about the wetland viability resolved.

Suggested timeframe for nomination:

Resolution of issues probably would be completed after May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 31 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Brixton Street Swamps

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Brixton Street Swamps - SWA005WA - page 876.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Kelmscott on 3/9/98 with Jim Lane (Principal Research Scientist, Science Division), Bruce Harvey (Manager, Swan Region) and David Mitchell (Nature Conservation Program Leader, Swan Region) and a meeting at Woodvale on 4/9/98 with Neil Gibson (Senior Research Scientist, Science Division).

Ramsar criteria and how met:

- 2a (it supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species). The Swamps support appreciable populations of wetland-dependent native plants (3 species) listed as vulnerable at national level.

New information on application of the criteria to the wetland:

The site supports appreciable populations of the flora listed as nationally vulnerable. The status of some of the listed flora may eventually be changed (to no longer vulnerable?) but this is not imminent. Apparently no plant species is endemic to these wetlands. No other site in WA of comparable (small) size contains so many rare plant species. Further survey work (of the few other remnant wetlands of this type) is unlikely to diminish this importance in the context of the Swan Coastal Plain. The greater Brixton Street wetland (see below) is still regarded as the best example of the wetland (sub-) type remaining on the Swan Coastal Plain.

Tenure and extent of the potential new nomination:

None of the "greater" Brixton Street Swamps wetland is NPNCA vested though some of it eventually may be so. The southernmost portion (19 ha), south of Brixton Street, is Homeswest land and thus has potential to become NPNCA vested; the University of WA owns contiguous wetland immediately north; other contiguous wetland to the north is owned by the WA Planning Commission and probably 4-5 others. Total area of the land containing the "greater" Brixton Street Swamps wetland is in the order of 100 ha.

Major stakeholders other than CALM:

All current landowners are stakeholders to be consulted. There are probably tens of suburban neighbours.

Potential to maintain the wetland's values (viability of the potential new nomination):

The potential nomination is a viable option only if the greater/total site area is considered. Long term viability of the wetland's conservation values is at risk due to changes to drainage over the last 10-20 years.

Other wetland management considerations:

The wetland has considerable community support, though not necessarily from immediate neighbours. The "Friends of Brixton Street Wetlands" have produced a management plan. There is an Environmental Planning Policy over part of the site.

Other information on conservation values:

Surveys of the greater Brixton Street wetland have revealed additional flora conservation values. The site supports 8 wetland-dependent plants that are declared rare in WA (but not nationally threatened), though apparently some (2) may soon be de-listed. Eventually the wetland may be listed as a threatened ecological community. The rare sedge found at the site is now named: *Eleocharis keigheryi*.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

CALM should consult with the current landowners regarding their support for a Ramsar nomination. There is also a need to consider the viability of the conservation values and review whether/not the flora are still nationally endangered/vulnerable immediately prior to nomination.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 31 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff**Camballin Floodplain (Le Lievre Swamp System)**

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Camballin Floodplain (Le Lievre Swamp System) - DL002WA - page 791.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Broome on 15/9/98 with Allen Grosse (Manager, West Kimberley District).

Ramsar criteria and how met:

- 3a (it regularly supports 20,000 waterfowl). More than 38,000 waterbirds have been counted at Camballin Floodplain: up to 38,553 at Le Lievre Swamp (May 1986) and 21,840 at Moulamen Swamp (March 1988). The number of individual waterbirds that use the Floodplain each year probably exceeds 20,000 and the wetland conditions are suitable for use 20,000 waterbirds at least several times within a 25 year period; in the context of wetland availability in Western Australia this is considered sufficient evidence of regular use by 20,000 waterbirds.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). Camballin Floodplain supports more than 1% of the flyway population of Wood Sandpiper (up to 185 counted), Australian Pratincole (600) and Marsh Sandpiper (276).

New information on application of the criteria to the wetland:

None provided.

Tenure and extent of the potential new nomination:

Specific boundaries for a potential Ramsar Site would need to be determined following discussions with the leaseholders (Liveringa Station/Camballin Farm pastoral leases) and the Department of Land Administration. The minimum Site should include Le Lievre Swamp and Moulamen Swamp.

Major stakeholders other than CALM:

Liveringa Station, Camballin Farm and the adjacent Looma community.

Potential to maintain the wetland's values (viability of the potential new nomination):

Future land use of the Camballin Floodplain has the potential to greatly effect the wetland values. Currently proposals are being evaluated to dam the Fitzroy River upstream and use the water for cotton growing at Camballin and possibly elsewhere.

Other wetland management considerations:

The site is within an area identified in the State Planning Strategy as an "Agricultural Priority Management Area" (Western Australian Planning Commission 1997).

The Kimberley region at present has four existing Ramsar Sites. Management planning and implementation by CALM is severely hampered by the inadequate resources available for the region (Watkins *et al.* 1997). The nomination of additional Ramsar Sites in this region may add to the difficulties unless additional resources are allocated.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

Watkins D, Brennan K, Lange C, Jaensch R & Finlayson M. 1997. *Management Planning for Ramsar Sites in the Kimberley Region of Western Australia*. Report to the Department of Conservation and Land Management. Wetlands International - Oceania. Canberra.
Western Australian Planning Commission. 1997. *State Planning Strategy, Final Report*. Western Australian Planning Commission. Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Agreement is needed on future land use and, following this, management arrangements for the wetlands. A further issue that needs to be addressed is to increase resources for the CALM Kimberley Region to enable appropriate planning and management of the existing Ramsar listed wetlands.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Cape Range Subterranean Waterways

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Cape Range Subterranean Waterways - CAR001WA - page 774.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Crawley on 9/9/98 with Jim Lane (Principal Research Scientist, Science Division) and Peter Moore (Operations Officer, Pilbara Region) and at Karratha on 17/9/98 with Chris Muller (Manager, Pilbara Region) and Peter Kendrick (Regional Ecologist, Pilbara Region).

Ramsar criteria and how met:

- 1d (it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region). Cape Range has one of only two subterranean karst wetland systems that exist in the Arid Interior region of Western Australia.
- 2d (it is of special value for one or more endemic plant or animal species or communities). The blind fishes *Ophisternon candidum* and *Milyeringa veritas* are endemic to Cape Range: they are known from 11 and 18 locations respectively, mostly outside Cape Range National Park. Both species occur in wells, sinkholes and caves and possibly occur widely in the groundwater. There is also a diverse endemic stygofauna including two species of blind shrimps *Stygiocaris lancifera* and *S. stylifera* (Atyidae) and numerous newly described and undescribed species of stygofauna, mostly crustaceans.

New information on application of the criteria to the wetland:

None provided.

Tenure and extent of the potential new nomination:

The area described in the Directory covers almost all of the Cape Range peninsula including the town sites of Exmouth and Learmouth. It seems unrealistic and inappropriate to include such a large area in a Ramsar nomination. A smaller area that includes Cape Range National Park and a small part of the immediately adjacent Commonwealth land to the south would contain a significant proportion of the populations of endemic fauna. Negotiations to significantly add to the Cape Range National Park are in progress: this should create potential for possible future extensions to the Ramsar nomination. At a future stage there may be support for the inclusion of significant areas to the north of the Cape Range National Park including Jurabi Coastal Park, Bundegi Coastal Park and the area adjacent to the north of Cape Range National Park marked for "Conservation and Recreation" in the Exmouth-Learmouth (North West Cape) Structure Plan (Western Australian Planning Commission 1998).

Major stakeholders other than CALM:

Commonwealth Department of Defence and Exmouth Shire.

Potential to maintain the wetland's values (viability of the potential new nomination):

Potential threats to the cave fauna, especially on the eastern side of the peninsula (which is outside the proposed Ramsar boundary), are nutrient enrichment of the ground water, water abstraction, and townsite development. Other potential threats are limestone quarrying, quicklime manufacture, contamination (petrochemicals, heavy metals, nutrients) and vegetation clearance. Although the threats are significant, the ecological importance of the area has been recognised in the Exmouth-Learmouth (North West Cape) Structure Plan.

Other wetland management considerations:

A Management Plan has been prepared for Cape Range National Park. Cape Range National Park is included on the Register of the National Estate.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

Western Australian Planning Commission 1998. Exmouth-Learmouth (North West Cape) Structure Plan.
Western Australian Planning Commission. Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Approaches need to be made to the Department of Defence and the Shire of Exmouth to discuss the potential nomination. It is recommended that CALM request Environment Australia to assist with liaison with the Department of Defence.

Suggested timeframe for nomination:

It would seem feasible that negotiations could be concluded to enable the nomination (National Park plus small part of Commonwealth land) to be put forward by May 1999. Extensions could be addressed at a later stage.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Chandala Swamp

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Chandala Swamp - SWA006WA - page 877.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Kelmscott on 3/9/98 with Jim Lane (Principal Research Scientist, Science Division), Bruce Harvey (Manager, Swan Region) and David Mitchell (Nature Conservation Program Leader, Swan Region).

Ramsar criteria and how met:

2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle). Chandala Swamp regularly supports breeding colonies of thousands of Straw-necked Ibis *Threskiornis spinicollis* and smaller numbers of many other waterbird species and is one of the most important breeding sites for the Ibis, and for waterbirds in general, in South-Western Australia.

New information on application of the criteria to the wetland:

A review of data on other wetlands in South-Western Australia revealed that few other wetlands were as important for waterbird breeding and as ecologically viable as Chandala Swamp. However, due to apparent lack of surveys for possibly about 10 years it would be timely for CALM to make a site visit in spring 1998 to see if ibises are breeding and to confirm that paperbarks are continuing to regenerate.

Tenure and extent of the potential new nomination:

The nomination would comprise the Chandala Swamp Nature Reserve. There have been no recent additions of land to the reserve. However, land immediately NE of the NE corner of the reserve, which includes catchment of the Swamp, is in the process of being purchased by CALM.

Major stakeholders other than CALM:

Apparently there are no mining or water usage interests over Chandala Swamp. There are about 4 neighbouring land managers.

Potential to maintain the wetland's values (viability of the potential new nomination):

There are no major concerns regarding salinity of Chandala Swamp. Inflow to the wetland is primarily from land to the east, which is partly-vegetated. Aided by regular drawdown of the Swamp's water, significant regeneration of *Melaleuca* is occurring in the reserve.

Other wetland management considerations:

The 'final option' alignment of the proposed Perth-Darwin highway lies east of the reserve; it is not considered a (potential) threat to the ecological character of the Swamp. A small part of the SE sector of the swamp is in freehold land and thus is outside the proposed Ramsar Site boundary. The landowner immediately E of the reserve apparently is sympathetic to maintaining conservation values.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

There is no obvious impediment to Ramsar listing of the Chandala Swamp Nature Reserve. Extension of the Ramsar Site to include the proposed new reserve immediately to the NE should be considered in due course.

Suggested timeframe for nomination:

Listing of the Chandala Swamp Nature Reserve by May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 31 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Culham Inlet System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Culham Inlet System - ESP002WA - page 802.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Albany on 1/9/98 with Jim Lane (Principal Research Scientist, Science Division) and John Watson (Manager, South Coast Region).

Ramsar criteria and how met:

3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). The 1% criterion is met for Banded Stilt: counts of up to 44,000 have been recorded.

New information on application of the criteria to the wetland:

The few existing data may not be sufficient to confirm regular use by 1% (2100) of the Banded Stilt population, but the large area of suitable habitat and the tendency for Banded Stilts to congregate in large numbers at coastal wetlands in summer in South-Western Australia suggests that regular use (several times in a 25 year period) by 1% of the population does occur. (The CALM officer, Mark True, at East Mount Barren could possibly advise on recent occurrences of stilts.)

Tenure and extent of the potential new nomination:

The System comprises a mix of tenures including NPNCA "land" (Phillips R), VCL (Steere R) and marine waters (Culham Inlet itself). Culham Inlet is the part that supports the values under which the nomination would be put forward, but it would be sensible to include the contiguous river waters and NPNCA land.

Major stakeholders other than CALM:

Not discussed.

Potential to maintain the wetland's values (viability of the potential new nomination):

The inflowing rivers bring high salt and nutrient loads from mainly unprotected catchment (farmland). The extent to which this could affect use of Culham Inlet by Banded Stilts is not clear.

Other wetland management considerations:

Culham Inlet is not regarded by the CALM Region as a high priority for a marine park or a Ramsar listing.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Further consideration needs to be given to the composition of a potential Ramsar Site based on Culham Inlet System and to concerns regarding viability. The CALM Region's higher priorities for nominations are expected to be considered ahead of Culham Inlet System.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 16 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Drysdale River

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Drysdale River - NK001WA - page 858.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Broome on 15/9/98 with Gordon Graham (Ecologist, Kimberley Region).

Ramsar criteria and how met:

2d (it is of special value for one or more endemic plant or animal species or communities). Three freshwater fishes, Drysdale Hardyhead *Craterocephalus helenae*, Drysdale Grunter *Sycomistes rastellus* and Drysdale Gudgeon *Kimberleyeleotris notata*, are endemic to the Drysdale River (Allen 1982, and pers. comm.)

New information on application of the criteria to the wetland:

The Drysdale Hardyhead occurs in the central part of the National Park from Bango Creek to Drysdale Crossing. The Drysdale Grunter occurs more widely in the system, probably down to the seawater interface. The Drysdale Gudgeon is restricted to the waters with rocky substrate near Solea Falls (G. Allen pers. comm.). Present evidence supports the status of these species as being endemic to the Drysdale River.

Tenure and extent of the potential new nomination:

A suitable Ramsar nomination would comprise the river and associated vegetation within or adjacent to Drysdale River National Park (Reserve 32853).

Major stakeholders other than CALM:

It may be appropriate to consult the holder of the adjacent Ellenbrae pastoral lease.

Potential to maintain the wetland's values (viability of the potential new nomination):

No significant threats identified.

Other wetland management considerations:

The site is identified in the State Planning Strategy as an "Environmental Priority Management Area" (Western Australian Planning Commission 1997).

The Kimberley region at present has four existing Ramsar Sites. Management planning and implementation by CALM is severely hampered by the inadequate resources available for the region (Watkins *et al.* 1997). The nomination of additional Ramsar Sites in this region may add to the difficulties unless additional resources are allocated.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

Watkins D, Brennan K, Lange C, Jaensch R & Finlayson M. 1997. *Management Planning for Ramsar Sites in the Kimberley Region of Western Australia*. Report to the Department of Conservation and Land Management. Wetlands International - Oceania. Canberra.

Western Australian Planning Commission. 1997. *State Planning Strategy, Final Report*. Western Australian Planning Commission. Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

No major site issues need to be resolved. However, adequate resourcing is needed to enable the CALM Kimberley Region to appropriately plan and implement management of the existing Ramsar Sites. A strategy needs to be developed for the order in which the three Kimberley river systems (Drysdale, Prince Regent and Mitchell River System) will be addressed as potential Ramsar Sites.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Dumbleyung Lake

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Dumbleyung Lake - AW002WA - page 768

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Narrogin on 2/9/98 with Jim Lane (Principal Research Scientist, Science Division), Ken Wallace (Manager, Wheatbelt Region) and Amanda Smith (project officer, Lake Toolibin Recovery Plan).

Ramsar criteria and how met:

- 3a (it regularly supports 20,000 waterfowl). Dumbleyung Lake regularly supports at least 20,000 waterbirds: up to 40,000 have been counted at one time, the number of individual waterbirds that use the lake each year probably exceeds 20,000 and the annual data on water depth suggest conditions are suitable for use by 20,000 waterbirds at least several times within a 25 year period.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). The 1% criterion is met for Banded Stilt: thousands occur regularly and counts of up to 6000 have been recorded.

New information on application of the criteria to the wetland:

There was agreement in the meeting that both of the criteria are met.

Tenure and extent of the potential new nomination:

A potential new nomination would comprise all of Dumbleyung Lake. Most of the lake is in NPNCA Nature Reserve (26664) but a large part in the east is recreation reserve (26665) and some in the SE is leasehold and freehold. Coblinine River Nature Reserve (25133) is contiguous and adds a little to conservation value but not to the Ramsar criteria met.

Major stakeholders other than CALM:

The Shires of Dumbleyung and Wagin have an interest in the recreation reserve; the owner of freehold land in the Lake is also a major stakeholder. A mineral exploration lease has existed over the Lake: possibly it no longer exists. The number of neighbouring landowners is probably several tens.

Potential to maintain the wetland's values (viability of the potential new nomination):

Although the lake was originally much less saline, its present Ramsar values may not have changed or be vulnerable to change in the future because the Lake has been saline for many years. However, the impact of proposals to divert saline water off farms through deep drains into the lake is not yet known.

Other wetland management considerations:

None identified.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Any potential nomination will require consultation with the Shires of Dumbleyung and Wagin and other landowners and should await the outcome of present and possible future research on the inter-relationship of changes in salinity, water depth and waterbird usage. In particular, it may be necessary to determine the salinity at which Grey Teal would no longer use the lake in large numbers.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 16 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Ellen Brook Swamps System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Ellen Brook Swamps System - SWA007WA - page 878.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Kelmscott on 3/9/98 with Jim Lane (Principal Research Scientist, Science Division), Bruce Harvey (Manager, Swan Region) and David Mitchell (Nature Conservation Program Leader, Swan Region) and a meeting at Woodvale on 4/9/98 with Andrew Burbidge (Director, WATSC Unit).

Ramsar criteria and how met:

- 2a (it supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species). The wetland system supports the entire wild population of the nationally endangered Western Swamp Tortoise, which is a wetland-dependent species as well as appreciable numbers of the nationally vulnerable wetland plant *Hydrocotyle lemnoides*.
- 2d (it is of special value for one or more endemic plant or animal species or communities). The Western Swamp Tortoise is endemic to the swamps that are included in the wetland system.

New information on application of the criteria to the wetland:

Whereas the tortoise was thought to be extinct at Twin Swamps, since translocation of tortoises to Twin Swamps Nature Reserve the population there (about 60) has become greater than the population at Ellen Brook Nature Reserve (30-40). Thus both Reserves should be part of any nomination. A Western Swamp Tortoise was found at the Perth Airport wetlands in about 1970 but apparently there are no extant populations outside Ellen Brook and Twin Swamps Nature Reserves. Appreciable numbers of the nationally vulnerable wetland plant *Hydrocotyle lemnoides* occur in Twin Swamps and/or the Ellen Brook swamps.

Tenure and extent of the potential new nomination:

The proposed Ramsar nomination would include both Ellen Brook and Twin Swamps Nature Reserves. Note that there has been a small recent addition to the SW part of Ellen Brook Nature Reserve. No other additions are currently proposed. Wetlands in the two Nature Reserves apparently have no surface or groundwater connection; they are separated by about 2.5 km of cleared land and there is no current proposal to buy up land and join the Reserves.

Major stakeholders other than CALM:

The DEP/EPA should be consulted due to the EPP that applies to the area (see below). Possible future actions over the area by the Water and Rivers Commission are likely to improve rather than reduce the conservation values. There are no mining interests over the Reserves. There are about eight neighbouring land managers. The Species Recovery Team for the tortoise, which should be supportive of Ramsar listing, is another stakeholder.

Potential to maintain the wetland's values (viability of the potential new nomination):

No major concerns exist other than those being addressed by current/ongoing actions under the Species Recovery Plan. For example, water is being pumped into Twin Swamps to help the tortoises endure the long dry season.

Other wetland management considerations:

The tortoise is subject to a Species Recovery Plan, with ongoing (?federal) funding. An Environmental Planning Policy (WA Government) has been developed for the area. The first draft was too prescriptive; a second draft is less so. However, there has been (and remains) considerable opposition to the EPP, by some local landowners, despite support from most/all other stakeholders.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Some consultation with DEP/EPA is recommended, yet this may not produce any obstacles to proceeding with a Ramsar nomination.

Suggested timeframe for nomination:

by May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 31 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Exmouth Gulf East

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Exmouth Gulf East - CAR002WA - page 775.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Crawley on 9/9/98 with Jim Lane (Principal Research Scientist, Science Division) and Peter Moore (Operations Officer, Pilbara Region) and at Karratha on 17/9/98 with Chris Muller (Manager, Pilbara Region) and Peter Kendrick (Regional Ecologist, Pilbara Region).

Ramsar criteria and how met:

2a (it supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species). The nationally and globally vulnerable Dugong *Dugong dugon* occurs in substantial numbers: up to 200 have been sighted at this wetland.

New information on application of the criteria to the wetland:

A rigorous assessment of this species in Australia has led to the suggestion that Dugong should be de-listed by IUCN. The estimated population in northern Australia is at least 70,000 and the five most important sites in Australia each support numbers ranging from 6000 to 12,500. Hence it may be wise to not consider Exmouth Gulf East for Ramsar nomination on the basis of criterion 2a. There is insufficient information to enable testing of other criteria.

Tenure and extent of the potential new nomination:

Not considered.

Major stakeholders other than CALM:

Not considered.

Potential to maintain the wetland's values (viability of the potential new nomination):

Not considered.

Other wetland management considerations:

The CALM Regional Office considers that additional information would need to be collected on this wetland before it could be considered for Ramsar nomination.

Other information on conservation values:

Not considered.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: No (on the basis of present information).

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Forrestdale and Thomsons Lakes

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Forrestdale Lake - SWA008WA - 879.
Thomsons Lake - SWA023WA - 902.

Potential new Ramsar nomination or extension to existing Ramsar site:

The possibility of extensions to the existing Site was discussed with the CALM personnel. As a consequence, the possibility of a split of the Ramsar Site into two parts was also discussed.

CALM personnel consulted:

Meeting at Kelmscott on 3/9/98 with Jim Lane (Principal Research Scientist, Science Division), Bruce Harvey (Manager, Swan Region) and David Mitchell (Nature Conservation Program Leader, Swan Region).

Ramsar criteria and how met:

The criteria under which Forrestdale and Thomsons Lakes was originally designated as a Ramsar Site are:

- 1 (presumably 1a: it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region).
- 2b (it is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna);
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). The Site regularly supports at least 1% of the population of Black-winged Stilt, Red-necked Avocet, Red-capped Plover and Curlew Sandpiper.

Note that criteria 1a and 2b are not being used in the present project to identify potential new Ramsar Sites, because comprehensive frameworks for applying these criteria do not exist for Western Australia.

New information on application of the criteria to the wetland:

It was noted that Forrestdale Lake and Thomsons Lake were originally listed jointly as one Ramsar Site due to movement of waterbirds between them, that this approach created difficulty for deciding which nearby wetlands to include in potential extensions to the Site (since waterbirds probably move among most of the metropolitan wetlands); that there was no CALM land connecting the Lakes; that the lakes are (more than 10 km) apart on opposite sides of the Jandakot groundwater mound; and that each lake would on its own merits meet at least one criterion. All persons present concluded that in the first instance hydrologically unconnected wetlands should be considered individually on their own merits against the criteria. Thus, Forrestdale Lake and Thomsons Lake should each be re-evaluated against the criteria and if each meet at least one criterion, the existing Site could be split into two Ramsar Sites. (Preliminary investigation suggests that each Lake meets criterion 3c for two shorebird species.)

Tenure of potential extensions:

Forrestdale Lake. There have been no extensions to the Nature Reserve since Ramsar listing occurred; this was confirmed by a search with DOLA (Alan Clark pers. comm.). The WA Planning Commission has zoned substantial areas of contiguous land, including wetland, to the E, S and W of the Nature

Reserve as "parks and recreation" and future acquisition for conservation purposes has been foreshadowed. This would create opportunities for considering extensions to the Ramsar Site. Gibbs Road Swamp and adjoining wetland does not on its own meet a Ramsar criterion, is in Jandakot (Botanic) Regional Park which does not include Forrestdale Lake, is not connected to the Lake by land zoned for parks and recreation, and thus at present is not considered appropriate for inclusion in considerations on extensions to the Ramsar site.

Thomsons Lake. Banganup Lake Nature Reserve is (ignoring Russell Road) contiguous with the existing Ramsar site but is under lease to the University of WA. The lessee would need to be consulted before that area could be added to the existing Ramsar Site. Other wetland in Beeliar Regional Park situated in locations contiguous with Thomsons Lake, such as Kogolup Lake, is not vested in NPNCA but eventually could be added to the Ramsar site pending change to vesting or securing agreement of the land managers.

Major stakeholders other than CALM:

The University of WA and the WA Planning Commission (re. possible extensions into leased and non-NPNCA land in the Regional Park).

Potential to maintain the wetland's values:

Not discussed.

Other wetland management considerations:

Not discussed.

Other information on conservation values:

Not discussed.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important: Yes: already a Ramsar Site.

Issues that must first be resolved before action can proceed:

The Lakes should be tested systematically against the Ramsar Criteria to confirm that each is a Wetland of International Importance. If this is the case, the existing Ramsar site could be split into Forrestdale Lake Ramsar Site, and Thomsons Lake Ramsar Site.

No extensions are proposed at present. The Regional Park Planning Unit of CALM should consider the merits and opportunities of extending the existing Thomsons Lake Ramsar Site to include adjoining components of the Beeliar Regional Park, not limited to NPNCA-vested areas.

Suggested timeframe for action:

It may be possible to prepare documentation for a split of the existing Ramsar Site into two Ramsar Sites, by May 1999. Extensions will require consultation and probably will not be ready by May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 1 November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Fortescue Marshes

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Fortescue Marshes - PIL002WA - page 864.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Crawley on 9/9/98 with Jim Lane (Principal Research Scientist, Science Division) and Peter Moore (Operations Officer, Pilbara Region) and at Karratha on 17/9/98 with Chris Muller (Manager, Pilbara Region) and Peter Kendrick (Regional Ecologist, Pilbara Region).

Ramsar criteria and how met:

1d (it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region). The wetland is a type of irregularly inundated, inland floodplain system which is unique in the Arid Interior region in WA.

New information on application of the criteria to the wetland:

None provided. Further information is needed on the values of the area during flood periods.

Tenure and extent of the potential new nomination:

No part of the wetland is in the CALM estate. The majority of the site is pastoral lease (Mt Florence, Mulga Downs, Hillside, Marillana and Roy Hill) with some government reserves (Water/Stopping Place). There is insufficient information to define appropriate northern and southern boundaries for a Ramsar Site.

Major stakeholders other than CALM:

Pastoral leaseholders; WA Dept of Land Administration; possibly also Native Title claimants.

Potential to maintain the wetland's values (viability of the potential new nomination):

Maintaining the values of the wetland will be dependent on developing appropriate management arrangements with leaseholders. It is anticipated that some leaseholders would not be interested in discussing potential future management arrangements at this time (C. Muller pers. comm.).

Other wetland management considerations:

The State Planning Strategy identifies the site as an "Environmental Priority Management Area" that links to Karajini National Park (Western Australian Planning Commission 1997).

Other information on conservation values:

None provided.

References (additional to those in the Directory):

Western Australian Planning Commission. 1997. *State Planning Strategy, Final Report*. Western Australian Planning Commission. Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

The key issue to be addressed is development of an agreement with pastoral lease holders on appropriate management of the area. A possible nomination would be greatly strengthened by the collection of additional information on the values of the wetland.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Guraga Lake

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Guraga Lake - SWA010WA - page 882.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Como on 10/9/98 with Jim Lane (Principal Research Scientist, Science Division) and Kelly Gillen (Manager, Midwest Region).

Ramsar criteria and how met:

- 2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle).
Guraga Lake regularly supports moulting by 5000-8000 Australian Shelducks and is one of the most important moulting sites for shelducks in South-Western Australia. The Lake is also used as a drought refuge by large numbers of waterbirds (up to 27,697; more than 10,000 annually).

New information on application of the criteria to the wetland:

None identified.

Tenure and extent of the potential new nomination:

The site referred to in the Directory is Lake Guraga, to the maximum high water mark (the edge of the basin). The lake covers approximately 350 ha and is part of a 1110 ha Recreation Reserve vested in the Shire of Dandaragan. The southern margin of the lake is freehold. Land to the north and west of the Recreation Reserve is Vacant Crown Land. Land immediately south and around Namming Lake is freehold. Namming Nature Reserve adjoins the Namming Lake Water Reserve.

Major stakeholders other than CALM:

The Shire of Dandaragan and adjoining landholders on the southern margin of Guraga Lake. There are perhaps 8 additional neighbours in the surrounding area.

Potential to maintain the wetland's values (viability of the potential new nomination):

Potential threats to the ecological character of Lake Guraga are: salinisation of inflow, eutrophication, water diversion and recreation use (especially boating). Recreation can be controlled and thus need not be a threat to the biodiversity values of the site. However, changes caused to water quality and flow in the catchment will be difficult to manage and may have some adverse impacts on downstream wetland vegetation and wetland productivity. However these changes are unlikely to substantially affect the value of the site as a moulting and refuge site for ducks.

Other wetland management considerations:

The Central Coast Regional Strategy identifies Lake Guraga and Namming Lake as being where "a range of uses will be allowed by public authorities and where these are not inconsistent with conservation principles" (Western Australian Planning Commission 1996). The group of wetlands that includes Guraga Lake is part of the Cataby Coastal Catchment in "Planning Unit C9". Planning and management guidelines for this planning unit include:

- undertake a comprehensive study of the VCL to determine the area to be consolidated in the conservation estate; and
- prepare management plans for the existing reserves.

Wetlands protection is to be addressed in accordance with the principles of the EPA's EPP for the Swan Coastal Plain Lakes.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

Western Australian Planning Commission. 1996. Central Coast Regional Strategy: A Strategy to Guide Land Use in the next Decade. State of Western Australia, Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

The key issue to be resolved is the future vesting and management of Guraga Lake. Two options are available:

1. CALM to seek vesting of Guraga Lake (and potentially also Namming Lake) as part of the consolidations of the conservation estate recommended in the Central Coast Planning Study.
2. CALM to develop a management agreement with the Shire of Dandaragan to ensure that recreational activities will not impact adversely on the ecological character of Guraga Lake.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Lake Ballard

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Lake Ballard - MUR003WA - page 853.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Crawley on 9/9/98 with Jim Lane (Principal Research Scientist, Science Division) and Rob Thomas (Conservation Program Leader, Goldfields Region).

Ramsar criteria and how met:

- 2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle). Lake Ballard is a major breeding area for the Banded Stilt. Breeding has been recorded in spring 1929 (uncertain record), in 1963, July 1973, July 1974, May 1975, September 1981, September 1986, March-July 1995 and probably occurs whenever depth over most of the lake reaches 0.3 m or more.
- 3a (it regularly supports 20,000 waterfowl). More than 20,000 waterbirds (Banded Stilts) have been counted at Lake Ballard. As shown by the breeding records, conditions probably are suitable for use by tens of thousands of Banded Stilts at least several times within a 25 year period; in the context of wetland availability in Western Australia this is considered sufficient evidence of regular use by 20,000 waterbirds.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). At least 1% of the population of Banded Stilt occurs at the Lake: counts of tens of thousands (e.g. 10% of the population) have been recorded.

New information on application of the criteria to the wetland:

None obtained.

Tenure and extent of the potential new nomination:

The lake bed is Vacant Crown Land. The boundary of the lake bed is well defined by the white salt crust. Adjacent to the margins of the lake bed are the pastoral leases of Jeedanya (Kookynie), Riverina, Melita and Adelong.

Access to the lake is possible only via one of the pastoral leases. For this reason the CALM Goldfields Regional does not favour the Vacant Crown Land becoming CALM estate (R Thomas pers. comm). The lake was not identified as "proposed CALM managed land" in the Goldfields Regional Management Plan (CALM 1994).

Major stakeholders other than CALM:

It is understood that the area is subject to a Native Title Claim (R Thomas pers. comm.). The WA Department of Land Administration also is a stakeholder due to the Lake being VCL.

Potential to maintain the wetland's values (viability of the potential new nomination):

No serious concerns were identified.

Other wetland management considerations:

There is probably interest in extracting water from the Lake for mineral processing.

Lake Ballard is considered to be the most suitable of the three internationally important lakes identified in the Goldfields region for Ramsar Listing on the basis of its conservation values and the potential support from adjacent lease holders (R Thomas pers. comm.).

Other information on conservation values:

The biodiversity values of Lake Ballard are associated with episodic flooding of the lake. It is considered that rain events delivering 100 mm of rainfall are sufficient to flood the lake bed (R. Thomas pers. comm.). There are several freshwater wetlands adjacent to the lake (Thomas pers. comm.).

References (additional to those in the Directory):

CALM 1994. Goldfields Regional Management Plan: 1994 - 2004. Department of Conservation and Land Management for the National Parks and Nature Conservation Authority and the Lands and Forests Commission. Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Agreement is needed on the future tenure of the lake (including resolution of any Native Title issues) and mechanisms need to be developed for management of the site.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Lake Barlee

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Lake Barlee - MUR004WA - page 854.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Crawley on 9/9/98 with Jim Lane (Principal Research Scientist, Science Division) and Rob Thomas (Conservation Program Leader, Goldfields Region).

Ramsar criteria and how met:

- 2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle). Lake Barlee is a major breeding area for the Banded Stilt with 179,000 nests recorded in 1980. It is considered to be one of the most important breeding areas for Banded Stilt in the world.
- 3a (it regularly supports 20,000 waterfowl). More than 20,000 waterbirds (mainly stilts) were recorded in March 1995 and similar numbers probably occur whenever the lake is full. There were presumably several hundreds of thousand of stilts for a period in 1980. Conditions probably are suitable for use by tens of thousands of Banded Stilts at least several times within a 25 year period; in the context of wetland availability in Western Australia this is considered sufficient evidence of regular use by 20,000 waterbirds.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). The highest number of adult Banded Stilts recorded was ca. 25, 000 (June-July 1992), which is more than 12% of the national population.

New information on application of the criteria to the wetland:

The banded ironstone areas on small 'islands' in the lake may have threatened flora species (R Thomas pers. comm.); it is not known if these are *nationally* threatened species.

Tenure and extent of the potential new nomination:

The lake bed is Vacant Crown Land. Adjacent to the margins of the lake bed are the pastoral leases of Lake Barlee, Cashmere Downs, Perrinvale, Diemals and Mt Elvire. CALM holds the lease for Mt Elvire Station. The lake was not identified as "proposed CALM managed land" in the Goldfields Regional Management Plan (CALM 1994).

Major stakeholders other than CALM:

It is understood that the area may be subject to a Native Title Claim. The WA Department of Land Administration also is a stakeholder due to the Lake being VCL.

Potential to maintain the wetland's values (viability of the potential new nomination):

No serious concerns were identified.

Other wetland management considerations:

Lake Ballard (rather than Lake Barlee) is considered to be the most suitable of the three internationally important lakes identified in the Goldfields region for Ramsar Listing on the basis of its conservation values and the potential support from adjacent lease holders (R Thomas pers. comm.).

Other information on conservation values:

None provided.

References (additional to those in the Directory):

CALM 1994. Goldfields Regional Management Plan: 1994 - 2004. Department of Conservation and Land Management for the National Parks and Nature Conservation Authority and the Lands and Forests Commission. Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Agreement is needed on the future tenure of the lake (including resolution of any Native Title issues) and mechanisms need to be developed for the management of the site. Priority may be given to progressing the potential nomination of Lake Ballard.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Lake Gore System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Lake Gore System - ESP004WA - page 805.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Albany on 1-2/9/98 with Jim Lane (Principal Research Scientist, Science Division) and John Watson (Manager, South Coast Region) and communication by telephone and fax with Klaus Tiedemann (Manager, Esperance District).

Ramsar criteria and how met:

- 2a (it supports an appreciable assemblage of rare, **vulnerable** or endangered species or subspecies of plant or **animal**, or an appreciable number of individuals of any one or more of these species). The nationally and globally vulnerable Hooded Plover occurs regularly at Lake Gore in appreciable numbers. Lake Gore is the most important wetland (in the world) for this species.
- 2c (it is of special value as the habitat of plants or **animals** at a critical stage of their biological cycle). Lake Gore regularly supports moulting by thousands of Australian Shelducks and is one of the most important moulting sites for shelducks in South-Western Australia. The Lake is also used as a drought refuge by large numbers of waterbirds.
- 3a (it regularly supports 20,000 waterfowl). More than 29,000 waterbirds have been counted at Lake Gore. The number of individual waterbirds that use the lake each year probably exceeds 20,000 and the annual data on water depth suggest conditions are suitable for use 20,000 waterbirds at least several times within a 25 year period; in the context of wetland availability in Western Australia this is considered sufficient evidence of regular use by 20,000 waterbirds.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one **species** or subspecies of waterfowl). Lake Gore supports up to 1600 Hooded Plovers which constitutes more than 1% (actually almost one third) of the global population. At least 1% of the population uses the Lake each year. The 1% criterion also is met for Banded Stilt: thousands occur regularly and counts of up to 20,000 (about 10% of the population) have been recorded.

New information on application of the criteria to the wetland:

The possibility of including the Mortijinup Lakes in the nomination was discussed. The only Ramsar criterion met by the Mortijinup Lakes alone would be 2c (breeding colony of Little Black Cormorants).

Tenure and extent of the potential new nomination:

The core component of the System is Lake Gore Nature Reserve (A 32419), which is NPNCA-vested, and this component alone captures all the Ramsar criteria met by the System. Nature Reserve 26885 is contiguous (apart from a 100 m gap) with Reserve 32419 and includes a large part of the "overflow swamp" (wooded swamp and saline lakes) on the watercourse between Lake Gore and Quallilup Lake. (In exceptionally wet years - at least 3 times in the last 25 years - water may flow from Lake Gore westwards through the overflow swamps in Reserve 26885, into Barkers Inlet.)

Qualililup Lake is in Reserve 30672 which is un-vested at present but proposed for NPNCA vesting. The "satellite lakes" (Gidong, Kubitch and Carbul) of Lake Gore, all of which are important for Hooded Plover, are VCL. Over 12 years ago, plans were made, including a formal survey, for exchanging a 686 m wide strip of Reserve 26885 for land surrounding these satellite lakes, but subsequently there has been no progress on this (K. Tiedemann pers. comm.). Other parts of the System, notably the remaining (eastern) part of the "overflow swamp" between Reserves 26885 and 30672, are in freehold land some of which is cleared.

Consideration also could be given to including the Mortijinup Lake chain, through to Nambarup Lake and associated swamps, in the Ramsar Site. However this would first require changes to the boundaries of Mortijinup Lake Nature Reserve (A 35557) and vesting of (part of) Reserve 24486 to create continuous NPNCA land from Lake Gore southwards and eastwards to as far as the freshwater swamps immediately east of Mortijinup Lake. Another consideration would be adding the lower reaches of Dalyup River (up to the highway), Lake Gore's principal source of water, which currently is in VCL.

Major stakeholders other than CALM:

Apparently there are no mining or water usage interests over Lake Gore System. About 5 freehold properties adjoin Reserves A 32419 and 26885.

Potential to maintain the wetland's values (viability of the potential new nomination):

The inflowing rivers (Dalyup River to Lake Gore, Coobidge Creek to the satellite lakes, Caitup Creek to Mortijinup Lake) carry substantial salt and nutrient loads from mainly unprotected catchment (farmland). The extent to which this could affect usage by Hooded Plover and Banded Stilt is not clear. However, there have been no observable changes to the ecological character of Lake Gore (a saline lake) in the past 25 years, apart from occasional algal mats washed up on the shores. Eutrophication issues are being actively addressed by the Dalyup Catchment Group. Also it is possible that the catchment may be considered as a Recovery Catchment under the Salinity Action Plan: in principle this would have firm support of the CALM Region. The CALM Region believes that the Lake Gore System has better prospects for maintenance and enhancement of conservation values than the Lake Warden System because, unlike Lake Warden, it is not subject to expanding urban and subdivisional pressures.

Other wetland management considerations:

Lake Gore system is regarded by the CALM Region as a high priority for a Ramsar Site. It would be highly desirable in the short and medium term to rationalise tenure and vestings over the abovementioned reserves and VCL, to create a coherent management unit. This would be consistent with CALM Region plans for the Esperance coastal strip.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

There is no obvious impediment to Ramsar listing of Lake Gore Nature Reserve (32419), and the near-contiguous eastern part of Nature Reserve 26885 as far west as the "protected road" to "Warrinup Beach". The latter should exclude the land originally surveyed for possible exchange in regard to freehold land around Lakes Gidong, Kubitch and Carbul.

Lakes Gidong, Kubitch and Carbul and Dalyup River should be considered for conversion from VCL to NPNCA reserves and Quallilup Lake should be vested in NPNCA. These areas should then be added to the Ramsar site, subject to any other consultations deemed necessary. Negotiations on the freehold land around Lakes Gidong, Kubitch and Carbul should be re-opened.

Meanwhile, work on the addition of Mortijinup Lake and associated wetlands should be undertaken: both areas could eventually be added to the Ramsar site. Eventually it may also be possible to purchase the freehold parts of the System, which would complete the optimal Ramsar site, capturing all wetland conservation values.

Suggested timeframe for nomination:

Listing of some parts by May 1999; other actions after May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 17 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Lake Grace System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Lake Grace System - MAL002WA - page 850.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Narrogin on 2/9/98 with Jim Lane (Principal Research Scientist, Science Division), Ken Wallace (Manager, Wheatbelt Region) and Amanda Smith (project officer, Lake Toolibin Recovery Plan).

Ramsar criteria and how met:

3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). The 1% criterion is met for Banded Stilt: thousands occur regularly and counts of up to 12,000 have been recorded.

New information on application of the criteria to the wetland:

Existing data may not be sufficient to confirm frequent use by 1% (2100) of the Banded Stilt population, but water and salinity data and the large area of suitable habitat (which is not easily surveyed) suggest that regular use (several times in a 25 year period) by 1% does occur. Criterion 2c has not been used because breeding by Banded Stilts apparently has not occurred in recent decades despite probably suitable conditions.

Tenure and extent of the potential new nomination:

The potential new nomination would need to include Lake Grace North, which is where the largest numbers of Banded Stilt have been counted and is the site of at least one of the historical breeding records. Much of the System is in NPNCA reserve (28395) but most of Lake Grace North is in VCL.

Major stakeholders other than CALM:

There are interests in lake-bed mining of gypsum over the wetland. The number of neighbouring land managers is probably several tens.

Potential to maintain the wetland's values (viability of the potential new nomination):

Apparently the lake has always been saline. However, the ongoing rise of saline groundwater in this area and any plans to divert saline water off farms into the wetlands, could affect use by waterbirds.

Other wetland management considerations:

None identified.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Any potential nomination will require consultation with the Shire of Lake Grace and other landowners in regard to the VCL. If nomination was to rely substantially on representativeness (this criterion is not being considered at present), other systems such as the Lake King system should be considered concurrently.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 16 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff**Lake Gregory System**

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Lake Gregory System - TAN001WA - page 910.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Broome on 15/9/98 with Gordon Graham (Ecologist, Kimberley Region).

Ramsar criteria and how met:

- 2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle). Lake Gregory System is a major breeding area for waterbirds, especially cormorants and terns, supporting the largest documented breeding colony of Little Black Cormorant *Phalacrocorax sulcirostris* in Australia (8000+ pairs). It is also a major drought or non-breeding refuge area for waterbirds, notably Eurasian Coot *Fulica atra*, having an important role in support of waterbird populations at regional and national levels. At times it is a major migration stop-over area for shorebirds, notably Oriental Plover *Charadrius veredus*.
- 3a (it regularly supports 20,000 waterfowl). The System regularly supports 20,000 (if not more than 100,000) waterbirds. Highest count has been 239,666 and highest estimate by extrapolation has been 600,000.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). Lake Gregory supports more than 1% of the flyway population of the following species of shorebirds:
- | | |
|------------------------|----------------------------------|
| Masked Lapwing | (up to 10,000 estimated/counted) |
| Oriental Plover | (25,707) |
| Marsh Sandpiper | (788) |
| Sharp-tailed Sandpiper | (10,000) |

New information on application of the criteria to the wetland:

None provided.

Tenure and extent of the potential new nomination:

The site is completely within the Lake Gregory pastoral lease which is held by the Aboriginal Lands Trust for the Mulan Aboriginal Community.

Major stakeholders other than CALM:

Mulan Aboriginal community.

Potential to maintain the wetland's values (viability of the potential new nomination):

The lake is part of an active pastoral station. Concern has been expressed about the impact of cattle on the margins of the lake. Grazing pressure is considered to be preventing regeneration (of seedlings) in the seasonally flooded areas of the wetland. Sound management of the pastoral operation may ensure that the wetlands values are not adversely effected.

Other wetland management considerations:

The report on Nature Reserves in the Kimberley recommended that CALM "...commence negotiations with the Mulan community with a view to reserving the wetlands for conservation and developing management of Lake Gregory and associates wetlands ... so as to minimise cattle damage to the lake and surrounds..." (Burbidge *et al.* 1991). This report also suggested that consultations occur with regard to the nomination of the area as a Ramsar Site.

The Kimberley Land Council is interested in assisting the local aboriginal community to plan for the future management of the wetland. A report on management on internationally important wetlands in the Kimberley recommended that CALM actively support the planning proposal being developed by the Kimberley Land Council (Watkins *et al.* 1994). The CALM East Kimberley Office has had discussions with the Kimberley Land Council and is presently supporting an application to fund a planning study at the site (Gordon Graham pers. comm.)

The Kimberley region at present has four existing Ramsar Sites. Management planning and implementation by CALM is severely hampered by the inadequate resources available for the region (Watkins *et al.* 1997). The nomination of additional Ramsar Sites in this region may add to the difficulties unless additional resources are allocated.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

Watkins D, Brennan K, Lange C, Jaensch R & Finlayson M. 1997. *Management Planning for Ramsar Sites in the Kimberley Region of Western Australia*. Report to the Department of Conservation and Land Management. Wetlands International - Oceania. Canberra.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

The site is part of a pastoral station and extensive consultation is needed with the lease holders (the local aboriginal community). The Kimberley Land Council is keen to assist the community to develop a management plan for the lake and this provides the means for the community to consider Ramsar nomination of the lake.

CALM is urged to continue support for the development of a management plan for the wetland and to seek to have the aboriginal community consider supporting Ramsar nomination as part of a planning process for the area.

A third issue that needs to be addressed is to increase resources for the CALM Kimberley Region to enable appropriate planning and management of the existing Ramsar listed wetlands.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Lake Logue-Indoon System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Lake Logue-Indoon System - GS002WA - page 819.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Como on 10/9/98 with Jim Lane (Principal Research Scientist, Science Division), Kelly Gillen (Manager, Midwest Region) and Ken Atkins (Principal Botanist) and personal communications with Andrew Brown (Technical Officer, WATSC Unit).

Ramsar criteria and how met:

2a (it supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species). The wetland system supports a population of the nationally vulnerable plant *Eremophila microtheca*, which grows on winter wet flats to the south of Lake Logue.

New information on application of the criteria to the wetland:

Eremophila microtheca is known from only two locations: the Lake Logue area (2 populations totalling 10,265 plants) and Kalbarri National Park (2 populations totalling 1225 plants) (CALM Threatened Flora Species database, 9 Sept. 1998). In the Lake Logue area the populations are clustered in a strip to the south of the lake. An area of land between Lake Indoon and the Coolimba - Eneabba Road that contains two populations (31 plants) has recently been acquired and added to the Lake Logue Nature Reserve. Two further populations occur on the road verge. The firth and largest population, consisting of 10,200 plants occurs about 1 km south on freehold land. As such, the Lake Logue Nature Reserve accounts for only 2 of the 9 populations and 32 of an estimated 11,490 plants.

Tenure and extent of the potential new nomination:

The site listed in the Directory consists of Lake Logue (Nature Reserve 29073, Class C), Lake Indoon (Recreational Reserve 29072, Class A, 271 ha), smaller shallow ephemeral wetlands to the north and south of Lake Logue, intermittent creeks and drainage lines. The wetland area with respect to *E. microtheca*, is that part of the Nature Reserve south of Lake Logue, the Road Reserve and a strip of freehold land about 1.5 km to the south. The future land use promoted in the Central Coast Structure for this freehold land is "*continued broadacre agricultural use involving grazing and limited cropping...*" (Western Australian Planning Commission 1996). Thus tenure and landuse issues need to be resolved before a potential Ramsar Site boundary can be determined.

Major stakeholders other than CALM:

If land south of the Nature Reserve was to be included in a Ramsar Site, under its present tenure, stakeholders would include the Shire of Carnamah and one freehold owner.

Potential to maintain the wetland's values (viability of the potential new nomination):

An objective for management of the wetland system should be to maintain and enhance the status of *E. microtheca* in the area. The lack of management control and/or a management agreement with the freehold owner greatly limits the potential to conserve the species. The Directory account records potential threats as *Phytophthora* and an increase in salinity and nutrients.

Other wetland management considerations:

Lake Logue Nature Reserve is listed on the Register of the National Estate.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

- Patrick S. and Brown A. (in prep.). Declared Rare and Poorly Known Flora in the Moora District. Western Australian Department of Conservation and Land Management, Perth.
Western Australian Planning Commission 1996. Central Coast Regional Strategy: A Strategy to Guide Land Use in the next Decade. State of Western Australia, Perth.

Conclusions:**Is the wetland internationally important and thus suitable to be nominated:**

Yes. If the abovementioned freehold land to the south of the Nature Reserve was included then the site meets Ramsar criterion 2a.

Issues that must first be resolved before nomination can proceed:

The major issue to be resolved before progressing nomination of the site is the development of a Threatened Species Recovery Plan. As *E. microtheca* is classified as "vulnerable" it may take a number of years before a Recovery Plan is developed (priority lies with Recovery Plans for endangered species).

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff**Lake MacLeod**

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Lake MacLeod - CAR004WA - page 778.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Crawley on 9/9/98 with Jim Lane (Principal Research Scientist, Science Division), Kelly Gillen (Manager, Midwest Region) and Steve Van Leeuwin (Senior Research Scientist, Pilbara Region).

Ramsar criteria and how met:

- 1d (it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region). Lake MacLeod is a unique wetland in Australia in that it has an inland occurrence of mangroves that are maintained by upwelling sea water.
- 2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle). The Lake is an important staging area for migratory shorebirds (see 3a).
- 3a (it regularly supports 20,000 waterfowl). Up to 114,956 waterbirds, mostly shorebirds, have been recorded at the Lake on mudflats and shallow lagoons associated with the upwelling sea water and tens of thousands probably occur annually.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). Lake MacLeod supports more than 1% of the Flyway population of:
- | | |
|-------------------|--------|
| Curlew Sandpiper | 41,606 |
| Banded Stilt | 53,098 |
| Red Knot | 2566 |
| Red-capped Plover | 2110 |
| Red-necked Stint | 8312 |
| Red-necked Avocet | 2401 |

New information on application of the criteria to the wetland:

None provided.

Tenure and extent of the potential new nomination:

Lake MacLeod is Vacant Crown Land. A mining lease is held over the area by Dampier Salt. The values identified for Lake MacLeod are associated with an area along the north-western margin of the lake where seawater upwells. This supply of water supports 22.5 ha of mangroves. It also floods out to form a sheet of water on the lake bed approximately 5 km by 10 km. The large concentrations of shorebirds have been recorded in the upwelling areas and around the sheet of flood-out water. The action of wind on the water sheet creates a 'tide like' effect.

Thus the minimum area to be considered for potential Ramsar listing is that associated with the upwelling and the floodout area.

Major stakeholders other than CALM:

Dampier Salt P/L, WA Department of Minerals and Energy, WA Department of Land Administration. Two pastoral leases (Quobba and Gnaraloo) are adjacent to the up-welling areas. Three additional pastoral leases exist around other parts of the lake.

Potential to maintain the wetland's values (viability of the potential new nomination):

The pumping of hypersaline water from the bed of the lake for commercial production of salt and gypsum are two potential threats to the conservation values of the lake. The operations of the mining company are conducted under comprehensive environmental impact guidelines that aim to ensure the ecological character of the upwelling area is not effected.

Other wetland management considerations:

Dampier Salt has commenced a program to monitor the mangrove stands. The site is included on the Register of the National Estate.

Other information on conservation values:

None provided.

References (additional to those in the Directory):**Conclusions:**

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

The documented values of Lake MacLeod are associated with the area of up-welling on the north-west edge of the lake. A high level approach should be made to Dampier Salt to encourage them to support the nomination of the upwelling and floodout area for Ramsar listing.

Suggested timeframe for nomination:

By May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Lake Marmion

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Lake Marmion - MUR005WA - page 856.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Crawley on 9/9/98 with Jim Lane (Principal Research Scientist, Science Division) and Rob Thomas (Conservation Program Leader, Goldfields Region).

Ramsar criteria and how met:

2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle).
The limited data suggest that the lake is an important breeding site for the Banded Stilt. Breeding has been recorded in March-May 1975 and June-July 1995 and probably occurs whenever depth over most of the lake reaches 0.3 m or more. Nests are prepared on low islands in colonies of hundreds to tens of thousands.

New information on application of the criteria to the wetland:

It is possible that criteria 3a (it regularly supports 20,000 waterfowl) and 3c (it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl) may apply at Lake Marmion in regard to Banded Stilt but more observations are required to establish whether or not occurrence of the large numbers (e.g. 20,000 to 25,000 Banded Stilt present in July 1995) is "regular".

Tenure and extent of the potential new nomination:

Lake Marmion is mostly within the Mendleyarri pastoral lease. Part of the southern end of the lake extends into Goongarrie National Park. The lake was not identified as "proposed CALM managed land" in the Goldfields Regional Management Plan (CALM 1994).

Major stakeholders other than CALM:

Mendleyarri pastoral lease and the WA Department of Land Administration.

Potential to maintain the wetland's values (viability of the potential new nomination):

No concerns at present, though there is potential for mining interests.

Other wetland management considerations:

The Goldfields Region is currently seeking to develop a model cooperative management agreement on a pastoral lease (using Section 16(a) of the CALM Act). Further development is needed because of limitations on the transferability of the agreement on the sale of the lease, before it could be applied at Lake Marmion.

The Northern Goldfields LCDC is an active group and there is potential to involve them in the development of cooperative management arrangements.

A gas pipeline runs through the south-west corner of the lakes linked to Lake Marmion.

Other information on conservation values:

Lakes peripheral to the south-west corner may have conservation value for waterbirds (R Thomas pers. comm.).

References (additional to those in the Directory):

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Support from the Mendleyarri lease holder is needed for nomination of the area and the development of a cooperative management agreement.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Lake Muir, and Byenup Lagoon System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Lake Muir - JF004WA - page 838

Byenup Lagoon System - JF002WA - page 834

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Manjimup on 1/9/98 with Jim Lane (Principal Research Scientist, Science Division), Peter Keppel (Manager, Southern Forests Region) and Roger Hearn (Conservation Program Leader, Southern Forests Region).

Ramsar criteria and how met:

- 2a (it supports an appreciable assemblage of rare, **vulnerable** or endangered species or subspecies of plant or **animal**, or an appreciable number of individuals of any one or more of these species). Three wetland-dependent orchids that are nationally vulnerable occur at the Site in appreciable numbers. These plants mainly occur on seasonally inundated areas or wetland margins, which have been extensively cleared for agriculture elsewhere in South-Western Australia.
- 2c (it is of special value as the habitat of plants or **animals** at a critical stage of their biological cycle). The open lakes of the Site regularly support moulting by thousands of Australian Shelducks; this is one of the most important moulting sites for shelducks in South-Western Australia. Lake Muir is used as a drought refuge by tens of thousands of waterbirds.
- 3a (it regularly supports 20,000 waterfowl). Up to 51,000 waterbirds have been counted at the Site (at Lake Muir, when full). The annual data on water depth suggest conditions are suitable for use by 20,000 waterbirds at least several times within a 25 year period, which in the context of wetland availability in Western Australia is considered sufficient evidence of regular use by 20,000 waterbirds.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one **species** or subspecies of waterfowl). At least five, possibly in the order of 10 Australasian Bitterns occur regularly and possibly breed in the sedge swamps of the Site, which constitutes more than 1% of the South-Western Australian population.

New information on application of the criteria to the wetland:

In view of the results of recent surveys, it is possible that following a review by the WA Threatened Species Scientific Committee, one or more of the flora taxa currently listed as rare may eventually be removed from the list of nationally vulnerable species, but this is unlikely to occur in the next 12 months due to timing of updates. None of the nationally endangered flora are endemic to the site. Surveys have also revealed presence of additional rare or poorly known flora (not yet nationally listed but potentially so) in the area, notably *Euphrasia scabra* (once relatively common nationally but now known only from a handful of populations in Tasmania, Victoria and one at Lake Muir). A taxon considered rare in WA (priority 4) but not under threat) *Schoenus natans*, until recently a declared rare species, was located during recent survey work. Three other notable aquatic or wetland margin taxa have recently been located in the complex: *Wurmbea sp. Cranbrook* (WA priority 2), *Caladenia starteorum* (WA priority

2), and *Lilaeopsis polyantha* (WA priority 2 – the single known population in WA though common on the East Coast) (R. Hearn pers. comm.).

Recent surveys have also revealed the presence of *Galaxiella munda* (Mud Minnow – WA priority 4) and *G. nigrostriata* (Black Striped Minnow – WA priority 3) in Poorginup Swamp and Myalgelup Lagoon, and *Nannatherina balstoni* (Balston's Pygmy Perch – WA priority 4) in Mulgarnup Swamp. These wetlands are all part of the Byenup Lagoon System (JF002WA) south of Muir Highway. (R. Hearn pers. comm.).

Tenure and extent of the potential new nomination:

The potential Ramsar nomination would comprise all of Nature Reserve 31880, which includes Lake Muir and the Byenup Lagoon wetlands (south of the Highway), but should exclude the small area of Reserve 31880 which extends north of Muir Highway next to Cowerup Swamp due to mining issues not yet being resolved in areas north of the Highway. One person (B. Hannekamp) owns the freehold land that would be surrounded by the Ramsar Site.

Major stakeholders other than CALM:

There are no current mining leases or major interests over Reserve 31880; former mining leases (interest in peat extraction) have been revoked. There are about 10 owners of land that adjoins the Reserve.

Potential to maintain the wetland's values (viability of the potential new nomination):

Waterbird conservation values do not appear to be under threat. Actions under the substantially funded Catchment Recovery Plan (Salinity Action Plan) for this wetland are considered sufficient to ensure the viability of the other conservation values in Reserve 31880. Work under the same Plan will identify any threats to biodiversity values at the (more vulnerable) Nature Reserves north of Muir Highway.

Other wetland management considerations:

A draft management plan for the Perup/Lake Muir/Unicup reserves is due for release late in 1998 [subsequently advised by R. Hearn that the Plan recently has been released]. CALM has often informed landowners of the potential Ramsar listing during the past 18 months (R. Hearn pers. comm.).

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

None with respect to Nature Reserve 31880.

Possible future inclusion of wetlands in the several Nature Reserves to the north of Muir Highway (which are part of the Directory account for JF002WA) should be considered though, due to lack of surface hydrological connection or contiguous reserves, these may instead be better nominated as a separate Site provided the Ramsar criteria are met. Issues to be resolved in this area include resolution of new mining interests (rare minerals) over the wetlands, closure of the mining lease at Cowerup Lake (in year 2003), and possible adding of adjacent reserves vested in the Water and Rivers Commission. This two staged approach to Ramsar listing of wetlands in the Muir-Unicup area may be useful for maintaining community interest and participation in the Salinity Action Plan.

At some stage, the Muir Highway road reserve (400 m wide) should be reduced to the usual width (20 m?) to enhance management of the proposed Ramsar site.

The Draft Management Plan should be reviewed to ensure that nomination of the Muir-Byenup wetlands as a Ramsar Site is adequately addressed.

Suggested timeframe for nomination:

It is recommended that a Ramsar Site comprising Reserve 31880 be nominated by May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 15 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Lake Pleasant View System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Lake Pleasant View System - JF005WA - page 839.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Albany on 2/9/98 with Jim Lane (Principal Research Scientist, Science Division) and John Watson (Manager, South Coast Region).

Ramsar criteria and how met:

3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). Lake Pleasant View System regularly supports at least 1% of the South-Western Australian population of Australasian Bittern *Botaurus poiciloptilus* (1% level = 3 birds): up to ten pairs occur, and it is one of the few known breeding localities in South-Western Australia.

New information on application of the criteria to the wetland:

Wetlands International is confident that the 1% level for Australasian Bittern (Rose & Scott 1997, which is the official source of population data for this criterion) is met.

Tenure and extent of the potential new nomination:

All of the System as described in the Directory is in NPNCA land. However, there are other wetlands in nearby reserves (e.g. Reserve 23850 = Lake Corimup; Reserve 36550 = White Lake) and in freehold land which together with the Lake Pleasant View and North Sister wetlands form a larger system of similar (but poorly known) wetlands, situated at the uppermost part of the catchments of several rivers. Further consideration of the component wetlands would be advisable before deciding on a Ramsar Site boundary.

It would not be appropriate to include these wetlands with the Moates Lake System in the same Ramsar Site.

Major stakeholders other than CALM:

Need to check with Water and Rivers Commission, Albany (Naomi Arrowsmith or Chris Gunby), regarding any potential interest the Commission may have in the wetlands being considered. There are at least ten, possibly 15 neighbours to Lake Pleasant View System, plus residents of the Manypeaks townsite.

Potential to maintain the wetland's values (viability of the potential new nomination):

There is little or no buffer between Lake Pleasant View and surrounding pasture on two sides. Otherwise there are no major concerns for viability. A significant amount of "wetland conservation work" is being

undertaken on selected farms in the vicinity (via Basil Scur, APACE Greenskills, Denmark); thus there may be better than average community acceptance of wetland conservation initiatives.

Other wetland management considerations:

Unlike the Moates Lake System (also being considered for nomination), the Lake Pleasant View System has no on-site CALM management staff and there is little or no public perception of the System's importance.

Other information on conservation values:

Wetland mapping and classification work by V & C Semeniuk (unpublished?) has shown this to be an unusual perched wetland system.

References (additional to those in the Directory):

Rose, P.M. and Scott, D.A. 1997. Waterfowl population estimates. Second edition. Wetlands International Publication 44, Wageningen, The Netherlands.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Further consideration should be given to the composition of a system of wetlands to comprise an optimal Ramsar Site based on the Lake Pleasant View System. Also it would also be timely to conduct further systematic surveys of biodiversity (mainly at wetlands other than Lake Pleasant View itself), including usage and breeding by Australasian Bittern, and comparing this to biodiversity of the Moates Lake System because criterion 3c is the basis for both systems being considered as potential Ramsar Sites.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 16 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Lake Thetis

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Lake Thetis - SWA015WA - page 889.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Como on 10/9/98 with Jim Lane (Principal Research Scientist, Science Division) and Kelly Gillen (Manager, Midwest Region).

Ramsar criteria and how met:

1d (it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region). Lake Thetis is an unusual example of a permanent saline lake and one of few lakes in South-Western Australia where both submerged benthic microbial mats and developing microbial structures occur.

New information on application of the criteria to the wetland:

The Central Coast Regional Strategy recognises the scientific significance of the lake (Western Australian Planning Commission 1996).

Tenure and extent of the potential new nomination:

Lake Thetis is situated on a 38 ha Recreation Reserve (35819) vested in the Shire of Dandaragan. The Nambung National Park Management Plan recommends inclusion of Lake Thetis into the nearby National Park (CALM 1998).

Major stakeholders other than CALM:

Shire of Dandaragan.

Potential to maintain the wetland's values (viability of the potential new nomination):

The flow of saline water into the lake is essential to maintaining its ecological character. The flow and quality of this ground water is not considered to be threatened because it is from the National Park. While the water supply bores for Cervantes are located only 500 m west of the lake, these draw from a deep freshwater aquifer.

Physical destruction of stromatolites by motor vehicles (which cause the most severe damage) and visitors has occurred on about 25% of the lake edge. The area has been fenced to exclude vehicles.

The Nambung National Park Management Plan recognises the potential for Lake Thetis to be adversely affected by future residential development. The Plan calls for future expansion of the Cervantes town site to be directed to the north-east (CALM 1998).

Other wetland management considerations:

Management strategies for Lake Thetis are included in the Nambung National Park Management Plan.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

CALM 1998. Nambung National Park Management Plan: 1998 -- 2008. Western Australian Department of Conservation and Land Management, Perth.
Western Australian Planning Commission 1996. Central Coast Regional Strategy: A Strategy to Guide Land Use in the next Decade. State of Western Australia, Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

CALM should take action to ensure the efficient transfer of vesting of Lake Thetis Reserve to Nambung National Park. Ramsar nomination could be considered further once this has been achieved.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Toolibin Lake

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Toolibin Lake - AW003WA - page 770 (Note: also known as "Lake Toolibin".)

Potential new Ramsar nomination or extension to existing Ramsar site:

Extension.

CALM personnel consulted:

Meeting at Narrogin on 2/9/98 with Jim Lane (Principal Research Scientist, Science Division), Ken Wallace (Manager, Wheatbelt Region) and Amanda Smith (project officer, Lake Toolibin Recovery Plan).

Ramsar criteria and how met:

The criteria under which Toolibin Lake was originally designated as a Ramsar Site are:

- 1a (it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region). Lake Toolibin is the last, large tree-dominated wetland, with mostly living trees, in the inland agricultural area of South-Western Australia. (Note that this criterion is not being used in the present project to identify potential new Ramsar Sites because a comprehensive framework for applying this criterion does not exist for Western Australia.)
- 2b (it is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna). As the last remnant of a formerly common wetland type, Toolibin Lake is vital to maintaining the genetic and ecological diversity of the inland agricultural area of South-Western Australia. (Note that this criterion is not being used in the present project to identify potential new Ramsar Sites because a comprehensive framework for applying this criterion does not exist for Western Australia.)
- 2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle). Toolibin Lake supports more breeding waterbird species than most if not all other wetlands in South-Western Australia. It supports breeding by Freckled Duck *Stictonetta naevosa* and small breeding colonies of cormorants, egrets, night herons and spoonbills.

New information on application of the criteria to the wetland:

The extension does not cause additional criteria to be met.

Tenure and extent of the potential extension:

Land on the west side of Toolibin Lake which has been acquired by the State Government for conservation purposes, could be added to the Ramsar Site.

Contiguous NPNCA Nature Reserves to the SW (Walbyring Lake) and NE (Dulbinning Lakes) potentially could be added to the Ramsar Site. Each would add substantially to the conservation values of the Ramsar Site, having living wooded swamp and substantial conservation value for waterbirds. The latter will be added to with further land purchases under the Catchment Recovery Plan.

Major stakeholders other than CALM:

The Recovery Plan team is a stakeholder but is expected to support the extension on the west side of Toolibin Lake. Probably there is only one neighbour to this extension. There are several neighbours to the other Nature Reserves.

Potential to maintain the wetland's values (viability of the potential extension):

The extension does not include wetland ; its viability therefore is not a concern.

Other potential extensions (Dulbinning and Walbyring Lakes). Ken Wallace indicated that a priority for further efforts under the Recovery Plan was for additional pumping of saline groundwater from under Toolibin Lake itself. This would be desirable in order to succeed with the recovery objectives and thereby demonstrate the viability of the Recovery Plan process to landholders and other stakeholders. If funding permitted, the next target would be replanting of trees in the Dulbinning Lake catchment, then pumping at Dulbinning Lake which is in Toolibin Lake's catchment. Thus there was no plan at present to do pumping under Walbyring Lake, which might therefore be lost to salinisation. Some measures (by-pass of the saline water, tree planting) are in place and will enhance the chances of Walbyring being saved.

Other wetland management considerations:

New information: only water of less than 1.0 ppt TDS is now allowed to flow into Toolibin Lake.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important: Yes: already a Ramsar Site.

Issues that must first be resolved before extension can proceed:

There is no impediment to the extension west of Toolibin Lake proceeding.

Options for adding Dulbinning Lake, and contiguous Nature Reserve, to the Ramsar Site at a suitable time in the future should be explored as progress with the Recovery Plan (outcome of groundwater pumping) permits.

Suggested timeframe for extension:

The Ramsar Site extension to the west of Toolibin Lake can proceed by May 1999. Other possible extensions should be considered after May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 16 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Lake Warden System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Lake Warden System - ESP005WA - page 807.

Potential new Ramsar nomination or extension to existing Ramsar site:

Extension.

CALM personnel consulted:

Meeting at Albany on 1-2/9/98 with Jim Lane (Principal Research Scientist, Science Division) and John Watson (Manager, South Coast Region) and communication by telephone and fax with Klaus Tiedemann (Manager, Esperance District).

Ramsar criteria and how met:

The criteria under which Lake Warden System was originally designated as a Ramsar Site are:

- 1a (it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region). Lake Warden System is a good representative example of a system of saline coastal lagoons, typical of South-Western Australia. (Note that this criterion is not being used in the present project to identify potential new Ramsar Sites because a comprehensive framework for applying this criterion does not exist for Western Australia.)
- 3a (it regularly supports 20,000 waterfowl). The number of individual waterbirds that use Lake Warden System each year probably exceeds 20,000 and annual data on water depth and the area of waterbird habitat suggest conditions are suitable for use by 20,000 waterbirds at least several times within a 25 year period; in the context of wetland availability in Western Australia this is considered sufficient evidence of regular use by 20,000 waterbirds.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). Lake Warden System supports more than 500 Hooded Plovers, which constitutes more than 1% of the global population, and at least 1% of the population uses the Lake each year. The 1% criterion also is met for Banded Stilt: thousands occur regularly and counts of up to 10,000 (September 1982) have been recorded.

New information on application of the criteria to the wetland:

The threshold for waterbird numbers in Ramsar criterion 3a changed from 10,000 (ducks) to 20,000 (waterbirds), after nomination of Lake Warden System occurred. Counts of 20,000 have not been recorded but the sum of highest numbers counted for each species recorded exceeds 30,000 for the Lake Warden System, so it can be confidently stated that at least 20,000 waterbirds use the System in most years and thus the criterion is met. In the original nomination, criterion 2a (the Site supports an appreciable assemblage of rare, **vulnerable** or endangered species or subspecies of plant or **animal**, or an appreciable number of individuals of any one or more of these species) was not indicated as being met, but would certainly be satisfied for Lake Warden System in regard to the nationally vulnerable Hooded Plover.

Tenure and extent of the potential extension:

There have been no additions to the Nature Reserves that comprise the Ramsar Site as originally nominated. Part of Mullet Lake Nature Reserve (sand dune country to the SE) apparently was excluded from the Ramsar Site, perhaps because it has no major wetlands.

Part of Windabout Lake is a reserve vested in the Shire of Esperance and is outside the Ramsar boundary. Whereas transfer of this to NPNCA control is more likely to be successful at present than in the recent past (K. Tiedemann pers. comm.), it may not be wise to discuss it with the Shire at present in view of the stage of progress of the Draft Management Plan for the Esperance Lakes.

Similar reasons apply to the suggestion (put forward by the Conservation Council of WA) that Pink Lake be added to the Ramsar Site. In any case, Pink Lake is a mix of tenures (including reserve 22422), has commercial use (salt extraction) and has not been proposed as an extension to the Ramsar Site in the Draft Management Plan or in comments received from public submissions. The NW side of Pink Lake (sedgeland) is in NPNCA Nature Reserve 24511.

Major stakeholders other than CALM:

There are several owners of the land that includes Pink Lake.

Potential to maintain the wetland's values (viability of the potential extensions):

Not discussed.

Other wetland management considerations:

Not discussed.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

Not identified.

Conclusions:

Is the wetland internationally important: (Yes. It is already a Ramsar Site.)

Issues that must first be resolved before extension can proceed:

It is recommended that no action be taken on Pink Lake. With respect to extending the Ramsar Site to include the part of Windabout Lake outside the Site, negotiations should be opened with the Shire of Esperance at an appropriate time and subject to the final outcomes of the Management Plan.

Suggested timeframe for extension:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 16 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff**Leslie (Port Hedland) Saltfields System**

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Leslie (Port Hedland) Saltfields System - PIL004WA - page 867.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Crawley on 9/9/98 with Jim Lane (Principal Research Scientist, Science Division) and Peter Moore (Operations Officer, Pilbara Region) and at Karratha on 17/9/98 with Chris Muller (Manager, Pilbara Region) and Peter Kendrick (Regional Ecologist, Pilbara Region).

Ramsar criteria and how met:

- 2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle). The site is a major migration stop-over area for shorebirds (counts of up to 66,800 waterbirds, mostly shorebirds) in the East Asian-Australasian Flyway; 27 migrant shorebird species occur, most of them regularly.
- 3a (it regularly supports 20,000 waterfowl). The number of waterbirds using the site annually is more than 20,000; allowing for onward movement of migrants, the number would probably exceed 50,000.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). Species of waterbirds recorded in numbers exceeding 1% of the minimum Flyway populations (Watkins 1993) are:
- | | |
|------------------------|--------|
| Broad-billed Sandpiper | 6000 |
| Oriental Plover | 29,900 |
| Oriental Pratincole | 10,000 |
| Sharp-tailed Sandpiper | 20,000 |
| Curlew Sandpiper | 25,000 |
| Red-necked Stint | 23,000 |
| Lesser Sand Plover | 668 |
| Red-necked Avocet | 3000 |

New information on application of the criteria to the wetland:

See below.

Tenure and extent of the potential new nomination:

The Leslie Saltfield System is covered by two mineral leases (ML 242SA & ML 269SA) which are linked to the Leslie Solar Salt Industry Agreement Act 1966.

Major stakeholders other than CALM:

Cargill Salt P/L.

Potential to maintain the wetland's values (viability of the potential new nomination):

The wetland habitat of the Leslie Saltfields System has both natural and man-made components (Royal Australasian Ornithologists Union 1990). Important natural habitats are the extensive tidal flats along the coast between the mouth of the De Grey River and Port Hedland and the supra-tidal flats of Ridley Creek adjacent to the saltfields. The coastal habitat provides extensive feeding areas and at high tide many waterbirds move on to the supra-tidal areas of Ridley Creek and the saltfields to roost.

In addition to providing roosting sites, the saltfields provide two other habitats for waterbirds. Over a number of years, as a result of pumping immense quantities of high sediment seawater from the tidal creeks, mudflats have formed in the outflow area in Pond 1 and are continuing to form near the Rock Cod Creek Pumping Station. These mudflats have a high productivity and are favoured feeding areas for migratory shorebirds (especially Asian Dowitcher and Broad-billed Sandpiper). The second habitat developed in the saltworks is as a result of high densities of invertebrates in the concentration ponds. Migratory shorebirds feed around the edges of the ponds on invertebrates concentrated by wind and wave action. During calm conditions some species of shorebirds also swim on the ponds and glean invertebrates from the surface.

As such the Leslie Saltfield System has both natural and man-made environments that are important to maintaining the presently recognised biodiversity values of the area.

Maintaining the site's existing values is linked to ongoing operation of the saltfield. In 1990 a Consultative Environmental Review was conducted on a proposal to extend the salt ponds (LeProvost *et al.* 1990). This report did not fully recognise the importance of the area for waterbirds and downplayed the potential impact of the changes to the flow of water within the ponds (Royal Australasian Ornithologists Union 1990). Approval was given for the extension of the ponds and the subsequent Environmental Management Program included a commitment to seek to create mudflat habitat in Pond 0, monitor shorebird numbers and biological productivity of Ponds 0 and 1 (LeProvost 1991). The Ministerial conditions set out in the approval for the project require the development of a decommissioning plan at least six months before the cessation of operations.

Other wetland management considerations:

CALM would need to give careful consideration to the abovementioned management implications if the site was Ramsar listed. A more suitable option to recognise the international importance of the system without having any legal obligations may be to seek to have the site listed in the East Asian-Australasian Shorebird Reserve Network.

The Department of Environmental Protection will be conducting a review of the Ministerial Conditions of the expansion of the saltworks in late 1998.

The State Planning Strategy identifies the coastal areas immediately north of the concentrator ponds as an Environmental Priority Management Area (Western Australian Planning Commission 1997). However this report and the Port Hedland Area Planning Study (Ministry of Planning 1998) have overlooked the biodiversity values of the Leslie Saltworks System.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

- LeProvost Environmental Consultants 1991. Leslie Salt, Extension of Salt Ponds, Port Hedland. Environmental Management Programme. LEC Ref: J225. Report No. R347. Perth, Western Australia.
- Ministry of Planning 1998. Port Hedland Area Planning Study, for Public Comment. Western Australian Planning Commission. Perth.
- Royal Australasian Ornithologists Union 1990. Leslie Salt Project, Proposed Solar Salt Development near Port Hedland: Submission on the Consultative Review. Unpublished report to the EPA.

Watkins, D 1993. A National Plan For Shorebird Conservation In Australia. RAOU Report No. 90.
Western Australian Planning Commission 1997. State Planning Strategy, Final Report. Western
Australian Planning Commission. Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Some of the values of the site are linked to ongoing commercial salt production. This raises major concerns about the potential to maintain biodiversity values linked, in part, to a commercial operation. As such it is essential to obtain the support of Cargill Salt before CALM seeks Ramsar listing of the site.

It is recommended that CALM makes high level representation to Cargill Salt to emphasise the international importance of the saltworks system. These discussions should consider potential options to ensure that the biodiversity values of the concentration ponds are optimised. Cargill Salt should be encouraged to nominate the area for listing as part of the East Asian-Australasian Shorebird Reserve Network.

It is also recommended that CALM make a submission to the Port Hedland Area Planning Study stressing the value of the Leslie Saltfields System for waterbirds.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Loch McNess System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Loch McNess System - SWA016WA - page 891.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Kelmscott on 3/9/98 with Jim Lane (Principal Research Scientist, Science Division), Bruce Harvey (Manager, Swan Region) and David Mitchell (Conservation Program Leader, Swan Region) and at Woodvale on 4/9/98 with Andrew Burbidge (Director, WATSC Unit) and John Blyth (Scientific Advisor, WATSC Unit).

Ramsar criteria and how met:

- 2d (it is of special value for one or more endemic plant or animal species or communities). The subterranean (cave) wetlands of Loch McNess National Park are of special value for endemic stygofauna, i.e. animal species (cave-dwelling aquatic invertebrates) and also animal communities (invertebrate communities of the cave root mats).

New information on application of the criteria to the wetland:

The question of whether/not the stygofauna of the Yanchep Caves truly is endemic was discussed. Will further surveys reveal that the species occur elsewhere in the region? Andrew Burbidge and John Blyth indicated that the research to date suggests that, due to lack of gene flow, the endemism of fauna in most cave systems will prove valid. However, future surveys are also likely to show that other cave systems (Leeuwin-Naturaliste, Kimberley, etc.) support endemic aquatic stygofauna. Thus the new question is which cave system(s) should be nominated as a Ramsar site? In this regard it is proposed that only the subterranean karst wetlands that are widely recognised as globally important for aquatic stygofauna (i.e. Cape Range), the importance of which is unlikely to diminish with further research, should be nominated at present. Note that the above-ground swamps and lakes of Loch McNess would add some value to a Ramsar nomination but do not meet a Ramsar criterion on their own.

Tenure and extent of the potential new nomination:

The potential nomination would comprise the subterranean caves and possibly also the above-ground lake and swamps, all of which are within NPNCA vested Yanchep National Park.

Major stakeholders other than CALM:

The Water and Rivers Commission should be consulted regarding groundwater issues. There are probably tens of neighbouring landowners (freehold) apart from CALM (State Forests).

Potential to maintain the wetland's values (viability of the potential new nomination):

Recently it has been necessary to pump water into the caves to protect the fragile root mat fauna, due to the falling water table of the Gngangara groundwater mound. Planned thinning and/or removal of plantation pine trees on the mound should redress this problem.

Other wetland management considerations:

There is an Interim Recovery Plan (restricted circulation) for the stygofauna of the Yanchep Caves and a current Management Plan for the National Park.

Other information on conservation values:

The root mat invertebrate fauna of Yanchep Caves has now been well studied by Adita Jasinska and more than two species are known to be endemic to these caves.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Given the approach outlined above, there is a need to clarify whether or not the Yanchep stygofauna are globally important. Regardless, first priority would be given to nomination of the Cape Range subterranean site.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 1 November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Millstream Pools

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Millstream Pools - PIL005WA - page 869.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Crawley on 9/9/98 with Jim Lane (Principal Research Scientist, Science Division) and Peter Moore (Operations Officer, Pilbara Region) and at Karratha on 17/9/98 with Chris Muller (Manager, Pilbara Region) and Peter Kendrick (Regional Ecologist, Pilbara Region).

Ramsar criteria and how met:

- 1d (it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region). Millstream Pools is an important, isolated habitat for wetland flora and fauna in the Arid Interior region in Western Australia.
- 2d (it is of special value for one or more endemic plant or animal species or communities). Endemic wetland dependent insect species occur, including dragonflies and damselfies.

New information on application of the criteria to the wetland:

Knowledge of the distribution of wetland species considered to be endemic to the site is limited (C Muller pers. comm.) and the nomination would be greatly strengthened by further survey work on these species in the Pilbara.

Tenure and extent of the potential new nomination:

The site is within Millstream Chichester National Park (Reserve 38333) and covers approximately 150 ha. There are additional areas of interest downstream of the site.

Major stakeholders other than CALM:

The WA Water and Rivers Commission, WA Water Corporation, Aboriginal Traditional Owners and local Aboriginal communities.

Potential to maintain the wetland's values (viability of the potential new nomination):

Water supply for the Millstream wetlands comes from intermittent flooding of the Fortescue River and from seepage of ground water. It is the ground water seepage that maintains the flora and fauna that make the site internationally important.

Groundwater is extracted from the aquifer that feeds the Millstream springs. This water complements the Harding River Dam as the water supply for the Pilbara coastal towns. The Waters and Rivers Commission and the Water Corporation have conducted extensive studies on the aquifer to ensure that the springs are not adversely affected by water extraction. A Millstream Water Management Plan has

been developed: it sets waterlevel-based criteria for water extraction. There is also a Millstream Water Management Committee that meets every 6 months.

A major threat to the site has developed since 1991: erosion of the river bed. This is occurring below all the major pools but has had the most severe impact below Crossing Pool. It has already caused a drop in the water level in Crossing Pool by 2 m. If erosion continues then the water level may drop by another 2 m to give a total drop of 4 m (Chris Muller pers. comm., P. Kendrick pers. comm.). Erosion of the river bed has potential in the long term to destroy the river pools and lower the water level in the aquifer, thereby depriving the existing springs of water.

It is considered that the recent erosion of the river bed may be a natural process that occurs over hundreds of years (perhaps 500-1000 years: C Muller pers. comm.). However, in the present case there is concern that the erosion may have been accelerated by a combination of fire and over-grazing (P Kendrick pers. comm., J Kite pers. comm.).

The erosion issue is receiving detailed attention by the Waters and Rivers Commission and the CALM Pilbara Office. The construction of structures in the river bed is being discussed and the Waters and Rivers Commission has been funding design and research work.

Exotic plants (e.g. date palms, cotton palms, *Parkinsonia*, *Ceratopteris* and *Nymphaea*) are a major problem at the site. Interim Management Guidelines have been developed for the control of exotic palms.

Other wetland management considerations:

The site is included on the Register of the National Estate.

A management plan being drafted and there is the potential to include consideration of Ramsar nomination into the planning process.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None provided.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated:

Yes. However the nomination may be strengthened by additional biological survey work.

Issues that must first be resolved before nomination can proceed:

Further survey work is needed to confirm the status of species considered endemic to the site. Decisions need to be made on management of erosion problems in the river bed and resources obtained for implementation.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Mitchell River System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Mitchell River System - NK002WA - page 860.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Broome on 15/9/98 with Gordon Graham (Ecologist, Kimberley Region).

Ramsar criteria and how met:

2d (it is of special value for one or more endemic plant or animal species or communities). The Mitchell Gudgeon *Kimberleyeleotris hutchinsi* is endemic to the site (Allen 1982 and pers. comm.)

New information on application of the criteria to the wetland:

The Mitchell Gudgeon occurs in the lower sections of the Mitchell River, above Mitchell Falls (G. Graham pers. comm.).

Tenure and extent of the potential new nomination:

Most of the site is Vacant Crown Land but it also includes part of a pastoral lease (King Edward River station) in the headwaters of the river and part of Reserve 30643 (for use and benefit of Aborigines) to the west of the river.

It has been recommended that a Marine Park be established to cover the Mitchell River Estuary (Marine Parks and Reserves Selection Working Group 1994).

Major stakeholders other than CALM:

The Western Australian Department of Land Administration, Native Title Claimants (?), King Edward River station and the local Aboriginal community.

Potential to maintain the wetland's values (viability of the potential new nomination):

No significant threats identified.

Other wetland management considerations:

The area is identified as being part of a larger Environmental Priority Management Area in the State Planning Strategy (Western Australian Planning Commission 1997). Part of the Mitchell River and its surrounds has been recommended to become a National Park (G. Graham pers. comm.).

The Kimberley region at present has four existing Ramsar Sites. Management planning and implementation by CALM is severely hampered by the inadequate resources available for the region

(Watkins *et al.* 1997). The nomination of additional Ramsar Sites in this region may add to the difficulties unless additional resources are allocated.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

Marine Parks and Reserves Selection Working Group. 1994. *A Representative Marine Reserve System for Western Australia*. Department of Conservation and Land Management, Western Australia.

Watkins D, Brennan K, Lange C, Jaensch R & Finlayson M. 1997. *Management Planning for Ramsar Sites in the Kimberley Region of Western Australia*. Report to the Department of Conservation and Land Management. Wetlands International - Oceania. Canberra.

Western Australian Planning Commission. 1997. *State Planning Strategy, Final Report*. Western Australian Planning Commission. Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Land tenure and management arrangements need to be resolved. It can be anticipated that Native Title issues will take some time to resolve.

A further issue to be addressed is the need to increase resources for the CALM Kimberley Region to enable appropriate planning and management of the existing Ramsar listed wetlands.

A strategy needs to be developed for the order in which the three Kimberley river systems (Drysdale, Prince Regent and Mitchell River System) will be addressed as potential Ramsar Sites.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Moates Lake System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Moates Lake System - JF006WA - page 840.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Busselton on 31/8/98 with Jim Lane (Principal Research Scientist, Science Division) and Alan Danks (Conservation Program Leader, South Coast Region) and at Albany on 2/9/98 with John Watson (Manager, South Coast Region).

Ramsar criteria and how met:

- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). Moates Lake System regularly supports at least 1% of the South-Western Australian population of Australasian Bittern *Botaurus poiciloptilus* (1% level = 3 birds): up to ten occur.

New information on application of the criteria to the wetland:

Alan Danks confirmed that the System regularly supports at least 10 Australasian Bitterns and that the birds occur in most areas of sedgeland in the system. Wetlands International is confident that the 1% level for Australasian Bittern (Rose & Scott 1997, which is the official source of population data for this criterion) is met.

Tenure and extent of the potential new nomination:

All of the System as described in the Directory is in NPNCA land apart from the southern part of Angove Lake. The latter part is in freehold tenure and is thought to be an integral component of the wetland system and is suitable habitat for Australasian Bittern. Two water reserves contiguous with the NPNCA land, presumably vested in the Water and Rivers Commission, potentially could be added to the nomination since they protect much of the surface catchment of Moates Lake System and include habitat of freshwater fishes notably *Galaxias truttaceus*. Further consideration thus needs to be given to the composition of the optimal Ramsar Site nomination based on Moates Lake System.

Major stakeholders other than CALM:

Need to check with the Water and Rivers Commission, Albany (Naomi Arrowsmith or Chris Gunby) regarding tenure of the water reserves and any plans for changes to water extraction from the inflowing rivers/creeks especially Goodga Creek. A former mineral sands interest around Angove Lake was not economically viable. There are at least three owners of land neighbouring Moates Lake System.

Potential to maintain the wetland's values (viability of the potential new nomination):

Overall the viability is good, due to the ongoing efforts by CALM to maintain the ecological character of the NPNCA land. However there are concerns about drainage/degradation of the freehold part of Angove Lake and about that landowner's development interests including potential subdivision.

Other wetland management considerations:

Moates Lake System has on-site CALM management staff and there is some public perception of importance of the wetlands. The staff have tried to draw attention to the wetland conservation values in recent years.

Other information on conservation values:

In WA the fish *Galaxias truttaceus* is known to occur only in the inflow creeks to Moates Lake (Goodga Creek, Black Cat Creek; larvae in the lake: recent surveys by David Morgan of Murdoch University) and Angove Lake (past surveys, ? Storey *et al.*) and in a nearby inlet. However it is neither nationally threatened nor gazetted as rare at State level. Part of the population of the recently rediscovered Gilbert's potoroo occurs in wetland (waterlogged gullies) in the NPNCA land. Potentially the wetlands can support 70 singing male Noisy Scrub-birds which is about 12% of the world population (about 600 singing males).

References (additional to those in the Directory):

Rose, P.M. and Scott, D.A. 1997. Waterfowl population estimates. Second edition. Wetlands International Publication 44, Wageningen, The Netherlands.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Consultation on the inclusion of the water reserves and the freehold part of Angove Lake, and resolution of drainage and development issues, should be undertaken. Clarification of the importance of the wetlands (including waterlogged gullies) for the rare birds and mammals would strengthen the case for proceeding with nomination (but alone are not sufficient grounds for nomination).

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 16 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Ord River Floodplain

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Ord Estuary System - VB004WA - page 917.
Parry Floodplain - VB005WA - page 918.

Potential new Ramsar nomination or extension to existing Ramsar site:

Extension.

CALM personnel consulted:

Meeting at Broome on 15/9/98 with Gordon Graham (Ecologist, Kimberley Region) and subsequent correspondence.

Ramsar criteria and how met:

The criteria under which Ord River Floodplain was originally designated as a Ramsar Site are:

- 1a (it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region). The Site includes among the best examples of riverine floodplain marshes and mangrove systems in North-Western Australia.
- 2a (it supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species). The Site supports a substantial population of the globally-threatened saltwater crocodile.
- 2b (it is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna). In the context of the North-Western Australia region, it supports a large number of wetland plant and animal species.
- 3b (it regularly supports substantial numbers of individuals from particular groups of waterfowl, indicative of wetland values, productivity or diversity). It supports many thousands of ducks and many thousands of shorebirds.

Note that criteria 2b and 3b are not used in the current project.

New information on application of the criteria to the wetland:

None provided.

Tenure and extent of the potential extensions:

Several groups of extensions were proposed:

- Group 1 Recently gazetted additions to the Parry Lagoons Nature Reserve:
- a. additions in the south part of Parry Lagoons Nature Reserve (upper reaches of Parry Creek);
 - b. additions near Wild Goose Creek - includes most of Wild Goose Lagoon.
- Group 2 Realignment to improve ecological boundaries and match pastoral lease boundaries:
- a. mudflats of the proposed Marine Park - align the Ramsar boundary to match the edge of Carlton Hill Station, which is the edge of the nature reserve (i.e. 40 m above high water mark);
 - b. False Mouths of the Ord - align the Ramsar boundary to match the edge of Carlton Hill Station (40 m above high water mark).

Group 3 Cape Domeett and Hinterland:

This area contains a major Flatback Turtle *Natator depressus* rookery (CALM 1998) and would significantly add to the values of the Ord River Floodplain Ramsar Site. The area is Vacant Crown Land. The area is identified as part of a larger Environmental Priority Management Area in the State Planning Strategy (Western Australian Planning Commission 1997). The area has previously been identified as a potential port site (CALM 1998).

Group 4 Cambridge Gulf Components of the proposed Marine Park:

The existing Ramsar Site includes some areas of marine and estuarine water: these are not part of the nature reserves. The proposal is to extend the Ramsar Site out to the proposed boundary of the Marine Park (Marine Parks and Reserves Selection Working Group 1994) and thereby include more marine and estuarine waters. The marine area is identified as part of a larger Environmental Priority Management Area in the State Planning Strategy (Western Australian Planning Commission 1997).

Group 5 Adolphus Island:

The proposal is to include Adolphus Island (Vacant Crown Land) in the Ramsar Site. This area is identified as part of a larger Environmental Priority Management Area in the State Planning Strategy (Western Australian Planning Commission 1997).

Major stakeholders other than CALM:

Carlton Hill pastoral station, Native Title Claimants and the Department of Land Administration.

Potential to maintain the wetland's values (viability of the potential extension):

Addressed in the Lower Ord Ramsar Site Draft Management Report (CALM 1998).

Other wetland management considerations:

This site is one of four existing Ramsar Sites in the Kimberley region. Management planning and implementation is being severely hampered by a lack of resources (Watkins *et al.* 1997). However it is anticipated that the proposed extensions would not significantly add to existing management responsibilities.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

- CALM. 1998. Lower Ord Ramsar Site Draft Management Plan. Department of Conservation and Land Management. Kununurra, Western Australia.
- Marine Parks and Reserves Selection Working Group. 1994. A Representative Marine Reserve System for Western Australia. Department of Conservation and Land Management, Western Australia.
- Watkins D, Brennan K, Lange C, Jaensch R & Finlayson M. 1997. Management Planning for Ramsar Sites in the Kimberley Region of Western Australia. Report to the Department of Conservation and Land Management. Wetlands International - Oceania. Canberra.

Conclusions:

Is the wetland internationally important: Yes, it is an existing Ramsar Site.

Issues that must first be resolved before extension can proceed:

All extensions will involve some discussions with stakeholders. It is recommended that this be conducted by the East Kimberley Regional Office of CALM.

Obtaining agreement to nominate the areas of Vacant Crown Land (at Cape Domett and hinterland site and at Adolphus Island) may take some time. In addition to issues raised by the Department of Land Administration are those associated with Native Title claims.

It is suggested that the proposal to extend the Ramsar Site to include the Cambridge Gulf components of the proposed Marine Park (which are not yet in the Site) is premature at this stage. This would be an appropriate extension but would be better timed if it followed the establishment of the proposed Marine Park.

Suggested timeframe for extension:

By May 1999, CALM should extend the Ramsar Site to include the recent additions to Parry Lagoons Nature Reserve (Group 1 above). CALM also should ensure that documentation for the existing inland boundary of the Ramsar Site near the False Mouths of the Ord clearly equates this boundary to the current Nature Reserve boundary (Group 2). Other proposals for extensions (Groups 3-5) could be considered and/or completed after May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff**Owingup Swamp System**

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Owingup Swamp System - WAR008WA - page 932

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Manjimup on 1/9/98 with Jim Lane (Principal Research Scientist, Science Division), Peter Keppel (Manager, Southern Forests Region) and Roger Hearn (Deputy Manager, Southern Forests Region).

Ramsar criteria and how met:

- 2a (it supports an appreciable assemblage of rare, **vulnerable** or endangered species or subspecies of **plant** or animal, or an appreciable number of individuals of any one or more of these species). A wetland-dependent orchid that is nationally vulnerable occurs at the Site in appreciable numbers. It mainly occurs on seasonally inundated areas or wetland margins, which have been extensively cleared for agriculture elsewhere in South-Western Australia.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). At least five, possibly in the order of 10 Australasian Bitterns occur regularly and possibly breed in the sedge swamps of the Site, which constitutes more than 1% of the South-Western Australian population.

New information on application of the criteria to the wetland:

Since publication of the Directory, the nationally vulnerable orchid *Diuris drummondii* has been found in the Reserve's swamps. The population of 200 plants is one of the largest known, but apparently the species may be removed from the vulnerable list in the next 1-2 years. The lower Kent River is good habitat for Black Bittern, the SW population of which is endangered (but not gazetted as such).

Tenure and extent of the potential new nomination:

Owingup Nature Reserve (41010) includes all of the wetlands described in the Directory site account except a small part of the far W side of Owingup Swamp. Quarram NR (33842) is contiguous on the W and E sides and Mehinup NR (20381) is contiguous with the lower reaches of Kent River upstream of the Swamp, but inclusion of both would require additional consultations especially with other stakeholders. Thus the potential Ramsar Site would be Owingup Nature Reserve.

Major stakeholders other than CALM:

The Water and Rivers Commission apparently has plans to build a dam on Kent River upstream of Owingup Swamp System (just upstream of the South Coast Highway). This would have a major impact on the Owingup Swamp System since Kent River is its largest source of water. (Perhaps Ramsar listing would help ensure appropriate practice in regard to water allocations for environmental flows.) The Shire of Denmark controls land adjacent to Owingup Swamp System, on the coast at Boat Harbour. There are

about 12 owners of land neighbouring Owingup Swamp System, including rural smallholders adjacent to Kent River.

Potential to maintain the wetland's values (viability of the potential new nomination):

The Kent River and other inflow creeks introduce saline water and nutrients to the System. Clearing bans have been in place in the surface catchment since the early 1980s and there has been extensive tree planting, such that Owingup Swamp System is probably less threatened by salinisation than some other wetlands in South-Western Australia. However, landcare groups apparently are not very active in the vicinity, so input of nutrients derived from fertilisers applied to farmland immediately adjacent to Owingup Swamp System may result in eutrophication of the wetlands.

Other wetland management considerations:

CALM is preparing management guidelines for these (and nearby) wetlands.

Other information on conservation values:

Owingup Swamp possibly plays a role in removing nutrients from the Kent River because water apparently disperses widely (without a defined channel) through the Swamp's woodland/sedgeland before continuing downstream in a defined channel to Irwin Inlet.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

The proposal for damming of Kent River should be investigated (refer to RFA 1998 report Vol. 1 and maps) and salinity/nutrient issues clarified. Further biodiversity inventory work should be done (relatively little done so far): there seems to be potential for further significant discoveries in this large and diverse wetland system.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 16 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff**Peel-Yalgorup System**

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Peel-Harvey Estuary - SWA018WA - page 893.
 Lake McLarty System - SWA014WA - page 888.
 Yalgorup Lakes System - SWA026WA - page 908.

Potential new Ramsar nomination or extension to existing Ramsar site:

Extension.

CALM personnel consulted:

Meeting at Kelmscott on 3/9/98 with Jim Lane (Principal Research Scientist, Science Division), Bruce Harvey (Manager, Swan Region) and David Mitchell (Nature Conservation Program Leader, Swan Region).

Ramsar criteria and how met:

The criteria under which Peel-Yalgorup System was originally designated as a Ramsar Site are:

- 1 (presumably 1a: it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region). The Site includes the largest and most diverse estuary system in South-Western Australia.
- 2d (presumably meant to be 2c: it is of special value as the habitat of plants or animals at a critical stage of their biological cycle). It is a major drought refuge and migration staging area for waterbirds.
- 3a (it regularly supports 20,000 waterfowl). Up to 150,000 waterbirds occur each year.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). The Site regularly supports at least 1% of the population of several species including Banded Stilt and Red-necked Stint.

New information on application of the criteria to the wetland:

Whereas several of the Site components each meet the Ramsar criteria, it was concluded that it would not be wise to split the existing Ramsar Site because those components each are in NPNCA-vested land contiguous with the estuary or (see below) are likely to become contiguous. Little would be gained from splitting in this instance. This approach was supported by the regional staff.

Tenure and extent of the potential extensions:

The following potential extensions, each being areas contiguous to the existing Ramsar Site and which add conservation value or buffer to Ramsar Site, were considered:

- (1). new reserves 43690 and 43691, SW of the Mandurah bypass bridge;
- (2). land to be ceded to the Crown immediately NW of the bridge;
- (3). Soldiers' Cove area, NE of the bridge;
- (5). Creery Marshes (N of Creery Island, which is in the Ramsar Site);
- (6). any new NPNCA land in the Yunderup (Murray R delta) area;
- (7). former water reserve 7502, SW of Carrabungup Swamp, now believed to be NPNCA-vested;
- (8). part of Yalgorup National Park immediately adjacent the far NE end of Lake Clifton;
- (9). the recent addition to Yalgorup NP, immediately adjacent the far NW side of Lake Clifton; and
- (10). the recent addition to Yalgorup NP, immediately adjacent the mid-east side of Lake Clifton.

As the Peel Region Structure Plan is implemented, CALM should review the potential for additional extensions to the Ramsar Site. The CCWA (1985) suggestion of extension to southern Harvey Estuary was not clear but may have referred to marine waters; this was not considered further.

Major stakeholders other than CALM:

Not discussed.

Potential to maintain the wetland's values (viability of the potential extensions):

Not discussed.

Other wetland management considerations:

Not discussed.

Other information on conservation values:

Not discussed.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important: Yes: already a Ramsar Site.

Issues that must first be resolved before extensions can proceed:

Addition of areas already vested in the NPNCA, to the Ramsar Site, should proceed.

Suggested timeframe for nomination:

NPNCA areas to be added by May 1999, the other areas after May 1999 subject to resolution of tenure and any other issues.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 1 November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Prince Regent River System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Prince Regent River System - NK003WA - page 861.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Broome on 15/9/98 with Gordon Graham (Ecologist, Kimberley Region).

Ramsar criteria and how met:

- 2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle).
The site is a major breeding area in North-Western Australia for the saltwater crocodile *Crocodylus porosus*.
- 2d (it is of special value for one or more endemic plant or animal species or communities). The freshwater Pygmy Rainbowfish *Melanotaenia pygmaea* is endemic to the site.

New information on application of the criteria to the wetland:

The pygmy rainbowfish is known only from the rapid flowing water of Cascade Creek above King's Cascade (G Allen pers. comm.). A second species, the slender gudgeon *Hypseleotris ejuncida*, is restricted to the Prince Regent Nature Reserve (Prince Regent River and Roe River).

Tenure and extent of the potential new nomination:

Most of the site as described in the Directory is within the Prince Regent River Nature Reserve. A 40 km section of the wetland on the south-west side of Prince Regent River is in an Aboriginal Reserve. The very top parts of the catchment are Vacant Crown Land. It is proposed that the tenure of the Prince Regent River Nature Reserve be changed to National Park (Gordon Graham pers. comm.).

Consideration should be given to inclusion of Roe River within any potential Ramsar nomination. If the Morgan River branch was to be excluded from such a nomination, then almost all of Roe River would be within the Prince Regent Nature Reserve. The inclusion of Roe River would give full recognition of the restricted range of the slender gudgeon.

Saint George Basin and Prince Frederick Harbour have been recommended as a Marine Reserve (Marine Parks and Reserves Selection Working Group 1994). This provides the opportunity to include additional areas in a potential Ramsar nomination.

Major stakeholders other than CALM:

Occupiers and users of the Aboriginal Reserve and any Native Title Claimants.

Potential to maintain the wetland's values (viability of the potential new nomination):

The area is remote and is accessed mainly by boat. Principal management challenges are the control of feral animals (cattle) and fire.

Other wetland management considerations:

The site is identified in the State Planning Strategy as an "Environmental Priority Management Area" (Western Australian Planning Commission 1997). The Nature Reserve is listed as a UNESCO Man and Biosphere Reserve and is included on the Register of the National Estate.

The Kimberley region at present has four existing Ramsar Sites. Management planning and implementation by CALM is severely hampered by the inadequate resources available for the region (Watkins *et al.* 1997). The nomination of additional Ramsar Sites in this region may add to the difficulties unless additional resources are allocated.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

- Marine Parks and Reserves Selection Working Group. 1994. *A Representative Marine Reserve System for Western Australia*. Department of Conservation and Land Management, Western Australia.
- Watkins D, Brennan K, Lange C, Jaensch R & Finlayson M. 1997. *Management Planning for Ramsar Sites in the Kimberley Region of Western Australia*. Report to the Department of Conservation and Land Management. Wetlands International - Oceania. Canberra.
- Western Australian Planning Commission. 1997. *State Planning Strategy, Final Report*. Western Australian Planning Commission. Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

The Directory site includes land that is not managed by CALM and as such consultation with and support of the other landowners/stakeholders would be needed. Native Title Issues may also apply to the Vacant Crown Land.

A third issue that needs to be addressed is to increase resources for the CALM Kimberley Region to enable appropriate planning and management of the existing Ramsar listed wetlands.

A strategy needs to be developed for the order in which the three Kimberley river systems (Drysdale, Prince Regent and Mitchell River System) will be addressed as potential Ramsar Sites.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Roebuck Plains System

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Roebuck Plains System - DL006WA - page 797.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Broome on 15/9/98 with Allen Grosse (Manager, West Kimberley District).

Ramsar criteria and how met:

- 2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle). The grass plains are a key pre-migration feeding area for large concentrations of Little Curlew and Oriental Pratincole.
- 3a (it regularly supports 20,000 waterfowl). More than 20,000 waterbirds have been counted at Roebuck Plains System: up to 50,000 shorebirds have been counted feeding on or over the Plains.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). Roebuck Plains System supports more than 1% of the Flyway population of Little Curlew (up to 50,000 counted) and Oriental Pratincole (50,000).

New information on application of the criteria to the wetland:

None obtained.

Tenure and extent of the potential new nomination:

The site is contained within Roebuck Plains and Thangoo pastoral leases. The Roebuck Plains System adjoins the Roebuck Bay Ramsar Site and should be considered as an extension on the basis of the hydrological connection and the movement of waterbirds between the two areas.

Major stakeholders other than CALM:

Roebuck Plains, Thangoo Station and Rubibi Working Group.

Potential to maintain the wetland's values (viability of the potential new nomination):

Little Curlew feed on insects in the moist soil of the plains while Oriental Pratincole hawk for flying insects. The value of Roebuck Plains System for these species is unlikely to be compromised by sound pastoral operations. A change in land use that involved the removal of the grassland could be expected to adversely affect these two shorebird species.

The grasslands have been identified as a community that is "geographically restricted and presently or potentially subject to an endangering processes" (grazing) (CALM 1992).

Other wetland management considerations:

A management agreement would need to be developed to ensure that existing pastoral operations could continue while maintaining the waterbird populations of the plains.

For over ten years there have been a number of recommendations by CALM for the establishment of a Marine Park in Roebuck Bay (e.g. Marine Parks and Reserves Selection Working Group 1994). The State Planning Strategy recognised the Bay as a "Marine Planning Priority Area" (Western Australian Planning Commission 1997). The recent consultative planning process (Waterbank Structure Plan) may provide new mechanisms and opportunities to progress the marine park.

The Kimberley region at present has four existing Ramsar Sites. Management planning and implementation by CALM is severely hampered by the inadequate resources available for the region (Watkins *et al.* 1997). The nomination of additional Ramsar Sites in this region may add to the difficulties unless additional resources are allocated.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

- CALM. 1992. *A Nature Conservation Strategy for Western Australia (A draft for Public Comment)*. Department of Conservation and Land Management, Western Australia.
- Marine Parks and Reserves Selection Working Group. 1994. *A Representative Marine Reserve System for Western Australia*. Department of Conservation and Land Management, Western Australia.
- Watkins D, Brennan K, Lange C, Jaensch R & Finlayson M. 1997. *Management Planning for Ramsar Sites in the Kimberley Region of Western Australia*. Report to the Department of Conservation and Land Management. Wetlands International - Oceania. Canberra.
- Western Australian Planning Commission. 1997. *State Planning Strategy, Final Report*. Western Australian Planning Commission. Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

The key issue is to develop an agreement with pastoral lease holders on appropriate management for the area. There is a need to consider the proposed establishment of a marine protected area in Roebuck Bay and the potential to extend the existing Ramsar listed area to include more of the Bay. It is recommended that establishment of the marine protected area is a higher priority than the landward extension of the Ramsar Site. Agreement is needed on future land use and, following this, management arrangements for the wetlands. A further issue that needs to be addressed is to increase resources for the CALM Kimberley Region to enable appropriate planning and management of the existing Ramsar listed wetlands.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Rottnest Island Lakes

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Rottnest Island Lakes - SWA020WA - page 897.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Kelmscott on 3/9/98 with Jim Lane (Principal Research Scientist, Science Division), Bruce Harvey (Manager, Swan Region) and David Mitchell (Nature Conservation Program Leader, Swan Region).

Ramsar criteria and how met:

3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). The Rottnest Island Lakes support at least 1% of the population of Banded Stilt (counts of up to 3000).

New information on application of the criteria to the wetland:

Use of the Rottnest wetlands by Banded Stilts is regular and has given rise to the local name "Rottnest snipe" for that species. Further consideration could be given to whether/not criterion 1d also is met: the wetlands are a good example of a wetland type (permanent saline lakes), three of which are the only lakes in Australia known to exhibit seasonal meromixis.

Tenure and extent of the potential new nomination:

The potential Ramsar Site would comprise the wetlands on Rottnest Island, all of which are vested in the Rottnest Island Board (there is no NPNCA-vested land).

Major stakeholders other than CALM:

The Rottnest Island Board.

Potential to maintain the wetland's values (viability of the potential new nomination):

There is high potential to maintain the conservation values. Minor viability concerns are being addressed at present.

Other wetland management considerations:

A Management Plan exists for Rottnest Island

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

CALM should bring the potential Ramsar nomination to the attention of the Rottnest Island Board. Andrew Hill of CALM, formerly with RIB, may be a useful source of information.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 1 November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff**Shark Bay East and Hamelin Pool**

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Shark Bay East - CAR006WA - page 780.
Hamelin Pool - CAR003WA - page 777.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Crawley on 9/9/98 with Jim Lane (Principal Research Scientist, Science Division) and Kelly Gillen (Manager, Midwest Region).

Ramsar criteria and how met:

- 1d (it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region). Hamelin Pool, which is a hypersaline, shallow marine embayment, supports extensive microbialite formations, which are the most abundant and diverse examples of growing marine microbialites in the world. It is a unique wetland in the Arid Interior region.
- 2a (it supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species). Two nationally endangered species of turtle, the Loggerhead and Green Turtle, occur in significant numbers in Shark Bay.
- 2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle). Shark Bay is a major nursery and/or feeding area for turtles, rays, sharks, other fishes, prawns and other marine fauna; it is also a major migration stop-over area for shorebirds.
- 3a (it regularly supports 20,000 waterfowl). Waterbird counts at Shark Bay have recorded 50,000 and 37,400 shorebirds and tens of thousands of these and other waterbirds probably occur every year.
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). The Shark Bay East and Hamelin Pool system supports more than 1% of the Flyway population of:
- | | |
|-------------------|--------|
| Banded Stilt | 14,500 |
| Bar-tailed Godwit | 10,000 |
| Eastern Curlew | 313 |

New information on application of the criteria to the wetland:

Many of the values listed in the management plan for the area (CALM 1996) are relevant to and support the wetland meeting the criteria set for identifying wetlands of international importance under the Ramsar Convention. Additional nationally vulnerable species that have been recorded at the site are the Humpback Whale and Little Tern.

Tenure and extent of the potential new nomination:

In considering nomination of Shark Bay for Ramsar listing important decisions need to be made on the boundaries for the potential Ramsar Site. From the perspective of maintaining the values of the area and for ease of administration it is preferable to enlarge the area listed in the Directory to include the complete Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve. While this would include

some water greater than 6 m in depth this should be viewed in a similar way to the inclusion of upland areas in land-based Ramsar nominations, i.e. as part of a system and providing buffer for core areas that support the principal conservation values.

The Shark Bay Regional Strategy has proposed that those marine parts of the World Heritage Area which at present are not included in the Marine Reserves should be zoned for "Multiple Marine Use" (Shark Bay Region Plan Review Steering Committee 1997).

Major stakeholders other than CALM:

There is a large number of stakeholders involved in the area. This includes two World Heritage Committees that advise a Ministerial Council. Obtaining the support of Denham Shire will be an essential element of obtaining community support for Ramsar listing of the area (Kelly Gillian pers. comm.)

Potential to maintain the wetland's values (viability of the potential new nomination):

This is addressed in the Shark Bay Marine Reserves Management Plan: 1996 - 2006 (CALM 1996).

Other wetland management considerations:

Shark Bay is listed as a World Heritage Area and is included on the Register of the National Estate. A review of World Heritage values will be conducted by the Scientific Committee in 1999.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

CALM. 1996. *Shark Bay Marine Reserves Management Plan: 1996 - 2006*. Department of Conservation and Land Management for the National Parks and Nature Conservation Authority. Perth.
Shark Bay Region Plan Review Steering Committee. 1997. *Shark Bay Regional Strategy*. Western Australian Planning Commission. Perth.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Extensive community consultation is needed before proceeding with a nomination. The consultative arrangements established for the World Heritage Area and the proposed review of World Heritage values provide an opportunity for CALM to pursue discussions on potential Ramsar listing of the area

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Doug Watkins, Wetlands International - Oceania, October 1998, revised November 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff

Swan-Canning Estuary

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Swan-Canning Estuary - SWA022WA - page 900.

Potential new Ramsar nomination or extension to existing Ramsar site:

New nomination.

CALM personnel consulted:

Meeting at Kelmscott on 3/9/98 with Jim Lane (Principal Research Scientist, Science Division), Bruce Harvey (Manager, Swan Region) and David Mitchell (Nature Conservation Program Leader, Swan Region).

Ramsar criteria and how met:

3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). Data from the 1980s indicate that the Swan-Canning Estuary supports at least 1% of the populations of Red-capped Plover and Red-necked Stint.

New information on application of the criteria to the wetland:

There is some doubt (supported by comments by J. Blyth) that the Estuary still supports the numbers of shorebirds which enables the wetland to meet criterion 3c. Members of the WA Wader Study Group (e.g. Mike Bamford) should be consulted on this question.

Tenure and extent of the potential new nomination:

The potential Ramsar Site would comprise the three NPNCA vested Nature Reserves (Alfred Cove, Pelican Point, Milyu) and contiguous MPA vested Marine Parks over the mudflats, which are hydrologically connected. John Blyth (pers. comm.) agreed with this approach. Unlike Peel-Harvey Estuary, many parts of which are used by shorebirds, the three Nature Reserves/Marine Parks are the principal shorebird habitats on the Swan-Canning Estuary.

Major stakeholders other than CALM:

There are many stakeholders, e.g. The City of Melville would need to be consulted regarding the Alfred Cove component. There is at least one neighbour for each component of the proposed Ramsar Site.

Potential to maintain the wetland's values (viability of the potential new nomination):

Shorebird numbers apparently have declined in Swan-Canning Estuary since the high numbers were recorded in the 1980s. The Milyu component is threatened by widening of the Kwinana Freeway. Jet ski use has been proposed for parts of the Estuary and this may impact shorebird usage.

Other wetland management considerations:

None discussed.

Other information on conservation values:

None provided.

References (additional to those in the Directory):

None identified.

Conclusions:

Is the wetland internationally important and thus suitable to be nominated: Yes.

Issues that must first be resolved before nomination can proceed:

Research needs to be done to quantify current shorebird usage of each component of the proposed Ramsar Site. The viability of the proposed Ramsar Site also need to be assessed comprehensively.

Suggested timeframe for nomination:

After May 1999.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 16 October 1998.

Assessment of potential for Ramsar nomination following consultations with CALM Regional Staff**Vasse-Wonnerup Wetland System**

The following should be read in conjunction with the relevant data in *A Directory of Important Wetlands in Australia, Second edition*, Western Australia section (Lane *et al.* 1996).

Directory cross-reference:

Vasse-Wonnerup Wetland System - SWA024WA - page 904

Potential new Ramsar nomination or extension to existing Ramsar site:

Extension.

CALM personnel consulted:

Meeting at Busselton on 31/8/98 with Jim Lane (Principal Research Scientist, Science Division), Roger Banks (Manager, South West Capes District) and Kim Williams (Conservation Program Leader, Central Forest Region).

Ramsar criteria and how met:

The criteria under which Vasse-Wonnerup System was originally designated as a Ramsar Site are:

- 3a (it regularly supports 20,000 waterfowl). More than 33,000 waterbirds have been counted at Vasse-Wonnerup System (January 1988). Waterbird data indicate that probably more than 20,000 waterbirds use the Site each year and that particular counts in summer would have exceeded 20,000 in at least several of the past 25 years. This information supports the conclusion that, in the Western Australian context, the Site "regularly supports 20,000 waterfowl".
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl). At least 1% of the Australian population of Black-winged Stilt *Himantopus himantopus* and at least 1% of the world population of Red-necked Avocet *Recurvirostra novaehollandiae* use Vasse-Wonnerup System in most years.

New information on application of the criteria to the wetland:

This was not discussed because the proposal is for extension of an existing Ramsar Site..

Tenure and extent of the potential extensions:

Ten areas were identified as being potentially suitable for addition to the Ramsar site:

- (1) dryland parts of Sabina Nature Reserve (31188);
- (2) the new Nature Reserve (41568) on the NW side of Vasse Estuary (Busselton end);
- (3) dryland parts of Tuart National Park, south of old Bussell Hwy (note that Abba River is already included in the Ramsar site);
- (4) land ceded to the Crown on the NW side of Wonnerup Estuary;
- (5) land between the Port Geographe development and the NW side of Vasse Estuary, which is due to come to the Crown as conservation area;
- (6) land between Estuary Waters Estate and the SE side of Vasse Estuary, which is due to come to the Crown as conservation area;
- (7) land at the SE side of Wonnerup Estuary (status to be clarified);
- (8) land possibly already ceded to the Crown on the SE side of Vasse Estuary near Abba R.;
- (9) that part of Vasse Estuary, and associated wetlands, which is between Ford Road and the upstream limits of saline water (the weir at the butter factory), of which the open water is VCL, most of the swamp is thought to be Crown land (railway reserve?), some is Shire reserve and some is freehold; and
- (10) the Broadwater wetlands.

Of these, (1) to (3) are clearly in the CALM estate under NPNCA vesting and (4) to (8) and the non-freehold parts of (9) will become likewise over the next few years or have potential to be so. Area (10) is not yet described in the Directory and so has not been evaluated as a candidate Ramsar site on its own merits under the present process; its addition to the existing Ramsar site may depend on obtaining sufficient data on conservation values of the intervening (New River) wetlands.

Major stakeholders other than CALM:

None, for areas (1) to (4); the present owners, for (5) to (8); Westrail and the Shire of Busselton for (9); and adjacent landholders for (10).

Potential to maintain the wetland's values (viability of the potential extensions):

Most of the areas (1) to (10) above are or will be managed by CALM. Given the ongoing planning and management initiatives of CALM with respect to Vasse-Wonnerup System, it can be assumed that conservation values of the proposed extensions will be maintained.

Other wetland management considerations:

None discussed.

Other information on conservation values:

The proposed extensions provide substantial buffer zones for the wetlands of the Ramsar Site and habitat for animals that occur in the wetlands, e.g. the tuart forest (area 3) provides duck nesting habitat.

References (additional to those in the Directory):

Not applicable.

Conclusions:

Is the wetland internationally important: Yes: already a Ramsar Site.

Issues that must first be resolved before extensions can proceed:

Addition of areas (1) to (3) to the Ramsar Site can proceed.

In order to add areas (4) to (9) to the Ramsar site, completion of land tenure changes and/or consultation with stakeholders must be completed. The Broadwater (area 10) should be considered for inclusion in the next edition of the Directory and further data on conservation values need to be collected for the nearby New River wetlands.

Note: CALM needs to rectify the discrepancy between the map deposited with Ramsar Bureau and the map held by CALM, in regard to land at the far SE edge of Wonnerup Estuary.

Suggested timeframe for extensions:

Areas (1) to (3) to be added by May 1999, the other areas after May 1999 subject to resolution of tenure and any other issues.

Compiler and date:

Roger P. Jaensch, Wetlands International - Oceania, August 1998, revised 15 October 1998.

ANNEX 5

DOCUMENTS FOR NEW NOMINATIONS AND EXTENSIONS TO EXISTING SITES

Nominations for proposed new Ramsar Sites:

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Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

10 November 1998

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DD MM YY

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Designation date

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Site Reference Number

2. Country:

Australia

3. Name of wetland:

Becher Point Wetlands

4. Geographical coordinates:

32° 23' S, 115° 45' E.

5. Altitude: (average and/or max. & min.) a few m above sea level (Australian Height Datum).

6. Area: (in hectares) 672 ha (of which less than 10 % is wetland).

7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

The Site comprises a substantial portion of the system of inter-dunal wetlands associated with Becher Point, on the coast of South-Western Australia. The series of wetlands within the Site exhibits a continuum of development in geomorphology, hydrology and vegetation and is considered by researchers to be a unique wetland system in Western Australia and one of the youngest wetland systems on the Swan Coastal Plain.

8. Wetland Type (the applicable codes for wetland types as listed in Annex I of the *Explanatory Note and Guidelines* document.)

Where the type includes options, the relevant options are shown in bold:

Ts (**seasonal**/intermittent freshwater **marshes**/pools).

W (shrub-dominated wetlands).

Please now rank these wetland types by listing them from the most to the least dominant:

W, Ts.

9. Ramsar Criteria: (the applicable criteria; see point 12.)

1d (it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region).

Please specify the most significant criterion applicable to the site: 1d

10. Map of site included? Please tick *yes* -or- *no*

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

11. Name and address of the compiler of this form:

Roger Jaensch, Wetlands International - Oceania, GPO Box 636, Canberra ACT 2601, Australia, (Tel: +61-2-6250-0779; Fax: +61-2-6250-0799; email: roger.jaensch@ea.gov.au), on behalf of the Western Australian Department of Conservation and Land Management. All inquiries should be directed to Jim Lane, Department of Conservation and Land Management, 14 Queen Street, Busselton WA 6280, Australia, (Tel: +61-8-9752-1677; Fax: +61-8-9752-1432; email: jiml@calm.wa.gov.au).

12. Justification of the criteria selected under point 9, on previous page.

(Please refer to Annex II in the *Explanatory Note and Guidelines* document).

1d The Becher Point Wetlands are an example of shrub swamps and seasonal marshes that have formed in an extensive sequence of inter-dunal depressions that have arisen from seaward retreat of the coastline over recent millenia. This type of wetland system is rare in South-Western Australia. Examples of this type of geomorphological sequence in equally good condition and within a protected area, are rare world-wide.

13. General location: (include the nearest large town and its administrative region)

The Becher Point Wetlands are in the City of Rockingham (local authority) in the State of Western Australia (population ca. 1.77 million). The Becher Point Wetlands are 12 km south of the city of Rockingham (population ca. 64,000 in the local government area).

The Becher Point Wetlands Ramsar Site comprises the entire areas of Nature Reserves 44077 and 45041. It includes a substantial part of the suite of approximately 200 discrete, very small wetlands located between Becher Point (Indian Ocean coast) and the Perth-Mandurah Road.

14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

The Site is situated in the Perth Basin, in the Quindalup Dunes formation, on the beach ridge plains that form the cusate foreland at Becher Point. The Site's wetlands are within 0.2-1.5 km of the Indian Ocean. The wetlands comprise chains of microscale linear, ovoid or irregular swamps arranged in about ten groups roughly parallel to the coast, separated by sand ridges.

The Site's wetlands are seasonal: they are usually dry in summer-autumn. Water is derived primarily from groundwater and direct precipitation and generally is less than 0.3 m deep, exceptionally above 0.5 m deep. There is little or no information on water quality but water in the wetlands is thought to be fresh.

Median and mean annual rainfall at Rockingham are 818 mm and 826 mm respectively, mostly falling in May-August. Annual evaporation is about 1900 mm (Semeniuk 1991).

15. Hydrological values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

The Site's wetlands possibly contribute to maintenance of groundwater in surrounding areas.

16. Ecological features: (main habitats and vegetation types)

The swamps support sedgeland, tall open-shrubland and/or low open-forest in various spatial arrangements. The sedgeland is dominated by *Baumea articulata*, *B. juncea*, *Typha* spp., *Lepidosperma* spp. and *Bolboschoenus caldwellii* and *Juncus kraussii* also occur; the forest/woodland is dominated by *Melaleuca raphiophylla* and *M. hamulosa*, *M. cuticularis*, *M. teretifolia* also occur (Semeniuk 1991). Surrounding areas support mainly open-heathland.

17. Noteworthy flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

None identified, though in the near future the wetland vegetation community is likely to become nationally recognised as a threatened ecological community (J. Blyth pers. comm.).

18. Noteworthy fauna: (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

None recognised. The White-faced Heron *Ardea novaehollandiae* is one of the few fauna species recorded. The habitat is probably suitable for crakes and rails, some ducks and Little Grassbird *Megalurus gramineus* (Semeniuk 1991). All of the above are widespread and common species in South-Western Australia.

19. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

There is strong community support for protection of the natural history values of the Becher Point wetlands.

20. Land tenure/ownership of: (a) site (b) surrounding area

(a). The entire Ramsar Site is within Nature Reserves 44077 and 45041 vested in the National Parks and Nature Conservation Authority (appointed by the Government of Western Australia) for the purposes of "Conservation of Flora and Fauna".

(b). Surrounding areas include freehold (privately owned) land, Government Reserves (e.g. for recreation), Marine Park, other marine waters and Vacant Crown Land.

21. Current land use: (a) site (b) surroundings/catchment

(a). There is no land use other than nature conservation within the Ramsar Site. There are no facilities at present for nature-based recreation and this type of recreation is negligible within the Ramsar Site. Small numbers of anglers traverse the Site in order to undertake beach fishing.

(b). The most important land use in the surrounding areas is urban (residential), which is increasing; other uses include recreation and rural smallholdings. Human population in the Site's immediate surrounds is in the order of several hundreds of people but is increasing.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects: (a) at the site (b) around the site

(a). Some disturbance of the Site by off-road use of motor vehicles has occurred. Potentially important factors include too frequent burning, and invasion of exotic plants.

(b). Groundwater is extracted in the vicinity, to maintain a nearby golf course, but there is ongoing monitoring of the impact as required under WA Ministerial conditions of development approval.

23. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

The Nature Reserves were established in 1996-7. The site is listed on the Register of the National Estate. It is part of the proposed Port Kennedy Scientific Park and Rockingham Lakes Regional Park system, which is the subject of a management framework (Tingay and Associates 1997). Preparation of a management plan for the wetlands has begun (D. Mitchell pers. comm.); consultants have been engaged and a community advisory committee established. Actions undertaken or underway on-site have included vermin proof fencing and control of public access.

24. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

There is potential to extend the Ramsar Site in the future, following changes to land tenure and/or adequate consultation with land managers, to adjoining parts of the Rockingham Lakes Regional Park (immediately east, also in the Coo loongup Lake area). This would capture later stages (up to 7000 years before present) in the Holocene dune/wetland development.

25. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

The Site is of international significance in terms of research interest in the evolution of wetlands; it presents a rare opportunity for investigation of coastal history, biological succession and palaeoclimate in the period 7000-1000 years before present. (See Semeniuk 1991 & 1995; Semeniuk *et al.* 1988.) The Site as defined at present includes wetlands aged at up to 4500 years before present.

26. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

No facilities or materials are available at present. However there is considerable potential for this given the close proximity of the urban areas and there are plans to provide information shelters with interpretive signage, also walking paths.

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

Low level recreational use of the Site occurs (see items 21 and 26).

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

Territorial: The State Government of Western Australia.

Functional: The National Parks and Nature Conservation Authority (vesting) and the Western Australian Department of Conservation and Land Management (management).

29. Management authority: (name and address of local body directly responsible for managing the wetland)

The Swan Region, Western Australian Department of Conservation and Land Management.

30. Bibliographical references: (scientific/technical only)

Lane, J., Jaensch, R. and Lynch, R. 1996. Western Australia. In, ANCA. A directory of important wetlands in Australia. Second edition. Australian Nature Conservation Agency, Canberra.

Semeniuk, V. 1995. The Holocene record of climatic, eustatic and tectonic events along the coastal zone of Western Australia - a review. Pages 247-59 in Journal of Coastal Research Special Issue No. 17: Holocene Cycles: climate, sea levels and sedimentation.

Semeniuk, V. and C. Research Group 1991. Wetlands of the City of Rockingham - their classification, significance and management. Report to the City of Rockingham and Western Australian Heritage Committee.

Semeniuk, V., Searle, D.J. and Woods, P.J. 1998. The sedimentology and stratigraphy of a cusplate foreland, southwestern Australia. Journal of Coastal Research 4 (4), 551-564.

Tingay, A. and Associates 1997. Proposed Port Kennedy and Rockingham Parks Management Framework. Western Australian Planning Commission, Perth.

List of Attachments:

- Map of boundary of new Ramsar Site.

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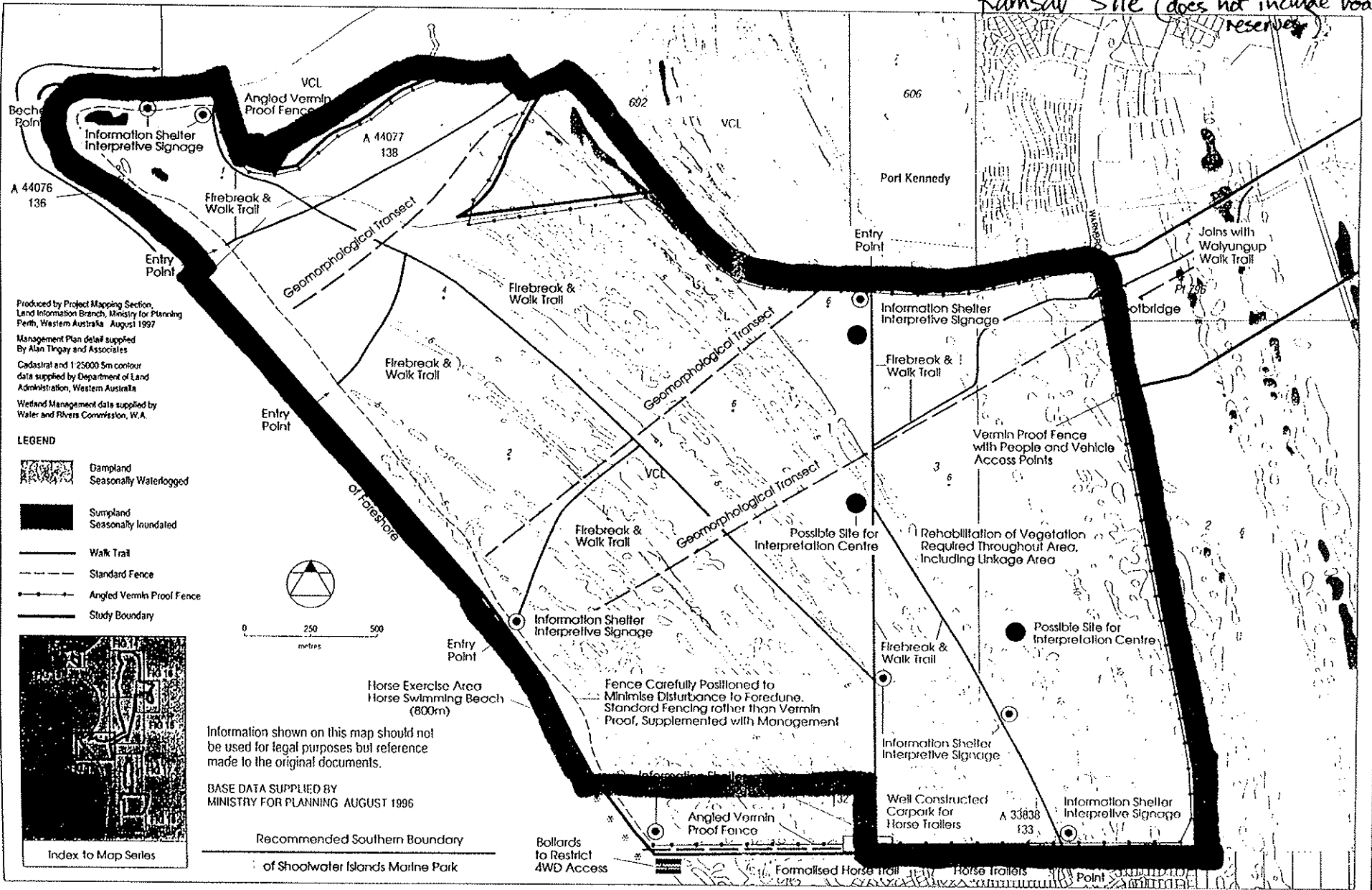
Please return to:

Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 GLAND, Switzerland

Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: ramsar@hq.iucn.org

Becher Point Wetlands

— = boundary of proposed Ramsar Site (does not include road reserves)



Produced by Project Mapping Section, Land Information Branch, Ministry for Planning Perth, Western Australia August 1997
 Management Plan detail supplied by Alan Tingay and Associates
 Cadastral and 1:25000 5m contour data supplied by Department of Land Administration, Western Australia
 Wetland Management data supplied by Water and Rivers Commission, W.A.

LEGEND

- Dampland Seasonally Waterlogged
- Sunpland Seasonally Inundated
- Walk Trail
- Standard Fence
- Angled Vermine Proof Fence
- Study Boundary

0 250 500
metres

Information shown on this map should not be used for legal purposes but reference made to the original documents.

BASE DATA SUPPLIED BY
MINISTRY FOR PLANNING AUGUST 1996

Recommended Southern Boundary

of Shoowater Islands Marine Park

Bollards to Restrict 4WD Access

Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

11 November 1998

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DD MM YY

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Designation date

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Site Reference Number

2. Country:

Australia

3. Name of wetland:

Cape Range Subterranean Waterways

4. Geographical coordinates:

22° 10' S, 113° 55' E (approx. centre of Ramsar Site).

5. Altitude: (average and/or max. & min.) 0-2 m (water surface); sea-level to about 300 m (land surface) (Australian Height Datum).

6. Area: (in hectares) approx. 51,000 ha (of which a small but not readily defined portion is subterranean wetland). The Ramsar Site comprises a large area of land within which subterranean waterways are located.

7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

The Site comprises a large part of the system of subterranean waterways and surface catchment of the Cape Range area, near North West Cape. It includes a suite of natural sinkholes, caves and underground waterways and a series of artificial wells, situated in limestone on an arid coastal plain. This type of wetland system is rare in the Arid Interior in Western Australia. The Site's subterranean waterways support a substantial number of the fish, crustacean and other invertebrate species that are endemic to the Cape Range area. These endemic species include the Blind Gudgeon *Milyeringa veritas*, the Blind Cave Eel *Ophisternon candidum*, blind shrimps *Stygiocaris* spp. and numerous newly described and undescribed species of stygofauna many of which are the only southern hemisphere representatives of entire classes, orders, families and genera of crustaceans.

8. Wetland Type (please circle the applicable codes for wetland types as listed in Annex I of the *Explanatory Note and Guidelines* document.)

Where the type includes options, the relevant options are shown in **bold**:

N (seasonal/**intermittent**/irregular rivers/streams/creeks)
Zk (subterranean karst and cave hydrological systems)

Please now rank these wetland types by listing them from the most to the least dominant:

Zk, N.

9. Ramsar Criteria: (please circle the applicable criteria; see point 12, next page.)

1d (it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region).

2d (it is of special value for one or more endemic plant or animal species or communities).

Please specify the most significant criterion applicable to the site: 2d

10. Map of site included? Please tick *yes* -or- *no*

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

11. Name and address of the compiler of this form:

Roger Jaensch, Wetlands International - Oceania, GPO Box 636, Canberra ACT 2601, Australia, (Tel: +61-2-6250-0779; Fax: +61-2-6250-0799; email: roger.jaensch@ea.gov.au), on behalf of the Western Australian Department of Conservation and Land Management. All inquiries should be directed to Jim Lane, Department of Conservation and Land Management, 14 Queen Street, Busselton WA 6280, Australia, (Tel: +61-8-9752-1677; Fax: +61-8-9752-1432; email: jiml@calm.wa.gov.au).

12. Justification of the criteria selected under point 9, on previous page.

(Please refer to Annex II in the *Explanatory Note and Guidelines* document).

1d. The Site includes extensive and diverse subterranean karst waterways: this wetland type is rare in the Arid Interior in Western Australia, being found at only a few other locations (notably Barrow Island).

2d. The Site's subterranean waterways support a substantial number of the fish, crustacean and other invertebrate species that are endemic to the Cape Range area. These endemic species include species of stygofauna which are the only southern hemisphere representatives of entire classes, orders, families and genera of crustaceans (see item 18). Note that whereas some populations of some of these endemic species are at present outside the Ramsar Site boundary, it may be possible to include more populations and species within the Site boundary in the future.

A comprehensive framework for identifying wetlands that are particularly good representative examples of wetland types (criterion 1a) does not exist for Western Australia. However, this framework is likely to become available in the future and in that event the Cape Range Subterranean Waterways should be assessed against this criterion.

13. General location: (include the nearest large town and its administrative region)

Cape Range Subterranean Waterways is in the Shire of Exmouth (local authority) in the State of Western Australia (population ca. 1.77 million). The Ramsar Site is 6 km west-south-west of the town of Exmouth (population ca. 2400).

The Site comprises Cape Range National Park and a small portion of the Commonwealth Government land (military reserve) that adjoins the Park's southern boundary. The latter component, which is north-east of Sandy Cape, is defined as commencing on the southern Park boundary 2 km east of the Indian Ocean, extending 2 km due south, then continuing due west to the Ocean. It ensures inclusion in the Ramsar Site of an important subterranean wetland located outside of the Park. Named wetlands within the Site include Milyering, Pilgramunna and Tulki Wells; Bundera Sinkhole is one of the important wetlands which at present is outside the Site. The Site does not include the marine waters of Ningaloo Marine Park, which extends seaward from the high water mark along the western boundary of the Site.

14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

The Ramsar Site is situated in the Carnarvon Basin, in Miocene and Quaternary limestones of the Cape Range foothills and surrounding coastal plain. The plain is a former wave cut platform 1-5 km wide cut into Miocene Limestones and with superficial Quaternary deposits. The Site's wetlands include a suite of natural sinkholes, caves and underground waterways and a series of artificial wells. Several creeks, including Tantabidi, Mandu Mandu, Pilgonaman and Yardie Creeks, traverse the Site. (Note that the intertidal wetlands of the Indian Ocean coast are outside the boundary of the Site.)

Water in the Site's wetlands is groundwater perched on a wedge of seawater. Inundation of the wells, sinkholes, caves and waterways generally is permanent. Water may be up to 0.5 m deep in wells, up to 32 m deep in caves. Some tidal movement of water-levels in the wetlands may be detected up to 3.5 km from the coast. The uppermost, thin layer of water is fresh; in places it lies atop brackish water. Water pH varies from 7.0 to 8.1. Water colour is recorded as 0-34 (W.F. Humphreys).

Median and mean annual rainfall at nearby Learmonth is 210 mm and 267 mm respectively, mostly falling in May-June. Annual evaporation at the land surface is about 3000 mm.

15. Hydrological values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

None recognised.

16. Ecological features: (main habitats and vegetation types)

Wetland vegetation associated with the freshwater Yardie Creek includes bulrush *Typha domingensis* and the sedge *Schoenoplectus littoralis* (Keighery and Gibson 1993).

Surrounding areas support low shrubland and tussock grassland.

17. Noteworthy flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

There are no rare, threatened or endemic wetland plants known at the Site.

18. Noteworthy fauna: (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

A rich, entirely endemic stygofauna inhabits the subterranean waterways of the Cape Range area. It is mostly a relictual Tethys Sea fauna. The affinities of many taxa lie with similar habitats in the Canary Islands (especially Lanzarote) and the Caribbean region. The wetland fauna includes the Blind Cave Eel *Ophisternon candidum*, the Blind Gudgeon *Milyeringa veritas*, and the only southern hemisphere representatives of entire classes, orders, families and genera of crustaceans.

Ophisternon candidum and *Milyeringa veritas* are known from 11 and 18 locations respectively, mostly outside Cape Range National Park. Populations (30+) of the latter are sometimes seen while no more than three eels have been recorded at one location. Both species occur in wells, sinkholes and caves and possibly occur widely in the groundwater. Both species are eyeless and colourless and are opportunistic, feeding on invertebrates accidentally entering the system as well as on the stygofauna (specialised subterranean aquatic fauna). The gudgeon has a well developed system of sensory papillae on the head as a special adaptation for cave-dwelling.

Two species of blind shrimps *Stygiocaris lancifera* and *S. stylifera* (Atyidae) which are endemic to the area, are gazetted as rare in Western Australia. There are numerous newly described and undescribed species of stygofauna, mostly crustaceans. These include: a new species of *Danielopolina* (Ostracoda: Halocyprida), the sister group of all other species; one species of *Liagoceradocus* (Amphipoda: Hadziidae); three species of melitid amphipod; the cirrolanid isopod *Haptolana pholeta* (genus known from Barrow Island, Somalia and Cuba); the thermosbaenacean *Halosbaena tulki* (genus known from Barrow Island, Lanzarote and the Caribbean); and the remiped *Lasionectes* (genus known from Turks and Caicos Islands in the Caribbean; the class Remipedia is known only from the Caribbean area and Lanzarote).

The extent to which the endemic stygofauna of the Cape Range area occurs within the Ramsar Site requires further investigation but it is clear that there is substantial inclusion. Proposed extensions to the National Park may facilitate extension of the Ramsar Site such that eventually the endemic stygofauna may be fully represented in the Ramsar Site.

Data are from Allen 1982, Humphreys & Feinburg 1995 and Lane *et al.* 1996.

19. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

Some caves in the Cape Range area have significant Aboriginal cultural (archaeological) values though it is not known whether or not these caves are within the Site, nor whether or not they include the caves that are important for stygofauna.

20. Land tenure/ownership of: (a) site (b) surrounding area

(a). The Ramsar Site is mostly in the Cape Range National Park (Reserve 27288), vested in the National Parks and Nature Conservation Authority (appointed by the Government of Western Australia), for the purpose of "National Park". The adjoining Commonwealth land component is controlled by the Department of Defence.

(b). Surrounding areas include Exmouth town site, Shire land, Vacant Crown Land, pastoral leasehold land, water reserve, limestone reserve and mining tenements.

21. Current land use: (a) site (b) surroundings/catchment

(a). The National Park component of the Site is used for nature conservation and recreation. The Commonwealth component is used as an aerial bombing range. There is negligible resident human population except around tourist facilities.

(b). The most important land uses in the surface catchment are pastoral grazing of sheep. Light industry, small holdings, subdivisions and water extraction are focused at Exmouth.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects: (a) at the site (b) around the site

(a). Water abstraction and nutrient enrichment are threats to the water quantity and quality of the subterranean wetlands. These issues are addressed in the management plan (see item 23).

(b). Potential threats in surrounding areas include limestone quarrying, quicklime manufacture, contamination (petrochemicals, heavy metals, nutrients) and vegetation clearance. Generally they are greatest on the eastern side of the Cape Range peninsula, which is not included in the Ramsar Site.

23. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

The National Park was established in 1964-9. There is a management plan for the Park. The Park is included on the Register of the National Estate.

24. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

It is proposed that adjoining areas, notably coastal plain immediately to the north, be added to the National Park. The Ramsar Site boundaries could be extended to incorporate these additions.

25. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

The groundwater fauna has been the subject of biogeographical and evolutionary studies (notably by W.F. Humphreys) and research on the rare fishes has been conducted by the Western Australian Museum.

26. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

There is potential for education of visitors to the Park on the rare fishes and stygofauna, by emplacement of interpretive signs.

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

The National Park is being used for nature-based recreation by increasing numbers of people as visitor facilities are developed. The focus is currently on coastal areas and few people other than scientific researchers visit the subterranean waterways.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment.etc.)

Territorial: National Park: The State Government of Western Australia; Commonwealth land: the Commonwealth Government of Australia.

Functional: : National Park: The National Parks and Nature Conservation Authority (vesting) and the Western Australian Department of Conservation and Land Management (management); Commonwealth land: the Department of Defence.

29. Management authority: (name and address of local body directly responsible for managing the wetland)

National Park: The Exmouth District (based in Exmouth) of the Pilbara Region, Western Australian Department of Conservation and Land Management.

30. Bibliographical references: (scientific/technical only)

Allen, G.R. 1982. A field guide to the inland fishes of Western Australia. Western Australian Museum, Perth.

Humphreys, W.F. and Feinburg, M.N. 1995. Food of the blind cave fishes of northwestern Australia. Records of the Western Australian Museum 17, 29-33.

Keighery, G. and Gibson, N. 1993. Biogeography and flora of the Cape Range peninsula, Western Australia, in, Western Australian Museum. The biogeography of Cape Range, Western Australia. Records of the Western Australian Museum, Supplement No. 45.

Lane, J., Jaensch, R. and Lynch, R. 1996. Western Australia. In, ANCA. A directory of important wetlands in Australia. Second edition. Australian Nature Conservation Agency, Canberra.

Note. For additional references on the stygofauna please contact Dr. W.F. Humphreys of the Western Australian Museum, Perth.

List of Attachments:

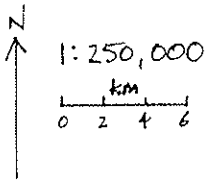
- Map of boundary of new Ramsar Site.

=====

Please return to:

Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 GLAND, Switzerland

Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: ramsar@hq.iucn.org

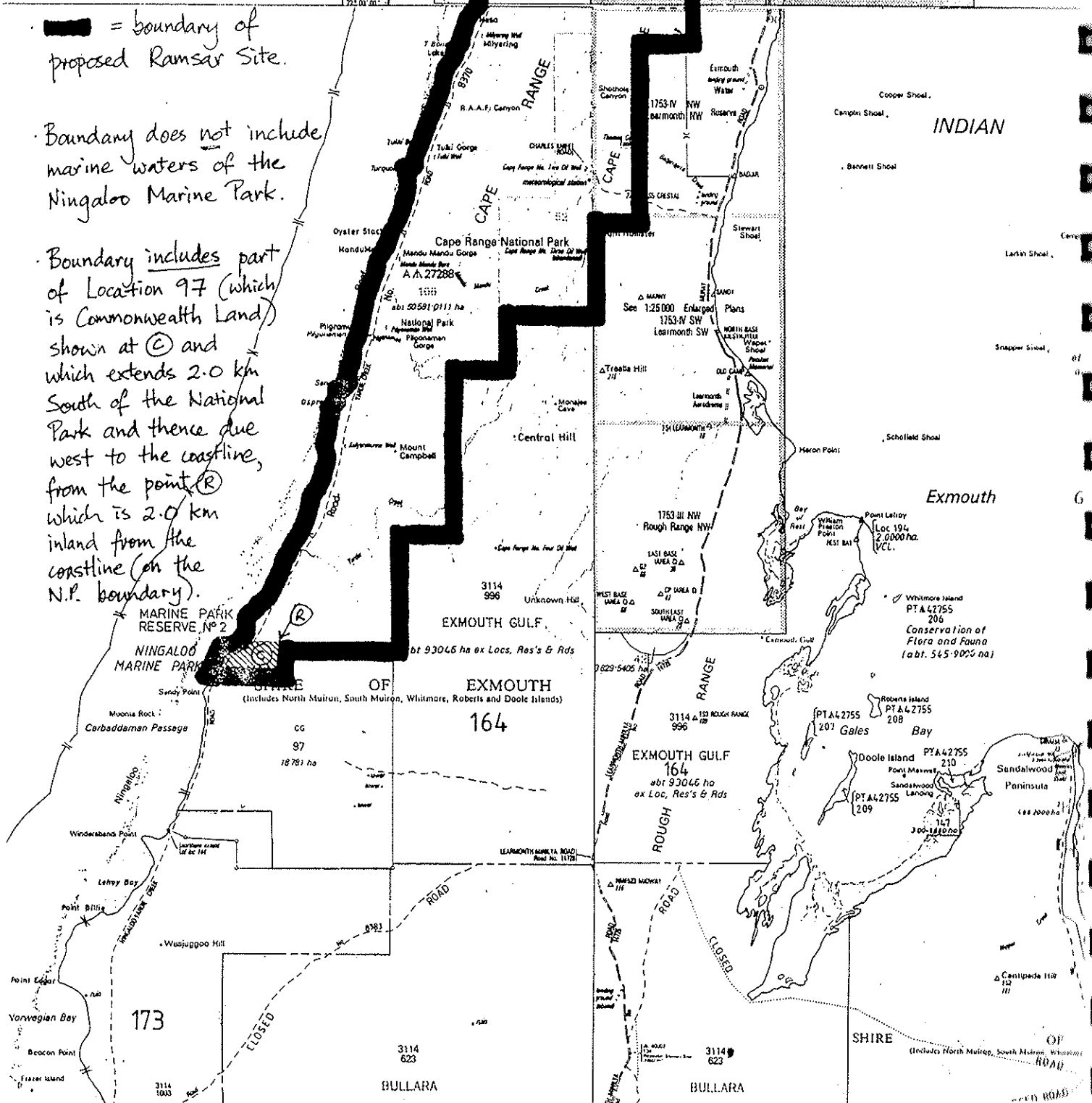


Cape Range Subterranean Waterways

█ = boundary of proposed Ramsar Site.

Boundary does not include marine waters of the Ningaloo Marine Park.

Boundary includes part of Location 97 (which is Commonwealth Land) shown at **Ⓢ** and which extends 2.0 km South of the National Park and thence due west to the coastline, from the point **Ⓡ** which is 2.0 km inland from the coastline (on the N.P. boundary).



NINGALOO MARINE PARK

Exmouth

INDIAN

Exmouth

EXMOUTH GULF
164

173

BULLARA

BULLARA

SHIRE

OF

ROAD

ROAD

Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

10 November 1998

FOR OFFICE USE ONLY.

DD MM YY

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Designation date

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Site Reference Number

2. Country:

Australia

3. Name of wetland:

Chandala Swamp

4. Geographical coordinates:

31° 30' S, 115° 58' E.

5. Altitude: (average and/or max. & min.) 65 m (Australian Height Datum)

6. Area: (in hectares) 134 ha (of which 120 ha is wetland)

7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

The Ramsar Site is Chandala Swamp, which is a small wooded wetland surrounded by agricultural land. It supports breeding colonies of thousands of Straw-necked Ibis *Threskiornis spinicollis* and is one of the most important (among the top three) and most regularly used breeding sites for the Ibis in Western Australia. The Swamp also supports a high diversity of other breeding waterbirds. The vegetation is dominated by mature paperbark *Melaleuca raphiophylla* forest which is characteristic of many permanent and near-permanent freshwater swamps of the Swan Coastal Plain.

8. Wetland Type (the applicable codes for wetland types as listed in Annex I of the *Explanatory Note and Guidelines* document.)

W (shrub-dominated wetlands).

Xf (freshwater, tree-dominated wetlands).

Please now rank these wetland types by listing them from the most to the least dominant:

Xf, W.

9. Ramsar Criteria: (the applicable criteria; see point 12.)

2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle).

Please specify the most significant criterion applicable to the site: 2c

10. Map of site included? Please tick yes -or- no

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

11. Name and address of the compiler of this form:

Roger Jaensch, Wetlands International - Oceania, GPO Box 636, Canberra ACT 2601, Australia, (Tel: +61-2-6250-0779; Fax: +61-2-6250-0799; email: roger.jaensch@ea.gov.au), on behalf of the Western Australian Department of Conservation and Land Management. All inquiries should be directed to Jim Lane, Department of Conservation and Land Management, 14 Queen Street, Busselton WA 6280, Australia, (Tel: +61-8-9752-1677; Fax: +61-8-9752-1432; email: jiml@calm.wa.gov.au).

12. Justification of the criteria selected under point 9, on previous page.

(Please refer to Annex II in the *Explanatory Note and Guidelines* document).

2c. Chandala Swamp regularly supports breeding colonies of thousands of Straw-necked Ibis *Threskiornis spinicollis* and smaller numbers of many other waterbird species (see item 18) and is one of the most important breeding sites for the Ibis, and for waterbirds in general, in South-Western Australia.

A comprehensive framework for identifying wetlands that are particularly good representative examples of wetland types (criterion 1a) does not exist for Western Australia. However, this framework is likely to become available in the future and in that event Chandala Swamp should be assessed against this criterion.

13. General location: (include the nearest large town and its administrative region)

Chandala Swamp is in the Shire of Chittering (local authority) in the State of Western Australia (population ca. 1.77 million). Chandala Swamp is 18 km south-south-east of the town of Gingin (population ca. 600).

Chandala Swamp Ramsar Site comprises the entire area of Nature Reserve 37060. The far south-eastern corner of the wetland is outside the Reserve and Ramsar Site.

14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

The Site is situated in the Perth Basin, on the northern Swan Coastal Plain, 1 km west of the Dandaragan Scarp, in gently undulating sand and alluvium overlying marine limestone. It comprises all but the far south-eastern corner of Chandala Swamp, which is a natural wetland.

Water is derived from a relatively small surface catchment (approx. 500 ha of plain and 800 ha of hills), mainly from drains originating up to 1 km north-east and from diffuse inflow from lowland to the north. Little or no surface inflow is derived from nearby Chandala Brook which by-

passes the Swamp; some outflow from the Swamp to the Brook via drains may occur. The surface catchment of Chandala Swamp is partly cleared.

Chandala Swamp is permanent: it dries back to its innermost areas in autumn but rarely dries completely. Maximum water depth recorded since 1979 is 1.0 m (September 1983, 1984) and the September mean is 0.9 m. Water salinity ranges from 2.5 parts per thousand (January 1981) to 0.5 ppt (May 1983) with a September mean of 0.9 ppt (n = 13); water pH ranges from 6.2 to 9.1; and the water is brown in colour.

Water data are from monitoring by the Department of Conservation and Land Management.

Median and mean annual rainfall at Gingin are 738 mm and 745 mm respectively, mostly falling in May-August. Annual evaporation is about 2200 mm.

15. Hydrological values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

The Swamp is thought to be a significant area for recharge of the Gnangara groundwater mound (A. Hill pers. comm., in Lane *et al.* 1996), from which a significant proportion of the domestic water supply of the city of Perth is drawn.

16. Ecological features: (main habitats and vegetation types)

The Swamp supports low shrubland, closed-scrub and low closed-forest (to closed-forest) more or less in concentric zones around an inner area of open water. The low shrubland includes the samphire *Sarcocornia blackiana*; closed-scrub includes *Melaleuca uncinata*; closed-forest is mainly paperbark *M. raphiophylla* with some *Eucalyptus rudis* near the inner area of open water (Halse *et al.* 1993). Some of the outermost natural vegetation was cleared in the past, creating shallow open water, but has been gradually regenerating.

Surrounding areas are mostly cleared, or support open-woodland of *Banksia* and eucalypts.

17. Noteworthy flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

There are no rare, threatened or endemic wetland plants known at the Site.

18. Noteworthy fauna: (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

Up to 1500 pairs of Straw-necked Ibis breed at Chandala Swamp, with low numbers about one year in five. The colony is one of the largest for this species in Western Australia and is one of the most regularly active colonies, i.e. in the top three (each with similar numbers of breeding pairs) of those used regularly. The ibises nest in *Melaleuca* trees and shrubs mainly near the innermost area of open water.

Other colonial waterbirds that breed in association with the Straw-necked Ibis, usually in small numbers and in the period August-January, are: Little Black Cormorant *Phalacrocorax sulcirostris*, Little Pied Cormorant *P. melanoleucos*, Great Egret *Egretta alba*, Australian White Ibis *Threskiornis molucca*, Yellow-billed Spoonbill *Platalea flavipes*, Rufous Night Heron *Nycticorax caledonicus* and Glossy Ibis *Plegadis falcinellus*. In total, 22 waterbird species are known to breed at Chandala Swamp, a number exceeded in South-Western Australia only at Toolibin Lake (which is a Ramsar Site).

Other information on waterbirds. Surveys have recorded 40 waterbird species at Chandala Swamp. Up to nine Freckled Duck *Stictonetta naevosa* have been counted and breeding has been recorded on at least three occasions. Thousands of ibises roost at night in the swamp trees before and after the breeding period. The highest number of waterbirds counted was 5202 in October 1983.

Data are from Jaensch *et al.* 1988, Lane *et al.* 1996, and data sets held by the Western Australian Department of Conservation and Land Management.

19. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

None recognised.

20. Land tenure/ownership of: (a) site (b) surrounding area

(a). The entire Ramsar Site is the A-Class Nature Reserve 37060 vested in the National Parks and Nature Conservation Authority (appointed by the Government of Western Australia) for the purposes of "Conservation of Flora and Fauna".

(b). Surrounding areas are freehold (privately owned) land.

21. Current land use: (a) site (b) surroundings/catchment

(a). There is no land use other than nature conservation within the Ramsar Site. There are no facilities for nature-based recreation and this type of recreation is negligible within the Ramsar Site.

(b). Freehold land adjoining the Ramsar Site is used for agriculture, notably grazing of domestic sheep and cattle and cereal crops. The Site is 2.5 km north (upstream) of a mineral sands processing plant. Human population in the Site's surface catchment is in the order of several tens of people.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects: (a) at the site (b) around the site

(a). Vegetation fringing the inner area of open water is sometimes damaged through prolonged use for nest sites by large numbers of ibises but tends to recover following short absences of nesting ibises from the Swamp. Periodic damage to vegetation in the Reserve has been caused by feral goats: in response, the Management Authority has undertaken control of the goats.

(b). Since the surface water entering the Swamp traverses agricultural land, input of salt and nutrients is a potential threat to water quality of the Swamp.

23. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

The Nature Reserve was established in 1981.

24. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

Land adjoining the Reserve on the north-east side, which includes much of the Swamp's surface catchment, is in the process of being purchased by the Government and once tenure is resolved potentially it could be added to the Ramsar Site.

25. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

Depth, salinity and other water quality parameters have been measured by the WA Department of Conservation and Land Management annually at Chandala Swamp since 1979 (J. Lane pers. comm.). Waterbird usage was surveyed annually during 1981-88 (Jaensch *et al.* 1988). Some banding of nestling ibises was undertaken in the early 1960s, with recoveries as far away as northern and eastern Australia (Marchant and Higgins 1990).

26. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

No facilities or materials are available at present and there is no convenient public access to the Site.

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

See item 26.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

Territorial: The State Government of Western Australia.

Functional: The National Parks and Nature Conservation Authority (vesting) and the Western Australian Department of Conservation and Land Management (management).

29. Management authority: (name and address of local body directly responsible for managing the wetland)

The Wanneroo District (based in Wanneroo) of the Swan Region, Western Australian Department of Conservation and Land Management.

30. Bibliographical references: (scientific/technical only)

Halse, S.A., Pearson, G.B. and Patrick, S. 1993. Vegetation of depth-gauged wetlands in nature reserves in south-west Western Australia. Western Australian Department of Conservation and Land Management Technical Report 30.

Jaensch, R.P., Vervest, R.M. and Hewish, M.J. 1988. waterbirds in nature reserves of south-western Australia: reserve accounts. Royal Australasian Ornithologists Union Report No. 30. 290 pp.

Lane, J., Jaensch, R. and Lynch, R. 1996. Western Australia. In, ANCA. A directory of important wetlands in Australia. Second edition. Australian Nature Conservation Agency, Canberra.

Marchant, S. and Higgins, P.J. 1990. Handbook of Australian, New Zealand and Antarctic Birds. Volume 1, ratites to ducks. Oxford University Press, Melbourne.

List of Attachments:

- Map of boundary of new Ramsar Site.


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Please return to:

Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 GLAND, Switzerland

Telephone: **+41 22 999 0170** • Fax: **+41 22 999 0169** • e-mail: **ramsar@hq.iucn.org**

Chandala Swamp

 = boundary of proposed Ramsar Site (includes narrow strip to highway).

M2091

982.9814 ha
PLAN 6457

CHATTERING

A 137060
9550
134.0066 ha
(135.9198 ha)
Conservation of Flora & Fauna
Mandowin
A 137060
135.9198 ha
Cons. of Flora & Fauna

PLAN M 2091 6457 982.9814 ha

IDIA. 652771

M 1986
2.0234 ha
IDIA. 112981

M 1909
624.1214 ha
IDIA. 112981

M 1909
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M 1909
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624.1214 ha
IDIA. 112981

M 1909
624.1214 ha
IDIA. 112981

M 1909
624.1214 ha
IDIA. 112981

M 2002

299.7431 ha
IDIA. 163761

Scale: 1:25,000

0 0.5 km

M 1921

500.6214 ha

Natural Gas Pipeline

Water

316
10385
11248
5-0417 ha

Reserve

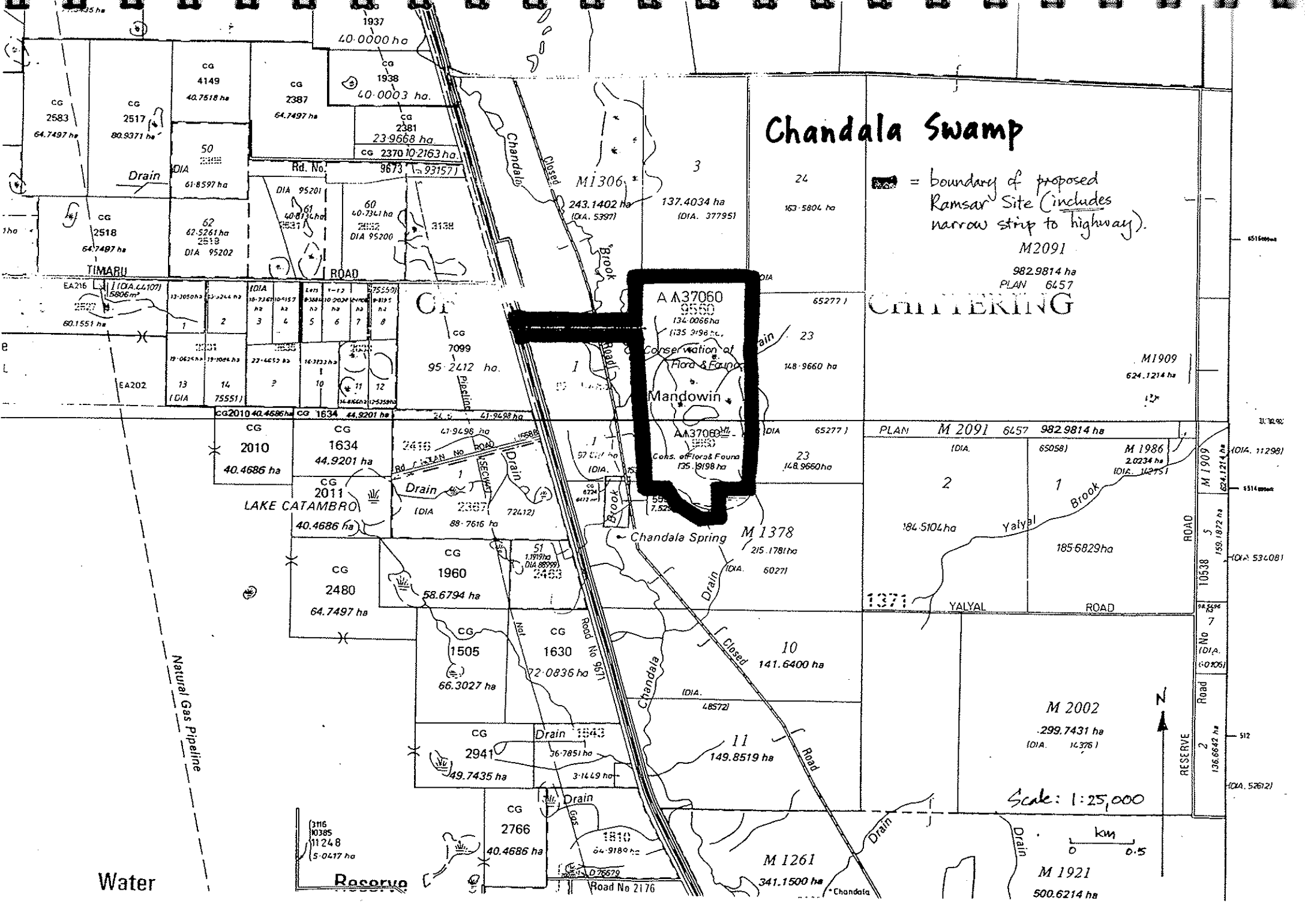
CG 2766
40.4686 ha

Road No 2176

M 1261

341.1500 ha

Chandala



Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

10 November 1998

FOR OFFICE USE ONLY.

DD MM YY

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Designation date

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Site Reference Number

2. Country:

Australia

3. Name of wetland:

Ellen Brook Swamps System

4. Geographical coordinates:

31° 45' S, 116° 02' E.

5. Altitude: (average and/or max. & min.) about 20 m (Australian Height Datum)

6. Area: (in hectares) 228 ha (of which approx. 152 ha is wetland).

7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

The Site comprises a series of winter-wet clay-based swamps that were formerly common on the Swan Coastal Plain but are now rare. The wetlands are situated in Ellen Brook and Twin Swamps Nature Reserves which are 2.5 km apart with farmland in between. The system supports the only known wild population of the Western Swamp Tortoise *Pseudemys umbrina*, considered one of the most endangered vertebrate animals in Australia.

8. Wetland Type (the applicable codes for wetland types as listed in Annex 1 of the *Explanatory Note and Guidelines* document.)

Where the type includes options, the relevant options are shown in bold:

Ts (**seasonal**/intermittent freshwater **marshes**/pools).

W (shrub-dominated wetlands).

Xf (freshwater, tree-dominated wetlands).

Please now rank these wetland types by listing them from the most to the least dominant:

W, Xf, Ts.

9. Ramsar Criteria: (the applicable criteria; see point 12.)

2a (it supports an appreciable assemblage of rare, vulnerable or **endangered** species or subspecies of plant or **animal**, or an appreciable number of individuals of any one or more of these species).

2d (it is of special value for one or more **endemic** plant or **animal** species or communities).

Please specify the most significant criterion applicable to the site: 2a

10. Map of site included? Please tick *yes* -or- *no*

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

11. Name and address of the compiler of this form:

Roger Jaensch, Wetlands International - Oceania, GPO Box 636, Canberra ACT 2601, Australia, (Tel: +61-2-6250-0779; Fax: +61-2-6250-0799; email: roger.jaensch@ea.gov.au), on behalf of the Western Australian Department of Conservation and Land Management. All inquiries should be directed to Jim Lane, Department of Conservation and Land Management, 14 Queen Street, Busselton WA 6280, Australia, (Tel: +61-8-9752-1677; Fax: +61-8-9752-1432; email: jiml@calm.wa.gov.au).

12. Justification of the criteria selected under point 9, on previous page.

(Please refer to Annex II in the *Explanatory Note and Guidelines* document).

2a. The Swamps support the only known wild populations of the Western Swamp Tortoise *Pseudemydura umbrina*, considered one of the most endangered vertebrate animals in Australia.

2d. See 2a above.

A comprehensive framework for identifying wetlands that are particularly good representative examples of wetland types (criterion 1a) does not exist for Western Australia. However, this framework is likely to become available in the future and in that event Ellen Brook Swamps System should be assessed against this criterion.

13. General location: (include the nearest large town and its administrative region)

Ellen Brook Swamps System is in the Shire of Swan (local authority) in the State of Western Australia (population ca. 1.77 million). Ellen Brook Swamps System is 15 km north-north-east of the Perth suburb of Midland (population ca. 4700).

Ellen Brook Swamps System Ramsar Site comprises the entire areas of Nature Reserves 27620 and 42126 (Ellen Brook) and 27621 (Twin Swamps), both of which are adjacent to, but do not receive inflow from, Ellen Brook.

14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

The Site is situated in the Perth Basin, on a gently undulating part of the Swan Coastal Plain, in a narrow zone of alluvial soils at the base of the Darling Scarp (to 200+ m). Swamp substrate at Ellen Brook Swamp is gilgai clay. The wetlands within the Site are microscale irregular-shaped swamps, typically only tens of metres in diameter.

The Site's swamps are perched wetlands receiving water from direct precipitation and, at Twin Swamps, short-distance surface runoff from surrounding cleared farmland.

Inundation is seasonal; under natural conditions the swamps dry out by mid October (Twin Swamps) or November (Ellen Brook Swamp) though water levels are now partly managed to prevent early drying out (see item 18 below). Maximum water depth recorded at the Ellen Brook Swamp wetlands since 1979 is 0.5 m and the September mean is 0.4 m. The Twin Swamps wetlands are shallower. Water salinity at Twin Swamps ranges from 1.8 parts per thousand (June 1974) to 0.3 ppt (June 1973, August 1987) with a September mean - varying among wetlands - of 0.1 to 0.6 ppt (n = 9). The Ellen Brook Swamp wetlands are slightly less saline. Water pH ranges from 5.3 to 7.8 and the water colour is brown at two swamps but colourless at the other swamps.

Water data are from monitoring by the Department of Conservation and Land Management and from Burbidge *et al.* (1990).

Median and mean annual rainfall at nearby Pearce airport are 660 mm and 692 mm respectively, mostly falling in May-August. Annual evaporation is about 2100 mm.

15. Hydrological values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

None recognised.

16. Ecological features: (main habitats and vegetation types)

The Site's wetlands support closed-heathland and open-sedgeland (Ellen Brook Swamp) and open-scrub (Twin Swamps wetlands), mainly at the wetland margins. The heathland is of *Melaleuca lateritia* and *Viminaria denudata* over the sedge *Leptocarpus canus*; open-scrub is *Melaleuca raphiophylla* over *M. viminea* and *M. teretifolia* and *Leptocarpus* spp.

Surrounding areas support open-scrub, or are cleared.

17. Noteworthy flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

The nationally vulnerable wetland plant *Hydrocotyle lemnoides* and several species that are gazetted as rare at State level ("Priority 2" and "Priority 3" flora), occur in appreciable numbers at the Site (Western Australian Department of Conservation and Land Management rare flora records). There are few examples of the clay-zone wetland heathland community remaining on the Swan Coastal Plain (Burbidge 1981).

18. Noteworthy fauna: (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

The nationally endangered Western Swamp Tortoise originally inhabited winter-wet swamps over 100-150 km² of the Swan Coastal Plain between Perth and Pearce Airports, which was one of the first parts of Western Australia developed for agriculture. Once thought extinct, it was rediscovered in 1953 but has declined in numbers from about 100 in two Nature Reserves to 30 (seven adult females) at Ellen Brook Swamp only, and 48 (six adult females) in captivity. It is strictly carnivorous, feeding mainly on aquatic beetles, damselfly larvae, conchostracans, mosquito larvae, ostracods and tadpoles. During the dry season it aestivates in natural holes in

the clay (Ellen Brook) or under leaf litter and fallen branches of *Banksia* trees (Twin Swamps). In drier years, the Twin Swamps wetlands have not held water for a sufficient period of time for tortoises to feed enough to survive summer aestivation: this is now being redressed through artificial maintenance of water levels. The species is threatened by its small range, marginality of remaining habitat, its specialised biology, increasing aridity and exotic predators (foxes). The Management Program for this species, which has federal funding, aims to maintain at least two viable populations in the wild through habitat improvement (supply of additional water to the wetlands), predator reduction (fencing, baiting), captive breeding and release and acquisition of additional habitat.

Information on waterbirds. Six waterbird species have been recorded at the Site. These include Spotless Crake *Porzana tabuensis* and Australian Crake *P. fluminea* which breed in low shrubs with fine sedge.

Other noteworthy fauna. The invertebrate fauna of the Site's wetlands is different from that typical of most Swan Coastal Plain wetlands. Surveys in 1991 revealed 63 invertebrate taxa, including 15 Dystichids, seven Chironomids and seven Odonata; several undescribed invertebrate species occur.

Data are from Burbidge *et al.* 1990, Jaensch *et al.* 1988 and data sets held by the Western Australian Department of Conservation and Land Management.

19. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

None recognised.

20. Land tenure/ownership of: (a) site (b) surrounding area

(a). The entire Ramsar Site is in the A-Class Nature Reserves 27620, 42126 and 27621 which are vested in the National Parks and Nature Conservation Authority (appointed by the Government of Western Australia) for the purposes of "Preservation of Fauna (Short Necked Tortoise)" (27620, 27621) and "Conservation of Flora and Fauna" (42126).

(b). Surrounding areas are freehold (privately owned) land and road reserve (the Great Northern Highway runs on one side of Ellen Brook Nature Reserve).

21. Current land use: (a) site (b) surroundings/catchment

(a). There is no land use other than nature conservation within the Ramsar Site. There are no facilities for nature-based recreation and public use of the Ramsar Site is not encouraged due to presence of the endangered tortoise.

(b). The most important land use in the surface catchment is agriculture (grazing of livestock, cereal crops). Human population in the Site's surface catchment is in the order of several tens of people.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects: (a) at the site (b) around the site

(a). Exotic animals are a threat to the Site's ecological character: foxes are predators of the tortoises. Too frequent wildfire could affect tortoise aestivating sites at Twin Swamps. These issues are being addressed through management.

(b). Factors operating in the Site's surface catchment and which potentially may affect the Site's ecological character include water pollution (via drains), and clay extraction from land adjacent to Ellen Brook Swamp (but which is subject to strict conditions).

23. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

Considerable effort has been made to protect the Western Swamp Tortoise. A Management Program (No. 6) for the tortoise has been published by the Western Australian Department of Conservation and Land Management (Burbidge *et al.* 1990) and implementation of the Recovery Plan for the tortoise is being overseen by a Recovery Team representing five State and Federal agencies. Actions taken include captive breeding, re-population of Twin Swamps, maintenance of water levels and erection of vermin-proof fencing. Draft Environmental Protection Policies (EPP) have been prepared, aimed at protecting Western Swamp Tortoise habitat (e.g. EPA 1994).

The Nature Reserves were established in 1966 (Reserve 27620) and 1992 (Reserve 42126). The site is listed on the Register of the National Estate.

24. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

See item 23.

25. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

Considerable research has been conducted by the Western Australian Department of Conservation and Land Management (principally A. A. Burbidge) and others on the tortoises, since the 1960s. Current wetland research includes hydrological and invertebrate studies. Wetland monitoring has been conducted by the Western Australian Department of Conservation and Land Management and some waterbird surveys were undertaken during 1981-8.

26. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

See item 21. Community awareness has been conducted locally, and widely across the State, to highlight the plight of the tortoise and the actions being taken to aid its recovery.

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

See item 21(a).

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

Territorial: The State Government of Western Australia.

Functional: The National Parks and Nature Conservation Authority (vesting) and the Western Australian Department of Conservation and Land Management (management).

29. Management authority: (name and address of local body directly responsible for managing the wetland)

The Wanneroo District (based in Wanneroo) of the Swan Region, Western Australian Department of Conservation and Land Management.

30. Bibliographical references: (scientific/technical only)

Burbidge, A.A. 1981. The ecology of the western swamp tortoise *Pseudemys umbrina* (Testudines: Chelidae). Australian Wildlife Research 8, 203-23.

Burbidge, A., Kuchling, G., Fuller, P., Graham, G. and Miller, D. 1990. The Western Swamp Tortoise. Western Australian Wildlife Management Program No. 6.

EPA 1994. Draft Environmental Protection Policy for the Western Swamp Tortoise Habitat. Environmental Protection Authority, Perth.

Halse, S.A., Pearson, G.B. and Patrick, S. 1993. Vegetation of depth-gauged wetlands in nature reserves in south-west Western Australia. Western Australian Department of Conservation and Land Management Technical Report 30.

Jaensch, R.P., Vervest, R.M. and Hewish, M.J. 1988. waterbirds in nature reserves of south-western Australia: reserve accounts. Royal Australasian Ornithologists Union Report No. 30. 290 pp.

Lane, J., Jaensch, R. and Lynch, R. 1996. Western Australia. In, ANCA. A directory of important wetlands in Australia. Second edition. Australian Nature Conservation Agency, Canberra.

List of Attachments:

- Map of boundary of new Ramsar Site.

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Please return to:

Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 GLAND, Switzerland

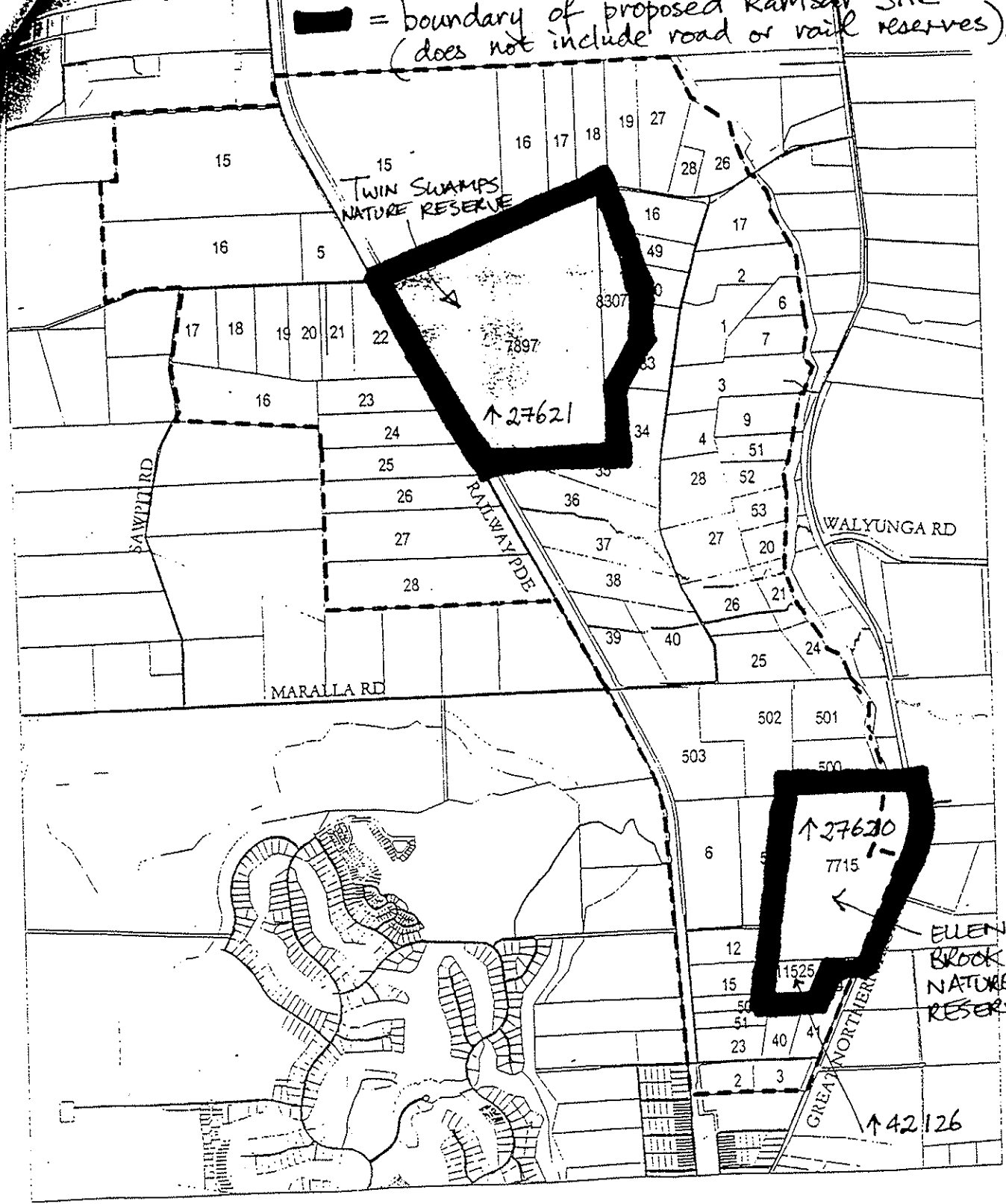
Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: ramsar@hq.iucn.org

WESTERN SWAMP TORTOISE

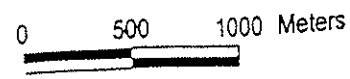
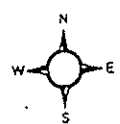
Policy Area and Lot Numbers

Ellen Brook ~~Swamp~~ Swamps System:

— = boundary of proposed Ramsar Site
(does not include road or rail reserves).



- - -** Policy Area Boundary
- ▭** Nature Reserve
- Roads
- Cadastral Boundaries



Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

10 November 1998

FOR OFFICE USE ONLY.

DD MM YY

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Designation date

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Site Reference Number

2. Country:

Australia

3. Name of wetland:

Lake Gore

4. Geographical coordinates:

33° 47' S, 121° 31' E (centre of Lake Gore).

5. Altitude: (average and/or max. & min.) approx. 10-20 m (Australian Height Datum)

6. Area: (in hectares) approx. 3500 ha of which Lake Gore itself comprises 738 ha.

7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

The Site comprises a near-permanent saline lake and part of a downstream system of inter-connected lakes and swamps of various sizes which are intermittently inundated. Lake Gore itself supports the largest known populations of the threatened Hooded Plover *Thinornis rubricollis*, is important for moulting by thousands of Australian Shelduck *Tadorna tadornoides* and for drought refuge by thousands of ducks and shorebirds, and it supports thousands of Banded Stilt *Cladorhynchus leucocephalus*.

8. Wetland Type (please circle the applicable codes for wetland types as listed in Annex I of the *Explanatory Note and Guidelines* document.)

R (seasonal/intermittent saline/brackish/alkaline lakes and flats)

Ss (seasonal/intermittent saline/brackish/alkaline marshes/pools)

Please now rank these wetland types by listing them from the most to the least dominant:

R, Ss.

9. Ramsar Criteria: (please circle the applicable criteria; see point 12, next page.)

- 2a (it supports an appreciable assemblage of rare, **vulnerable** or endangered species or subspecies of plant or **animal**, or an appreciable number of individuals of any one or more of these species).
- 2c (it is of special value as the habitat of plants or **animals** at a critical stage of their biological cycle).
- 3a (it regularly supports 20,000 waterfowl).
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one **species** or subspecies of waterfowl).

Please specify the most significant criterion applicable to the site: 2a

10. Map of site included? Please tick **yes -or- **no****

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

11. Name and address of the compiler of this form:

Roger Jaensch, Wetlands International - Oceania, GPO Box 636, Canberra ACT 2601, Australia, (Tel: +61-2-6250-0779; Fax: +61-2-6250-0799; email: roger.jaensch@ea.gov.au), on behalf of the Western Australian Department of Conservation and Land Management. All inquiries should be directed to Jim Lane, Department of Conservation and Land Management, 14 Queen Street, Busselton WA 6280, Australia, (Tel: +61-8-9752-1677; Fax: +61-8-9752-1432; email: jiml@calm.wa.gov.au).

12. Justification of the criteria selected under point 9, on previous page.

(Please refer to Annex II in the *Explanatory Note and Guidelines* document).

- 2a. The nationally and globally vulnerable Hooded Plover occurs regularly at Lake Gore in appreciable numbers (see criterion 3c and item 18); Lake Gore is the single most important wetland for this species.
- 2c. Lake Gore regularly supports moulting by thousands of Australian Shelducks (see item 18); it is one of the most important moulting sites for shelducks in South-Western Australia. The Lake is also used as a drought refuge by large numbers of waterbirds (see criterion 3a and item 18).
- 3a. More than 29,000 waterbirds have been counted at Lake Gore (see item 18). The number of individual waterbirds that use the lake each year probably exceeds 20,000 and the annual data on water depth suggest conditions are suitable for use by 20,000 waterbirds at least several times within a 25 year period; in the context of wetland availability in Western Australia this is considered sufficient evidence of regular use by 20,000 waterbirds.
- 3c. Lake Gore supports up to 1600 Hooded Plovers which constitutes more than 1% (actually almost one third) of the global population. At least 1% of the population uses the Lake each year. The 1% criterion also is met for Banded Stilt: thousands occur regularly and counts of up to 20,000 (about 10% of the population) have been recorded. See also item 18.

A comprehensive framework for identifying wetlands that are particularly good representative examples of wetland types (criterion 1a) does not exist for Western Australia. However, this framework is likely to become available in the future and in that event Lake Gore should be assessed against this criterion.

13. General location: (include the nearest large town and its administrative region)

Lake Gore is in the Shire of Esperance (local authority) in the State of Western Australia (population ca. 1.77 million). It is 34 km west-north-west of the town of Esperance (population ca. 10,000).

The Lake Gore Ramsar Site comprises the entire area of Nature Reserve 32419 and the eastern part of Nature Reserve 26885, which are almost contiguous (see map). The western boundary of the Site is the "protected road" (unformed track) that provides vehicular access across Nature Reserve 26885 to Warrinup Beach (see map). Wetlands within the Site include Lake Gore and part of a downstream system of inter-connected lakes and swamps of varied sizes ("the overflow wetlands").

A strip of land oriented east-west and approximately 686 m wide inside the northern boundary of Nature Reserve 26885 is excluded from the Site in anticipation of possible future exchange of this land for freehold land that may be added (subject to negotiation with and voluntary agreement of the present owner) to Nature Reserve 32419, and which would substantially enhance the conservation values and management of the wetlands (see map for details). Lakes Gidong, Kubitch and Carbul, which are adjacent but not connected to Lake Gore, are not in the Ramsar Site; neither are Quallilup Lake or the un-reserved overflow wetlands that connect that Lake to the Site (see map). There is potential for addition of these areas of wetland to the Site in the future, subject to resolution of tenure and other issues.

14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

The Site is situated in the Albany-Fraser Orogen, in alluvial/lacustrine sediments overlying marine limestone and gneiss/sandstone on a sub-coastal plain. It includes a large lake (Lake Gore: 738 ha), and a downstream system of inter-connected small lakes, swamps and creeks ("the overflow wetlands"), all of which are natural wetlands.

Water is derived from a relatively large surface catchment, mainly from Dalyup River, Coobidge Creek and minor seasonal streams. The total wetland area downstream of Lake Gore and within the Ramsar Site boundary is in the order of 600 ha. The greater part of the surface catchment of the Ramsar Site is cleared of native vegetation.

Lake Gore is a sub-terminal drainage basin. It is seasonal or near-permanent, sometimes being dry in autumn: maximum depth recorded is 2.0 m (September 1996) and the September mean is 1.4 m. In particularly wet years, which have occurred at least four times in the last 25 years, Lake Gore flows out at two points into the overflow wetlands: at times flow may continue for another 1-2 km beyond the Ramsar Site to Lake Quallilup (a terminal basin) and exceptionally also about 10 kilometres westward beyond the Ramsar Site to Barkers Inlet. Water may be more than 1.0 m deep in the overflow wetlands and may persist for more than 12 months before drying out, unless there are further floods.

Water quality, Lake Gore: salinity ranges from saturated salt (e.g. January 1984, when less than 0.5 m deep) to 6.5 parts per thousand (September 1989) with a September mean of 52.1 ppt (n=12); water pH ranges from 7.1 to 9.4; and the water is colourless. The overflow wetlands mainly hold water when the lake has overflowed and thus are at the lower end of salinities recorded for Lake Gore.

Water data are from monitoring by the Department of Conservation and Land Management.

Median and mean annual rainfall at Esperance (34 km east-south-east of Lake Gore) are 553 mm and 568 mm respectively, mostly falling in May-August. Annual evaporation is about 1800 mm.

15. Hydrological values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

None recognised.

16. Ecological features: (main habitats and vegetation types)

Lake Gore and many of the overflow wetlands support a zone (generally narrow, wide in some overflow swamps) of open-woodland of saltwater paperbark *Melaleuca cuticularis* over understorey of the sedges *Gahnia trifida* and *Schoenus brevifolius* at or near the margins (Halse *et al.* 1993; Lane *et al.* 1996). Areas of low shrubland dominated by the samphires *Suaeda australis* and *Sarcocornia quinqueflora*, the grass *Sporobolus virginicus* and the herb *Samolus repens*, occur in the overflow wetlands.

There is little information on long-term changes to the vegetation though many dead trees in the paperbark woodlands are indicative of prolonged inundation, possibly due in part to increased inflow to the Lake following land clearance in the surface catchment.

Surrounding areas support mainly open-scrub or open-heathland, or are cleared.

17. Noteworthy flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

There are no rare, threatened or endemic plants known at the Site.

18. Noteworthy fauna: (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

Almost one third of the total population (Rose & Scott 1997) of the nationally and globally vulnerable (Collar *et al.* 1994) Hooded Plover occurs regularly at Lake Gore: the maximum count was 1600 in January 1995. The birds often occur in loose groups, sometimes in dense flocks, along the broad north and north-east beaches of Lake Gore. Few if any have been seen in the overflow swamps and there is no evidence of Hooded Plover breeding anywhere in the Site. Although other nearby wetlands, including the Gidong suite of lakes and the Ramsar listed Lake Warden System (at Esperance), also support hundreds of Hooded Plovers, despite many surveys Lake Gore remains clearly the single most important wetland for this species.

Up to almost 10% of the world population of Banded Stilt (20,000 in March 1988) occurs at Lake Gore, usually when the Lake has dried back substantially. This is one of the most important drought refuges for Banded Stilt in South-Western Australia.

Lake Gore is used each year in spring-summer for moulting by thousands (up to 12,000, November 1986) of Australian Shelduck. It is one of the most important moulting sites for shelducks in the bioregion.

Use by shelducks and stilts (see above) indicates that Lake Gore is one of the most important drought refuges for waterbirds in the bioregion. The highest number of waterbirds counted was 29,273 in March 1988 and though no other counts have reached 20,000 the number of individual waterbirds that use the lake each year probably exceeds 20,000. The most abundant species at Lake Gore are Banded Stilt, Australian Shelduck, Grey Teal *Anas gracilis* (3500, December 1987) and Hoary-headed Grebe *Poliiocephalus poliocephalus* (1000, March 1988).

Other information on waterbirds. Surveys have recorded 48 waterbird species at Lake Gore and about 33 at the overflow wetlands: 14 are migrant shorebirds. Fairy Tern *Sterna nereis* (unusual inland) and Freckled Duck *Stictonetta naevosa* sometimes occur in small numbers. Eight species of waterbirds have been recorded breeding at Lake Gore; several species (e.g. Chestnut Teal *Anas castanea*) breed in the overflow wetlands. Most breeding is in wetter years, mainly in samphire and inundated woodland. The most abundant migrant shorebird is Red-necked Stint *Calidris ruficollis* (625 at Lake Gore). Major roost sites for waterbirds in Lake Gore are at the delta-spit of Dalyup River and on rock outcrops (flightless shelducks).

Other noteworthy fauna. The beaches of Lake Gore have red shell deposits of an ostracod (cf *Australocypris* sp.) that thrives in the lake (S. Halse pers. comm.).

Data are from Jaensch *et al.* 1988, Halse *et al.* 1990, Lane *et al.* 1996 and data sets held by the Western Australian Department of Conservation and Land Management.

19. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

None recognised. (See also item 26.)

20. Land tenure/ownership of: (a) site (b) surrounding area

(a). The Ramsar Site comprises A-Class Nature Reserve 32419 and the eastern part of Nature Reserve 26885, both vested in the National Parks and Nature Conservation Authority (appointed by the Government of Western Australia), for the purposes of "Water and Conservation of Flora and Fauna" (32419), and "Conservation of Flora" (26885). Reserve 26885 has been proposed as an addition to Stokes Inlet National Park (CALM 1991).

(b). Surrounding areas include freehold (privately owned) land, Nature Reserve, Recreation Reserve, Vacant Crown Land and marine waters.

21. Current land use: (a) site (b) surroundings/catchment

(a). The principal land use within the Ramsar Site is nature conservation. In addition, low level recreational use occurs. There are no developed facilities for nature-based recreation and this type of recreation is negligible within the Ramsar Site.

(b). The most important land uses in the surface catchment are agriculture (cereal, other seed crops) and grazing of sheep. Some adjoining areas are reserved for nature conservation. Some recreational fishing by local residents occurs at or near Warrinup Beach. Human population in the surface catchment of the Site is in the order of several hundreds of people.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects: (a) at the site (b) around the site

(a). Major algal blooms, probably due to use of agricultural fertilisers in the Dalyup River catchment, occur at Lake Gore from time to time and result in deposits of algal mats on the shores. The impact of these blooms/mats on waterbirds including Hooded Plovers is not known. It is thought that the Site's wetlands were naturally saline and that further substantial salinisation probably will not occur. Dead trees in the paperbark woodlands are indicative of prolonged inundation, possibly due in part to increased inflow to the Lake following land clearance in the surface catchment.

(b). Eutrophication and salinisation are significant threats in surrounding farmland and wetlands. Changes in agriculture are possible, e.g. possible establishment of tree plantations, which if extensive may reduce surface and ground water inputs and input of nutrients and salt.

23. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

Lake Gore formerly was open for duck hunting but recreational duck hunting has been prohibited in Western Australia since 1992.

Cooperative management of parts of the surface catchment, with substantial community participation (Dalyup Catchment Group), is occurring under the federally funded Landcare program.

Most of the shoreline of Lake Gore has less than 50 m of buffer zone within protected areas.

24. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

There is some local interest in the surface catchment becoming designated as a "Key Wetlands and Natural Diversity" Recovery Catchment under the Salinity Action Plan for Western Australia and in the Site becoming part of a continuous "macro-corridor" of natural lands, including protected areas, along the South Coast between Albany and Esperance.

25. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

Depth, salinity and other water quality parameters have been measured by the Western Australian Department of Conservation and Land Management at least annually at Lake Gore since 1979 (J. Lane pers. comm.). Waterbird usage was surveyed annually during 1981-91, with an emphasis on shorebirds and ducks (e.g. Jaensch *et al.* 1988, Halse *et al.* 1990). Intensive study of the Hooded Plover at Lake Gore and elsewhere in the bioregion has been undertaken by Birds Australia. Murdoch University and University of WA have undertaken research on classification and management of the Coobidge Creek wetlands. Also see items 21 and 26.

26. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

No facilities or materials are available at present. Since 1994, depth, salinity and other water quality parameters have been measured at Lake Gore every three months by the Esperance Senior High School as part of a "Ribbons of Blue" community-based water monitoring program. The Site is difficult to access without 4-wheel-drive vehicles.

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

Low level recreation occurs, mainly in Reserve 26885 and associated with the coastline (fishing, swimming). Also see items 21 and 26.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

Territorial: The State Government of Western Australia.

Functional: The National Parks and Nature Conservation Authority (vesting) and the Western Australian Department of Conservation and Land Management (management).

29. Management authority: (name and address of local body directly responsible for managing the wetland)

The Esperance District (based in Esperance) of the South Coast Region, Western Australian Department of Conservation and Land Management.

30. Bibliographical references: (scientific/technical only)

CALM 1991. South Coast Region, Regional Management Plan 1992-2002. Management Plan No. 24, Department of Conservation and Land Management, Perth, Western Australia.

Collar, N.J., Crosby, M.J. and Stattersfield, A.J. 1994. Birds to watch 2. The world list of threatened birds. BirdLife Conservation series No. 4. BirdLife International, Cambridge, UK. 407 pp.

Lane, J., Jaensch, R. and Lynch, R. 1996. Western Australia. In, ANCA. A directory of important wetlands in Australia. Second edition. Australian Nature Conservation Agency, Canberra.

Halse, S.A., Jaensch, R.P., Munro, D.R. and Pearson, G.B. 1990. Annual waterfowl counts in south-western Australia - 1988/89. Dept. of Conservation and Land Management Technical Report No. 25. 43 pp.

Halse, S.A., Pearson, G.B. and Patrick, S. 1993. Vegetation of depth-gauged wetlands in nature reserves in south-west Western Australia. Western Australian Department of Conservation and Land Management Technical Report 30.

Jaensch, R.P., Vervest, R.M. and Hewish, M.J. 1988. waterbirds in nature reserves of south-western Australia: reserve accounts. Royal Australasian Ornithologists Union Report No. 30. 290 pp.

Rose, P.M. and Scott, D.A. 1997. Waterfowl population estimates. Second edition. Wetlands International Publication 44, Wageningen, The Netherlands.

List of Attachments:

- Map of boundary of new Ramsar Site.

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AUSTRALIA

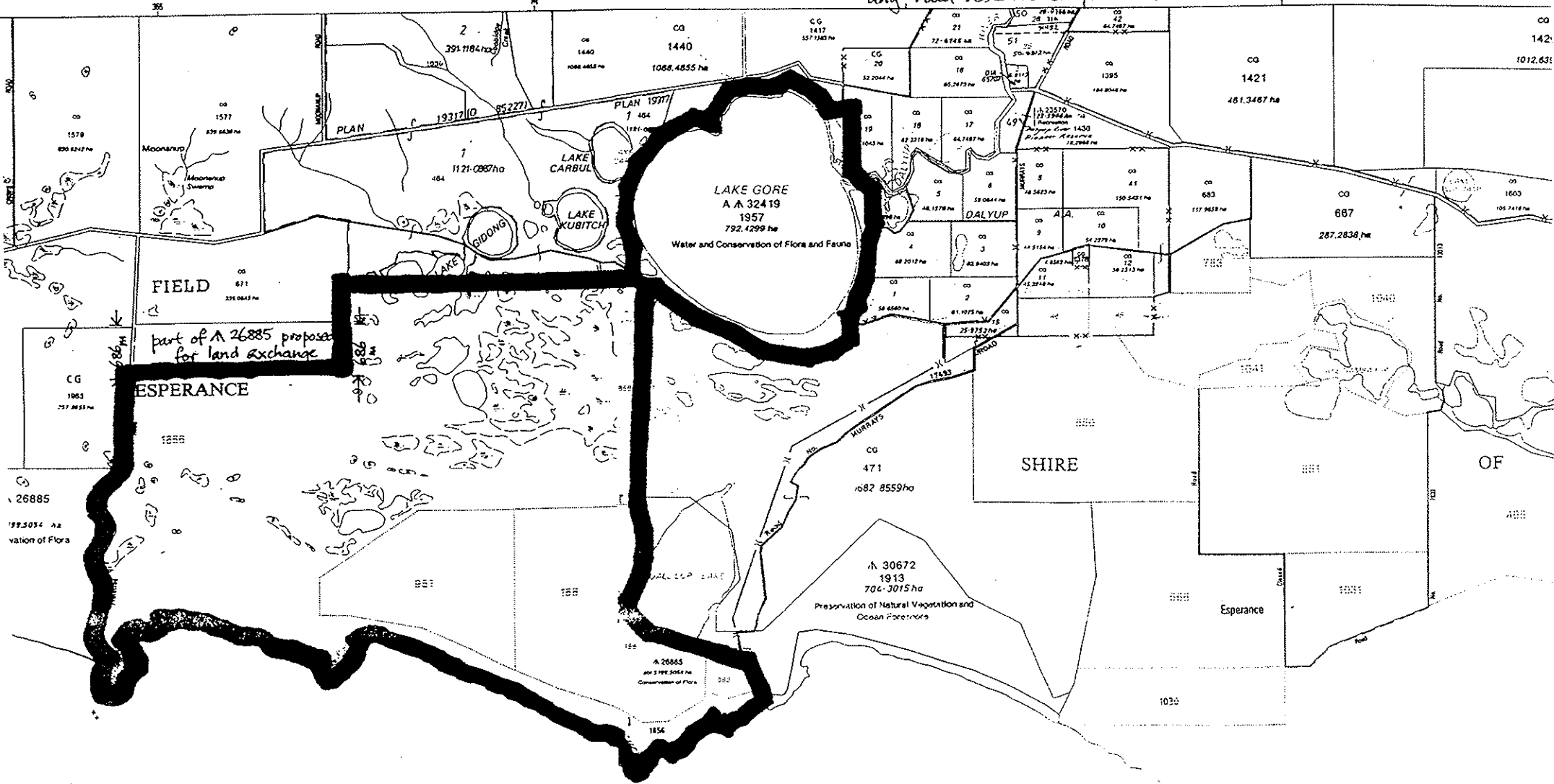
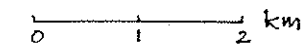
LAKE GORE : PROPOSED RAMSAR SITE

LAKE GORE
WESTERN AUSTRALIA

= boundary of proposed Ramsar Site

N Scale: 1:50,000

Note: this boundary does not include any road reserves or 'protected roads'.



Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

5 November 1998

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DD MM YY

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Designation date

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Site Reference Number

2. Country:

Australia

3. Name of wetland:

Lake MacLeod

4. Geographical coordinates:

23° 56' S, 113° 41' E (approx. centre of Ramsar Site).

5. Altitude: (average and/or max. & min.) from sea level to 3 m below sea level (Australian Height Datum).

6. Area: (in hectares) approx. 37,000 ha (all of which is wetland). Note that the Ramsar Site covers only part of Lake MacLeod, the total area of which is approx. 150,000 ha.

7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

The Ramsar Site is part of Lake MacLeod, one of the most remarkable wetlands in Australia, with a unique combination of features. It comprises intermittently inundated, brackish-saline flats surrounding a series of saline springs and associated permanent saline channels and permanent lagoons. It supports a rare inland occurrence of mangroves which is sustained by upwelling of subterranean seawater because much of the Site is below sea-level. It is internationally important for both migratory and non-migratory shorebirds, with total numbers exceeding 100,000. It supports more than 1% of the population of six shorebird species, notably Curlew Sandpiper *Calidris ferruginea* and Banded Stilt *Cladorhynchus leucocephalus*.

8. Wetland Type (please circle the applicable codes for wetland types as listed in Annex I of the *Explanatory Note and Guidelines* document.)

Where the type includes options, the relevant options are shown in **bold**:

Q (permanent **saline**/brackish/alkaline lakes)

R (seasonal/**intermittent saline/brackish/alkaline lakes** and flats)

Sp (permanent **saline**/brackish/alkaline marshes/pools)

Note that the Site also includes:

I (intertidal forested wetlands) but these mangroves are not in an intertidal situation; and
 Y (freshwater springs), but these are saline rather than freshwater.

Please now rank these wetland types by listing them from the most to the least dominant:

R, Q, Sp.

9. Ramsar Criteria: (please circle the applicable criteria; see point 12, next page.)

- 1d (it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region).
 2c (it is of special value as the habitat of plants or **animals** at a critical stage of their biological cycle).
 3a (it regularly supports 20,000 waterfowl).
 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one **species** or subspecies of waterfowl).

Please specify the most significant criterion applicable to the site: 1d

10. Map of site included? Please tick **yes -or- **no****

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

11. Name and address of the compiler of this form:

Roger Jaensch, Wetlands International - Oceania, GPO Box 636, Canberra ACT 2601, Australia, (Tel: +61-2-6250-0779; Fax: +61-2-6250-0799; email: roger.jaensch@ea.gov.au), on behalf of the Western Australian Department of Conservation and Land Management. All inquiries should be directed to Jim Lane, Department of Conservation and Land Management, 14 Queen Street, Busselton WA 6280, Australia, (Tel: +61-8-9752-1677; Fax: +61-8-9752-1432; email: jiml@calm.wa.gov.au).

12. Justification of the criteria selected under point 9, on previous page.

(Please refer to Annex II in the *Explanatory Note and Guidelines* document).

- 1d. The Site includes an unusual occurrence of mangroves, more than 15 km inland from the ocean and with no surface water connection but sustained by upwelling of seawater delivered by subterranean waterways to springs (sinkholes) in the lake bed. It is unique in the Arid Interior in Western Australia and apparently in all of Australia.
- 2c. The Site is an internationally important migration stopover area for shorebirds and one of the most important such areas in Western Australia (see item 18).
- 3a. More than 114,000 waterbirds have been counted at the Site (see item 18). The permanent wetlands of the Site probably are suitable for use by more than 20,000 waterbirds each year.
- 3c. The Site supports at least 1% of the population of Banded Stilt (up to 53,000 counted), Curlew Sandpiper (up to 41,000) and four additional shorebird species (see item 18).

A comprehensive framework for identifying wetlands that are particularly good representative examples of wetland types (criterion 1a) does not exist for Western Australia. However, this framework is likely to become available in the future and in that event Lake MacLeod should be assessed against this criterion.

13. General location: (include the nearest large town and its administrative region)

Lake MacLeod is in the Shire of Carnarvon (local authority) in the State of Western Australia (population ca. 1.77 million). The Ramsar Site is 105 km north of the town of Carnarvon (population ca. 5000).

The Lake MacLeod Ramsar Site comprises the part of Lake MacLeod that lies north and west of a line joining the trigonometric point "Cape Cuvier Kap 21" (88 m) near Cape Cuvier to the trigonometric point "NMF 581" (9 m) near Sandy Bluff, and south and west of a line joining NMF 581 to the point where the southern boundary of Ningaloo Marine Park meets the coast (near Amherst Point). The margin of the Lake is that shown on the cadastral maps for this area; the Site therefore excludes any pastoral leasehold land including the so-called "Panhandle", an island-like feature connected to the surrounding upland by a narrow peninsula.

The Site does not include the northernmost part of the Lake (including the Lyndon River mouth and outflow), nor the southernmost parts (where commercial salt production takes place), nor the easternmost parts including the mouth and outflow of the Minilya River. However it includes all those areas that provide the Lake's principal conservation values, i.e. the permanent springs, channels and lagoons.

14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

Lake MacLeod is situated in the Carnarvon Basin, in calcareous marine deposits. It is a former (Pleistocene) sea embayment that was isolated from the sea at both north and south ends by falling sea level and development of sand dunes. It is underlain by sand, silt, clay and evaporite beds of gypsum and halite. To the west is limestone upland, forming high cliffs at the sea-front, overlain with red quartzite sand. Alluvial lowlands lie to the south-east and north and Gnargoo Range (of marine origin) is at the north-east side.

The Lake is situated roughly parallel to the coast and is approximately 120 km long and is mostly around 10 km (exceptionally 40 km) wide. The part that is within the Ramsar Site is about 45 km long. A series of sinkholes, typically only a few tens of metres wide, is situated in the north-west part of the Lake, which is within the Ramsar Site. The sinkholes are connected by channels, between a few metres and hundreds of metres wide, to a system of permanent lagoons, marshes and mudflats. The largest lagoon, at the southern end of the system, varies in dimensions according to evaporation but may be 1-2 km wide and several kilometres long.

Water from the Indian Ocean passes underground 18 km through coastal limestone and under hydrostatic pressure rises up in the Site's sinkholes, which are slightly below sea level. Water flows southwards from several principal points of discharge within the sinkhole network, through the channel system to the main permanent lagoon. It periodically overflows across a broad mudflat to the terminal lagoon. Daily two-way exchange of water across the mudflat occurs in spring, and possibly also in other seasons, when prevailing winds have an easterly component in the morning and a westerly component in the afternoon. Water discharging from minor sinkholes terminates in adjacent saline marshes.

The upwelling of seawater is continuous and the discharge rate varies during the day, apparently under the influence of twice-daily tides. Water in the sinkholes may be several metres deep; water in the lagoons and marshes can be in the order of 1 m in depth. The whole of Lake MacLeod was 1 m deep during the 1980 flood.

The greater part of Lake MacLeod periodically receives freshwater from the Lyndon and Minilya Rivers and Cardabia and Boolathana Creeks, the latter being a distributary of the Gascoyne

River which originates 620 km to the east south-east (surface catchment 73,000 sq. km). Surface inflow from the smaller rivers is intermittent and may affect only the vicinity of the river mouths, not spreading as far west as the Ramsar Site. Major flooding from Gascoyne River is infrequent, probably once in ten years, but it can cause the lake to be extensively inundated (e.g. 1989) or to fill (e.g. 1980). Most floods occur during the cyclone season (February-March) and in mid-winter (May-June)(Logan 1993). All surface catchments are highly disturbed by grazing.

Water emerging from the sinkholes is at sea salinity but is hypersaline to brine when it reaches the terminal lagoon. River floodwaters are initially fresh and brown in colour, but become brackish or saline.

Median and mean annual rainfall at Gnaraloo (15 km west-north-west of the Site) are 203 mm and 230 mm respectively, mostly falling in May-July. Annual evaporation across the site is about 2800-3000 mm.

15. Hydrological values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

None recognised.

16. Ecological features: (main habitats and vegetation types)

Mangroves *Avicennia marina* occur within the Site in low closed-forest to open-scrub/shrubland formations, mainly fringing the sinkholes, channels and permanent lagoon although small patches of mangrove also are scattered across surrounding lake bed. The mangrove community is the largest (covering 22.5 ha) of only two inland occurrences in WA (Johnstone 1990); the other is at Mandora Salt Marshes which is within the Eighty Mile Beach Ramsar Site. Low shrubland of samphire (species not identified) occurs near the high water mark of the (greater) lake. The alga *Dunaliella salina* occurs. Algal mats cover parts of the mudflats within the lagoon complex.

Surrounding areas support low shrubland and open-shrubland.

17. Noteworthy flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

There are no rare, threatened or endemic plants known at the Site.

18. Noteworthy fauna: (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

Lake MacLeod is one of the most important non-tidal sites for migratory shorebirds in Australia. More than 53,000 migratory shorebirds of 22 species have been counted at the Ramsar Site (September 1987), mainly on the shallows and mudflats (across which a thin sheet of water spreads as it is driven by daily shifts in wind direction) associated with the permanent lagoons. It is likely that conditions are suitable for annual use by large numbers of shorebirds. It is possible that many of the shorebirds may be using the Lake as a stop-over site during their journey from north-western to south-western and perhaps south-eastern Australia.

The most abundant migratory shorebird at the Ramsar Site is the Curlew Sandpiper: highest number counted was 41,600 (September 1987) which is 16% of the population of this species in the East Asian-Australasian Flyway. Other migratory species occurring in numbers exceeding

1% of the Flyway population are Red-necked Stint *Calidris ruficollis* (up to 8300 counted) and Red Knot *C. canutus* (2500).

The Site is also internationally important for non-migratory shorebirds. Up to 26% of the world population of Banded Stilt (53,000 in September 1987) occurs and the Site also supports more than 1% of the population of Red-necked Avocet *Recurvirostra novaehollandiae* and Red-capped Plover *Charadrius ruficapillus*.

The total number of waterbirds counted at the Site has exceeded 20,000 (maximum was 115,000 in September 1987) and it is likely that conditions may be suitable for similar numbers to occur on a regular basis.

Other information on waterbirds. Surveys have recorded 58 waterbird species at Lake MacLeod: 26 of these are listed under bilateral treaties on migratory species. Uncommon species recorded at the Lake include the globally threatened (Collar *et al.* 1994) Asian Dowitcher *Limnodromus semipalmatus*. Seven species of waterbirds have been recorded breeding at Lake MacLeod: most breeding is in the mangroves (cormorants) and on bare ground (terns).

Other noteworthy fauna. A fish known locally as "yellowtail" occurs in the sinkholes. Very high densities of polychaetes have been recorded in the permanent lagoons (J. Lane pers. comm.).

Data are from Smith and Johnstone 1985, Jaensch and Vervest 1990, Lane *et al.* 1996 and data sets held by the Western Australian Department of Conservation and Land Management.

19. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

None recognised.

20. Land tenure/ownership of: (a) site (b) surrounding area

(a). The entire Ramsar Site is Vacant Crown Land, that is, lacking a gazetted vesting or purpose, but the operators of the Lake's saltfields (Dampier Salt) have a mining lease over the entire Lake including the Ramsar Site.

(b). Surrounding areas include Vacant Crown Land (other parts of the Lake) and pastoral leasehold land.

21. Current land use: (a) site (b) surroundings/catchment

(a). There is no land use within the Ramsar Site other than any mineral exploration that may be conducted by Dampier Salt in connection with its mining lease. There are no facilities for nature-based recreation and this type of recreation does not occur within the Ramsar Site.

(b). The most important land use in the surface catchment is pastoral grazing of sheep and/or cattle. Human population in the surface catchment of Lake MacLeod is in the order of several hundreds of people.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects: (a) at the site (b) around the site

(a). Brine solution is pumped from beneath the bed of Lake MacLeod in the salt-making operation of Dampier Salt near the southern end of the Lake (outside the Ramsar Site). This activity is subject to requirements stipulated by the Environmental Protection Authority of Western Australia, which are intended to protect the conservation values of the springs and mangroves (which are within the Ramsar Site). Similar conditions could be expected to apply to any proposal for extraction of gypsum from the lake bed.

(b). Excessive grazing in the surface catchment may lead to soil erosion and therefore changes in depositional processes in Lake MacLeod, but this is unlikely to have significant impact on the part of the Lake that is within the Ramsar Site.

23. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

See 22 (a). No part of Lake MacLeod is within a protected area. The Lake is however listed on the Register of the National Estate.

24. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

None identified.

25. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

Surveys of the wetlands and waterbirds within the Ramsar Site have been conducted by J. Lane *et al.* of the Western Australian Department of Conservation and Land Management (1970s), L. Smith and R. Johnstone of the Western Australian Museum (Smith & Johnstone 1985) and R. Jaensch *et al.* of the Royal Australasian Ornithologists Union (Jaensch & Vervest 1990). Dampier Salt is undertaking monitoring of the condition of the Site's mangroves. Otherwise there has been relatively little research into the Site's conservation values.

26. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

No facilities or materials are available at present. The Site normally is inaccessible to visitors and thus has low potential for conservation education.

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

None occurring at present. Also see items 21 and 26.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

Territorial: The State Government of Western Australia.

Functional: The Western Australian Department of Land Administration (in regard to Vacant Crown Land) and The Western Australian Department of Minerals and Energy (in regard to the mining lease).

29. Management authority: (name and address of focal body directly responsible for managing the wetland)

Dampier Salt P/L has management responsibility for its operations situated within the mining lease.

30. Bibliographical references: (scientific/technical only)

Collar, N.J., Crosby, M.J. and Stattersfield, A.J. 1994. Birds to watch 2. The world list of threatened birds. BirdLife Conservation series No. 4. BirdLife International, Cambridge, UK. 407 pp.

Jaensch, R.P. and Vervest, R.M. 1990. Waterbirds at remote wetlands in Western Australia, 1986-8. Part 2: Lake MacLeod, Shark Bay, Camballin Floodplain and Parry Floodplain. Royal Australasian Ornithologists Union Report 69.

Johnstone, R.E. 1990. Mangroves and mangrove birds of Western Australia. Records of the Western Australian Museum Supplement 32.

Lane, J., Jaensch, R. and Lynch, R. 1996. Western Australia. In, ANCA. A directory of important wetlands in Australia. Second edition. Australian Nature Conservation Agency, Canberra.

Logan, B.W. 1993. Gypsum mine feasibility study. Report to Dampier Salt P/L by Logiden P/L Geoscience and Environmental Services.

Smith, L.A. and Johnstone, R.E. 1985. The birds of Lake MacLeod, upper west coast, Western Australia. Western Australian Naturalist 16, 83-7.

List of Attachments:

- Map of boundary of new Ramsar Site.

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Please return to:

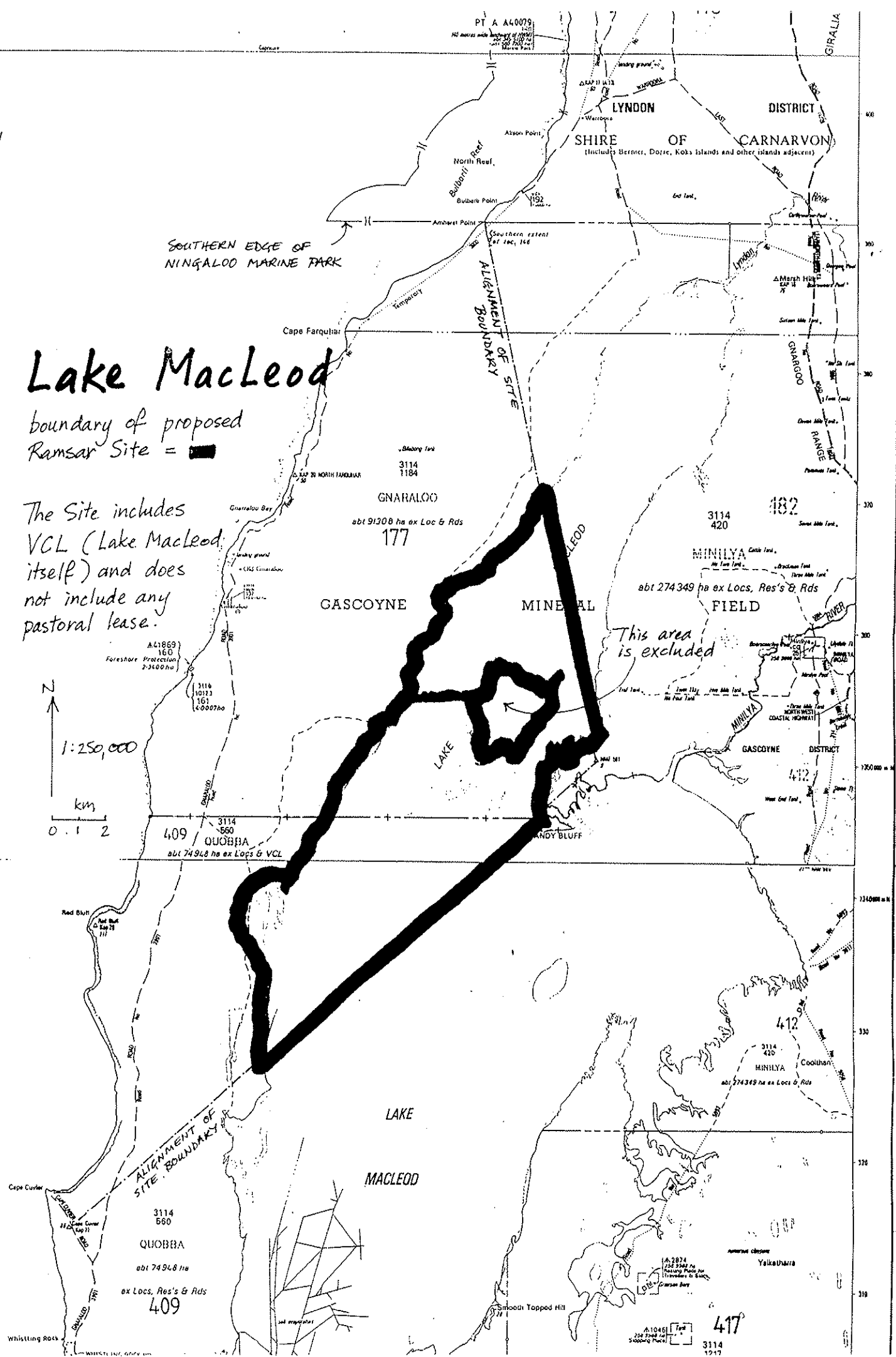
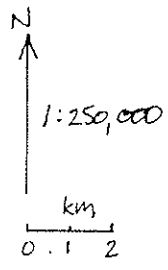
Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 GLAND, Switzerland
 Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: ramsar@hq.iucn.org

N

Lake MacLeod

boundary of proposed Ramsar Site = 

The Site includes VCL (Lake MacLeod itself) and does not include any pastoral lease.



This area is excluded

ALIGNMENT OF SITE BOUNDARY

3114 560

QUOBBA

abt 74948 ha

ex Locs, Res's & Rds

409

3114 1217

417

Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

10 November 1998

FOR OFFICE USE ONLY.

DD MM YY

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Designation date

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Site Reference Number

2. Country:

Australia

3. Name of wetland:

Muir-Byenup System

4. Geographical coordinates:

34° 29' S, 116° 40' E (centre of Lake Muir).

5. Altitude: (average and/or max. & min.) 170-180 m (Australian Height Datum)

6. Area: (in hectares) 12,136 ha (of which 7021 ha is wetland)

7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

The Site comprises a suite of partly inter-connected lakes and swamps of varied size (up to 4600 ha), salinity (saline to fresh), permanence (permanent to seasonal) and substrate (peat and inorganic), in an internally-draining catchment. The open lakes are used for moulting by thousands of Australian Shelduck *Tadorna tadornoides* and for drought refuge by tens of thousands of other ducks while the sedge/shrub-dominated swamps support an important population of Australasian Bittern *Botaurus poiciloptilus*, and threatened orchids. Vegetation communities of the Site's wet flats are among the few remaining in non-coastal parts of South-Western Australia and the Site has some of the largest natural sedgelands in Western Australia.

8. Wetland Type (the applicable codes for wetland types as listed in Annex 1 of the *Explanatory Note and Guidelines* document.)

Where the type includes options, the relevant options are shown in bold:

O (permanent freshwater lakes).

R (**seasonal**/intermittent **saline**/brackish/alkaline **lakes** and flats).

Tp (permanent freshwater **marshes**/pools).

Ts (**seasonal**/intermittent freshwater **marshes**/pools on inorganic soil).

U (non-forested peatlands).

W (shrub-dominated wetlands).

Xf (freshwater, tree-dominated wetlands).

Please now rank these wetland types by listing them from the most to the least dominant:

R, U, O, Ts, Tp, W, Xf.

9. Ramsar Criteria: (the applicable criteria; see point 12.)

- 2a (it supports an appreciable assemblage of rare, **vulnerable** or endangered species or subspecies of plant or **animal**, or an appreciable number of individuals of any one or more of these species).
- 2c (it is of special value as the habitat of plants or **animals** at a critical stage of their biological cycle).
- 3a (it regularly supports 20,000 waterfowl).
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one **species** or subspecies of waterfowl).

Please specify the most significant criterion applicable to the site: 2c

10. Map of site included? Please tick *yes* -or- *no*
(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

11. Name and address of the compiler of this form:

Roger Jaensch, Wetlands International - Oceania, GPO Box 636, Canberra ACT 2601, Australia, (Tel: +61-2-6250-0779; Fax: +61-2-6250-0799; email: roger.jaensch@ea.gov.au), on behalf of the Western Australian Department of Conservation and Land Management. All inquiries should be directed to Jim Lane, Department of Conservation and Land Management, 14 Queen Street, Busselton WA 6280, Australia, (Tel: +61-8-9752-1677; Fax: +61-8-9752-1432; email: jiml@calm.wa.gov.au).

12. Justification of the criteria selected under point 9, on previous page.
(Please refer to Annex II in the *Explanatory Note and Guidelines* document).

- 2a. Three wetland-dependent orchids (see item 17) that are formally recognised as nationally vulnerable, and at least one other wetland plant species that may soon be so recognised, occur at the Site in appreciable numbers. These plants mainly occur on seasonally inundated areas or wetland margins, which have been extensively cleared for agriculture elsewhere in South-Western Australia.
- 2c. The open lakes of the Site regularly support moulting by thousands of Australian Shelducks (see item 18); this is one of the most important moulting sites for shelducks in South-Western Australia. Lake Muir is used as a drought refuge by tens of thousands of waterbirds (see criterion 3a and item 18).
- 3a. Up to 51,000 waterbirds have been counted at the Site (at Lake Muir, when full: see item 18). The annual data on water depth suggest conditions are suitable for use by 20,000 waterbirds at least several times within a 25 year period, which in the context of wetland availability in Western Australia is considered sufficient evidence of regular use by 20,000 waterbirds.

- 3c. At least five, possibly in the order of 10 Australasian Bitterns occur regularly and possibly breed in the sedge swamps of the Site, which constitutes more than 1% of the South-Western Australian population. The Site contains the core component of a wider suite of wetlands that constitutes one of the five remaining refuges for the South-Western Australian population of this globally threatened species (see item 18).

A comprehensive framework for identifying wetlands that are particularly good representative examples of wetland types (criterion 1a) does not exist for Western Australia. However, this framework is likely to become available in the future and in that event the Muir-Byenup Wetland System should be assessed against this criterion.

13. General location: (include the nearest large town and its administrative region)

The Muir-Byenup System is primarily in the Shire of Manjimup and to a lesser extent the Shire of Cranbrook (local authorities) in the State of Western Australia (population ca. 1.77 million). Lake Muir is 55 km east-south-east of the town of Manjimup (population ca. 4300).

The Muir-Byenup System comprises the entire area of Nature Reserve 31880. Named wetlands in the Site include Lake Muir, Byenup Lagoon, Tordit-Gurruup Lagoon, Poorginup Swamp, Neeranup Swamp, Coorimup Swamp and Wimbilup Swamp. Freehold land and gazetted road reserves enclosed by the Ramsar Site boundary are not part of the Ramsar Site. Parts of the western shoreline of Lake Muir are outside the Reserve and Ramsar Site.

14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

The Site is situated in the Albany-Fraser Orogen, in alluvial/lacustrine deposits and peat (peat to 4 m thick) overlying granite and gneiss, in broadly undulating country. It includes a large lake (Lake Muir: 4600 ha), smaller lakes and swamps (notably Byenup Lagoon, Tordit-Gurruup Lagoon and Poorginup Swamp: each 140-690 ha), and inter-connected flats, all of which are natural wetlands.

Water is derived from a surface catchment that covers about 38,400 ha, mainly from minor seasonal streams up to about 5 km long. Some of the component wetlands, and a swamp that is outside the Site and is subject to peat mining, drain into Lake Muir. Substantial parts of the surface catchments of most of the component wetlands are cleared. Little is yet known on the interactions between the shallow and deep groundwater systems in the area and the interaction of these with the surface water systems (hence potential impacts on conservation values of the wetlands).

Lake Muir and most of the other component wetlands are terminal drainage basins. Lake Muir is seasonal, often dry in autumn: maximum depth recorded since 1978 is 1.3 m (November 1988) and the September mean is 0.78 m. Byenup Lagoon is permanent: maximum depth recorded is 2.6 m (September 1991) and the September mean is 2.3 m. Some of the other component wetlands are permanent or near-permanent, though peaty Poorginup Swamp frequently shows little or no surface water, and the minor swamps and broad flats are inundated or waterlogged only in winter-spring.

Water quality, Lake Muir: salinity ranges from 96 parts per thousand (March 1982) to 0.6 ppt (November 1990) with a September mean of 10.1 ppt (n=12); water pH ranges from 6.2 to 9.7; and the water is colourless. Water quality, Byenup Lagoon: salinity ranges from 42 ppt (March 1988) to 1.4 ppt (November 1988) with a September mean of 3.2 ppt (n=15); and water pH varies from 7.4 to 9.3. Other component wetlands such as Tordit-Gurruup Lagoon and Poorginup Swamp are less saline, or fresh, some are more acidic and some have brown coloured water.

Water data are from monitoring by the Department of Conservation and Land Management.

Median and mean annual rainfall at Rocky Gully (29 km east of Lake Muir) are 723 mm and 715 mm respectively, mostly falling in May-September. Annual evaporation is about 1300 mm.

15. Hydrological values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

The Site's wetlands possibly contribute to maintenance of groundwater in surrounding areas, but little is known on the interactions between the shallow and deep groundwater systems in the area and the interaction of these with the surface water systems.

16. Ecological features: (main habitats and vegetation types)

Lake Muir supports a narrow zone of open-scrub, sedgeland and low shrubland at or near its margins. The dominant low shrubs are the samphires *Sarcocornia quinqueflora* and *Halosarcia lepidosperma*, the wetland scrub is dominated by the tall shrubs *Melaleuca halmaturorum* and *M. cuticularis* and there is some *M. raphiophylla* and *M. aff. viminea* (Halse *et al.* 1993; Lane *et al.* 1996). Other wetland plants near the lake margins include *Lepidosperma effusum*, *Gahnia trifida*, *Schoenus brevifolius* and *Wilsonia backhousei*.

Most of the other component lakes and swamps support extensive sedgeland and fringing or scattered areas of low closed-forest or closed-scrub, while open-heathland over open-sedgeland occurs on the wet flats. Major areas of sedgeland are dominated by *Baumea articulata*; commonly associated species are *Schoenus brevifolius*, and at Poorginup Swamp *Leptocarpus scariosus*; *B. vaginalis*, *Gahnia drummondii* and *G. trifida* also occur (Halse *et al.* 1993; Lane *et al.* 1996). The dominant wetland tree is *Melaleuca raphiophylla*. *Melaleuca lateritia*, *Astartea fascicularis* and *Agonis juniperina* occur in some wetlands.

Surrounding areas mainly support open-forest dominated by eucalypts, or are cleared.

17. Noteworthy flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

The nationally vulnerable, wetland dependent orchids *Caladenia christineae*, *Caladenia harringtoniae* and *Diuris drummondii* occur at the margins of Lake Muir and elsewhere in the Site, in appreciable numbers (Halse *et al.* 1993; Lane *et al.* 1996, R.W. Hearn pers. comm.).

Other notable plants that occur in winter wet swamps at the Site include several species that currently are poorly known and that soon may be declared rare at a State level: *Euphrasia scabra*, *Stylidium ripidium*, *Apodasmia ceramophilus* ms (formerly *Leptocarpus ceramophilis* ms), *Wurmbea sp. Cranbrook*, *Caladenia starteorum* ms, and *Lilaeopsis polyantha*. *E. scabra* has a national distribution and may be nationally rare; *L. polyantha* likewise has a national distribution but is common outside Western Australia; and the remaining taxa all are endemic to Western Australia. *Villarsia submersa* and *Schoenus natans*, which are Western Australian endemics that are considered relatively rare (but not gazetted as such) but not under threat, both have strongholds at the Site. Further survey work may reveal additional noteworthy flora. None of the abovementioned plants are endemic to the Site (R. Hearn pers. comm.).

Vegetation communities of the wet flats are well represented at the Site and are among the few remaining in non-coastal parts of South-Western Australia. The Site has some of the largest natural sedgelands in Western Australia.

18. Noteworthy fauna: (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

Lake Muir is regularly used in spring for moulting by thousands of Australian Shelduck. To a lesser extent this occurs also at the smaller open lakes, an exceptional concentration of 12,000 being recorded at Tordit-Gurru Lagoon in December 1982. Muir-Byenup System is one of the most important moulting sites for shelducks in South-Western Australia.

The same lakes are also used as drought refuges by large numbers of waterbirds. The highest number of waterbirds counted at Lake Muir was 51,613 in March 1989, an unusually high total following a wet winter in the surrounding district but, together with depth data, indicative of occurrence by more than 20,000 waterbirds from time to time.

The Australasian Bittern has been recorded in four of the component sedge-dominated wetlands and probably also occurs elsewhere in the Site. The Site possibly supports in the order of ten pairs of Australasian Bittern and behaviour suggests that some pairs breed there. This number constitutes more than 1% of the South-Western Australian population: the 1% level is 3 birds (Rose & Scott 1997). The Site contains the core component of a wider suite of wetlands that constitutes one of the five remaining refuges for the South-Western Australian population of this globally threatened (Collar *et al.* 1994) species.

Other information on waterbirds. Surveys have recorded 23 waterbird species at Lake Muir and 41 at Byenup Lagoon: most are non-migrants. The most abundant species at Lake Muir are Pacific Black Duck *Anas superciliosa* (up to 18,450), Grey Teal *Anas gracilis* (16,002) and Eurasian Coot *Fulica atra* (9628) (all counts in March 1989). Lake Muir is a migration stop-over site for small numbers of shorebirds, notably Red-necked Stint *Calidris ruficollis* (up to 517 in November 1985). A breeding colony of up to 40 pairs of Silver Gull *Larus novaehollandiae* occurs on rock outcrops in Lake Muir; up to 700 birds have been counted. Little Bittern *Ixobrychus minutus* and Spotless Crake *Porzana tabuensis* are among the several waterbirds recorded breeding in the sedge-dominated wetlands.

Other noteworthy fauna: fishes. Recent surveys have revealed the presence of mud minnow *Galaxiella munda* and black stripe minnow *G. nigrostriata* in Poorginup Swamp and/or Myalgelup Lagoon, and Balston's pygmy perch *Nannatherina balstoni* in Mulgarnup Swamp (these wetlands are part of the Byenup Lagoon System). All are geographically restricted (endemic to South-Western Australia), uncommon and poorly known species of biological interest and in need of monitoring. They are not gazetted as rare at State or national level and are not being considered for gazettal.

Other noteworthy fauna: invertebrates. Surveys of macro-invertebrates have revealed 97 invertebrate taxa in the suite comprising Tordit-Gurru Lagoon, Byenup Lagoon and Poorginup Swamp. These include 11 water mites Hydracarina, six of which (found at Poorginup Swamp) have restricted distributions and some (e.g. *Pseudohyrophantes* sp. nov.) so far have not been found elsewhere and are of considerable zoogeographic interest. The Poorginup Swamp Water-mite *Acercella* sp. is declared protected in Western Australia. One species, *Huitfeldtia* sp. nov., is the second known species in its genus; the other species occurs in northern Europe and Canada. The crustaceans *Cherax preissii* and *C. quinquecarinatus* occur at the site; also the oblong tortoise *Chelodina oblonga*.

Data are from Jaensch & Vervest 1988, Jaensch *et al.* 1988, Halse *et al.* 1990, Lane *et al.* 1996, DeHaan 1986, McComb & Lake 1988, R. Hearn pers. comm. and data sets held by the Western Australian Department of Conservation and Land Management.

19. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

No information.

20. Land tenure/ownership of: (a) site (b) surrounding area

(a). The entire Ramsar Site is the A-Class Nature Reserve 31880 vested in the National Parks and Nature Conservation Authority (appointed by the Government of Western Australia) for the purposes of "Conservation of Flora and Fauna" and "Water".

(b). Surrounding areas include freehold (privately owned) land, Nature Reserve, special leases for mining, and State Forest. An area of freehold land is enclosed within, but not part of, the Ramsar Site (see map).

21. Current land use: (a) site (b) surroundings/catchment

(a). There is no land use other than nature conservation within the Ramsar Site. There are no facilities for nature-based recreation and this type of recreation is negligible within the Ramsar Site.

(b). Freehold land enclosed by and adjoining the Ramsar Site is used for agriculture, notably grazing of domestic sheep and cattle and tree plantations. The special leases are for extraction of peat; the special leases expire in 2003 and 2004 though mining may finish earlier than this. Timber is extracted from the State Forests. The most important land uses in the catchment are agriculture and forestry (plantations and native forest). Human population in the Site's surface catchment is in the order of about 20, with a further 8 absentee owners .

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects: (a) at the site (b) around the site

(a). Recently pigs *Sus scrofa* were unlawfully released on the Site. They are causing considerable damage to vegetation and soil. Determined efforts are being made to reduce feral pig numbers by trapping, shooting and poisoning but eradication may be impossible without new technology. Also, exotic plants such as *Typha orientalis* are appearing in some of the wetlands. Some unlawful disturbance of dry lake bed by motor vehicles occurs at Lake Muir.

Potentially important factors include: eutrophication (algal blooms caused by agricultural fertilisers); salinisation (smaller wetlands adjacent to cleared land), too frequent and inappropriate fire regime (destruction of peat and retardation of regeneration of wetland shrub thickets, especially those used by breeding waterbirds), and drainage works.

(b). Factors operating in the Site's surface catchment and which potentially may affect the Site's ecological character include salinisation, past catchment drainage and future drainage proposals, and too frequent and inappropriate fire regime.

23. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

The Nature Reserve was established in 1973. Parts of Lake Muir formerly were open for duck hunting but recreational duck hunting has been prohibited in Western Australia since 1992. In the past, proposed commercial extraction of peat from Tordit-Gurrup Lagoon was opposed by the Western Australian Department of Conservation and Land Management and others and was not approved. The entire Site is included on the Register of the National Estate.

Under the Salinity Action Plan for WA, Lake Muir and associated wetlands have been designated as a "Key Wetlands and Natural Diversity" Recovery Catchment. Cooperative management of the catchment, with substantial community participation, is occurring. Besides commercial tree crops (both hardwood and softwood), non commercial plantings of recharge and discharge areas has been undertaken as joint operations between the Western Australian Department of Conservation and Land Management and landowners on private lands to improve water quality impacting downstream on wetlands. Stream flow and water quality monitoring is in place in several locations (R. Hearn pers. comm.).

A Draft Management Plan for the Reserve (and nearby Perup and Unicup Reserves) was released for public comment late in 1998.

Also see item 20.

Large parts of the shoreline of Lake Muir and Byenup Lagoon have no protected area buffer zones whereas other wetlands within the Ramsar Site have protected buffers more than 100 m wide.

24. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

Measures proposed under the Salinity Action Plan include planting of trees (including commercial plantations) on freehold land as a strategy to reduce dryland salinity in the Lake Muir catchment. Proposals to divert high salt water flows away from freshwater systems at critical times are being investigated. A Recovery Catchment Management Plan is being prepared (R. Hearn pers. comm.).

25. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

Intensive surveys of flora and fauna are occurring at present within the Site with funding from Environment Australia Biodiversity Group (Natural Heritage Trust) and the State Government (Salinity Action Plan). Reports on the Site's fish, aquatic macro-invertebrates and physico-chemistry (A.W. Storey) and floristics (G. Keighery & N. Gibson) are expected in 1999. Identification of aquatic micro-invertebrates is underway (J. Lane pers. comm., R. Hearn pers. comm.).

Magnetic and radiometric survey data have been collected to improve knowledge of the geology of the area. Hydrogeological and limnological surveys, analysis and mapping will follow with a view to improving knowledge of groundwater and surface water systems. "Salt mapping" will allow synthesis into a model for the area to allow adequate planning of future management of the area, particularly (high water use) tree and agricultural crops, to maintain conservation values of the wetland system (R. Hearn pers. comm.).

Depth, salinity and other water quality parameters have been measured by the WA Department of Conservation and Land Management at least twice each year at one or more of Lake Muir, Byenup Lagoon, Tordit-Gurru Lagoon and Poorginup Swamp since 1977 (J. Lane pers. comm.). Waterbird usage was surveyed annually during 1981-91, with an emphasis on bitterns and ducks (Jaensch *et al.* 1988, Jaensch and Vervest 1988, Halse *et al.* 1990).

The Ramsar Site is also of interest for scientific research of past climatic regimes (peat record).

26. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

No facilities or materials are available at present. It is intended to develop road verge signage and an information bay to advise and educate. Ultimately a brochure will be available. The area is likely to become one of the targets of education through the Perup Ecology Centre, located in the adjacent Perup Nature Reserve.

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

There is low level, irregular use for birdwatching from the few public access points, e.g. Muir Highway adjacent to Lake Muir. Also see items 21 and 26.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

Territorial: The State Government of Western Australia.

Functional: The National Parks and Nature Conservation Authority (vesting) and the Western Australian Department of Conservation and Land Management (management).

29. Management authority: (name and address of local body directly responsible for managing the wetland)

The Manjimup District (based in Manjimup) of the Southern Forests Region, Western Australian Department of Conservation and Land Management.

30. Bibliographical references: (scientific/technical only)

Collar, N.J., Crosby, M.J. and Stattersfield, A.J. 1994. Birds to watch 2. The world list of threatened birds. BirdLife Conservation series No. 4. BirdLife International, Cambridge, UK. 407 pp.

DeHaan, M. 1986. The possible effects of peat mining on aquatic invertebrates in the Lake Muir wetlands, Western Australia. BSc Hons thesis, Murdoch University, Perth.

Lane, J., Jaensch, R. and Lynch, R. 1996. Western Australia. In, ANCA. A directory of important wetlands in Australia. Second edition. Australian Nature Conservation Agency, Canberra.

Halse, S.A., Jaensch, R.P., Munro, D.R. and Pearson, G.B. 1990. Annual waterfowl counts in south-western Australia - 1988/89. Dept. of Conservation and Land Management Technical Report No. 25. 43 pp.

Halse, S.A., Pearson, G.B. and Patrick, S. 1993. Vegetation of depth-gauged wetlands in nature reserves in south-west Western Australia. Western Australian Department of Conservation and Land Management Technical Report 30.

Jaensch, R.P. and Vervest, R.M. 1988. Waterbirds in the eastern Muir wetlands 1986-1987. Royal Australasian Ornithologists Union Report No. 47. 21 pp.

Jaensch, R.P., Vervest, R.M. and Hewish, M.J. 1988. waterbirds in nature reserves of south-western Australia: reserve accounts. Royal Australasian Ornithologists Union Report No. 30. 290 pp.

McComb, A.J. and Lake, P.S. eds. 1988. The conservation of Australian wetlands. Surrey Beatty and Sons, Chipping Norton, NSW.

Rose, P.M. and Scott, D.A. 1997. Waterfowl population estimates. Second edition. Wetlands International Publication 44, Wageningen, The Netherlands.

List of Attachments:

- Map of boundary of new Ramsar Site.

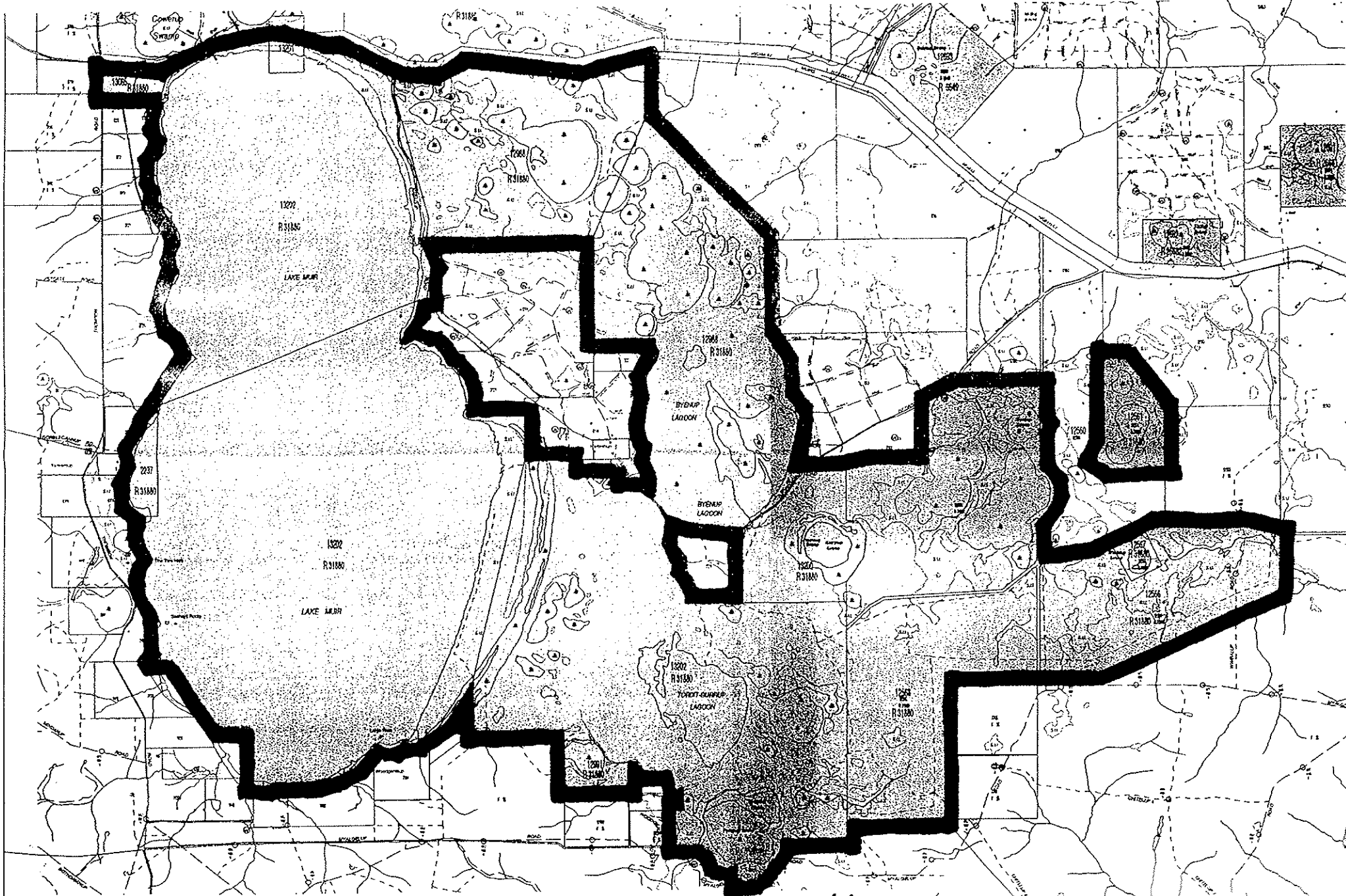
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= boundary of Ramsar Site.
 Note: enclosed freehold land and road reserves are not included in the Site.

CALM tenure (1994 FMP)
 Nature Reserve
 Multiple use forest
 (g) reserve



Muir
 Byenup
 System

Scale 1:50,000

Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

11 November 1998

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DD MM YY

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Designation date

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Site Reference Number

2. Country:

Australia

3. Name of wetland:

Spearwood Creek Wetlands

4. Geographical coordinates:

34° 05' S, 115° 19' E (approx. centre of Site).

5. Altitude: (average and/or max. & min.) approx. 5-100 m (Australian Height Datum).

6. Area: (in hectares) approx. 1612 ha.

7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

The Site comprises the lower reaches of a series of seasonal creeks, of which Spearwood Creek is the largest, and associated waterlogged and seasonally inundated flats. It includes the entire known population of the nationally endangered orange-bellied frog *Geocrinia vitellina*, which inhabits some of the creek flats. The Site's wetlands are subject to planning and management for recovery of this wetland dependent frog and are vital to its survival.

8. Wetland Type (please circle the applicable codes for wetland types as listed in Annex I of the *Explanatory Note and Guidelines* document.)

N (seasonal/intermittent/irregular rivers/streams/creeks);

W (shrub-dominated wetlands).

Please now rank these wetland types by listing them from the most to the least dominant:

N, W.

9. Ramsar Criteria: (please circle the applicable criteria; see point 12, next page.)

2a (it supports an appreciable assemblage of rare, vulnerable or **endangered** species or subspecies of plant or **animal**, or an appreciable number of individuals of any one or more of these species).

2d (it is of special value for one or more **endemic** plant or **animal** species or communities).

Please specify the most significant criterion applicable to the site: 2d

10. Map of site included? Please tick **yes -or- **no****

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

11. Name and address of the compiler of this form:

Roger Jaensch, Wetlands International - Oceania, GPO Box 636, Canberra ACT 2601, Australia, (Tel: +61-2-6250-0779; Fax: +61-2-6250-0799; email: roger.jaensch@ea.gov.au), on behalf of the Western Australian Department of Conservation and Land Management. All inquiries should be directed to Jim Lane, Department of Conservation and Land Management, 14 Queen Street, Busselton WA 6280, Australia, (Tel: +61-8-9752-1677; Fax: +61-8-9752-1432; email: jiml@calm.wa.gov.au).

12. Justification of the criteria selected under point 9, on previous page.

(Please refer to Annex II in the *Explanatory Note and Guidelines* document).

2a. The Site includes the entire known population of the nationally endangered (IUCN status = vulnerable) orange-bellied frog *Geocrinia vitellina* (see also item 18) and thus is vitally important to the survival of this species.

2d. *Geocrinia vitellina* is endemic to the creeks that are included in the Site. All known records of the species are within the Site.

A comprehensive framework for identifying wetlands that are particularly good representative examples of wetland types (criterion 1a) does not exist for Western Australia. However, this framework is likely to become available in the future and in that event Spearwood Creek should be assessed against this criterion.

13. General location: (include the nearest large town and its administrative region)

Spearwood Creek is in the Shire of Augusta-Margaret River (local authority) in the State of Western Australia (population ca. 1.77 million). It is 25 km south-east of the town of Margaret River (population ca. 8000).

The Site is bounded in the south by the Blackwood River (northern bank), in the east by an un-named track (apparently a continuation of Adelaide Road), in the north by Denny Road and in the west by an un-named track (apparently a continuation of Shep Road) (see map). The boundary extends north of Denny Road for 500 m in a strip 100 m wide along Spearwood Creek, in order to include the northernmost known population of the orange-bellied frog.

14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

The Site is situated in the Leeuwin Block, in sediments overlying gneiss/granite in undulating land with narrow U and V shaped valleys and drainage depressions. It includes the lower reaches and associated waterlogged and seasonally inundated flats of Spearwood Creek and three other creeks that are more than 1.0 km long. Each of the creeks terminates in the Blackwood River and all are natural wetlands.

Water in the creeks is derived from a surface catchment of approximately 3800 ha total area, all of which is under forest cover. The creeks exhibit seasonal flow and may become up to 0.75 m deep at times of maximum flow in winter-spring. The flats generally are waterlogged with little or

no surface water. Water in the creeks is fresh (less than 1.0 parts per thousand). Data are from Western Australian Department of Conservation and Land Management files and K. Williams (pers. comm.).

Median and mean annual rainfall at Augusta (30 km south-south-west) are 984 mm and 1003 mm respectively, mostly falling in May-August. Annual evaporation is ca. 1100 mm.

15. Hydrological values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

None recognised.

16. Ecological features: (main habitats and vegetation types)

Vegetation in or immediately alongside the creek beds includes open-forest and open/closed-scrub. Dominant plants within the creek systems are *Homalospermum firmum*, *Pseudoloxocarya grossa*, *Loxocarya* sp., *Boronia molluyae*, *Acacia uliginosa*, *Agonis linearifolia* and *Astartea fascicularis*. The flats support open/closed-scrub dominated by *Agonis* species, over sedges. Surrounding areas support mainly open-forest dominated by eucalypts.

The vegetation in the wetlands is subject to burning from wildfire; this occurred most recently in 1997. There is little information on long-term changes to the vegetation though it is likely that too frequent fires of high intensity may cause long-term changes. Surrounding forest has been subject to logging in the past.

17. Noteworthy flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

There are no rare, threatened or endemic wetland plants known at the Site though at least one species of conservation concern (*Euphrasia scabra*: "Priority 2") at State level occurs (K. Williams pers. comm.).

18. Noteworthy fauna: (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

The Site includes the entire known population of the nationally endangered orange-bellied frog *Geocrinia vitellina* and thus is vitally important to the survival of this species. *Geocrinia vitellina* is endemic to undisturbed vegetation in or associated with the creeks that are included in the Site. All known records of the species are within the Site. The frog seems to have highly specific habitat requirements: about 20 ha of suitable wetland habitat exists within the known area of occurrence (630 ha), though recent mapping of populations suggests this may be an overestimate. It is considered to have the most geographically restricted distribution of any vertebrate species in Australia. It is thought to not be free-swimming during any stage of its life cycle and thus prefers waterlogged rather than inundated situations. The orange-bellied frog occurs in close proximity (approx. 10 km) to populations of the nationally vulnerable white-bellied frog *G. alba*. (Some of the above data are from K. Williams pers. comm.).

Other information on fauna. Other wetland dependent species known from the Site include Spotless Crake *Porzana tabuensis* and the frogs *Crinia georgiana*, *C. glauerti*, *Limnodynastes dorsalis*, *Litoria adelaidensis* and *L. moorei*.

19. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

None recognised.

20. Land tenure/ownership of: (a) site (b) surrounding area

(a). The Ramsar Site is in State Forest, vested in the Lands and Forests Commission (appointed by the Government of Western Australia), for the purpose of conservation, recreation, timber production on a sustained yield basis and water catchment protection.

(b). Surrounding areas are in State Forest.

21. Current land use: (a) site (b) surroundings/catchment

(a). Timber production has occurred within the Ramsar Site (last logging probably was in the 1980s) but there is no intention by the Management Authority (see item 29) to resume logging in the immediate vicinity of the core habitat of *Geocrinia vitellina*. There are no facilities for nature-based recreation and this type of recreation is negligible within the Ramsar Site (but some canoeing occurs on the Blackwood River, which adjoins the Site).

(b). The only significant land use in the surface catchment is timber production. Human population in the surface catchment is negligible.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects: (a) at the site (b) around the site

(a). *Geocrinia vitellina* appears to be vulnerable to intense and/or too frequent fires, at least in terms of reduction of frog numbers at a site where they occur. If creek zones are to be burnt, the Recovery Team advises that a frequency of no more than 8-12 years (allowing for 2-3 frog generations) should be adopted. In the most recent fire (October 1997) many sites at which the frog occurs were burnt: the population immediately north of Denny Rd is one of only four sites that were not burnt. This has raised the management significance of protecting this northernmost site from disturbance at least in the short-medium term (4-12 years) while the main body of the Spearwood Creek population recovers from the fire.

Spread of exotic plants, and disturbance of frog habitat by feral pigs *Sus scrofa*, are potential threats to the ecological character of the frog habitats. The susceptibility of *Geocrinia* species to "chytrid" frog fungus, newly discovered in southern Western Australia, is unknown. Disease management (hygiene) measures have been implemented for all research and monitoring activities in *G. vitellina* locations (K. Williams pers. comm.).

(b). Logging regimes and fire in surrounding State Forest may have some impact on water quality of the creeks that enter the Site.

23. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

A joint Federal and State funded *Geocrinia* Recovery Plan for two species of *Geocrinia* frogs has been published (Wardell-Johnson et al. 1995). A Species Recovery Team comprising representatives from local government, local community conservation groups, the University of

Western Australia and the Western Australian Department of Conservation and Land Management (CALM) was formed in 1992. The Team has been implementing management actions identified in the plan. Actions completed so far have included:

- (1). survey of riparian habitat: creeklines that may have contained suitable habitat within the current range of the orange-bellied frog, both to the north and south of the Blackwood River, have been surveyed on repeated occasions during the peak frog calling season;
- (2). changes to land management: CALM has deferred all major land disturbance activities where the orange-bellied frog occurs pending the outcome of research undertaken by the Recovery Team, and activities on adjoining CALM managed lands have also been modified to minimise impact on frog habitat;
- (3). fire management and research: pending the outcome of ongoing fire ecology research, a fire exclusion zone has been established around the habitat areas and immediate upland vegetation containing the largest populations of orange-bellied frogs; at all other occurrences, modified prescriptions associated with spring hazard reduction burning have been employed; two experiments investigating the impact of fire on related *Geocrinia* species have been established; monitoring of these sites has been ongoing for about five years within the required eight year timeframe;
- (4). habitat protection: a feral pig monitoring and control program, implemented in 1994 using trapping and hunting techniques, has been maintained since that date;
- (5). wider community participation: a "Geocrinia Recovery Kit" and newsletter has been developed and circulated to key local community groups and representatives;
- (6). population monitoring: annual monitoring of all known populations of the orange-bellied frog is undertaken; data are maintained in readily available database and GIS software; and
- (7). genetic studies: all populations of orange-bellied frogs have been sampled to investigate genetic stability and diversity and allozyme electrophoresis and analysis of the data has been completed.

24. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

The southernmost part of the Site (a corridor along the Blackwood River) is proposed as a Conservation Park (Western Australia Department of Conservation and Land Management, Central Forest Regional Management Plan 1987-97 and Forest Management Plan 1994-2003). The final boundaries have not been determined so there is potential for this Park to be widened to include all of the *Geocrinia vitellina* populations. Also, no further logging is proposed in parts of the Site which are important for *G. vitellina*.

Suitable sites within the Ramsar Site have been selected and techniques developed to undertake experimental translocations of *G. vitellina* eggmass in 1999. This follows and complements the development of captive breeding techniques by the Recovery Team in conjunction with Melbourne Zoo as a fall back position if eggmass translocation is not successful (K. Williams pers. comm.).

25. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

Considerable research has been undertaken and is continuing on *Geocrinia vitellina*. Completed work includes: the genetic structure of *G. vitellina* and *G. alba* populations; the impact of routine prescribed burning on a closely related *Geocrinia* species; and identification of vegetation and soil associations of *Geocrinia* swamps. Current research includes: population viability analysis; further investigation of the impact of fire; and eggmass translocation techniques. Principal investigators have included Dr Grant Wardell-Johnson, Dr Dale Roberts, Dr Don Driscoll and Mr Simon Conroy.

26. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

No facilities or materials are available at present. The Site is remote from schools and thus has relatively low potential for conservation education.

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

No appreciable use for recreation at present other than canoeing on the adjacent Blackwood River. Also see items 21 and 26.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

Territorial: The State Government of Western Australia.

Functional: The Lands and Forests Commission (vesting) and the Western Australia Department of Conservation and Land Management (management).

29. Management authority: (name and address of local body directly responsible for managing the wetland)

The South West Capes District (based in Busselton) of the Central Forest Region, Western Australian Department of Conservation and Land Management.

30. Bibliographical references: (scientific/technical only)

Lane, J., Jaensch, R. and Lynch, R. 1996. Western Australia. In, ANCA. A directory of important wetlands in Australia. Second edition. Australian Nature Conservation Agency, Canberra.

Majors, C., Wardell-Johnson, G. and Roberts, J.D. 1991. Recovery plan for the orange-bellied (*Geocrinia vitellina*) and white-bellied (*Geocrinia alba*) frogs. Report to Western Australian Department of Conservation & Land Management & Australian National Parks & Wildlife Service.

Wardell-Johnson, G., Roberts, J.D., Driscoll, D. and Williams, K. 1995. Orange-bellied and White-bellied Frogs Recovery Plan. Wildlife Management Program No. 19. Department of Conservation and Land Management, Western Australia.

Williams, K. 1994. *Geocrinia* Recovery Team Annual Report. Produced for the Australian Nature Conservation Agency.

List of Attachments:

- Map of boundary of new Ramsar Site.

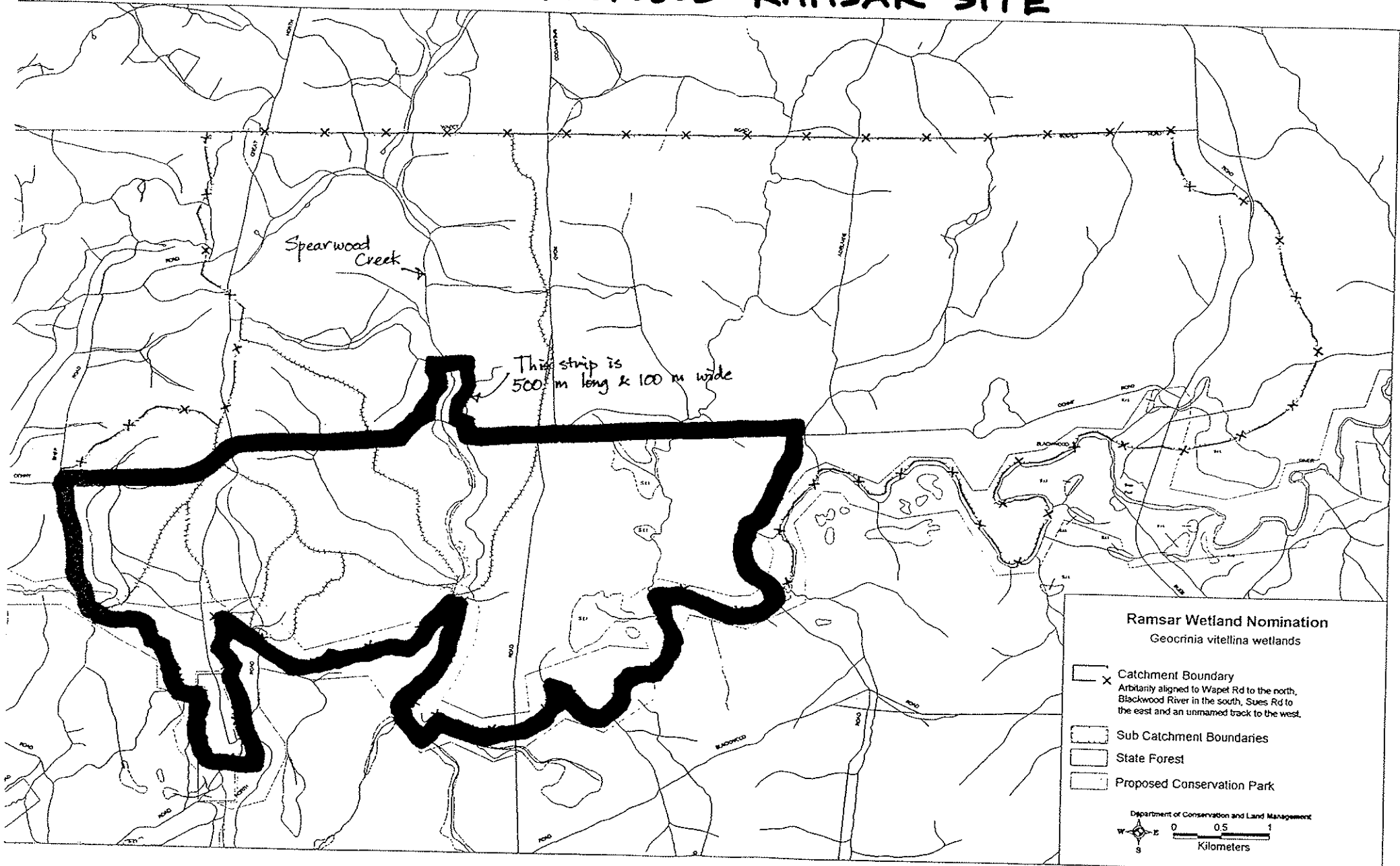
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SPEARWOOD CREEK : PROPOSED RAMSAR SITE



Note²: boundary extends 500 along Spearwood Creek N. of Denny Road.

█ = boundary of Ramsar Site.
 Note¹: boundary follows northern edge of Blackwood River and inner edge of roads.

Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

10 November 1998

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Designation date

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Site Reference Number

Note: this Information Sheet documents extensions to the existing Ramsar Wetland.

2. Country:

Australia

3. Name of wetland:

Ord River Floodplain

4. Geographical coordinates:

As indicated in the original nomination document (copy attached).

5. Altitude:

 (average and/or max. & min.) approx. at sea level (Australian Height Datum)

6. Area: (in hectares) the original nomination was approximately 102,000 ha, the total area of the extension is approx. 20,000 ha, thus the total area of the Ramsar Site is now approx. 122,000 ha.

7. Overview:

 (general summary, in two or three sentences, of the wetland's principal characteristics)

A large system of river, seasonal creek, tidal mudflat and floodplain wetlands that supports extensive stands of mangroves, large numbers of waterbirds and significant numbers of salt-water crocodiles.

8. Wetland Type

 (please circle the applicable codes for wetland types as listed in Annex I of the *Explanatory Note and Guidelines* document.)

Where types include options, the relevant options are shown in **bold**:

F (estuarine waters).

G (intertidal **mud, sand** or salt flats).

H (intertidal marshes).

I (intertidal forested wetlands).

J (coastal **brackish**/saline lagoons).

N (**seasonal**/intermittent/irregular rivers/streams/creeks).

Tp (permanent freshwater **marshes**/pools).

Ts (**seasonal**/intermittent freshwater **marshes**/pools).

- W (shrub-dominated wetlands).
 Xf (freshwater, tree-dominated wetlands).
 Y (freshwater springs, oases).

The extension (see item 13) does not contribute additional wetland types, though it adds substantially to the area of seasonal creek in the Site. The creeks include permanent waterholes.

Please now rank these wetland types by listing them from the most to the least dominant:

Ts, G, I, H, F, N, Xf, Tp, J, W, Y.

9. Ramsar Criteria: (please circle the applicable criteria; see point 12, next page.)

The criteria under which Ord River Floodplain was originally designated as a Ramsar Site are:

- 1 (presumably 1a: it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region).
- 2a (it supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species).
- 2b (it is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna).
- 3b (it regularly supports substantial numbers of individuals from particular groups of waterfowl, indicative of wetland values, productivity or diversity).

In addition, although a comprehensive review has not been conducted, it appears likely that the following criteria also may be met:

- 2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle).
- 3a (it regularly supports 20,000 waterfowl).
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl).

The extension (see item 13) does not cause additional criteria to be met.

Please specify the most significant criterion applicable to the site:

10. Map of site included? Please tick **yes -or- **no****

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

The map shows the original Ramsar Site and the extension.

11. Name and address of the compiler of this form:

Roger Jaensch, Wetlands International - Oceania, GPO Box 636, Canberra ACT 2601, Australia, (Tel: +61-2-6250-0779; Fax: +61-2-6250-0799; email: roger.jaensch@ea.gov.au), on behalf of the Western Australian Department of Conservation and Land Management. All inquiries should be directed to Jim Lane, Department of Conservation and Land Management, 14 Queen Street, Busselton WA 6280, Australia, (Tel: +61-8-9752-1677; Fax: +61-8-9752-1432; email: jiml@calm.wa.gov.au).

12. Justification of the criteria selected under point 9, on previous page.

(Please refer to Annex II in the *Explanatory Note and Guidelines* document).

- 1 (1a) The Site is the best example in Western Australia of an extensive system of wetlands (e.g. grass-dominated wetland) associated with the floodplain and estuary of a major tropical river.
- 2a The Site supports a viable population of the globally threatened saltwater crocodile *Crocodylus porosus*.
- 2b The Site includes the most biologically diverse, contiguous floodplain and mangroves system in Western Australia.
- 3b The Site supports substantial numbers of individuals from most of the waterbird families, but especially those (herons, ducks, shorebirds) typically associated with tropical floodplains.

13. General location: (include the nearest large town and its administrative region)

Ord River Floodplain is in the Shire of Wyndham-East Kimberley (local authority) in the State of Western Australia (population ca. 1.77 million). It is 8 km east of the town of Wyndham (population ca. 1000).

The Ramsar Site as originally nominated comprises: former Nature Reserves 30866, 1058, 1059 and 31636 (now amalgamated as Nature Reserve 42155); areas that at the time were proposed for reservation and which are now in Nature Reserve 31967; and some adjacent parts of the marine waters of Cambridge Gulf and the lower Ord River. The main wetland features of the Site therefore are the floodplain and associated wetlands of the lower Ord River and of Parry Creek as well as the intertidal wetlands associated with the East Arm of Cambridge Gulf and the "False Mouths of the Ord".

The Site has now been extended (see map) to correspond with present Nature Reserve boundaries, though tidal and marine waters of the originally nominated Site remain outside the present reserve system. The extension comprises land between the former eastern/southern boundary of the Site and the present eastern/southern boundary of Nature Reserve 42155, which is added so that the entire area of Reserve 42155 (as it is now defined) is within the Ramsar Site.

The extension brings more of the wetlands associated with Goose Creek (e.g. part of Wild Goose Lagoon) and upper Parry Creek (waterholes and gorge wetlands) into the Ramsar Site. No part of the Ramsar Site as originally described has been excised due to the above changes.

14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

As indicated in the original nomination document.

The extension is briefly described in item 13.

15. Hydrological values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

None recognised.

16. Ecological features: (main habitats and vegetation types)

As indicated in the original nomination document. Vegetation of the extension is similar to that of relevant wetlands described in the original nomination document.

17. Noteworthy flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

There are no nationally rare, threatened or endemic plants known at the Site. However, several species that are under consideration for declaration as "rare flora" at State level occur at the Site, notably *Utricularia aurea*.

18. Noteworthy fauna: (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

As indicated in the original nomination document.

19. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

As indicated in the original nomination document.

20. Land tenure/ownership of: (a) site (b) surrounding area

(a). See item 13. The Nature Reserves are all vested in the National Parks and Nature Conservation Authority of Western Australia (appointed by the State Government). The purpose of the Nature Reserves is "Conservation of Flora and Fauna". The estuarine and marine waters within the Site are Crown Waters.

(b). Surrounding areas are mostly pastoral leasehold land (notably Carlton Hill and Ivanhoe leases), government reserves (e.g. Reserve 20623), and Vacant Crown Land (estuarine and marine waters).

21. Current land use: (a) site (b) surroundings/catchment

(a). As indicated in the original nomination document. The extension is used for nature conservation.

(b). As indicated in the original nomination document.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects: (a) at the site (b) around the site

(a). As indicated in the original nomination document.

(b). As indicated in the original nomination document.

23. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

As indicated in the original nomination document.

In addition, since the Site was originally nominated, changes to the extent, vesting and purpose of the component Nature Reserves have been achieved (see item 13).

Preliminary management planning work for the Ramsar Site in 1997 was followed by production of a draft "Management Report" by the Western Australian Department of Conservation and Land Management in 1998. With the approval of the National Parks and Nature Conservation Authority, this document will now be progressed to the status of a formal management plan for the area.

24. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

As indicated in the original nomination document.

In addition, a number of measures have been proposed (CALM 1998), notably: declaration of the Cambridge Gulf Marine Park (which includes tidal creeks that are currently excluded from the Site); management zoning; formation of a site management council; further biological surveys; preparation of a fire master plan; and management of recreational use. Also it is proposed (CALM 1998; G. Graham pers.comm.) that eventually the turtle rookeries at Cape Dornett, and possibly also Adolphus Island, will be added to the Ramsar Site.

25. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

As indicated in the original nomination document.

26. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

As indicated in the original nomination document. Walkways and bird viewing platforms have been constructed at Marigu Lagoon. Interpretive signs about the Site are to be put in place during 1998-9 (G. Graham pers. comm.).

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

As indicated in the original nomination document.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

Territorial: The State Government of Western Australia.

Functional: The National Parks and Nature Conservation Authority (vesting) and the Western Australian Department of Conservation and Land Management (management).

29. Management authority: (name and address of local body directly responsible for managing the wetland)

The East Kimberley District (based in Kununurra) of the Kimberley Region, Western Australian Department of Conservation and Land Management.

30. Bibliographical references: (scientific/technical only)

As indicated in the original nomination document.

Also:

CALM 1998. Lower Ord Ramsar Site Draft Management Report June 1998. Western Australian Department of Conservation and Land Management, Kununurra.

List of Attachments:

- Original nomination document (as held on file by Environment Australia).
- Map of boundary of existing Ramsar Site.
- Map of boundary of extensions to Ramsar Site.

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Please return to:

Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 GLAND, Switzerland

Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: ramsar@hq.iucn.org

Original nomination document**NUMBER 31****NAME:**

Ord River Floodplain, Western Australia

DESIGNATED:

7 June 1990

GEOGRAPHICAL COORDINATES:

Latitude (approx.) 14⁰ 51'S to 15⁰ 39'S
Longitude (approx.) 128⁰ 12'E to 128⁰ 33'E

GENERAL LOCATION:

Cambridge Gulf, Kimberley, Western Australia

AREA:

Approximately 102 000 ha.

WETLAND TYPE:

Dominant:
Marine and Coastal Wetlands - 7 & 9

Others:
Marine and Coastal Wetlands - 11
Inland Wetlands - 1, 9

ELEVATION:

Sea level

OVERVIEW:

A large system of river, tidal mudflat and floodplain wetlands that supports extensive stands of mangroves, large numbers of waterbirds and significant numbers of Salt-water Crocodiles.

PHYSICAL FEATURES:

The seasonal wetlands south of the river are fresh and sometimes fringed by low shrubs or trees. They are surrounded by a flat, grass-covered plain. The mud flats along the river and the eastern side of Cambridge Gulf support patches of *Sporobolus* grassland and samphire. They are incised by numerous creeks and channels, along which mangroves grow. Mangroves also grow along the Ord River and the seaward side of the mudflats.

The grassland around the seasonal wetlands is dominated by cane-grass *Oryza australiense*. Parry Lagoons is surrounded by mudflats containing the samphires *Halosarcia indica leiostachya* and *Tecticornia verrucosa* and grasses. At the edge of the water the sedge *Eleocharis brassii* and a low shrub *Aeschynomene indica* occur. In the water a taller shrub, *Sesbania cannabina*, grows seasonally and a variety of water

lilies and other aquatics occur, including *Ipomoea diamantinensis*, *Nymphaea gigantea*, *Nymphoides* sp., *Utricularia* sp. and *Ceratophyllum* sp. A few *Terminalia* sp. trees grow in some areas. Seasonal wetlands occurring on black soil plains, including Jobalong Flat, are dominated by sedges, principally *Eleocharis* sp. However, in some cases *Terminalia* sp. trees also occur, together with low shrubs, water lilies (*Nymphaea gigantea*, *Nymphoides indica* and *Nymphoides crenata*) and other aquatics.

Permanent waterholes are fringed with a variety of trees, including *Barringtonia acutangula*, *Melaleuca argentea* and *Terminalia platyphylla*. *Pandanus spiralis* occurs around Palm Spring.

In the northern part of the Ramsar site zonation is evident in the mangrove community fronting onto Cambridge Gulf. Mangrove species in the seaward zone, a woodland about 8 m high, include *Sonneratia alba*, *Avicennia marina* and *Aegiceras corniculatum*. Behind this, in a woodland 10 m high, grow *Bruauiera parviflora*, *Avicennia marina* and *Aegiceras corniculatum*, then there is a belt of *Rhizophora stylosa* 12-15 m high. On the landward edge is a 4 m high thicket of *Avicennia marina*, *Cerriops tagal* and *Aegialitis annulata*. Patches of *Sporobolus virginicus* grassland and samphire grow on the mudflats behind the mangroves.

Other species of mangrove occur occasionally in the northern section or along the creeks and the Ord River. These include: *Xylocarpus moluccensis*, *Excoecaria agallocha* and *Camptostemon schultzei*.

ECOLOGICAL FEATURES:

The seasonal wetlands on the Ord River floodplain support large numbers of waterbirds: totals of 13 000 in May 1979; 20 000 in March 1980; 15 000 in January 1981 and 27 000 in May 1986 have been recorded. They regularly contain more than 10 000 ducks: in May 1986 18 400 ducks were recorded there, including 6 500 Hardheads *Aythya australis* and 6 000 Grey Teal *Anas gibberifrons*, and in November 1968 15 000 Plumed Whistling Duck *Dendrocygna eytoni* were seen in the Parry Lagoons. The lagoons are also an important site for waders: several thousand Little Curlews *Numenius minutus* and Oriental Pratincoles *Glareola maldivarum* and hundreds of Wood Sandpipers *Tringa glareola* have been counted. The Parry Lagoons are probably the most important site in Australia for Wood Sandpipers and Marsh Sandpipers *Tringa stagnatilis*. In years when local rainfall is good the lagoons and other seasonal wetlands constitute one of the major breeding areas for waterbirds in the Kimberley and an enormous number and diversity can be seen. Fifty-four species were recorded in May 1986.

The eastern side of Cambridge Gulf has some of the best areas of mangroves in the Kimberley in terms of species diversity, structural complexity, and massiveness of the stands. Besides being of great conservation value in their own right, the mangroves contain a number of species of terrestrial bird which are restricted to this type of habitat or rainforest: the Black Butcherbird *Cracticus quoyi* is an example whose population in the Kimberley is limited to the area around Cambridge Gulf. The mangroves support at least six species of insectivorous bat, Black Flying-foxes *Pteropus alecto* and an undescribed species of mozaic-tailed rat *Melomys*.

The lower Ord River contains a high density of Salt-water Crocodiles *Crocodylus porosus*, a species declared "in need of special protection" under the Western Australian Wildlife Conservation Act, and the surrounding grasslands form the only area in Western Australia where Zitting Cisticolas *Cisticola juncidis* occur.

LAND TENURE:

The wetland area consists of Nature Reserves 30866, 1058, 1059, 31636, 3197 and the proposed northwards extension of 3197, which will include the False Mouths of the Ord. The reserves are vested in the National Parks and Nature Conservation Authority of Western Australia and managed by the Department of Conservation and Land Management.

There is a small freehold area around Twenty-mile Lagoon, within Nature Reserve 31636, which is not included in the Ramsar site.

CONSERVATION MEASURES TAKEN:

Reserves 30866, 1058, 1059, 31636, 3197 have been declared in the southern half of the wetland area.

CONSERVATION MEASURES PROPOSED BUT NOT YET IMPLEMENTED:

A northern extension of 3197, to cover the northern half of the wetland area, has been proposed.

CURRENT LAND USE:

The seasonal wetlands are visited regularly by tourists from Wyndham, which is about 15 km west of Parry Lagoons. The remainder of the reserve area attracts little human usage but the surrounding land is leased for the grazing of cattle, which frequently stray onto the reserves and cause great damage to the seasonal wetlands, especially in 1059.

Mining tenements are held over the majority of the area and exploration for alluvial diamonds is in progress.

DISTURBANCES/THREATS:

Continuing efforts must be made to ensure cattle do not stray into the wetland area and that infestations of Nugurra Burr *Xanthium pungens*, an exotic plant, do not spread. These efforts constitute part of the normal management of nature reserves by the Department of Conservation and Land Management. Trees of *Parkinsonia* sp., another exotic plant, occur around some wetlands near Wild Goose Creek and will need to be eradicated. Exploration for diamonds will be allowed to continue, subject to environmental constraints imposed to minimise disturbance and to maintain wetland ecology and habitat. The question of mining will be assessed by the appropriate State authorities in the event of the discovery of commercial diamonds.

HYDROLOGICAL AND PHYSICAL VALUES:

The principal hydrological value of the wetland are those of floodplain wetlands and mangrove areas.

SOCIAL AND CULTURAL VALUES:

The major social value is tourism although there is a possibility that mining for alluvial diamonds will occur. Mining may, or may not, be compatible with maintaining the ecological character of the wetland.

NOTEWORTHY FAUNA:

See ECOLOGICAL FEATURES.

NOTEWORTHY FLORA:

See ECOLOGICAL FEATURES.

CURRENT SCIENTIFIC RESEARCH AND FACILITIES:

None.

CURRENT CONSERVATION EDUCATION:

None.

CURRENT RECREATION AND TOURISM:

There is a low level of tourist use, especially of Parry Lagoons.

MANAGEMENT AUTHORITY:

Department of Conservation and Land Management, PO Box 104, Como WA 6152.

JURISDICTION:

Government of Western Australia

REFERENCES:

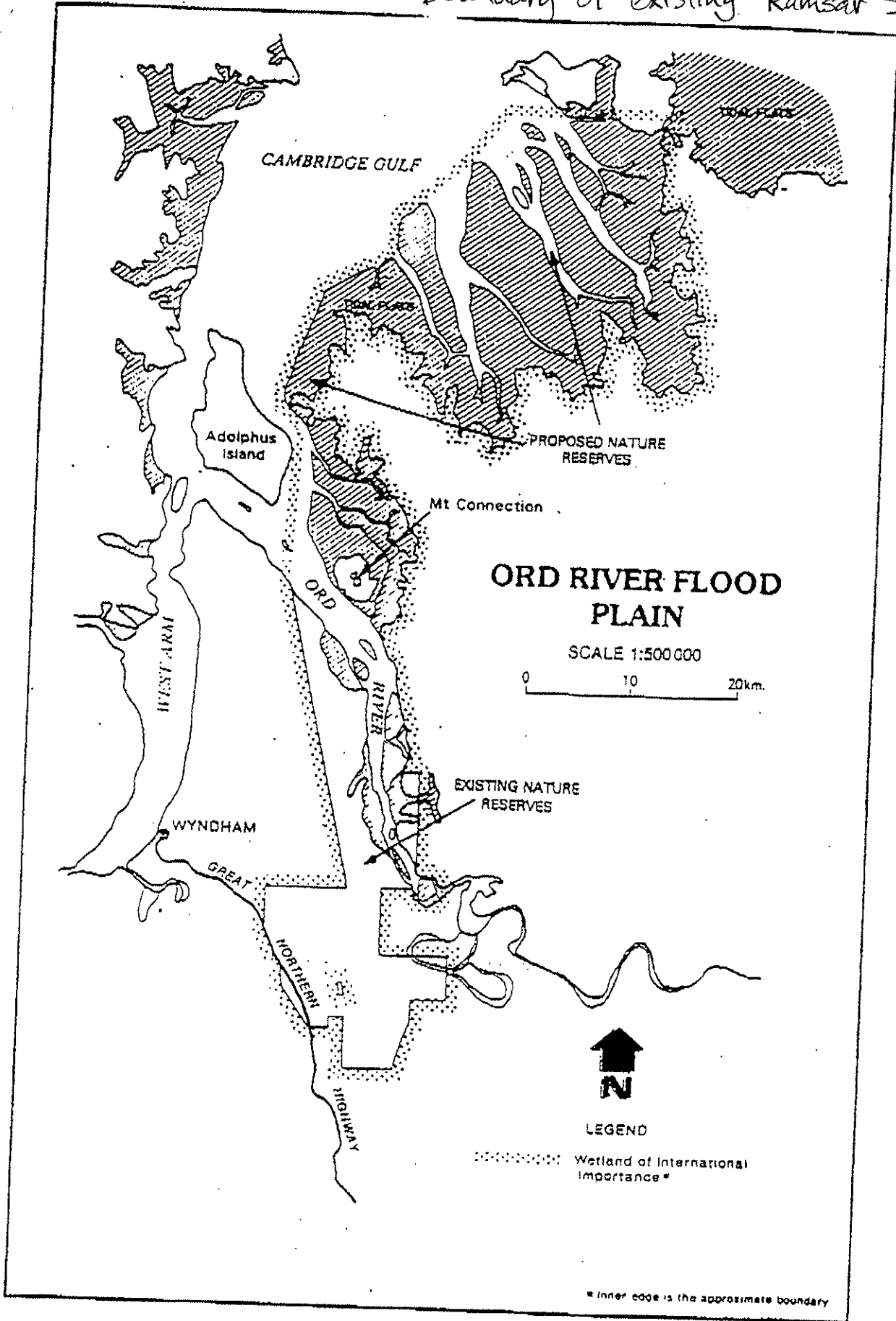
- Burbidge, A.A. and Messel, H. (1979). The status of the Salt-water Crocodile in the Glenelg, Prince Regent and Ord River Systems, Kimberley, Western Australia. Western Australian Department of Fisheries and Wildlife Report 34, 1-38.
- Jaensch, R.P. and Vervest, R.M. (1990). Waterbirds at remote wetlands in Western Australia, 1986-88. Part Two : Lake MacLeod, Shark Bay, Camballin Floodplain and Parry Floodplain. Royal Australasian Ornithologists Union Report 69, 1-40.
- Johnstone, R.E. (1990). Mangroves and mangrove birds of Western Australia. Records of the Western Australian Museum supplement 32, 1-120.
- Thom, B.L., Wright, L.D. and Coleman, J.M. (1975). Mangrove ecology and deltaic-estuarine geomorphology: Cambridge Gulf - Ord River, Western Australia. Journal of Ecology 63, 203-232.

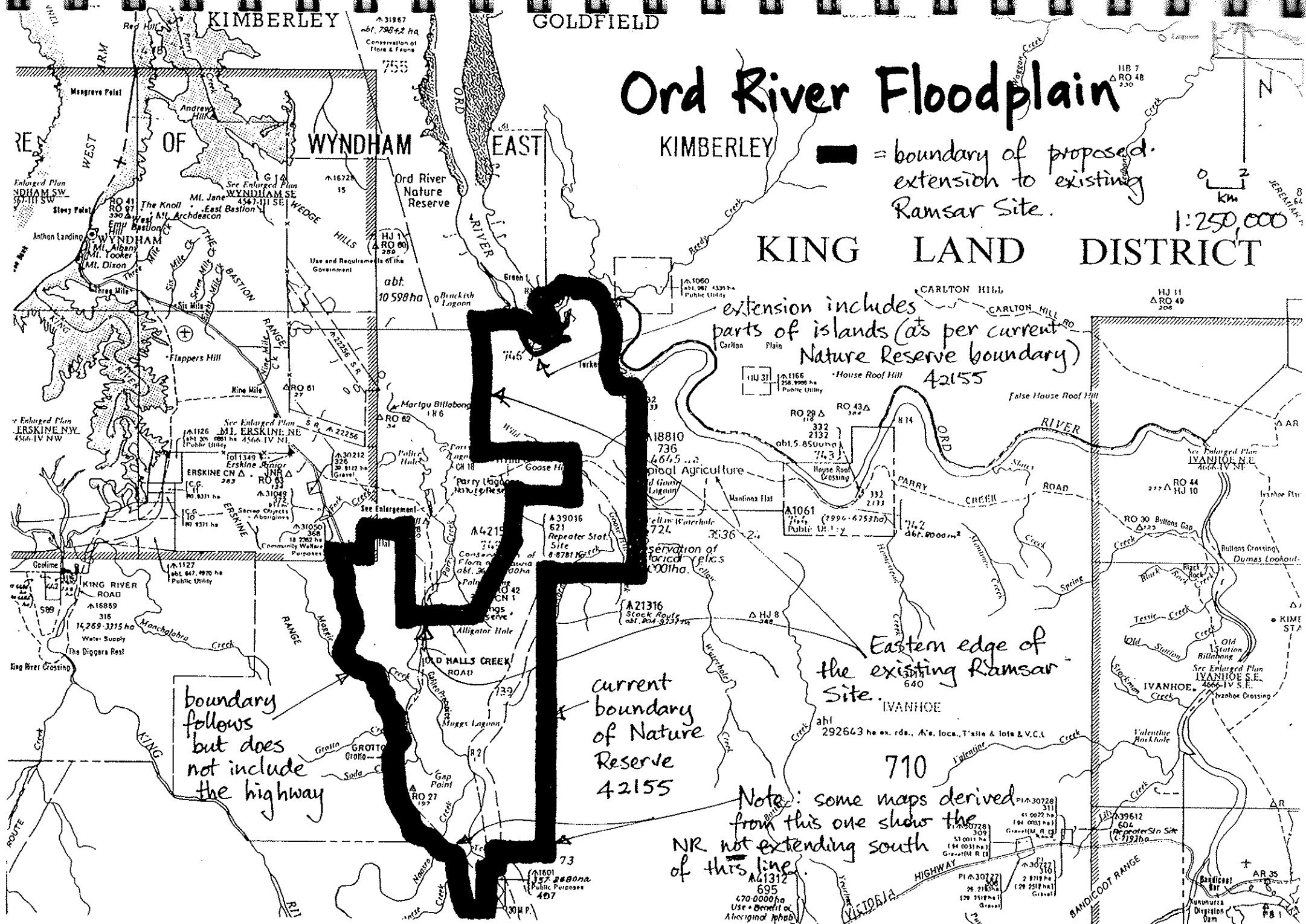
REASONS FOR INCLUSION:

1, 2(a), 2(b) and 3(b).

MAP:

Boundary of existing Ramsar Site





Ord River Floodplain

= boundary of proposed extension to existing Ramsar Site.

1:250,000

KING LAND DISTRICT

extension includes parts of islands (as per current Nature Reserve boundary)

boundary follows but does not include the highway

current boundary of Nature Reserve 42155

Eastern edge of the existing Ramsar Site.

Note: some maps derived from this one show the NR not extending south of this line.

A41312
 695
 670-0000ha
 Use + Benefit of Aboriginal People

P1A30728
 311
 61 0022 ha
 104 0013 ha
 Grawan (M R 1)
 31 0011 ha
 184 0011 ha
 Grawan (M R 1)
 P1A30727
 316
 2 8719 ha
 29 2519 ha
 Grawan

P1A39612
 604
 Repeater Sta Site
 (7197)ha

Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

10 November 1998

FOR OFFICE USE ONLY.
DD MM YY

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Designation date

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Site Reference Number

Note: this Information Sheet documents extensions to the existing Ramsar Wetland.

2. Country:

Australia

3. Name of wetland:

Peel-Yalgorup System

4. Geographical coordinates:

As indicated in the original nomination document (copy attached).

5. Altitude: (average and/or max. & min.) approx. at sea level (Australian Height Datum)

6. Area: (in hectares) the original nomination was approximately 21,000 ha, the total area of the extension is approx. 2000 ha, thus the total area of Ramsar Site is now approx. 23,000 ha.

7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

As indicated in the original nomination document.

8. Wetland Type (please circle the applicable codes for wetland types as listed in Annex I of the *Explanatory Note and Guidelines* document.)

Where types include options, the relevant options are shown in bold:

- F (estuarine waters).
- G (intertidal **mud, sand** or salt flats).
- H (intertidal marshes).
- Q (permanent **saline**/brackish/alkaline lakes).
- Tp (permanent freshwater **marshes**/pools).
- Ts (**seasonal**/intermittent freshwater **marshes**/pools).
- W (shrub-dominated wetlands).
- Xf (freshwater, tree-dominated wetlands).

The extension (see item 13) does not contribute additional wetland types.

Please now rank these wetland types by listing them from the most to the least dominant:

F, Q, Ts, G, H, W, Xf, Tp.

9. Ramsar Criteria: (please circle the applicable criteria; see point 12, next page.)

The criteria under which Peel-Yalgorup System was originally designated as a Ramsar Site are:

- 1 (presumably 1a: it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region).
- 2d (it is of special value for one or more endemic plant or animal species or communities).
Note that this appears to be an error and that the intent was that criterion 2c is met (it is of special value as the habitat of plants or **animals** at a critical stage of their biological cycle).
- 3a (it regularly supports 20,000 waterfowl).
- 3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl).

The extension (see item 13) does not cause additional criteria to be met.

Please specify the most significant criterion applicable to the site: 3a

10. Map of site included? Please tick *yes* -or- *no*

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

The map shows the original Ramsar Site and the extension.

11. Name and address of the compiler of this form:

Roger Jaensch, Wetlands International - Oceania, GPO Box 636, Canberra ACT 2601, Australia, (Tel: +61-2-6250-0779; Fax: +61-2-6250-0799; email: roger.jaensch@ea.gov.au), on behalf of the Western Australian Department of Conservation and Land Management. All inquiries should be directed to Jim Lane, Department of Conservation and Land Management, 14 Queen Street, Busselton WA 6280, Australia, (Tel: +61-8-9752-1677; Fax: +61-8-9752-1432; email: jiml@calm.wa.gov.au).

12. Justification of the criteria selected under point 9, on previous page.

(Please refer to Annex II in the *Explanatory Note and Guidelines* document).

(Summary of information provided in the original nomination document.)

- 1 (1a) The System includes the largest and most diverse estuarine complex in South-Western Australia and also particularly good examples of coastal saline lakes and freshwater marshes. It also includes extensive stromatolite formations, which are a rare feature of wetlands in Australia. (Note that, in the absence of a comprehensive framework, criterion 1a is not being applied to new nominations at present.)
- 2d (presumably meant to be 2c) The System is a major nursery area for fishes, crabs and prawns and is the most important drought refuge area for waterbirds and migration stop-over site for shorebirds in South-Western Australia.
- 3a The System supports up to 150,000 waterbirds annually.
- 3c The System regularly supports 1% of the population of at least 7 waterbird species.

13. General location: (include the nearest large town and its administrative region)

Peel-Yalgorup System is in the Shires of Murray, Mandurah, Waroona and Harvey (local authorities) in the State of Western Australia (population ca. 1.77 million). It is immediately south of the city of Mandurah (population ca. 43,500).

The Ramsar Site as originally nominated comprises: the marine waters of Peel Inlet (south of Mandurah Estuary Bridge) and Harvey Estuary; islands (e.g. Creery Island, Channel Island) in northern Peel Inlet which are Vacant Crown Land; Nature Reserves (4990, 24036, 28087 and 2707) adjoining the east and south-east sides of Peel Inlet; Nature Reserves (2738, 24739, 23756 and 36126) adjoining the east and south-east sides of Harvey Estuary; Lake McLarty (Nature Reserve 39404, which is contiguous with 24739); Lake Mealup (partly in Nature Reserve 6627 and partly freehold owned by the Lake Mealup Preservation Society); and Lakes Clifton and Preston and associated smaller wetlands, within Reserves 11710 and 22057 (which constitute part of Yalgorup National Park).

The Site has now been extended to include six areas, which collectively are referred to in this document as "the extension", and most of which have been recent additions to the protected areas system (see map):

- Extension 1: the addition to Nature Reserve (4990), which was formerly a water reserve (7502) and includes brackish-saline marsh and shrub-swamp connected by a drain to Peel Inlet at Robert Bay; and
- Extension 2: the new Nature Reserve (44978) which comprises the western margins and southern part of Lake McLarty; and
- Extension 3: the addition to Yalgorup National Park at former Locations 5334 and 5578, which is dryland that widens the buffer zone for part of the eastern side of Lake Preston; and
- Extension 4: the addition to Yalgorup National Park (Reserve 11710) at former Locations 1700 and (part of) 2085, which includes some of the north-western shore of Lake Clifton and also dryland that widens the buffer zone for the north-western side of Lake Clifton, but does not include Location; and
- Extension 5: the south-eastern part of Reserve 12189, which is also part of Yalgorup National Park and which widens the buffer zone for part of the north-eastern side of Lake Clifton; and
- Extension 6: Erskine Conservation Park (Nature Reserve 43690), which has two parts and which includes shore and associated marshes on the north-western side of Peel Inlet near "The Chimneys".

Of these components, Extensions 1, 2 and 6 include substantial areas of wetland whereas the others include shoreline that is already at the edge of the existing Ramsar Site and/or dryland that provides a buffer zone for the wetlands.

See also item 24.

14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

As indicated in the original nomination document.

The extension is briefly described in item 13.

15. Hydrological values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

None recognised.

16. Ecological features: (main habitats and vegetation types)

As indicated in the original nomination document. This information also applies to the extension.

17. Noteworthy flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

There are no nationally rare, threatened or endemic wetland plants known at the Site. At least one species (*Schoenus natans*) that is of conservation concern ("Priority 4") at State level is found at the Site (D. Mitchell pers. comm.).

18. Noteworthy fauna: (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

As indicated in the original nomination document.

Areas now added to the Site enhance the conservation values of the Site through inclusion of shorebird feeding habitat (Extensions 1, and 6), inclusion of the remainder of Lake McLarty (the southern part consistently is used by large numbers of waterbirds including migratory shorebirds), and provision/widening of protected buffer zones for the Site's wetlands.

19. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

As indicated in the original nomination document.

The southern end of Lake McLarty is a popular birdwatching site.

20. Land tenure/ownership of: (a) site (b) surrounding area

(a). See item 13. The Nature Reserves and National Park are all vested in the National Parks and Nature Conservation Authority of Western Australia (appointed by the State Government). The purpose of most of the Nature Reserves is "Conservation of Flora and Fauna": an exception is Reserve 43690 which is "Conservation Park". The purpose of the Reserves that comprise Yalgorup National Park is "National Park".

(b). Surrounding areas are mostly freehold (privately owned) land or Vacant Crown Land and there are some other local/State government reserves.

21. Current land use: (a) site (b) surroundings/catchment

(a). As indicated in the original nomination document. The extension is used for nature conservation.

(b). As indicated in the original nomination document.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects: (a) at the site (b) around the site

(a). As indicated in the original nomination document. In addition, changes to the hydrology of Peel Inlet and Harvey Estuary have occurred since the Dawesville Cut was opened in 1994, effectively creating a more marine environment in the Inlet (greater tidal exchange/range within Peel Inlet and Harvey Estuary).

(b). As indicated in the original nomination document. In addition, urban (housing, including canal estate) development has continued to expand in the immediate vicinity of the Site. The already substantial urban population adjacent to many parts of the Ramsar Site is expected to increase markedly.

23. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

As indicated in the original nomination document. In addition, since the Site was originally nominated, four new Nature Reserves (included in the extension: see item 13) on or near the edge of Peel Inlet or Harvey Estuary have been declared and Yalgorup National Park has been extended (some of this is included in the Site extension). A management plan exists for Yalgorup National Park (CALM 1995).

24. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

As indicated in the original nomination document.

The conservation value of the "Creery Marshes" (salt marsh immediately north of Creery Island) has been recognised and under zoning and development approval processes currently underway the wetlands of the Creery Marshes will be reserved for conservation. When future tenure and precise boundaries have been determined the area is proposed to be added to the Ramsar Site.

Subject to resolution of land tenure and consultation with stakeholders, it may be possible to add other areas to the Ramsar Site in the future, notably the system of reserves, vested in the Shire of Murray, which comprises the system of deltaic islands situated where the Murray River enters Peel Inlet.

25. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

As indicated in the original nomination document.

26. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

As indicated in the original nomination document.

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

As indicated in the original nomination document.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

With respect to the Nature Reserves and National Park:

Territorial: The State Government of Western Australia.

Functional: The National Parks and Nature Conservation Authority (vesting) and the Western Australian Department of Conservation and Land Management (management).

With respect to the waters and shores: The Peel Inlet Management Authority.

29. Management authority: (name and address of local body directly responsible for managing the wetland)

The Dwellingup District (based in Dwellingup and with an office also in Mandurah town) of the Swan Region, Western Australian Department of Conservation and Land Management, and the Mandurah office of the Peel Inlet Management Authority.

30. Bibliographical references: (scientific/technical only)

As indicated in the original nomination document, plus the following:

CALM 1995. Yalgorup National Park Management Plan 1995-2005. Management Plan No. 29, Western Australian Department of Conservation and Land Management, Perth.

List of Attachments:

- Original nomination document (as held on file by Environment Australia).
- Map of boundary of existing Ramsar Site.
- Map of boundary of extensions to Ramsar Site.

=====

Please return to:

Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 GLAND, Switzerland

Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: ramsar@hq.iucn.org

Original nomination document**NUMBER 36****NAME:**

Peel-Yalgorup System, Western Australia

DESIGNATED:

7 June 1990

GEOGRAPHICAL COORDINATES:

Latitude (approx) 32° 32'S to 33° 06'S
Longitude (approx) 115° 38'E to 115° 46'E

GENERAL LOCATION:

Mandurah, south-western Australia.

AREA:

Approximately 21,000

WETLAND TYPE:

Dominant:
Marine and Coastal Wetland - 6
Inland Wetland - 7

Others:
Inland Wetland - 5

ELEVATION:**OVERVIEW:**

A large system of estuary and saline lakes. Up to 150 000 waterbirds have been recorded in the estuary, and the saline lakes have an interesting hydrology.

PHYSICAL FEATURES:

Peel Inlet and Harvey Estuary form a shallow estuarine system connected to the sea via a narrow channel at the northern end of the Inlet. The Murray and Serpentine Rivers drain into the north-eastern corner of the Inlet; the Harvey River enters the Estuary at its southern end. Several major drains from agricultural land empty into the eastern side of the Estuary and Inlet.

A large proportion of the Peel Inlet and southern end of the Harvey Estuary contains water less than 0.5 m deep; the maximum depth of the water is only about 2 metres. Salinity varies according to season and location in the system but, in general terms, varies from 10 ppt in winter to 45 ppt TDS in summer. Tidal flushing in summer is not great enough to prevent evaporation making the water slightly more concentrated than seawater.

The Yalgorup lakes vary from about 1-4 metres in depth and are saline (although they are principally supplied by fresh groundwater and precipitation) because of long-term concentration of salt by evaporation; they never overflow. The salinity regime in particular lakes varies according to their hydrology. Lake Clifton has very extensive areas of groundwater seepage, which result in pronounced horizontal salinity gradients; away from the shoreline the water varies from about 10 ppt in winter to 40 ppt TDS in summer. Large quantities of calcium carbonate precipitate out of seepage water as it enters Lake Clifton and Lake Pollard. Lake Hayward reaches about 200 ppt TDS in summer but is remarkable for exhibiting vertical stratification of salinity in winter when it is only about 2 metres deep. Surface water contains about 70 ppt, that on the bottom contains 180 ppt. This results in an inverse thermal stratification with water at the bottom of the lake reaching 35° C and, because of prolific growth of cyanophyta, being about 2 000% saturated with oxygen.

Parts of Peel Inlet and Harvey Estuary and some of the lakes in the Yalgorup chain are fringed by samphire flats. Behind the samphire, or sometimes adjacent to the water where samphire is absent, rushes and sedges occur. Outside this is a zone of trees tolerant of water-logging while the higher ground away from the lake supports open forest. Large parts of the shoreline throughout the Peel-Yalgorup system have been cleared, usually for agriculture, thus altering or eliminating the tree zones.

Samphire vegetation around Peel Inlet and Harvey Estuary is dominated by *Halosarcia Halocnemoides*. The dominant species of sedge is *Bolboschoenus caldwellii*, which grows both being samphire and to the water's edge where low trees of *Melaleuca raphiophylla* and *M. hamulosa* around the eastern side of the Inlet or *M. cuticularis* and *M. raphiophylla* along the Estuary. *Melaleuca* is sometimes replaced by *Acacia saligna* and *Eucalyptus rudis* farther from the water. As the ground begins to rise the vegetation changes to open forest dominated by *Eucalyptus gomphocephala* and *Agonis flexulosa* on the western side of the system or *E. marginata* and *E. calophylla* on the eastern side.

The vegetation around the Yalgorup lake is virtually the same. Around hypersaline lakes there is a narrow belt of samphire, behind which clumps of *Juncus kraussii* and *Gahnia trifida* occur. Hyposaline lakes lack samphire but have a dense belt of *Melaleuca cuticularis* and *M. raphiophylla* in the cast of hyposaline lakes; samphire and rushes are replaced by *M. cuticularis* and *Acacia cyclops* in the case of hypersaline ones. The surrounding woodland is dominated by *Eucalyptus gomphocephala* and *Agonis flexuosa*.

ECOLOGICAL FEATURES:

In terms of total number, Peel Inlet and Harvey Estuary comprise the most important area for waterbirds in south-western Australia: over 150 000 were recorded in February 1977. It was conservatively estimated that 12 000-15 000 ducks and swans used the area each year between 1981-85; much higher usage occurred in 1976-77. Particularly abundant species of duck are:

Black Swan	<i>Cygnus atratus</i>	5 422 Aug 1976
Australian Shelduck	<i>Tadorna tadornoides</i>	5 644 Dec 1984
Pacific Black Duck	<i>Anas superciliosus</i>	3 000 Feb 1982
Grey Teal	<i>A. gibberifrons</i>	>20 000 Dec 1976
Australasian Shoveler	<i>A. rhynchotis</i>	500 Feb 1982
Blue-billed Duck	<i>Oxyura australis</i>	1 200 Jul 1983

Highest numbers of many species in southwestern Australia have been recorded in the Inlet and Estuary system, including the Little Egret *Egretta garzetta* and Royal Spoonbill *Platalea regia*, which are uncommon in the region. Species recorded in large numbers include:

Hoary-headed Grebe	<i>Poliiocephalus poliocephalus</i>	1 000s	Jun	1977
Australian Pelican	<i>Pelecanus conspicillatus</i>	2 102	Dec	1976
Black-winged Stilt	<i>Himantopus himantopus</i>	2 703	Nov	1977
Banded Stilt	<i>Cladorhynchus leucocephalus</i>	>60 000	Feb	1977
Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>	>1 100	Apr	1977
Red Knot	<i>Calidris canutus</i>	>1 000	Oct	1976
Sharp-tailed Sandpiper	<i>C. acuminata</i>	2 119	Jan	1983
Red-necked Stint	<i>C. ruficollis</i>	8 063	Mar	1985
Curlew Sandpiper	<i>C. ferruginea</i>	1 000s	Dec	1976

A total of 67 species of waterbird has been recorded in Peel Inlet and Harvey Estuary. Many species also occur in the Yalgorup lakes, including large numbers of ducks, swans and waders. Over 2 200 Musk Duck (*Biziura lobata*) were counted in Lake Clifton in March 1986 and 11 000 Australian Shelduck were recorded there in November 1986.

Peel Inlet and Harvey Estuary contain large numbers of fish, Blue Manna Crabs (*Portunus pelagicus*) and Greasy-back Prawns (*Metapeneas dalli*). The area supports the biggest professional and amateur estuarine fishery in Western Australia.

Lake Clifton is one of only two sites known in the world where "stromatolite-like" structures occur in hyposaline water. They are formed by calcium carbonate precipitating out of freshwater seepage and being incorporated in the mucilage secreted by the cyanophyta growing on the bottom of the lake. The hydrology of the Yalgorup lakes is extremely interesting: several types of salinity regime occur in lakes with similar physiognomy that are supplied by the same underground aquifer.

LAND TENURE:

The wetlands area in Peel Inlet and Harvey Estuary extends to high water mark and mostly falls within the Shire of Murray; the southern tip of Harvey Estuary is in the Shire of Waroona. Various State Governments agencies, including the Peel Inlet Management Authority, Waterways Commission and Marine and Harbours Department, have statutory powers in the waters of Peel Inlet and Harvey Estuary. There is a series of small Nature Reserves at the southern end of Harvey Estuary and Inlet (2990, 23756, 24739, 2738, 2707, 2436, 4990), some of which are included in the wetland area. There is also an aquatic Nature Reserve (28087) in the south-eastern corner of the Inlet. Yunderup National Park is located in the delta where the Murray River enters Peel Inlet.

Lake McLarty is a proposed Nature Reserve. Most of Lake Mealup is either Nature Reserve or is owned by the Lake Mealup Preservation Society. These areas are included in the proposed Wetland of International Importance.

The Yalgorup lakes are contained in Yalgorup National Park but in many cases only a very thin band of riparian land has been included in the Park. All Nature Reserves in the wetlands area and Yalgorup National Parks are vested in the National Parks and Nature Conservation Authority of Western Australia; Yalgorup National Park is vested in the Murray Shire. The reserves and Yalgorup National Parks are managed by the Department of Conservation and Land Management; Yunderup National Park is managed by the Murray Shire.

CONSERVATION MEASURES TAKEN:

There are a series of Nature Reserves around Harvey Estuary and Peel Inlet (2990, 23756, 24739, 2738, 2707, 2436, 4990, 28087) and there is a National Park where the Murray River enters Peel Inlet. Yalgorup lakes are all within Yalgorup National Park. A management plan was prepared for Peel Inlet and Harvey Estuary in 1982.

CONSERVATION MEASURES PROPOSED BUT NOT YET IMPLEMENTED:

There is a proposal to create another connection with the sea (the 'Dawesville Cut') on the western side of Peel Inlet to improve tidal flushing and reduce the build up nutrients (draining in from the catchment) in the system.

CURRENT LAND USE:

Peel Inlet and Harvey Estuary are used extensively for public recreation, especially fishing. The town of Mandurah is on the northern edge of the Inlet and there are several small housing developments along the shores of the Inlet and the north-western part of the Estuary. The area to the east is used principally for cattle farming and there are many farmlets and holiday homes on the western side of the Estuary.

The Yalgorup lakes are in a National Park and are used only for passive recreation associated with their natural values. However, much of the surrounding land has been cleared for cattle farming and an area on the north-eastern shore of Lake Clifton has recently been sub-divided for housing.

DISTURBANCES/THREATS:

A major management problem exists in Peel Inlet and Harvey Estuary. Large amounts of phosphate leached from surrounding agricultural land into the estuarine system have caused it to become eutrophic and there is massive production of benthic and planktonic algae, which causes a variety of biological problems. There has been intensive investigation into ways of managing the system and the Peel Inlet Management Authority is implementing a management plan produced in 1982. As far as waterbirds are concerned, any further development around the deltas where rivers enter the Inlet and Estuary should be carefully controlled. Similarly, urban development around the Yalgorup lakes should be approached cautiously, especially in the case of Lake Clifton where it may interfere with the groundwater seepages producing the "stromatolites". Furthermore, intensive human activity on the shore of Lake Clifton would result in severe damage to these comparatively delicate structures.

HYDROLOGICAL AND PHYSICAL VALUES:**SOCIAL AND CULTURAL VALUES:**

The major social values of Peel Inlet and Harvey Estuary are fishing, both commercial and recreational, and other aquatic activities. There is extensive residential development on the shores of the Inlet and Estuary; there is also residential development on the eastern shore of Lake Clifton. Farming occurs adjacent to Lakes Clifton and Preston and parts of Peel Inlet and Harvey Estuary.

NOTEWORTHY FAUNA:

See ECOLOGICAL FEATURES.

NOTEWORTHY FLORA:

See ECOLOGICAL FEATURES.

CURRENT SCIENTIFIC RESEARCH AND FACILITIES:

Extensive research has been, and currently is being, conducted by the Environmental Protection Authority and universities on management of Peel Inlet and Harvey Estuary. Limited research has been conducted on the lakes of the Yalgorup system, where the University of Western Australia operates the Neville Stanley Research Station.

CURRENT CONSERVATION EDUCATION:

An education program is being developed by Department of Conservation and Land Management.

CURRENT RECREATION AND TOURISM:

Peel Inlet and Harvey Estuary are used extensively for recreational fishing and boating. There is limited use of Yalgorup National Park for passive recreation.

MANAGEMENT AUTHORITY:

Peel Inlet Management Authority

Department of Conservation and Land Management, PO Box 104, Como WA 6152.

JURISDICTION:

Government of Western Australia

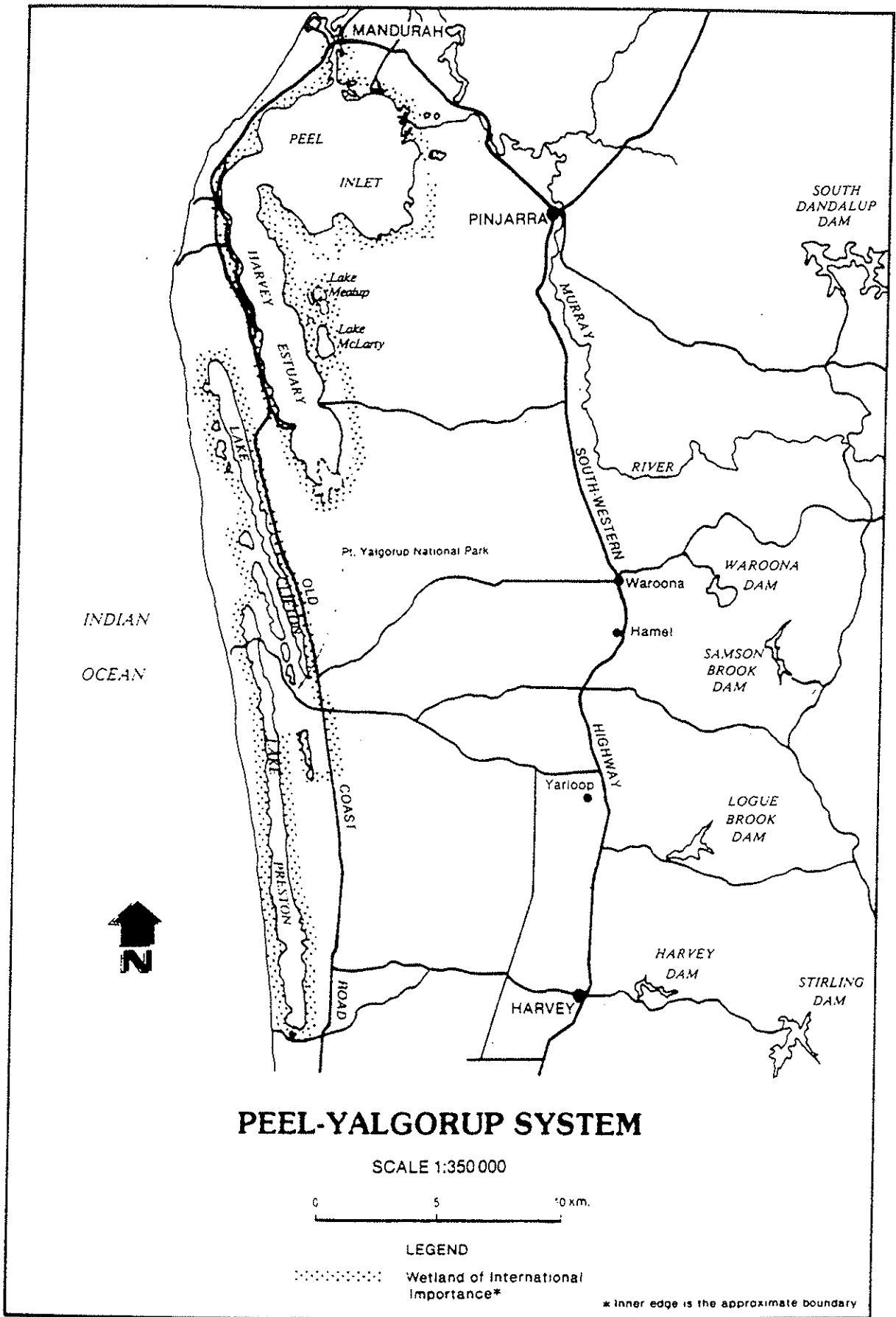
REFERENCES:

- Backshall, D.J. and Bridgewater, P.B. (1981). Peripheral vegetation of Peel Inlet and Harvey Estuary, Western Australia. *Journal of the Royal Society of Western Australia* 63, 5-11.
- Black, R.E. and Hodgkin, E.P. (1984). Management of Peel Inlet and Harvey Estuary. *Bulletin* 170. Department of Conservation and Environment, Perth.
- Burke, C.M. and Knott, B. (1989). Limnology of four groundwater-fed saline lakes in south-western Australia. *Australian Journal of Marine and Freshwater Research* 40, 55-68.
- Jaensch, R.P., Vervest, R.M. and Hewish, M.J. (1988). Waterbirds in nature reserves of south-western Australia, 1981-1985: reserve accounts. *Royal Australasian Ornithologists Union Report* 30, 1-290.
- Moore, L.S. (1987). Water chemistry of the coastal saline lakes of the Clifton-Preston Lakeland System, south-western Australia, and its influence on stromatolite formation. *Australian Journal of Marine and Freshwater Research* 38, 647-660.
- Moore, L., Knott, B. and Stnaley, N.F. (1984). The stromatolites of Lake Clifton, Western Australia. *Search* 14, 309-314.

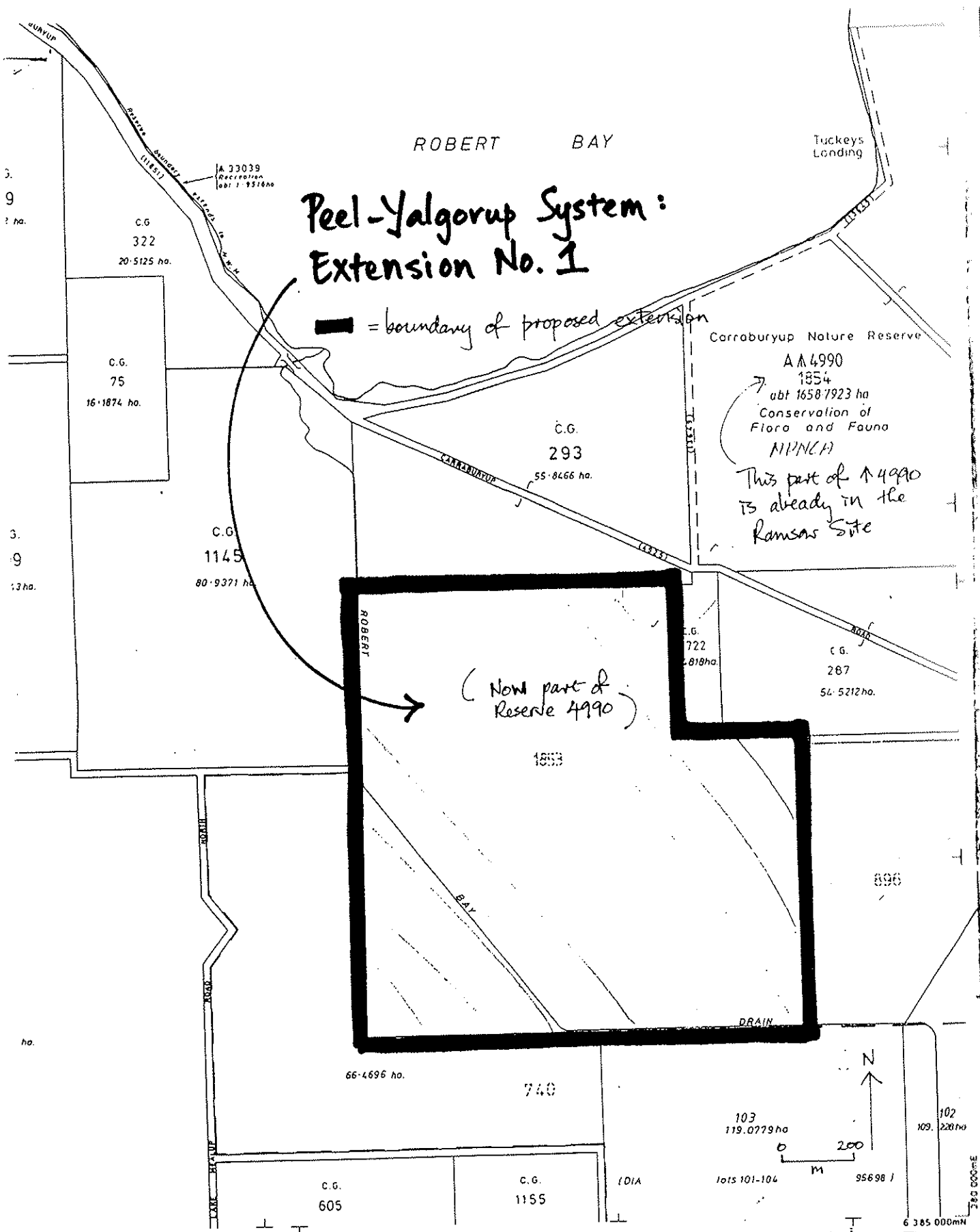
REASONS FOR INCLUSION:

1, 2(d), 3(a) and 3(c).

MAP:



Boundary of existing Ramsar Site



VALUER GENERAL'S OFFICE. PERTH.

MANDURAH & ENVIRONS
WESTERN AUSTRALIA

LAND DISTRICT MURRAY

Scale 1 : 10 000

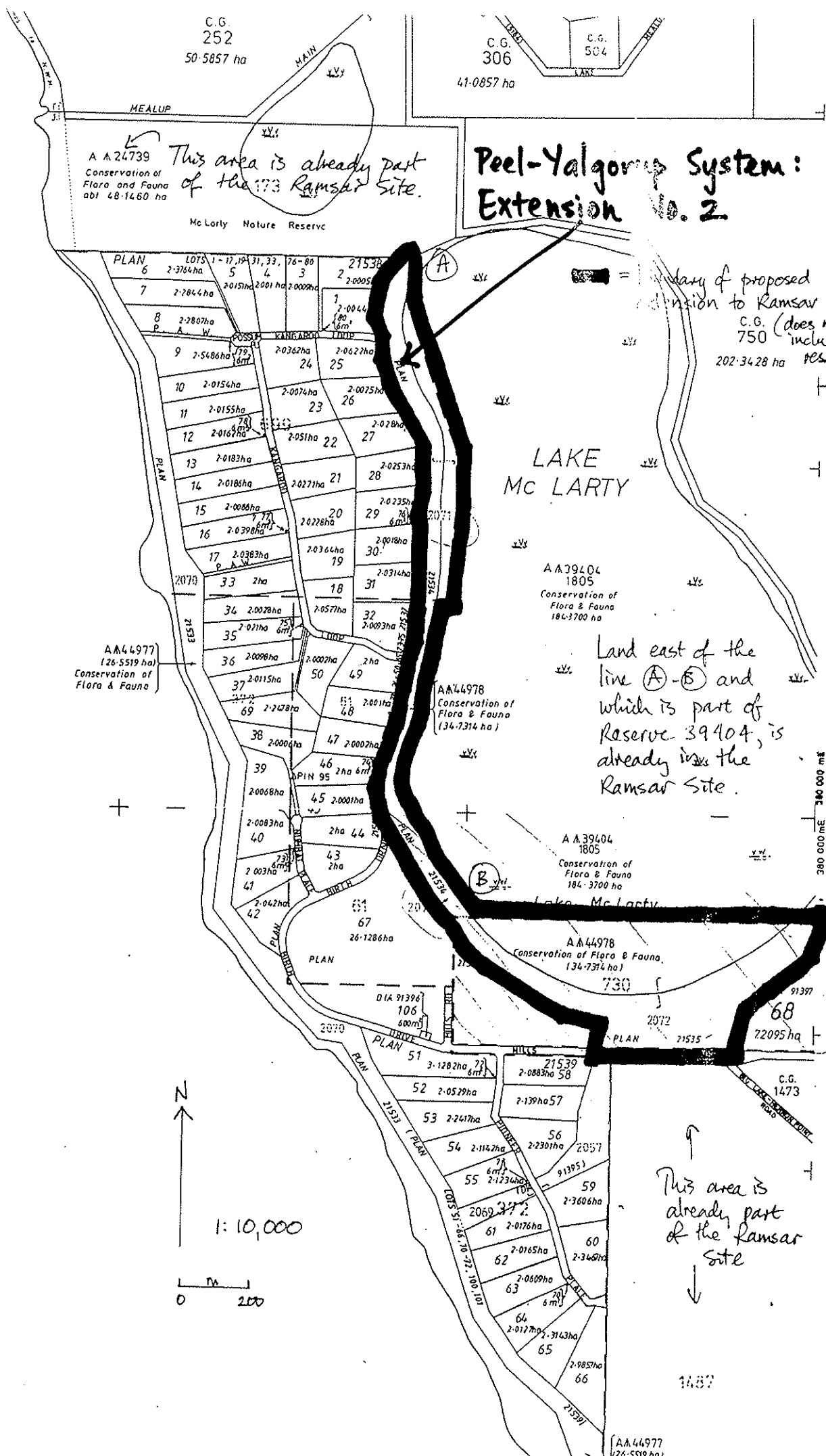
LOCAL AUTHORITY CITY OF MANDURAH & SHIRE OF MURRAY

ON PLAN 1:25 000 MANDURAH 2032 - IV NE
1:25 000 MANDURAH 2032 - IV SE SOUTH WEST MINERAL FIELD

ADJOINING SHEETS		
8-7	1-7	2-7
8-6	1-6	
OVERLAY IDENTIFICATION		

Sheet No:

10 000 BG . 32 / 1 . 6



C.G.
252
50-5857 ha

C.G.
306
41-0857 ha

C.G.
504

A.A.24739
Conservation of
Flora and Fauna
abi 48-1460 ha

*This area is already part
of the 173 Ramsar Site.*

Peel-Yalgoo System: Extension No. 2

McLarty Nature Reserve

Boundary of proposed
extension to Ramsar Site
C.G. (does not
750 include road
202-3428 ha reserves).

LAKE
MC LARTY

A.A.39204
1805
Conservation of
Flora & Fauna
184-3700 ha

Land east of the
line A-B and
which is part of
Reserve 39404, is
already in the
Ramsar Site.

A.A.44978
Conservation of
Flora & Fauna
(134-7314 ha)

A.A.39404
1805
Conservation of
Flora & Fauna
184-3700 ha

A.A.44978
Conservation of Flora & Fauna,
(134-7314 ha)

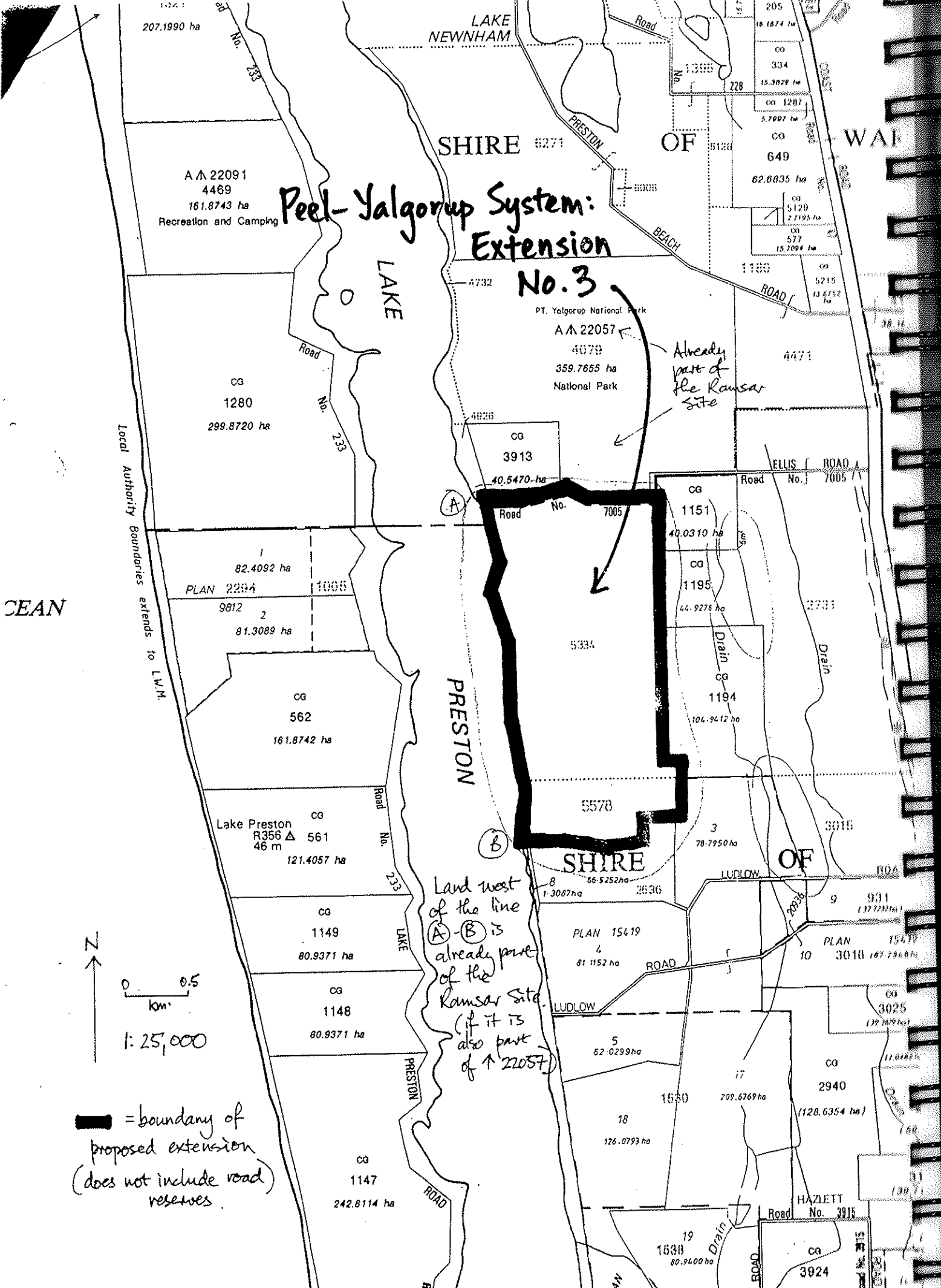
A.A.44977
(26-5519 ha)
Conservation of
Flora & Fauna

N
1: 10,000

0 200

*This area is
already part
of the Ramsar
Site*

A.A.44977
(26-5519 ha)
Conservation of
Flora & Fauna



Peel-Yalgorup System: Extension No. 3

CEAN

Local Authority Boundaries extends to L.M.

0 0.5
km
1:25,000

█ = boundary of proposed extension (does not include road reserves)

Land west of the line A-B is already part of the Ramsar Site (if it is also part of ↑ 22057)

Already part of the Ramsar Site

207.1990 ha

A.A. 22091
4469
161.8743 ha
Recreation and Camping

CG
1280
299.8720 ha

PLAN 22064
82.4092 ha

9812
81.3089 ha

CG
562
161.8742 ha

Lake Preston
R356 Δ 561
46 m
121.4057 ha

CG
1149
80.9371 ha

CG
1148
80.9371 ha

CG
1147
242.8114 ha

LAKE
NEWNHAM

SHIRE 6271

LAKE
PRESTON

4732

No. 3

PT. Yalgorup National Park

A.A. 22057
4079
359.7655 ha
National Park

4826
CG
3913
40.5470 ha

PRESTON

(B)

SHIRE

PLAN 15419
8
1.3087 ha

PLAN 15419
4
81.1152 ha

5
62.0299 ha

18
126.0793 ha

19
1638
80.9600 ha

205
18.1874 ha
CG
334
15.3029 ha
CG 1207
5.7907 ha
CG
649
62.8835 ha
CG 5120
2.7195 ha
CG 577
15.7094 ha

1130
CG
5215
13.6152 ha

ELLIS ROAD
Road No. 7005

CG
1151
40.0310 ha

CG
1195
44.9278 ha

CG
1194
104.9412 ha

3
78.7950 ha

66-5252 ha

2636

9
931
(17773 ha)

10
3018
(67796 ha)

CG
3025
(39169 ha)

CG
2940
(128.6354 ha)

HAZLETT
Road No. 3915
CG
3924

No. 13427
HILL ROAD

1871
CITY OF MANDURAH

ESTU

DIA 2 L2070
742
202.7349 ha

5523

CO 85
67-4813
ha

123
20.2622

5524

Yalgorup National Park
WELLINGTON DISTRICT

AA 11710
abt 10 425-2308 ha
National Park

SWAN POND

LAKE

CLIFTON

Peel-Yalgorup System:
Extension No. 4

— = boundary of proposed extension (does not include road reserves).

Land east of the line (A)-(B) and which is part of Yalgorup National Park, is already in the Ramsar Site.

MOUNT JOHN

BUCK POND

THIS LAKE IS ALREADY PART OF THE RAMSAR SITE

Scale 1:25 000

THIS AREA (LOC. 534) IS NOT INCLUDED IN THE RAMSAR SITE OR EXTENSION

NO DIVISION OR GENERAL FIELD



Map Grid from Cadastral Survey on December 1872
Institute Geodesic C.M. 1137 E
Australian Geodesic Datum 1984
Van Heighm Datum 1971
Hon of the Surveyor General
Western Australia

May 1985

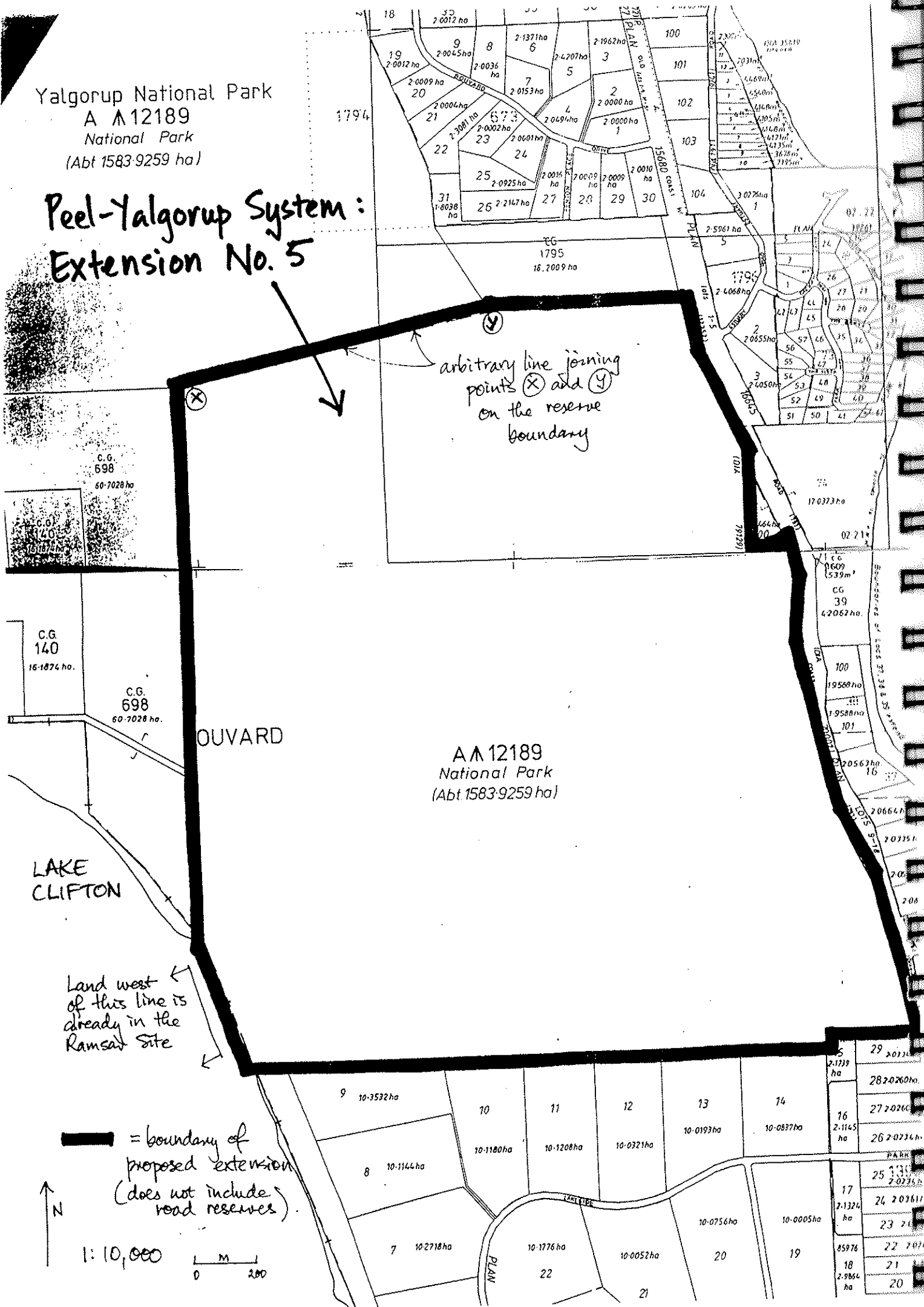
- Surveyed Boundary
- Unsurveyed Boundary
- Goldfield Boundary
- Townsite under Local Gov't Act
- Townsite Boundary
- State Forest Boundary
- Land District Boundary
- Agricultural Area or Estate Boundary
- Water Control Boundary
- Local Authority Boundary
- Land Division Boundary

Tenure: Freehold - Lease	CO 353
Reserve: Land Act, Forest Act	A1924 F.A. 55
Agricultural Area or Estate Lot	56... (to Subdivided)
Locations	3765... (to Subdivided)
Station Name	CONSLIDNEY
Locality Name	Annandale
L.T.O. Lots	34
Freehold Land	0m ² 1992
Land leased under special or C.I. condition	
Land leased under Section 11C	
Vacant Crown Land	



Yalgorup National Park
 A 12189
 National Park
 (Abt 1583.9259 ha)

Peel-Yalgorup System:
 Extension No. 5



arbitrary line joining
 points X and Y
 on the reserve
 boundary

OUVARD

A 12189
 National Park
 (Abt 1583.9259 ha)

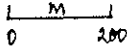
LAKE
 CLIFTON

Land west
 of this line is
 already in the
 Ramsar Site

— = boundary of
 proposed extension
 (does not include
 road reserves)



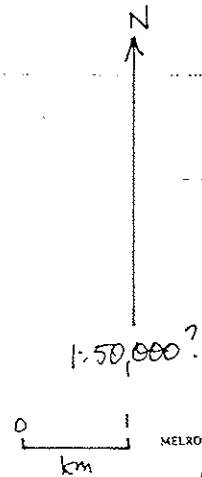
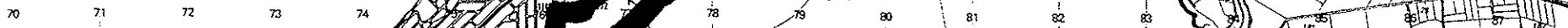
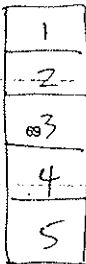
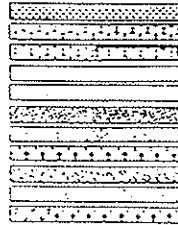
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= existing Ramsar Site

KEY TO SYMBOLS

- Disease Risk Quarantined Boundary
- Pine Plantation CALM
- Pine Private, Share Farming
- CALM Lands
- Regenerated Forest
- Mined Area
- Rehabilitated Mined Area
- Tuart (Dominant)
- Karrri (Occasional)
- Wandoo (Dominant)
- Mallet (Dominant)



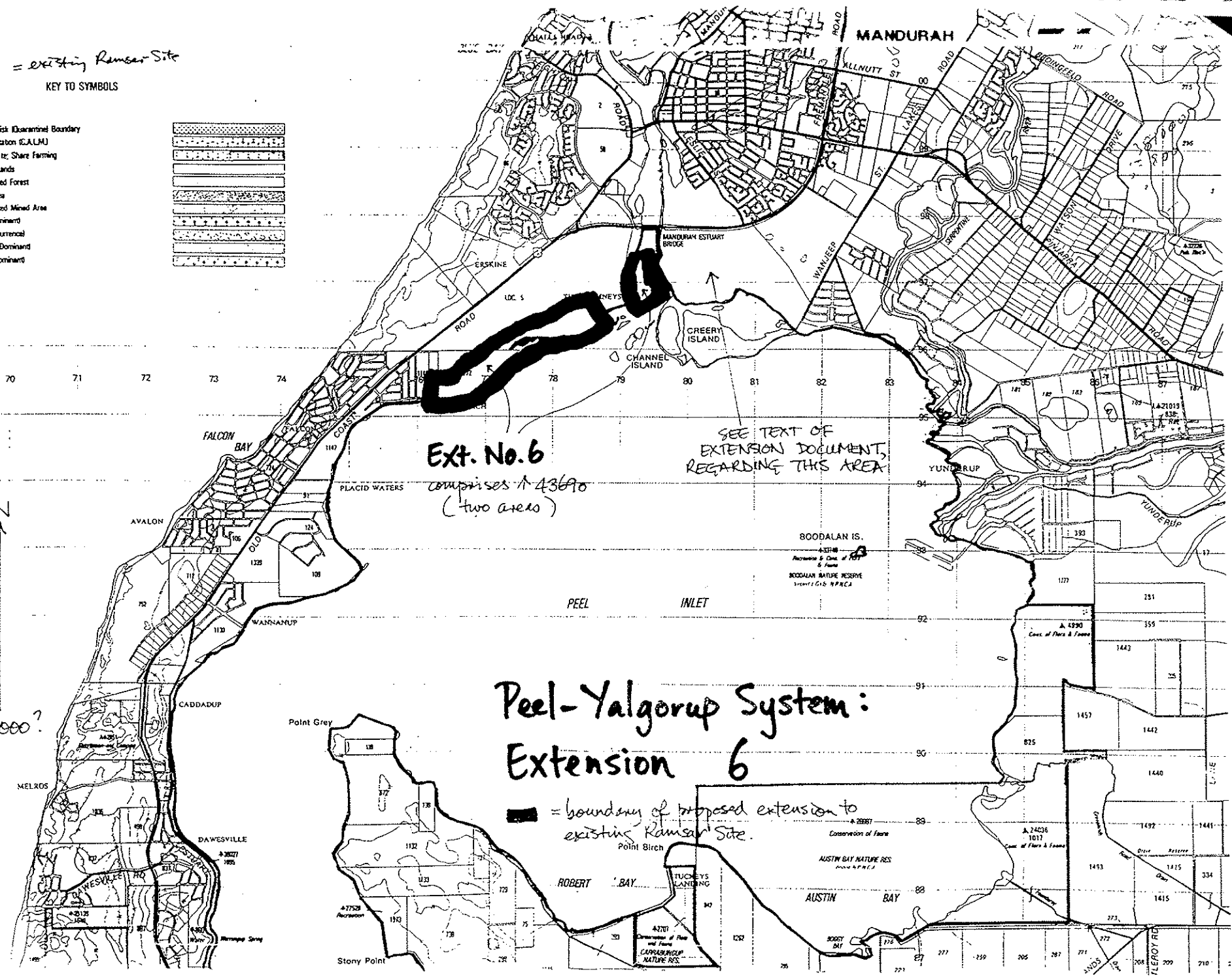
1:50,000?

Ext. No. 6
comprises A 43690
(two areas)

SEE TEXT OF
EXTENSION DOCUMENT,
REGARDING THIS AREA

Peel-Yalgorup System: Extension 6

= boundary of proposed extension to existing Ramsar Site.



Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

10 November 1998

FOR OFFICE USE ONLY.

DD MM YY

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Designation date

--	--	--	--	--	--	--	--	--	--

Site Reference Number

Note: this Information Sheet documents extensions to the existing Ramsar Wetland.

2. Country:

Australia

3. Name of wetland:

Lake Toolibin

(also known as Toolibin Lake)

4. Geographical coordinates:

As indicated in the original nomination document (copy attached).

5. Altitude: (average and/or max. & min.) approx. 300 m (Australian Height Datum).

6. Area: (in hectares) the original nomination was approximately 437 ha, the extension is approx. 56 ha, thus the total area of the Ramsar Site is now approx. 493 ha.

7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

As indicated in the original nomination document.

8. Wetland Type (please circle the applicable codes for wetland types as listed in Annex I of the *Explanatory Note and Guidelines* document.)

Where types include options, the relevant options are shown in bold:

Xf (freshwater, tree-dominated wetlands)

This describes the original wetland type. Due to salinisation the water is no longer fresh (see item 14). The wetland type that would more accurately reflect the present water salinity is R (seasonal/intermittent saline/**brackish**/alkaline lakes and flats) but this does not reflect the wooded character of the wetland, which is the dominant feature.

The extension (see item 13) does not contribute additional wetland types.

Please now rank these wetland types by listing them from the most to the least dominant:

9. Ramsar Criteria: (please circle the applicable criteria; see point 12, next page.)

The criteria under which Lake Toolibin was originally designated as a Ramsar Site are:

- 1a (it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region).
- 2b (it is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna).
- 2c (it is of special value as the habitat of plants or animals at a critical stage of their biological cycle).

The extension (see item 13) does not cause additional criteria to be met.

Please specify the most significant criterion applicable to the site:

The criteria are equally significant.

10. Map of site included? Please tick **yes -or- **no****

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

The map shows the original Ramsar Site and the extension.

11. Name and address of the compiler of this form:

Roger Jaensch, Wetlands International - Oceania, GPO Box 636, Canberra ACT 2601, Australia, (Tel: +61-2-6250-0779; Fax: +61-2-6250-0799; email: roger.jaensch@ea.gov.au), on behalf of the Western Australian Department of Conservation and Land Management. All inquiries should be directed to Jim Lane, Department of Conservation and Land Management, 14 Queen Street, Busselton WA 6280, Australia, (Tel: +61-8-9752-1677; Fax: +61-8-9752-1432; email: jiml@calm.wa.gov.au).

12. Justification of the criteria selected under point 9, on previous page.

(Please refer to Annex II in the *Explanatory Note and Guidelines* document).

(Summary of information provided in the original nomination document.)

- 1a Lake Toolibin is the last, large tree-dominated wetland, with mostly living trees, in the inland agricultural area of South-Western Australia. Whereas wetlands of this type formerly were widespread, the woodland in most of these wetlands has been degraded or lost due to salinisation associated with agricultural development.
- 2b As the last remnant of a formerly common wetland type, Lake Toolibin is vital to maintaining the genetic and ecological diversity of the inland agricultural area of South-Western Australia.
- 2c Lake Toolibin supports more breeding waterbird species than most if not all other wetlands in South-Western Australia. These include Freckled Duck *Stictonetta naevosa* which is declared "rare and endangered" in Western Australia. The Lake supports small breeding colonies of cormorants, egrets, night herons and spoonbills which are otherwise scarce or absent in the inland agricultural area of South-Western Australia.

13. General location: (include the nearest large town and its administrative region)

Lake Toolibin is in the Shire of Wickiepin (local authority) in the State of Western Australia (population ca. 1.77 million). It is 40 km east of the town of Narrogin (population ca. 4670).

The Ramsar Site as originally nominated comprises Nature Reserve 24556 and part of Nature Reserve 9617. It includes the entire area of Lake Toolibin and some adjacent land particularly on the north-eastern and eastern sides.

The Site has now been extended (see map) to include land on the northern and western sides of the Lake which was recently acquired by the Government of Western Australia for conservation purposes. This ensures a reserved buffer zone of at least 100 m width on all except the far southern side of the Lake.

14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

As indicated in the original nomination document.

15. Hydrological values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

As indicated in the original nomination document. (See also item 23.)

16. Ecological features: (main habitats and vegetation types)

As indicated in the original nomination document.

The extension formerly was mostly agricultural land used for cereal cropping and thus was almost completely devoid of native vegetation before it was acquired for conservation. It will be planted extensively with native vegetation to help control rising saline groundwater.

17. Noteworthy flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

There are no rare, threatened or endemic plants known at the Site.

18. Noteworthy fauna: (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

As indicated in the original nomination document.

19. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

None recognised.

20. Land tenure/ownership of: (a) site (b) surrounding area

(a). The Ramsar Site as originally nominated comprises Nature Reserve 24556 and part of Nature Reserve 9617. The land now added to the Site is land that recently has been added to the Nature Reserves (J. Lane pers. comm.). The Nature Reserves are vested in the National Parks and Nature Conservation Authority of Western Australia (appointed by the State Government). The purpose of Reserve 24556 is "Protection of Flora and Fauna" and the purpose of Reserve 9617 is "Conservation of Flora and Fauna".

(b). Surrounding areas include freehold (privately owned) land, and Nature Reserves.

21. Current land use: (a) site (b) surroundings/catchment

(a). There is no land use other than nature conservation within the Ramsar Site. There are no facilities for nature-based recreation; this type of recreation occurs at low levels within the Ramsar Site.

(b). As indicated in the original nomination document.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects: (a) at the site (b) around the site

(a). As indicated in the original nomination document.

(b). As indicated in the original nomination document.

23. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

As indicated in the original nomination document.

Under the Salinity Action Plan for WA, Lake Toolibin and associated wetlands have been designated as a "Key Wetlands for Natural Diversity" Recovery Catchment. Integrated management of the catchment, with substantial community participation, is occurring. Specific actions at the Lake have included diversion of highly saline, inflowing surface water (generally the first autumn-winter runoff) away from the Lake and pumping to lower the saline groundwater table under the Lake. Revegetation and other activities are occurring in the surface catchment to control groundwater rise (K. Wallace pers. comm.).

24. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

Under the Lake Toolibin Recovery Plan (Bowman Bishaw Gorham *et al.* 1992), it is proposed to install additional pumps that will contribute further to lowering of the saline groundwater under the Lake and in the immediate vicinity. Further work aimed at lowering of the saline groundwater, and reducing saline surface runoff, is planned for the upstream surface and groundwater catchment of the Lake (K. Wallace pers. comm.).

25. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

As indicated in the original nomination document.

26. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

As indicated in the original nomination document.

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

As indicated in the original nomination document.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

Territorial: The State Government of Western Australia.

Functional: The National Parks and Nature Conservation Authority (vesting) and the Western Australian Department of Conservation and Land Management (management).

29. Management authority: (name and address of local body directly responsible for managing the wetland)

The Narrogin District (based in Narrogin) of the Wheatbelt Region, Western Australian Department of Conservation and Land Management.

30. Bibliographical references: (scientific/technical only)

As indicated in the original nomination document, plus the following:

Bowman Bishaw Gorham, Jim Davies & Associates, and Rural Planning 1992. Recovery Plan for Toolibin Lake and Surrounding Reserves. Unpublished report prepared for the Department of Conservation and Land Management, Western Australia under the Australian National Parks and Wildlife Service Endangered Species Program, 1991/92. Western Australian Department of Conservation and Land Management.

List of Attachments:

- Original nomination document (as held on file by Environment Australia).
- Map of boundary of existing Ramsar Site.
- Map of boundary of extensions to Ramsar Site.

=====

Please return to:
Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 GLAND, Switzerland
Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: ramsar@hq.iucn.org

Original nomination document

NUMBER 37

NAME: Lake Toolibin, Western Australia

DESIGNATED: 7 June 1990

GEOGRAPHICAL COORDINATES:

Latitude (approx.) 32° 55'S

Longitude (approx.) 117° 36'E

GENERAL LOCATION: South West of Western Australia

AREA: Approximately 437 ha.

WETLAND TYPE: Dominant: Inland Wetlands - 11

ELEVATION:

OVERVIEW:

A semi-permanent lake supporting dense stands of *Casuarina obesa* and *Melaleuca strobophylla* trees. It is the last such lake in south-western Australia in which the vegetation is still viable; it also supports a high diversity of waterbirds and more breeding species than any other wetland in south west Western Australia.

PHYSICAL FEATURES:

Lake Toolibin is a fresh-brackish wetland that fills from surface run-off. It is almost permanent, containing at least 1 metre of water about 70 per cent of the time but it occasionally dries out and may receive no inflow for a year or two. The maximum depth of water is about 2 metres after which the lake overflows into other wetlands at the headwaters of the Arthur River. Most of the lake is covered in thickets or woodlands of water-tolerant tree species although there is a large open area on the eastern side. The higher ground around the lake supports open eucalypt woodland. There are pronounced undulations or 'gilgai mounds' on the floor of the lake and the trees tend to occur on the mounds.

Two aquatic macrophytes *Potamogeton* sp. and *Lepilaena* sp. grow in the lake. The trees in the thickets and woodlands there are principally *Casuarina obesa* although *Melaleuca strobophylla* is common and *M. laterifolia*, *M. viminea* and *Eucalyptus rudis* also occur. The *E. rudis* trees are found only in open woodlands. The sedge *Chorizandra endodis* is common in parts of the lake.

The fringing woodland around the waterbody consists of *Allocasuarina huegeliana*, *M. uncinata*, *E. rudis* and *Acacia accuminata*. *Eucalyptus loxophleba* forms an open woodland on higher ground.

ECOLOGICAL FEATURES:

Lake Toolibin supports 24 species of breeding waterbird, which is the greatest number for any wetland in south-western Australia. Altogether 41 species of waterbird have been recorded there, which is the highest species richness amongst inland wetlands in the south-west.

In particular, Lake Toolibin is important as a breeding area for Freckled Ducks *Stictonetta naevosa*, which are gazetted 'rare and endangered' under the Western Australian Wildlife Conservation Act, and for large wading birds - Pacific Herons *Ardea pacifica*, White-faced Herons *A. novaehollandiae*, Great Egrets *Egretta alba*, Rufous Night Herons *Nycticorax caledonicus* and Yellow-billed Spoonbills *Platalea flavipes* all breed there. In addition, Lake Toolibin is an important breeding area in south-western Australia for Great Cormorants *Phalacrocorax carbo*, Little Black Cormorants *P. sulcirostris*, Little Pied Cormorants *P. melanoleucos* and Blue-billed Ducks *Oxyura australis*.

Lake Toolibin is the only remaining example in south western Australia of a wetland with extensive thickets of living *Casuarina obesa*. This used to be one of the main types of inland freshwater wetland in the south-west before clearing for agriculture resulted in most inland wetlands becoming saline with the concomitant death of emergent vegetation. In addition, the lake supports extensive stands of *M. strobophylla*, which has a restricted distribution.

LAND TENURE:

Lake Toolibin and adjacent land are contained in Nature Reserve t24556 and part of Game Reserve t9617. The reserves are vested in the National Parks and Nature Conservation Authority of Western Australia and managed by the Department of Conservation and Land Management.

CONSERVATION MEASURES TAKEN:

The lake is contained in Reserve 24556.

CONSERVATION MEASURES PROPOSED BUT NOT YET IMPLEMENTED:

Groundwater pumps are being installed to lower saline groundwater levels under the lake to improve the vigour of the vegetation.

CURRENT LAND USE:

Two other reserves, the northern part of Game Reserve 9617 and Nature Reserve 27285, abut the Ramsar site on the northern side and these contain wetlands (suffering from varying degrees of salinization) and native vegetation. The reserves are used for nature conservation and duck-shooting. Otherwise, the surrounding land has all been cleared and is used to grow pasture for sheep or is cropped.

DISTURBANCES/THREATS:

The salinity of the water in the lake has increased over the past two decades as a result of the catchment area being affected by salinization. The groundwater in the area is saline and the water table (as a result of clearing native vegetation) has risen to within 1-2 metres of the lake bed. The high, saline water table and the saline run-off into the lake from the salt-affected catchment area have had a markedly detrimental effect on the trees in the lake; many have died on the western side.

To prevent this fate overtaking all trees in the lake some urgent remedial management is required. A series of pumps has been installed on the western side of the lake to lower the water table. A tree-planting program is under way in the catchment area. A strip of land has recently been acquired along the western side of the lake from the adjacent farmer and this strip is being planted with trees to help lower the water table through transpiration and reduce the salinity of surface run-off from this side.

HYDROLOGICAL AND PHYSICAL VALUES:

The lake is perched above the water table, being filled from surface run-off. The groundwater has become saline and risen to within 1 metre of the lake bed, however, as a result of surrounding farm being cleared and now threatens the health of the vegetation.

SOCIAL AND CULTURAL VALUES:**NOTEWORTHY FAUNA:**

See ECOLOGICAL FEATURES.

NOTEWORTHY FLORA:

See ECOLOGICAL FEATURES.

CURRENT SCIENTIFIC RESEARCH AND FACILITIES:

No research is being conducted at present but there have been recent studies of the hydrology and waterbird values of the lake. Waterbird numbers, salinity, depth and pH are being monitored.

CURRENT CONSERVATION EDUCATION:

None.

CURRENT RECREATION AND TOURISM:

None.

MANAGEMENT AUTHORITY:

Department of Conservation and Land Management, PO Box 104, Como WA 6152.

JURISDICTION:

Government of Western Australia

REFERENCES:

Bell, D.T. and Froend, R.H. (1990). Mortality and growth of tree species under stress at Lake Toolibin in the Western Australian wheatbelt. *Journal of the Royal Society of Western Australia* 72, 63-66.

Halse, S. (1988). The last lake. *Landscape* 3, 17-22.

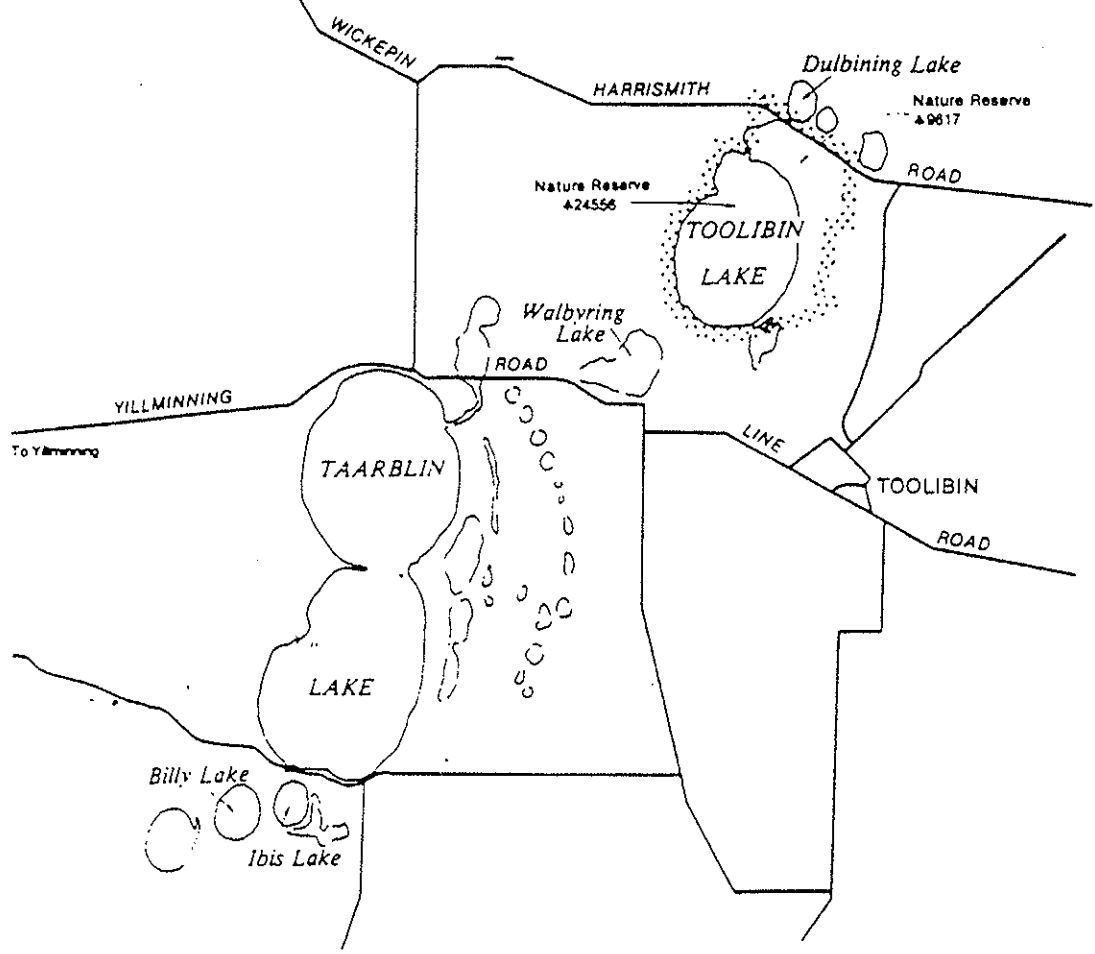
Northern Arthur River Wetlands Committee (1987). The status and future of Lake Toolibin as a wildlife refuge. Report WS2. Water Authority of Western Australia, Perth.

REASONS FOR INCLUSION:

1, 2(b) and 2(c).

MAP:

Boundary of existing Ramsar Site



LAKE TOOLIBIN

SCALE 1:100 000



LEGEND

..... Wetland of International Importance*

* Inner edge is the approximate boundary

Information Sheet on Ramsar Wetlands

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

NOTE: It is important that you read the accompanying *Explanatory Note and Guidelines* document before completing this form.

1. Date this sheet was completed/updated:

10 November 1998

FOR OFFICE USE ONLY.

DD MM YY

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Designation date

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Site Reference Number

Note: this Information Sheet documents extensions to the existing Ramsar Wetland.

2. Country:

Australia

3. Name of wetland:

Vasse-Wonnerup System

4. Geographical coordinates:

As indicated in the original nomination document (copy attached).

5. Altitude: (average and/or max. & min.) approx. 1-12 m (Australian Height Datum).

6. Area: (in hectares) the original nomination was approximately 740 ha, the total area of the extension is approx. 710 ha, thus the total area of the Ramsar Site is now approx. 1450 ha.

7. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

As indicated in the original nomination document.

8. Wetland Type (please circle the applicable codes for wetland types as listed in Annex 1 of the *Explanatory Note and Guidelines* document.)

Where types include options, the relevant options are shown in bold:

J (coastal **brackish**/saline lagoons)

N (**seasonal**/intermittent/irregular rivers/**streams**/creeks)

Ss (**seasonal**/intermittent saline/**brackish**/alkaline **marshes**/pools)

The extension (see item 13) does not contribute additional wetland types.

Please now rank these wetland types by listing them from the most to the least dominant:

J, Ss, N.

9. Ramsar Criteria: (please circle the applicable criteria; see point 12, next page.)

The criteria under which Vasse-Wonnerup System was originally designated as a Ramsar Site are:

3a (it regularly supports 20,000 waterfowl).

3c (where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl).

The extension (see item 13) does not cause additional criteria to be met.

Please specify the most significant criterion applicable to the site: 3a

10. Map of site included? Please tick **yes -or- **no****

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits).

The map shows the original Ramsar Site and the extensions.

11. Name and address of the compiler of this form:

Roger Jaensch, Wetlands International - Oceania, GPO Box 636, Canberra ACT 2601, Australia, (Tel: +61-2-6250-0779; Fax: +61-2-6250-0799; email: roger.jaensch@ea.gov.au), on behalf of the Western Australian Department of Conservation and Land Management. All inquiries should be directed to Jim Lane, Department of Conservation and Land Management, 14 Queen Street, Busselton WA 6280, Australia, (Tel: +61-8-9752-1677; Fax: +61-8-9752-1432; email: jiml@calm.wa.gov.au).

12. Justification of the criteria selected under point 9, on previous page.

(Please refer to Annex II in the *Explanatory Note and Guidelines* document).

(Summary of information provided in the original nomination document.)

3a. More than 33,000 waterbirds have been counted at Vasse-Wonnerup System (January 1988). Waterbird data indicate that probably more than 20,000 waterbirds use the Site each year and that particular counts in summer would have exceeded 20,000 in at least several of the past 25 years. This information supports the conclusion that, in the Western Australian context, the Site "regularly supports 20,000 waterfowl".

3c. At least 1% of the Australian population of Black-winged Stilt *Himantopus himantopus* and at least 1% of the world population of Red-necked Avocet *Recurvirostra novaehollandiae* use Vasse-Wonnerup System in most years.

A comprehensive framework for identifying wetlands that are particularly good representative examples of wetland types (criterion 1a) does not exist for Western Australia. However, this framework is likely to become available in the future and in that event Vasse-Wonnerup System should be assessed against this criterion.

13. General location: (include the nearest large town and its administrative region)

Vasse-Wonnerup System is in the Shire of Busselton (local authority) in the State of Western Australia (population ca. 1.77 million). It is immediately east of the town of Busselton (population ca. 17,500).

The Ramsar Site as originally nominated comprises Vasse Estuary and Wonnerup Estuary (as shown on official cadastral maps) as far west as Ford Road and as far seaward as Forrest Beach Road, but not including the dryland part of Nature Reserve 31188, nor dryland parts of Tuart Forest National Park, nor the 23 blocks of Vacant Crown Land that extend into the estuaries. The part of the lower reaches of Sabina River which is in Reserve 31188, also Abba River downstream of Tuart Drive (the old Bussell Highway) and part of Malbup Creek (both of which are part of Tuart Forest National Park), are included in the existing Ramsar Site.

The Site has now been extended to include (see map):

- Extension 1: the dryland component of Reserve 31188, which includes a substantial part of the southern shore of Vasse Estuary; and
- Extension 2: those dryland parts of Tuart Forest National Park (Reserve 40250) which are contiguous with Vasse Estuary (this does not include the lowest reaches of Abba River and part of Malbup Creek since they are already in the Ramsar Site, and does not include the part of Reserve 40250 at Location 4976 since that is not contiguous with the Estuary; and does not include road and railway reserves inside the Reserve boundary); and
- Extension 3: Nature Reserve 41568, which comprises a substantial part of the northern shore of Vasse Estuary east of Ford Road.

14. Physical features: (e.g. geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

As indicated in the original nomination document.

15. Hydrological values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc)

None recognised.

16. Ecological features: (main habitats and vegetation types)

As indicated in the original nomination document.

In addition, the vegetation of Tuart Forest National Park is dominated by open-forest of mature tuart *Eucalyptus gomphocephala*. Tall shrubs and small trees of Western Australian peppermint *Agonis flexuosa* occur as understorey in the forest.

The vegetation of the Nature Reserves that are now added to the Site includes low shrubland dominated by samphires and sedges and with small areas of tall shrubs mainly *Melaleuca* spp. *Eucalyptus rudis* trees and some sedges occur along the Sabina and Abba Rivers.

17. Noteworthy flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc)

There are no nationally rare, threatened or endemic wetland plants known at the Site.

18. Noteworthy fauna: (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

As indicated in the original nomination document.

In addition, the tuart forest is considered to contribute substantially to the conservation values of the Ramsar Site in providing breeding sites (tree hollows) for Australian Wood Duck *Chenonetta jubata*, Australian Shelduck *Tadorna tadornoides* and possibly other duck species. Adult ducks have been observed moving their young from the forest down Abba River to the vicinity of Vasse Estuary. The extension also provides a protected buffer zone for some of the Site's wetland.

Land within Nature Reserves that are now added to the Site adds to the conservation values of the Site in providing protected buffer zones for the Site's wetlands and seasonal feeding habitat for the Site's waterbirds.

The water rat *Hydromys chrysogaster* has been recorded at the Site.

Data are from files of the Western Australian Department of Conservation and Land Management.

19. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

As indicated in the original nomination document.

In addition, the (Ludlow) tuart forest is of historical interest because it was among the first areas to be gazetted (originally) as State Forest in Western Australia and the first formal training school for forest land managers in the State was located there.

20. Land tenure/ownership of: (a) site (b) surrounding area

(a). The Site as originally nominated comprised Vacant Crown Land (marine waters), Nature Reserve (part of Sabina Nature Reserve 31188) and Crown leasehold land; areas of freehold land that extended into the estuaries were not included. Land now added to the Site comprises Nature Reserve (the remainder of Sabina Nature Reserve; and all of Reserve 41568) and National Park (part of Tuart Forest National Park = Reserve 40250). The Nature Reserves and National Park are all vested in the National Parks and Nature Conservation Authority of Western Australia (appointed by the State Government). The purpose of Reserves 31188 and 41568 is "Conservation of Flora and Fauna" and the purpose of Reserve 40250 is "National Park".

(b). Surrounding areas include freehold (privately owned) land, State Forest and Vacant Crown Land (marine waters).

21. Current land use: (a) site (b) surroundings/catchment

(a). The principal land use at the Site is nature conservation. In addition, a bird hide has been constructed at Malbup Creek and a self-guided interpretive walk-trail commencing from Layman Picnic Area runs parallel to Malbup Creek and partially along the lower reaches of the Abba River within the Tuart Forest National Park. A schools-based education program, led by the Western Australian Department of Conservation and Land Management, exploring - among other things - the forest/wetland interface, has been in place for five years.

(b). As indicated in the original nomination document.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects: (a) at the site (b) around the site

(a). As indicated in the original nomination document. In addition, changes to the operation of the flood gates on Vasse Estuary have occurred; the extent to which this may impact waterbird usage of the Site in summer-autumn is the subject of ongoing investigation by the Western Australian Department of Conservation and Land Management (J. Lane pers. comm.). Furthermore, exotic plants including bulrush *Typha orientalis* and arum lily *Zantedeschia aethiopica* are established in and around the Sabina and Abba Rivers: ongoing control programs are in place.

(b). As indicated in the original nomination document. In addition, urban (housing estate) development has continued to expand in the immediate vicinity of the Site.

23. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

As indicated in the original nomination document. In addition, since the Site was originally nominated, one new Nature Reserve (41568) on the edge of Vasse Estuary has been declared and additional such reserves are in the process of being gazetted or are planned. Activities to control feral animals (foxes and rabbits) are undertaken regularly, notably monthly fox baiting in Tuart Forest National Park and Reserve 31188 to reduce fox predation on ducks that nest in the tuart forest and walk their young to the wetlands.

No management plan or interim management guidelines currently exist for Reserves 41568, 31188 or 40250.

24. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

As indicated in the original nomination document.

25. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

As indicated in the original nomination document. See also item 22.

26. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

A bird hide has been constructed at Malbup Creek and a self-guided interpretive walk-trail commencing from Layman Picnic Area runs parallel to Malbup Creek and partially along the lower reaches of the Abba River within the Tuart Forest National Park. A schools-based education program, led by the Western Australian Department of Conservation and Land Management (CALM), exploring - among other things - the forest/wetland interface, has been in place for five years. CALM also is running waterbird identification and "Frog Watch" activities at the Site.

27. Current recreation and tourism: (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

As indicated in the original nomination document. See also item 26.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

With respect to the Nature Reserves and National Park:

Territorial: The State Government of Western Australia.

Functional: The National Parks and Nature Conservation Authority (vesting) and the Western Australian Department of Conservation and Land Management (management).

29. Management authority: (name and address of local body directly responsible for managing the wetland)

The South West Capes District (based in Busselton) of the Central Forest Region, Western Australian Department of Conservation and Land Management.

30. Bibliographical references: (scientific/technical only)

As indicated in the original nomination document.

List of Attachments:

- Original nomination document (as held on file by Environment Australia).
- Map of boundary of existing Ramsar Site.
- Map of boundary of extensions to Ramsar Site.

=====
Please return to:

Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 GLAND, Switzerland

Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: ramsar@hq.iucn.org

Original nomination document

NUMBER 38

NAME: Vasse-Wonnerup System, Western Australia

DESIGNATED: 7 June 1990

GEOGRAPHICAL COORDINATES:

Latitude (approx.) 33° 35'S to 33° 39'S
Longitude (approx.) 115° 22'E to 115° 28'E

GENERAL LOCATION: Busselton, southwestern Australia

AREA: Approximately 740 ha.

WETLAND TYPE:

Dominant: Marine and Coastal Wetlands - 6

ELEVATION:

OVERVIEW:

An estuarine system with artificially manipulated water levels that supports very high numbers of waterbirds; up to 33 000 birds have been counted there.

PHYSICAL FEATURES:

The Wonnerup and Vasse Estuaries are no longer true estuaries because inflow of seawater is prevented by weirs across the two arms of Wonnerup Inlet. The Estuaries now act as compensating basins for water discharging from the Ludlow, Sabina, Abba and Vasse Rivers. When the water level in the Estuaries rises above sea level, hydrostatic pressure opens valves in the weirs and allows water to flow out to Wonnerup Inlet and the sea. When the level drops the valves close, thereby preventing ingress of seawater. Water in the Estuaries is fresh in winter and becomes brackish in summer. Wonnerup Estuary was mined in the 1950s for mineral sands.

The Vasse-Wonnerup system is shallow; almost all the wetland area has a maximum water depth of less than 1 metre and dries out in late summer. Small sections of the Estuaries near Wonnerup Inlet retain water because a limited amount of seawater seeps around the weirs.

The system consists of broad expanses of open water (except when dry) with fringing samphire and rushes. In some areas *Melaleuca* woodlands occur behind the samphire and eucalypt woodlands are found on higher ground. However all the area has been severely disturbed at various times in the past 50 years and much of it is currently cleared for agriculture.

The natural vegetation of the system is fairly uniform. The samphire belt is dominated by *Sarcocornia blackiana* and *Halosarcia pergranulata*. The rush and sedge zone is dominated by *Juncus kraussii* but *Lepidosperma* cf. *leptostachyum* and *Carex divisa* are also common. The tree zone behind the rushes comprises *Melaleuca raphiophylla*, *M. hamulosa* and *M. cuticularis* in either single-species or mixed stands. *Gahnia trifida* and *Juncus pallidus* occur in the understorey. *Melaleuca* woodlands often give way to an open woodland of *Eucalyptus rudis*.

ECOLOGICAL FEATURES:

The Vasse-Wonnerup system provides an important coastal habitat for waterbirds: 33 000 were counted there in January 1986. The wetlands supported 10 056 ducks and swans in 1984-85 and over 12 000 in 1985-86. The following species are particularly abundant:

Black Swan <i>Cygnus atratus</i>	3 460	Nov 1976
Australian Shelduck <i>Tadorna tadornoides</i>	1 873	Feb 1985
Pacific Black Duck <i>Anas superciliosa</i>	2 768	Feb 1985
Grey Teal <i>A. gibberifrons</i>	7 000	Jan 1986

Other species occurring in significant numbers include:

Australian Pelican <i>Pelecanus conspicillatus</i>	750	Feb 1986
Great Egret <i>Egretta alba</i>	237	Feb 1985
Yellow-billed Spoonbill <i>Platalea flavipes</i>	120	Jan 1986
Eurasian Coot <i>Fulica atra</i>	4 000	Jan 1986
Black-winged Stilt <i>Himantopus himantopus</i>	5 000	Jan 1986
Red-necked Avocet <i>Recurvirostra novaehollandiae</i>	4 000	Jan 1986
Wood Sandpiper <i>Tringa glareola</i>	61	Jan 1986
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	2 300	Jan 1986
Long-toed Stint <i>C. subminuta</i>	44	Jan 1986
Curlew Sandpiper <i>C. ferruginea</i>	1 200	Jan 1986

Sixty-eight species of waterbird have been recorded in the Vasse-Wonnerup system with numbers of six of them being higher than elsewhere in south-western Australia.

The system is important for breeding of Black Swans, particularly as an open-water refuge for their cygnets, and frequently supports >1% of the regional (and Australian) population of Red-necked Avocets and Black-winged Stilts.

The principal conservation value of the Vasse-Wonnerup system is as habitat for waterbirds.

LAND TENURE:

The Ramsar site consists of all non-freehold land within the boundaries of the two estuaries; dryland parts of Nature Reserve 31188, Tuart Forest National Park and the 23 blocks of vacant Crown Land that extend into the Estuaries are not included.

CONSERVATION MEASURES TAKEN:

Part of the wetland is included in Nature Reserve 31188.

CONSERVATION MEASURES PROPOSED BUT NOT YET IMPLEMENTED:

If a major residential development proceeds adjacent to the wetland (see SOCIAL AND CULTURAL VALUES), then the developers will provide 120 ha for a reserve on the northern side of Vasse Estuary. It will be outside the Ramsar site but within the seasonal boundaries of Vasse Estuary. A management strategy for the wetland is currently being prepared by the Department of Conservation and Land Management.

CURRENT LAND USE:

There is urban development along the southeastern end of Vasse Estuary. The remainder of Vasse Estuary and Wonnerup Estuary are surrounded by farmland used principally for cattle grazing. There is little recreational use of the wetlands.

At present there is a mineral sands mining operation west of Layman Road, part of the purpose of which is removing a radiation hazard left by earlier mining operations. However, the entire operation is occurring outside the Ramsar site.

DISTURBANCES/THREATS:

There is continual pressure to allow land developments that may impact on the Vasse-Wonnerup wetlands. The production of a management plan for the area was recommended in the System 1 Red Book to prevent degradation due to uncoordinated development.

Existing management of water levels in the system has proved satisfactory for waterbirds but the potential for altering the water regime slightly to enhance waterbird usage of the area has not been explored fully.

HYDROLOGICAL AND PHYSICAL VALUES:

The wetland is an estuary but has gates near the outlet to the ocean to prevent ingress of seawater during summer when the discharge rate from rivers is insufficient to do so. Most of the system dries out during summer.

SOCIAL AND CULTURAL VALUES:

The major social value is that parts of the wetland are used for summer grazing by cattle; this is compatible with maintaining the ecological character of the wetland. A major residential canal development is proposed adjacent to the wetland.

NOTEWORTHY FAUNA:

See ECOLOGICAL FEATURES.

NOTEWORTHY FLORA:

See ECOLOGICAL FEATURES.

CURRENT SCIENTIFIC RESEARCH AND FACILITIES:

Current research consists of monitoring waterbird numbers. There are no research facilities.

CURRENT CONSERVATION EDUCATION:

None.

CURRENT RECREATION AND TOURISM:

None.

MANAGEMENT AUTHORITY:

Department of Land Administration, Central Government Building,
Cathedral Avenue, Perth WA 6000

Department of Conservation and Land Management, PO Box 104, Como WA 6152.

JURISDICTION:

Government of Western Australia

REFERENCES:

Halse, S.A., Jaensch, R.P., Munro, D.R. and Pearson, G.B. (1990). Annual waterfowl counts in south-western Australia - 1988/89. Western Australian Department of Conservation and Land Management Technical Report 25, 1-43.

Jaensch, R.P. (1986). Vasse Estuary survey - 24 and 25 January 1986. Western Australian Bird Notes 37, 3-4.

McAlpine, K.W., Spice, J.F. and Humphries, R. (1989). The environmental condition of the Vasse-Wonnerup wetland system and a discussion of management options. Western Australian Environmental Protection Authority Technical Series 31, 1-35.

Tingay, A. and Tingay, S.R. (1980). The vegetation and flora of wetlands near Busselton. Unpublished report to Department of Fisheries and Wildlife, Perth.

CRITERIA MET:

3(a) and 3(c).

MAP:

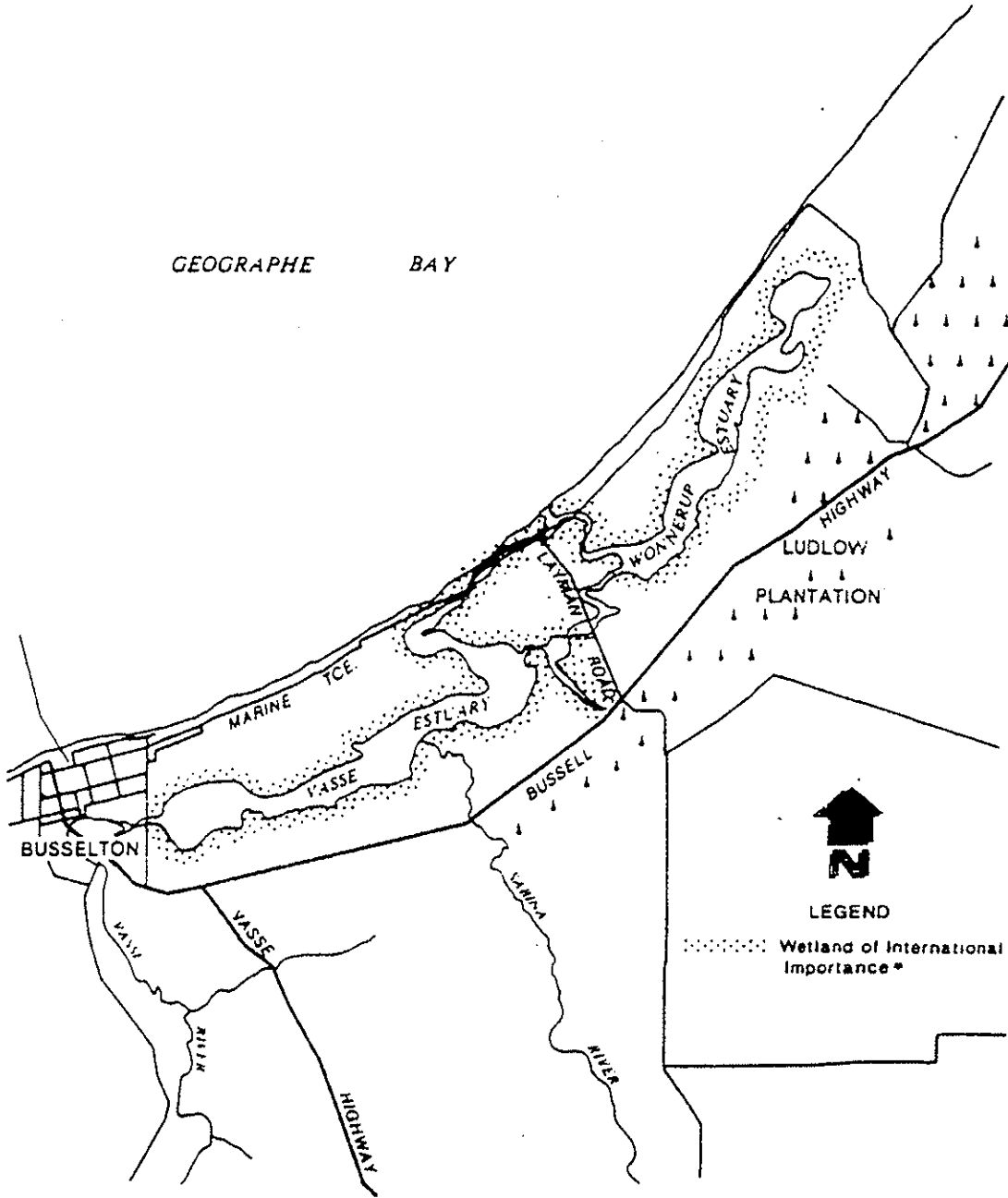
Boundary of existing Ramsar Site.

VASSE-WONNERUP SYSTEM

SCALE 1:100 000



GEOGRAPHE BAY

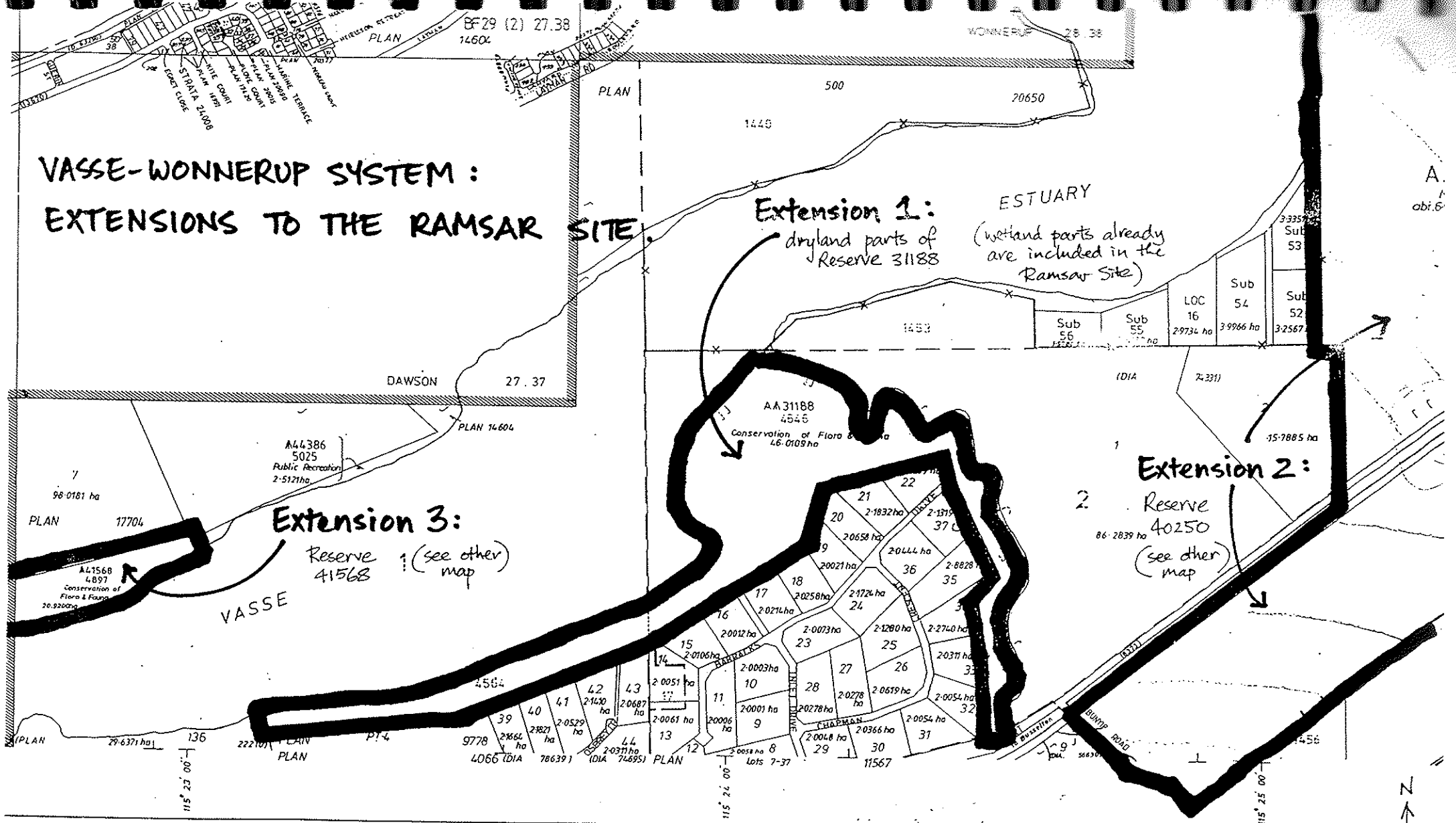


LEGEND

..... Wetland of International Importance *

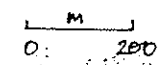
* inner edge is the approximate boundary

VASSE-WONNERUP SYSTEM: EXTENSIONS TO THE RAMSAR SITE



Freehold Land	UNCOLOURED
Land Leased Under Conditional Purchase	
Land Leased Under Section 115	
Vacant Crown Land	
Reserves	PINK WASH
Freehold Reserves	PINK WASH WITH GREEN BORDER
Temporary Reserves	
Reserves (Part 1)	
Reserves (Part 2)	
Reserves (Part 3)	
Reserves (Part 4)	
Reserves (Part 5)	
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Reserves (Part 100)	

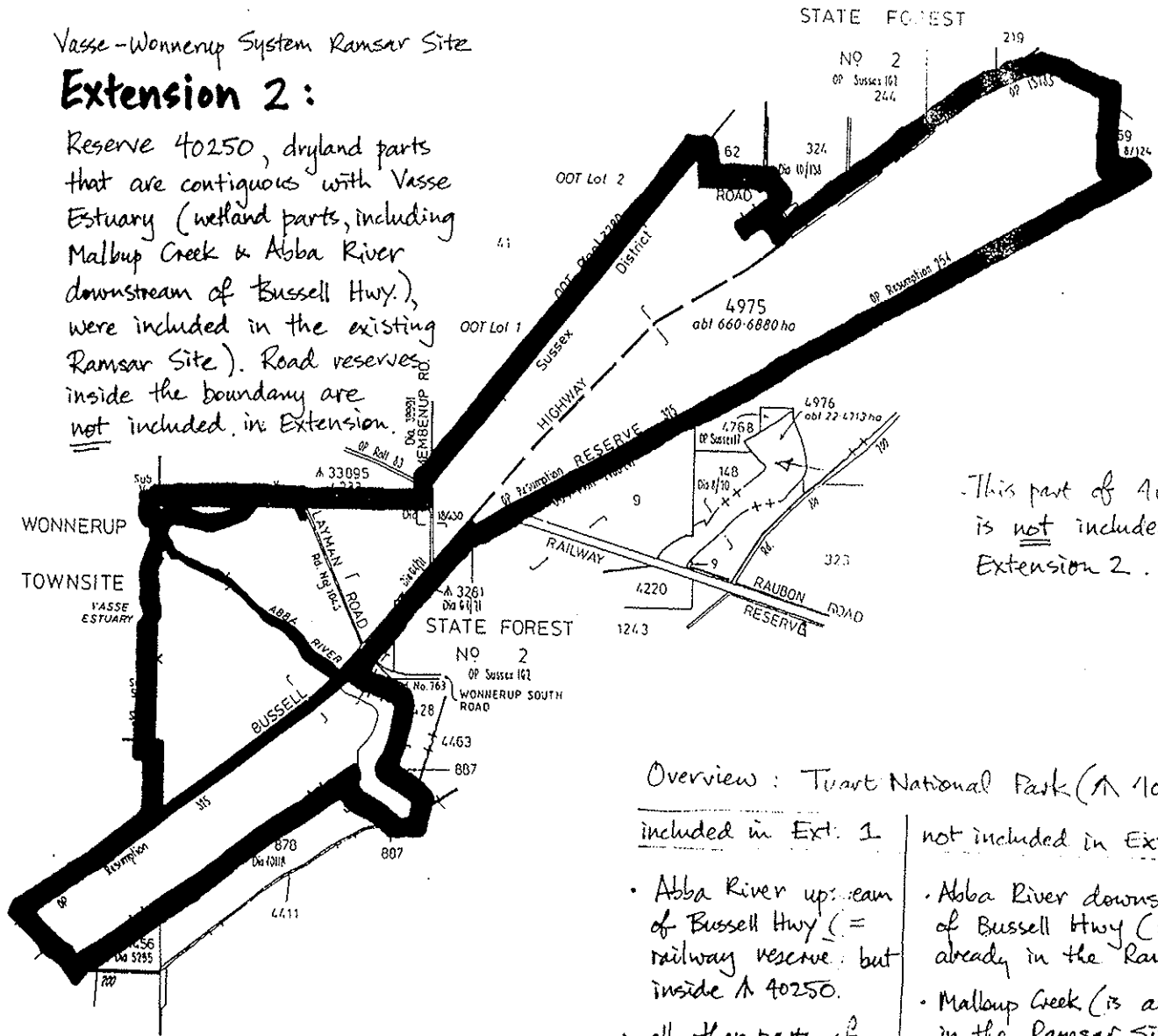
Part of DOLA Sheet No: DAWSON 10 000 BF29/6.8
Scale B 1:10 000



Includes Sussex Loc's 3918, 4830, 4831, 4832, 4833.
 Pt Sussex Loc's 9, 148, 324, 877, 878, 887, 1456, 4428 & 4768
 Supersedes Pt Dia's 8/20, 8/124, 40/130, 18630, 40118, Pt L.T.O. Dia. 5295, Res. Dia. 636,
 Pt O.P.'s Sussex 17, 49 & Wellington 43

Vasse-Wonnerup System Ramsar Site
Extension 2:

Reserve 40250, dryland parts that are contiguous with Vasse Estuary (wetland parts, including Malbup Creek & Abba River downstream of Bussell Hwy.), were included in the existing Ramsar Site). Road reserves inside the boundary are not included in Extension.



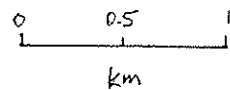
Overview: Tuart National Park (A 40250)

- | | |
|--|--|
| included in Ext. 1 | not included in Ext. 1 |
| <ul style="list-style-type: none"> Abba River upstream of Bussell Hwy (= railway reserve; but inside A 40250. all other parts of A 40250 except those listed as "not included" (opposite). | <ul style="list-style-type: none"> Abba River downstream of Bussell Hwy (is already in the Ramsar Site) Malbup Creek (is already in the Ramsar Site) That part of A 40250 in Location 4976. |



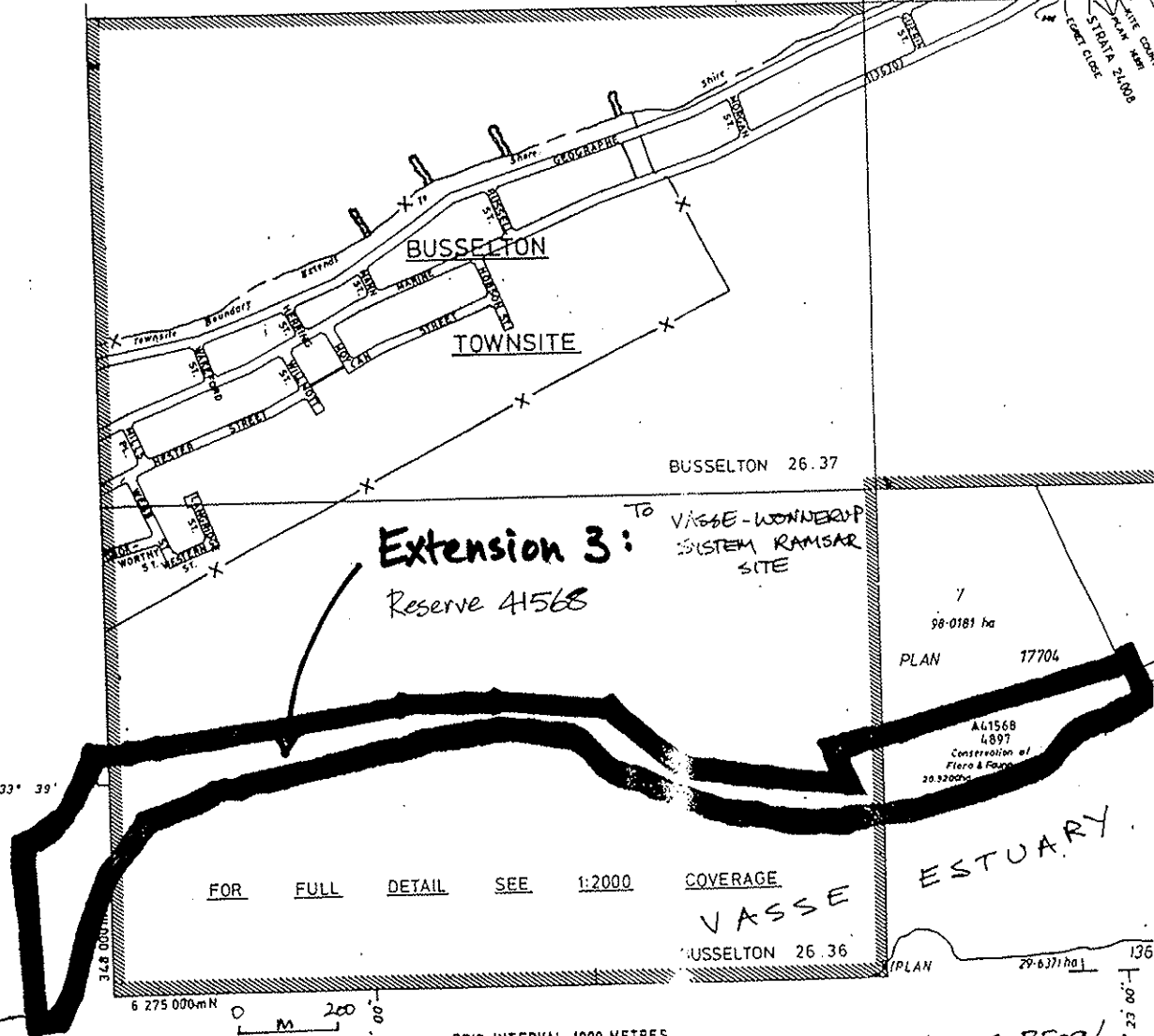
Sussex Loc's 4975 and 4976 created on this Diagram

RESERVE No. 40250	Area. abt 683.1593 ha ex rds	FILE No. 1799/987
Purpose National Park		SCALE 1:25000 All measurements in metres
DISTRICT SUSSEX	SUBJECT TO SURVEY	Gazetted 20-12-94 Page 6882
Public Plan BF29 (10) 6.8 BUSSELTON N.E. & S.E. (1:25000) 3	AMENDMENTS	Recorded on Public Plan R.G.J. 23-10-95
Reference Page	Gazette Page Initials	Registered R.LIST for Supervisor Graphic Bank Crown Surveys
Prepared by R.LIST Date 12/11/1993		On Key Plan As for Public Plans
Checked [Signature] Date		DEPT. OF LAND ADMINISTRATION RESERVE DIAGRAM No. 1215
Approved [Signature] Date 12/11/93 Manager Statutory Amendments		



33° 38' 00"

GEOGRAPHE



Extension 3: To VASSE-WONNERUP SYSTEM RAMSAR SITE
Reserve 41568

FOR FULL DETAIL SEE 1:2000 COVERAGE
VASSE
BUSSELTON 26.36

Scale is 1:10 000
6 275 000-m N
0 M 200

GRID INTERVAL 1000 METRES
Part of DOLA Sheet No: DAWSON 10 000 BF29/68

Approx. position of Ford Rd.

PRODUCED AS PART OF THE STATE LARGE SCALE SERIES OF CADASTRAL AND TOPOGRAPHICAL MAPS AT SCALES OF 1:10 000, 1:5 000, 1:2 000, 1:1 000, 1:500 AND BASED UPON THE AUSTRALIAN MAP GRID TO A STANDARD RECTANGULAR SHEET SYSTEM OF 500 mm. x 500 mm.
UNIVERSAL TRANSVERSE MERCATOR PROJECTION ZONE No. 80
HORIZONTAL DATUM — AUSTRALIAN GEODETIC DATUM 1966.
VERTICAL DATUM — AUSTRALIAN HEIGHT DATUM.
COMPILED BY — THE DEPARTMENT OF LANDS & SURVEYS.

Surveyed Boundary	-----	Freehold Land
Unsurveyed Boundary	- - - - -	Land Leased L
Grouped Lots or Locations Boundary	Land Leased C
Townsite Boundary (Under Land Act)	-----X-----	Vacant Crown
Townsite Boundary (Under Local Govt. Act)	-----XX-----	Reserves
Agricultural Area or Estate Boundary	-----XX-----	Freehold Rese
Land District Boundary	-----+-----	Temporary Re
State Forest Boundary	-----+-----	
Subdivided Crown Lot or Location Boundary	-----+-----	