

# Information Sheet on Ramsar Wetlands (RIS) – 2006-2008 version

*Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8<sup>th</sup> Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX.22 of the 9<sup>th</sup> Conference of the Contracting Parties (2005).*

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## 1. Name and address of the compiler of this form:

Compiled by the Western Australian Department of Conservation & Land Management (DCLM) in 1990 and updated by Roger Jaensch, Wetlands International - Oceania, on behalf of DCLM in 1998, by DCLM staff in 2000 and 2003 and by DEC in 2007.

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Designation date

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Site Reference Number

All inquiries should be directed to Michael Coote, DEC, 17 Dick Perry Ave, Technology Park, Kensington, WA 6983, Australia, (Tel: +61-8-9334-0479; Fax: +61-8-9334-0199; email: Michael.Coote@dec.wa.gov.au).

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## 2. Date this sheet was completed/updated:

December 2007

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## 3. Country:

Australia

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## 4. Name of the Ramsar site:

Peel – Yalgorup System, Western Australia

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## 5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only):

- a) Designation of a new Ramsar site ; or  
b) Updated information on an existing Ramsar site

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## 6. For RIS updates only, changes to the site since its designation or earlier update:

### a) Site boundary and area

The Ramsar site boundary and site area are unchanged:

or

If the site boundary has changed:

- i) the boundary has been delineated more accurately ; or  
ii) the boundary has been extended ; or  
iii) the boundary has been restricted\*\*

and/or

If the site area has changed:

- i) the area has been measured more accurately ; or  
ii) the area has been extended ; or  
iii) the area has been reduced\*\*

\*\* **Important note:** If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

**b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:**

Since the time of designation (1990) an artificial channel (the Dawesville Cut) has been constructed in the Peel - Harvey Estuary. This has increased exchange with the ocean resulting in decreased nutrient concentrations, a reduction in eutrophication and an increase in salinity and tidal fluctuations.

This revision of the RIS, re-assessed the site against the existing 6 Criteria as well as applying the recently added criteria for fish and non-avian biota (Criteria 7, 8 and 9).

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**7. Map of site:**

Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

**a) A map of the site, with clearly delineated boundaries, is included as:**

- i) a hard copy (required for inclusion of site in the Ramsar List): ;
- ii) an electronic format (e.g. a JPEG or ArcView image) ;
- iii) a GIS file providing geo-referenced site boundary vectors and attribute tables .

**b) Describe briefly the type of boundary delineation applied:**

e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The boundary follows existing reserved areas

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**8. Geographical coordinates** (latitude/longitude, in degrees and minutes):

Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

Latitude: 32° 32' S to 33° 06' S

Longitude: 115° 37' E to 115° 47' E

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**9. General location:**

Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town.

Peel-Yalgorup System is in the City of Mandurah and the Shires of Murray, Waroona and Harvey (local authorities) in the State of Western Australia. It is immediately south of the City of Mandurah within the Swan Coastal Plain bioregion.

The Ramsar Site as originally nominated in February 1990 comprised: Peel Inlet (south of the old Mandurah Estuary Bridge) and Harvey Estuary; Nature Reserves (4990, 24036, 28087 and 2707) adjoining the eastern and southern sides of Peel Inlet; Nature Reserves (2738, 24739, 23756 and 36126) adjoining the eastern and southern sides of Harvey Estuary; most of 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 the waters (principally Lakes Clifton, Preston, Boundary, Pollard, Martins Tank, Yalgorup, Hayward and Newnham) and lands of Yalgorup National Park.

The Site was extended in 2001 to include seven additional areas, most of which were recent additions to the conservation reserve system (see maps):

- Extension 1: an addition to Nature Reserve 4990 which includes brackish-saline marsh and shrub-swamp connected by a drain to Peel Inlet at Robert Bay;
- Extension 2: the Nature Reserve 44978 which comprises the western margins and southern part of Lake McLarty;
- Extension 3: an addition to Reserve 11710 (part of Yalgorup National Park) which is dryland that widens the buffer zone for part of the eastern side of Lake Preston;

- Extension 4: an addition to Reserve 11710 (part of Yalgorup National Park) 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;
- Extension 5: the south-eastern part of Reserve 12189 (also part of Yalgorup National Park) which widens the buffer zone for part of the north-eastern side of Lake Clifton;
- Extension 6: Erskine Conservation Park (Nature Reserve 43690), which has two parts and includes shore and associated marshes on the north-western side of Peel Inlet near “The Chimneys”.
- Extension 7: an area of salt marsh north of Creery Island ceded to the Crown (and subsequently to be made a conservation reserve) by Cedar Woods Properties Limited as part of the Mariners Cove Development at Mandurah.

Of these components, Extensions 1, 2, 6 and 7 include substantial areas of wetland. The others include shoreline at the edge of the Ramsar Site as originally nominated and/or dryland that provides a buffer zone for the wetlands.

**10. Elevation:** (in metres: average and/or maximum & minimum)

Sea level

**11. Area:** (in hectares)

26 530

**12. General overview of the site:**

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

The Peel-Yalgorup Ramsar site includes shallow estuarine waters, saline, brackish and freshwater wetlands of the Peel Inlet, Harvey Estuary, several lake systems including Lake McLarty and Lake Mealup and the Yalgorup National Park. The site is geomorphically complex and biologically diverse. Large populations of waterbirds utilise the estuary and lakes and there is a diversity of fish, aquatic invertebrates and fringing salt marsh and paperbark vegetation. In addition, the system contains rare microbial communities in the form of thrombolites.

**13. Ramsar Criteria:**

Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9

**14. Justification for the application of each Criterion listed in 13 above:**

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion 1: The site includes the largest and most diverse estuarine complex in south-western Australia and also particularly good examples of coastal saline lakes and freshwater marshes.

Criterion 3: The site is one of only two locations in south-western Australia and one of very few in the world where living thrombolites occur in inland waters.

Criterion 4: The basic description of this criterion implies a number of common functions/roles that wetlands provide and the following apply at Peel-Yalgorup Ramsar site, in most if not all cases both at the date of listing and at present:

- the critical life stage of migration: annual use by large numbers of many species of migratory animals;

- the critical life stage of drought refuge: seasonal influx of large numbers of waterbirds from dried out wetlands in surrounding areas, and periodic massive influx from wider regions during drought;
- the critical life stage of breeding: regionally and nationally significant colonies of cormorants occurred in the 1980s in paperbark swamp in “Carraburmup Swamp Nature Reserve” (Jaensch et al. 1988) on the south-east side of Peel Inlet (and part of the Ramsar site) and small breeding colonies of pelicans breed now and then on islets in Peel Inlet; in addition, the Yalgorup Lakes are a significant site bioregionally for breeding of Hooded Plover (Birds Australia 2005);
- breeding also applies to fishes, crabs and prawns; and
- the critical life stage of moulting: shelducks and Musk Ducks that congregate on the open waters of the Ramsar site outside the breeding season are engaging in moult (hence, the birds are flightless for a short period).

Criterion 5: The site comprises the most important area for waterbirds in south-western Australia, supporting in excess of 20,000 waterbirds annually, with greater than 150,000 individuals recorded at one time (February 1977). Numbers exceeding 20,000 birds have been recorded in all comprehensive surveys conducted in the 1990s in the Peel-Harvey Estuary.

Criterion 6: According to the 4th edition of Waterbird Population Estimates, the site regularly supports 1% of the population of: Red necked Avocet (*Recurvirostra novaehollandiae*), Red necked Stint (*Calidris ruficollis*), Red-capped Plover (*Charadrius ruficapillus*), Hooded Plover (*Thinornis rubricollis*), Black-winged Stilt (*Himantopus himantopus*), Banded Stilt (*Cladorhynchus leucocephalus*), Curlew Sandpiper (*Calidris ferruginea*), Sharp-tailed Sandpiper (*Calidris acuminata*), Fairy Tern (*Sterna nereis*), Musk Duck (*Biziura lobata*), Grey Teal (*Anas gracilis*), Australasian Shoveler (*Anas rhynchotis*), Australian Shelduck (*Tadorna tadornoides*) and, Eurasian Coot (*Fulica atra*).

Criterion 8: The Peel-Yalgorup Ramsar Site is important as a nursery and/or breeding and/or feeding ground for at least 50 species of fish as well as the commercially significant Blue Swimmer Crab (*Portunus pelagicus*) and Western King Prawn (*Penaeus latisulcatus*). In addition, the Peel - Harvey Estuary is a migratory route for the Pouched Lamprey (*Geotria australis*).

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**15. Biogeography** (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

**a) biogeographic region:**

Swan Coastal Plain

**b) biogeographic regionalisation scheme** (include reference citation):

Environment Australia 2000. Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1. Summary Report. Department of Environment and Heritage, Canberra.

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**16. Physical features of the site:**

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

The Peel-Yalgorup Ramsar site comprises of three geographically and hydrologically distinct sections: the Peel-Harvey Estuary, the saline lakes of the Yalgorup National Park and the freshwater, intermittent wetlands Lakes McLarty and Mealup.

The Peel - Harvey Estuary is a bar built estuary comprising of two connected basins, the circular Peel Inlet and the long, narrow Harvey Estuary. The estuary has one natural connection to the

Indian Ocean, adjacent to the City of Mandurah. In 1994, a second connection to the Indian Ocean (the Dawesville Channel) was constructed at the junction of the two basins. Three rivers flow into the estuary, the Murray and Serpentine into the Peel Inlet and the Harvey River into the Harvey Estuary. The basins are shallow and predominantly < 2 m deep with large areas < 0.5 m deep. Tidal ranges are approximately 32 cm for the Peel Inlet and 45 cm for the Harvey Estuary (DAL 2002). The system experiences seasonal fluctuations in salinity, with lower salinity during winter (the time of river inflows) and higher during summer (although this is moderated by ocean exchange). Water quality is predominantly good, although nutrient inflows from the catchment are high and there are temporal and seasonal variations in nutrient concentrations, with higher concentrations near the river mouths. Ocean exchange mitigates this and algal blooms, which were once a regular occurrence, are now rare.

The Yalgorup lakes are a series of ten, hypersaline to brackish lagoons in the coastal Spearwood dune system to the south of the Harvey Estuary. The lakes are all shallow (< 3 m deep) and have no defined inlet or outlet channels. Lake Preston is the largest of the wetlands (30km long x 1-1.5 km wide) and Lake Clifton is the second largest (20 km x 0.2 – 1.5km). The remaining wetlands are small by comparison and form a disconnected chain between Lake Preston and Lake Clifton. Groundwater is the primary water source for the lakes and localised run off is thought to be insignificant contributing < 0.005 % of total lake volume (Davies and Lane 1996). The lakes intersect the freshwater surficial unconfined aquifer that flows from the east towards the sea. The lakes vary between brackish and hypersaline with strong seasonal patterns. The groundwater is fresh, low in nutrients, however moving through the limestone results in alkaline conditions and high concentrations of calcium and bicarbonate are characteristic of all of the lakes (CALM 1995).

Lakes McLarty and Mealup are shallow; moderate sized depressional wetlands on the plain to the east of the Harvey Estuary. Lake McLarty is approximately 2.1 km long and 1.25 km wide and covers approximately 200 ha. The lake is, oval in shape with shallow gradient shorelines and a fine layer of silt across the bottom (CALM 2005). Lake Mealup is situated 500 m to the north, has a similar morphology, but is approximately one third the size at 70 ha. They intersect the shallow, surficial freshwater groundwater aquifer, which flows seasonally in response to rainfall. As a consequence, water levels are highest in spring after winter rains and groundwater seepage reach their maximum. They seasonally dry, with evaporation and loss of water back into the groundwater as aquifer levels fall. Lake Mealup experiences strong acid conditions (pH < 4) in years following drying due to exposure of acid sulphate soils (Peel Preservation Society).

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### **17. Physical features of the catchment area:**

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

The site is situated on the Swan Coastal Plain, which is separated from the ocean by a series of limestone dune systems. The climate is Mediterranean with dry hot summers (maximum average of 30 °C in February) and mild winters (average minimum 9°C in July). Average rainfall at the site is approximately 900mm and is highly seasonal, with 80% falling between May and October. The coastal area is subject to high winds (12 – 16 km/hour) year round.

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### **18. Hydrological values:**

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

The Peel-Harvey Estuary receives drainage water from a large number of artificial drainage systems. This serves as flood mitigation and control to surrounding agricultural, urban and peri-urban catchments.

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### **19. Wetland Types**

#### **a) presence:**

Circle or underline the applicable codes for the wetland types of the Ramsar “Classification System for Wetland Type” present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K •  
Zk(a)

Inland: L • M • N • O • P • Q • R • Sp • Ss • Tp Ts • U •  
Va •  
Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

**b) dominance:**

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

F, Q, O, Ts, G, H, W, Xf, Tp

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**20. General ecological features:**

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

The Peel-Yalgorup site provides a number of ecosystem benefits and services including commercial fishing, pollution control (Peel-Harvey Estuary acts as a nutrient sink), recreation and tourism, cultural and spiritual services and biodiversity.

The site provides a number of habitat types for a range of wetland dependant fauna. The Peel-Harvey Estuary contains extensive inter-tidal areas and mudflats as well as permanent open water environments. The Peel Inlet contains extensive benthic flora with both macroalgae (*Cladophora*, *Chaetomorpha*, *Hinksia*) as well as the seagrasses *Halophila ovalis* and *Ruppia megacarpa* (Wilson et al. 2000). Tidal saltmarshes are an important component of the fringing vegetation. Samphire (dominated by *Sarcocornia quinqueflora*) is the most extensive of the salt marsh communities and occupies the lowest elevation. The area immediately behind the saltmarsh is dominated by the salt tolerant trees such as *Casurina obesa* (Salt Sheoak) and *Melaleuca cuticularis* (Saltwater Paperbark). The Ramsar site includes some areas of riparian vegetation along the inflowing river systems. These areas contained a mixture of freshwater and estuarine vegetation including tree species such as *Melaleuca raphiophylla* (Swamp Paperbark) and sedges such as *Typha orientalis* (Cumbingi).

The Yalgorup lakes contain similar saltmarsh and paperbark vegetation. However, the littoral buffer is very narrow, particularly along the eastern margin of the national park (Davies and Lane 1996). Benthic microbial communities containing both heterotrophic and photosynthetic bacteria and algae dominate the benthos of most of the lakes. Lake Clifton contains extensive thrombolite communities comprised of benthic phytoplankton. Lake Pollard has extensive beds of the charaphyte *Lamprothamnium papulosum*, which provides a valuable food source for Black Swans and ducks.

Lakes McLarty and Mealup were once both dominated by sedges and rushes. However, although *Typha orientalis* is still common at Lake Mealup, other freshwater species have diminished (CLAM 2005). Freshwater paperbark communities dominate higher elevations at these freshwater wetlands.

The diversity of habitat supports approximately 100 species of waterbird and breeding has been recorded for nineteen species. The Peel - Harvey Estuary provides habitat for over 50 species of native fish and a large number of invertebrates including the Blue Swimmer Crab and the Western King Prawn.

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**21. Noteworthy flora:**

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities

are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

The thrombolites at Lake Clifton are considered to be 2,000 years old and are one of only two examples of living thrombolites in Western Australia and a handful in the world (Moore 1991). They cover an area of approximately 400 ha and are predominantly located along the eastern shore (Moore 1987). Thrombolites are rock-like structures that are formed by the activities of benthic microbial communities. These communities are diverse and typically comprise of cyanobacteria, diatoms and “true” bacteria. The cyanobacterium most commonly associated with the thrombolites at Lake Clifton is the filamentous *Scytonema*. Other genera include *Oscillatoria*, *Diclothrix*, *Chroococcus*, *Gloeocapsa*, *Johannesbaptista*, *Gomphosphaeria* and *Spirulina* (Moore 1991).

The substantial samphire areas at Peel Inlet and Harvey Estuary are significant because much of this community type has been lost from other estuaries in the bioregion. In addition, the samphire *Halosarcia indica* subspecies *leiostrachya* is unique to the Creery Wetlands (DAL 2002). At least one sedge species (*Schoenus natanus*) that is of conservation concern (“Priority 4”) at State level is also found at the Site.

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## 22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

A total of 86 species of waterbirds have been recorded in the Peel - Harvey Estuary including 29 species that are listed under the international migratory agreements JAMBA and CAMBA as well as an additional 32 Australian migratory species that are listed under the Federal Environmental Biodiversity and Conservation Act 1999 (EPBC). In terms of total numbers, Peel Inlet and Harvey Estuary comprise the most important area for waterbirds in south-western Australia, regularly supporting in excess of 20 000 waterbirds: over 150 000 were recorded in February 1977 (Lane and Pearson 2002), 51 000 were recorded in December 1996, and 42 000 were recorded in December 1998 (Lane et al. 2002a, 2002b).

The Peel-Harvey Estuary supports > 1% of the population of eleven species of waterbird:

Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>	2 443 Dec 1996
Red-necked Stint	<i>Calidris ruficollis</i>	16 436 Dec 1998
Red-capped Plover	<i>Charadrius ruficapillus</i>	1 754 Dec 1998
Banded Stilt	<i>Cladorhynchus leucocephalus</i>	6 954 Feb 1997
Fairy Tern	<i>Sterna nereis</i>	262 Feb 1997
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	1 972 Feb 1977
Curlew Sandpiper	<i>Calidris ferruginea</i>	6 260 Dec 1976
Musk Duck	<i>Biziura lobata</i>	435 Nov 1989
Grey Teal	<i>Anas gracilis</i>	25 077 Feb 1977
Australasian Shoveler	<i>Anas rhynchos</i>	358 Jun 1977
Eurasian Coot	<i>Fulica atra</i>	17 039 Oct 1976

The cumulative number of species recorded for the Yalgorup lakes during 1976-2007 is 73 including 24 species listed under the international migratory bird agreements JAMBA and CAMBA as well as an additional, 15 Australian migratory species protected under the EPBC Act. Large flocks of salt tolerant Musk Ducks and Australian Shelduck have been reported on the lakes as well as Black Swans, with 9,000 Australian Shelduck recorded on Lake Preston in 1988 (National Trust of Western Australia 1973; Halse et al. 1990; Halse et al. 1992; CALM 1995). Counts of up to 3200 Musk Duck at Lake Clifton (Jaensch et al. 1993) have been the highest for the western population of this species. The Yalgorup Lakes support at least 1% of the known population size of five waterbird populations; the Banded Stilt, Red-necked Stint, Musk Duck, Australian Shelduck and western Hooded Plover. The lakes are an important breeding site for western Hooded Plovers, and represent the largest known aggregation of breeding efforts in Western Australia (Birds Australia 2005).

A total of 85 waterbird species have been recorded at Lakes McLarty and Mealup including 32 species listed under international migratory bird agreements (JAMBA, CAMBA) and an additional 19 Australian migratory species protected under the EPBC Act. A total of twelve species have been recorded breeding at Lakes McLarty and/or Mealup (Kirkby 1996; Jaensch et al. 1988). Of note, is the provision of habitat for breeding of freshwater birds such as the Spotless Crake, Eurasian Coot and Purple Swamphen; as these lakes represent the only well-studied large freshwater wetlands within the Peel-Yalgorup Ramsar site.

Lakes McLarty and Mealup support > 1% of the population of ten species of waterbird:

Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>	5 468
Red-necked Stint	<i>Calidris ruficollis</i>	11 500
Red-capped Plover	<i>Charadrius ruficapillus</i>	> 1 500
Banded Stilt	<i>Cladorhynchus leucocephalus</i>	5 300
Black-winged Stilt	<i>Himantopus himantopus</i>	5 400
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	5970
Curlew Sandpiper	<i>Calidris ferruginea</i>	3 000
Australian Shelduck	<i>Tadorna tadornoides</i>	4 500
Eurasian Coot	<i>Fulica atra</i>	10 000
Australasian Shoveler	<i>Anas rhynchos</i>	487

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### 23. Social and cultural values:

**a)** Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

The Peel-Harvey estuary is an important commercial and recreational fishery. Commercial species include King George Whiting, Black Bream, Cobbler, Blue Swimmer Crabs and Western King Prawns. It is estimated that the commercial fishing operations in the estuary are worth about \$1 million a year in fish (URS 2007).

The Peel - Harvey Estuary and Yalgorup Lakes also represent important recreational and tourist sites. Tourism in the Peel region contributes approximately \$150 million annually to the region, with both domestic and international visitors. The most popular recreational and tourism activities associated with the Ramsar site include: bushwalking, birdwatching, camping, 4W-driving, fishing, boating, crabbing, boating, water skiing, canoeing and swimming (URS 2007).

The Peel-Yalgorup site is of cultural significance to the indigenous Nyoongar, as detailed below.

**b)** Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

If Yes, tick the box  and describe this importance under one or more of the following categories:

- i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:
- ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:



- iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:
- iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

The Peel-Yalgorup Ramsar site lies within Pinjarup country, a dialect group of the Nyoongar. As with other Indigenous Australians, Pinjarup people were strongly connected to each other, their culture and their country through the Dreaming. In southwest Australia, water is of special significance and the 'Waugal' is the creative and life-giving being associated with all freshwater sources, surface and ground. Although dormant most of the time, it may cause immense harm if disturbed. Hence all fresh water-bodies may be considered to be highly significant mythological sites, with certain areas having particular significance as a place where the Waugal enters or exits the ground, or where it rests. (Dortch et al. 2006).

There are over 356 sites of aboriginal significance in the Peel-Harvey Catchment and 27 specific sites on the Peel-Harvey Estuary have been identified for the proposed heritage trail (Dortch et al. 2006). This includes sites of artefact scatter, camp sites, ceremonial sites, fish traps, skeletal remains and sites of mythological significance.

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#### **24. Land tenure/ownership:**

a) within the Ramsar site:

The water area in the estuary is non-tenured crown land, all other lake (excluding ex-direct freehold), national parks, state forest and reserves are vested with the Western Australian Conservation Commission and managed by the Department of Environment and Conservation. Marine park areas are vested with the Western Australian Marine Parks and Reserves Authority and managed by the Department of Environment and Conservation. Foreshore areas are vested with the City of Mandurah.

b) in the surrounding area:

Surrounding areas are mostly freehold (privately owned) land or Unallocated Crown Land and there are some other local/State government reserves.

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#### **25. Current land (including water) use:**

a) within the Ramsar site:

Peel Inlet and Harvey Estuary are used extensively for public recreation, especially fishing and boating. There are small areas within the Ramsar boundary that are used for residential purposes and along canals. The Yalgorup lakes together with Lakes McLarty and Mealup are used for passive recreation associated with their natural values.

b) in the surroundings/catchment:

The town of Mandurah is on the northern edge of the Inlet and there are a number 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. Much of the land surrounding the Yalgorup lakes has been cleared for cattle farming and an area on the north-eastern shore of Lake Clifton has been sub-divided for housing. There has been a substantial increase in the population of Mandurah, which has nearly doubled to around 70,000 people since the time of listing and is expected to increase to 150,000 by 2025 (URS 2007). As the population in this area has increased there has been a shift from rural to urban and peri-urban developments in the surrounding lands.

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#### **26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:**

a) within the Ramsar site:

The Peel-Harvey Estuary suffered the effects of eutrophication for a number of decades from the 1970s to the mid 1990s with large nutrient loads from the catchment, delivered to the estuary via rivers and drains. On average, approximately 1,200 tonnes of nitrogen and 140 tonnes of phosphorus were discharged annually to the estuary over the period 1977 to 1988 (McComb and Lukatelich 1995). The greatest nitrogen load came from the Murray River and was discharged to the Peel Inlet, while the Harvey Estuary received the greatest phosphorus load from the Harvey River and associated drains. Due to the seasonality of river flow, 80 – 90 % of the nutrient loads to the estuary occurred in winter (Hodgkin et al. 1981). This discharge of nutrients from river flow led algal blooms of the toxic cyanobacteria *Nodularia* in the Harvey Estuary and excessive macroalgal growth in the Peel Inlet, with biomass estimates of > 60,000 tonnes dry weight recorded in the 1980s.

To address the problems of eutrophication in the estuary a three part strategy was instigated, comprising (Peel Inlet Management Authority 1994):

1. Reduction of nutrient run-off from the catchment;
2. Continued harvesting of macroalgae as necessary; and
3. Increased flushing to the ocean.

The latter of these was achieved by the constriction of the Dawesville Channel, which opened in 1994. The increased connection to the marine environment has resulted in fundamental and permanent changes to ecological components of the Peel - Harvey Estuary. The estuary has become more marine in nature and there has been an improvement in water quality with a decline in nutrient concentrations, a reduction in phytoplankton and macroalgal biomass.

Current threatening activities within the Ramsar site include commercial and recreational fishing and recreation within the sites. There are eleven commercial licences for fin-fish in the Peel - Harvey Estuary. A target catch is set annually (based on control charting techniques) to allow catch levels to fluctuate in response to natural variation in fish stocks. The target for 2005/6 was 75 – 220 tonnes (Fisheries WA 2006). Although there is potential for this to impact on the fish populations within the system, there is no evidence of significant impacts. There is a significant recreational fishery in the Peel-Harvey Estuary as well and it is estimated that the recreational catch for blue swimmer crabs was five times that of the commercial catch and an estimated 1,360,000 crabs or 290 tonnes (Malseed and Sumner 2001).

Recreational activities within the wetlands include bushwalking, camping, horse riding, motorbikes, four-wheel drives, boating, jet skiing, water skiing and swimming. While recreational enjoyment of the Peel-Yalgorup site is a service/benefit of the wetlands, it also has the ability to impact negatively on the ecological character. The two major impacts are erosion of the shoreline due to boating and recreational vehicle use, and disturbance of waterbirds at vulnerable stages in their lifecycle.

b) in the surrounding area:

The major threatening activities in the surrounding area that may impact on the ecological character of the Ramsar site are:

- Agricultural activities in the catchment;
- Water use and groundwater extraction
- Urban and peri-urban development; and
- Climate change.

Agricultural activities in the catchment impact on the Ramsar site through nutrient inputs and water extraction. Although the nutrient concentrations within the Peel-Harvey Estuary have decreased significantly since the opening of the Dawesville Channel in 1994, there is no evidence that there has been a corresponding reduction in nutrient loads entering the system from the catchment. In fact, there is some evidence that nutrient inflows from the catchment are continuing to increase (EPA 2007). While this has not yet impacted on the estuary itself, the inflowing rivers experience regular algal blooms.

Increased nutrient concentrations as a result of surrounding landuse also have the potential to affect the Yalgorup Lakes and the freshwater wetlands Lakes McLarty and Mealup. While data is scant, there is the potential for impacts to the thrombolites from increased macroalgal growth.

Hydrology is a key driver of wetland ecology and has an affect on both abiotic and biotic components. Of particular concern in the Peel Yalgorup Ramsar site is the alteration of river flows into the Peel - Harvey Estuary and the reduction in groundwater flow into the Yalgorup Lakes and Lakes McLarty and Mealup. These have the potential to seriously impact on the ecological character of the site

A large proportion of the Peel-Yalgorup Ramsar site is located within the City of Mandurah, which is experiencing rapid population growth. In addition, there are current and planned urban and high density rural developments, under the Peel Planning Scheme which are adjacent to the Peel - Harvey Estuary, Lakes McLarty and Mealup and the Yalgorup Lakes. There are a number of potential induced threats associated with increased development around the wetlands that could impact on the primary determinants of ecological character of the site. These include:

- Clearing of native vegetation (including saltmarsh and paperbark communities);
- Increased nutrient and contaminant run-off;
- Disturbance of acid sulphate soils; and
- Increased recreational pressure on the wetland sites.

The Indian Ocean Climate Initiative (IOC 2002) states that the climate in southwest western Australia has already changed with lower rainfall and higher temperatures. Predictions indicate that it is likely that there will be further decreases in rainfall and rises in sea level in the future (Hick 2006). This has the potential to impact significantly on the hydrology and hence ecological character of the Ramsar site.

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## **27. Conservation measures taken:**

**a)** List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site:

In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

There is a series of Nature Reserves around Harvey Estuary and Peel Inlet (2990, 23756, 24739, 2738, 2707, 2436, 4990, 28087) and there is a Shire reserve where the Murray River enters Peel Inlet. Yalgorup lakes are all within Yalgorup National Park. Since the Site was originally nominated, several new Nature Reserves on or near the edge of Peel Inlet and Harvey Estuary have been declared (44978, 11710, 12189, 43690) and Yalgorup National Park has been extended (some of this is now included in the Site following extensions to the Site in 2001). The conservation value of the "Creery Marshes" (salt marsh immediately north of Creery Island) has been recognised, and the area was ceded to the Crown and reserved in 2002. This area was included in the extensions to the Site made in 2001.

**b)** If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ; Ib ; II ; III ; IV ; V ; VI

**c)** Does an officially approved management plan exist; and is it being implemented?:

There is currently no management plan for the site.

**d)** Describe any other current management practices:

Although there is, as yet, no management plan for the entire site, management plans exist for two elements of the System namely: Yalgorup National Park Management Plan 1995-2005

(Department of Conservation and Land Management); (Draft) Lake McLarty Management Plan 2005 (Department of Conservation and Land Management)

The Department of Conservation and Land Management listed the thrombolite reef at Lake Clifton as a critically endangered Threatened Ecological Community (TEC - "Stromatolite-like freshwater community of coastal brackish lakes") in 2002. In 2002, the Department established a recovery team consisting of relevant stakeholders. The recovery team has produced and is implementing an interim recovery plan for the TEC.

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**28. Conservation measures proposed but not yet implemented:**

e.g. management plan in preparation; official proposal as a legally protected area, etc.

A management plan is currently in preparation for the Ramsar site.

A Draft Water Quality Improvement Plan for the Peel-Harvey Estuary was released in September 2007 for public comment.

Relevant government agencies are considering a proposal to expand the current Ramsar boundary to include Lakes Goegrup and Black on the Serpentine River.

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**29. Current scientific research and facilities:**

e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Extensive research has been conducted on the Peel-Harvey Estuary prior to and following the opening of the Dawesville Channel. This includes work undertaken by State Government Departments as well as universities. Aspects investigated include nutrient dynamics (water column and sediment), hydrology, phytoplankton, benthic plants (seagrass and macroalgae) community composition and extent, saltmarsh vegetation extent and condition, fish populations, invertebrates and waterbirds.

Some research and investigative work has also been undertaken at the Yalgorup Lakes and particularly at Lake Clifton, where the thrombolites are located.

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**30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:**

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

A Peel-Harvey Catchment Council public awareness raising project, in partnership with Peel Waterways Centre (a focal point for CEPA), over the past two years includes: banners, brochures, signs, surveys, presentations and displays.

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**31. Current recreation and tourism:**

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

Peel Inlet and Harvey Estuary are used extensively for recreational fishing and boating. Over 400,000 tourists visit the region annually, with the majority of tourist and recreational activities centred around the estuary. Activities include fishing, prawning, crabbing, canal cruising, boating/jet skiing, water skiing, canoeing and swimming (URS 2007).

There is limited use of Yalgorup National Park and Lakes McLarty and Mealup for passive recreation.

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**32. Jurisdiction:**

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

Territorial: The State Government of Western Australia.

Functional: The Nature Reserves and Yalgorup National Park – The Conservation Commission (vesting) and the Western Australian Department of Environment and Conservation; The waters of Peel-Harvey Estuary – Western Australian Department of Water.

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**33. Management authority:**

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Peel Harvey Catchment Council, Mandurah

Western Australian Department of Environment and Conservation, Perth

Western Australian Department of Water, Mandurah

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Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

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