Ramsar Information Sheet

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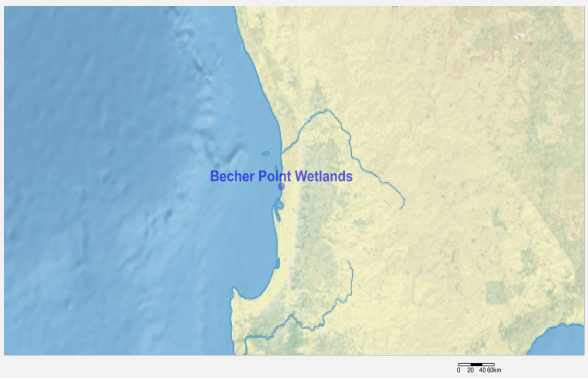
Australia

Becher Point Wetlands



Designation date	5 January 2001
Site number	1048
Coordinates	32°22'57"S 115°44'24"E
Area	708,00 ha

Color codes

Fields back-shaded in light blue relate to data and information required only for RIS updates.

Note that some fields concerning aspects of Part 3, the Ecological Character Description of the RIS (tinted in purple), are not expected to be completed as part of a standard RIS, but are included for completeness so as to provide the requested consistency between the RIS and the format of a 'full' Ecological Character Description, as adopted in Resolution X.15 (2008). If a Contracting Party does have information available that is relevant to these fields (for example from a national format Ecological Character Description) it may, if it wishes to, include information in these additional fields.

1 - Summary

Summary

The Becher Point Wetlands are located on the beach ridge plains that form the cuspate foreland at Becher Point, Western Australia. The Site comprises a series of parallel beach ridge dunes and swales with chains of small discrete basins within the swales. These seasonally inundated/ waterlogged wetlands mirror the orientation of the beach ridges. The Site's wetlands are within 0.2-1.5 kilometres of the Indian Ocean. The wetlands comprise chains of microscale linear, ovoid or irregular swamps arranged in about 5 groups roughly parallel to the coast, separated by sand ridges.

The Site derives its name from the apex of the cuspate foreland, known as Becher Point. The series of wetlands within the Site exhibit a continuum of development in geomorphology, sedimentary fill, hydrology, hydrochemistry and vegetation. The Site is considered a unique wetland system in Western Australia, and one of the youngest systems on the Swan Coastal Plain.

The wetlands in the Site are shallow and fill seasonally. Rainfall in winter and spring recharges the groundwater, which rises to waterlog the wetland basins. The wetlands then dry out again for summer to autumn. When flooded, the wetlands are mainly freshwater. The wetlands support sedgelands, herblands, grasslands, open-shrublands and low open-forests. The sedgelands that occur within the linear wetland depressions of the Ramsar Site are a nationally listed threatened ecological community. At least four species of amphibians and twenty-one species of reptiles have been recorded on the Site. The Site also supports the southern brown bandicoot.

The Site is a gazetted reserve for the conservation of flora and fauna. The Site includes the Port Kennedy Scientific Park and is used for research, education and recreation.

Becher Point meets two of the nine Ramsar listing criteria:
1: The Site is an example of shrub swamps and seasonal marshes that have formed in an extensive sequence of inter-dunal depressions that have arisen from seaward advancement of the coastline over recent millennia. The Site is considered a unique wetland system in Western Australia. Examples of this type of geomorphological sequence in equally good condition and within a protected area are rare world-wide.

2: The Site supports one nationally listed threatened ecological community: the 'Sedgelands in Holocene dune swales of the southern Swan Coastal Plain'. The Site may support other listed threatened species, but this is a knowledge gap.

2 - Data & location

2.1 - Formal data

2.1.1 - Name and address of the compiler of this RIS

Responsible compiler

Institution/agency: Department of Climate Change, Energy, the Environment and Water

Postal address:
GPO Box 3090
Canberra ACT 2601
Australia

National Ramsar Administrative Authority

Institution/agency: Department of Climate Change, Energy, the Environment and Water

Postal address:
GPO Box 3090
Canberra ACT 2601
Australia

2.1.2 - Period of collection of data and information used to compile the RIS

From year: 2001

To year: 2023

2.1.3 - Name of the Ramsar Site

Official name (in English, French or Spanish): Becher Point Wetlands

Unofficial name (optional): Becher Point

2.1.4 - Changes to the boundaries and area of the Site since its designation or earlier update

(Update) A. Changes to Site boundary	Yes ○ No ◉
(Update) B. Changes to Site area	No change to area
(Update) For secretariat only: This update is an extension	☐

2.1.5 - Changes to the ecological character of the Site

(Update) 6b i. Has the ecological character of the Ramsar Site (including applicable Criteria) changed since the previous RIS?	No

(Update) Optional text box to provide further information

While there has been no notifiable change in ecological character, the Site has been subjected to a changing climate. Australia has warmed by an average of 1.4°C (higher than the global average of 1°C) since national records began in 1910, leading to an increased frequency of extreme heat events. Further increases in temperature are projected, with more extremely hot days and fewer extremely cool days under all emissions scenarios (BoM and CSIRO 2020). These conditions will affect the critical components, processes and services of the Ramsar Site and will test the Site's resilience.

Climate projections and the information to guide wetland management under a changing climate is continually evolving. Relevant sections of the RIS will be reviewed and updated as new information becomes available.

2.2 - Site location

2.2.1 - Defining the Site boundaries

b) Digital map/image
<1 file(s) uploaded>

Former maps: 0

Boundaries description

The Becher Point Wetlands Ramsar Site comprises the entire area of Nature Reserve 44077 (Lot 216 on Plan 219947 and Lot 138 on Plan 219088) and an area of Unallocated Crown Land (UCL PIN 1338686) along the beach. It includes a substantial part of the suite of approximately 200 discrete, small wetlands located between Becher Point (Indian Ocean coast) and the Perth-Mandurah Road.

Geographical coordinates for the approximate centre of the Site are: Latitude: 32° 22′ S, Longitude: 115° 44′ E.

Note: Unallocated Crown Land (UCL) refers to Crown land which is not subject to any interest (aside from native title interests), and which is not reserved or dedicated. A Parcel Identifier Number (PIN) is allocated to areas of UCL that do not have a defined cadastral identifier (e.g., lot number). Boundary descriptions including UCL will be revised as more information is available.

The whole of the Site including the portion excised on the map is managed as part of the Rockingham Lakes Regional Park.

2.2.2 - General location

a) In which large administrative region does the site lie? Becher Point is in the City of Rockingham (Local Government Authority) in the State of Western Australia.

b) What is the nearest town or population centre? The Ramsar Site is 9 km south of the city of Rockingham, population 140,595 (ABS 2021 census data)

2.2.3 - For wetlands on national boundaries only

a) Does the wetland extend onto the territory of one or more other countries? Yes ○ No ◉

b) Is the site adjacent to another designated Ramsar Site on the territory of another Contracting Party? Yes ○ No ◉

2.2.4 - Area of the Site

Official area, in hectares (ha): 708

Area, in hectares (ha) as calculated from GIS boundaries: 708.037

2.2.5 - Biogeography

Biogeographic regions

Regionalisation scheme(s)	Biogeographic region
Other scheme (provide name below)	South-West Coast, Murray River (WA)
Other scheme (provide name below)	Swan Coastal Plain, Perth
Other scheme (provide name below)	Southwest IMCRA province

Other biogeographic regionalisation scheme

Bureau of Meteorology (2012). Australian Hydrological Geospatial Fabric (Geofabric): Topographic Drainage Divisions and River Regions – South-West Coast, Murray River WA (http://www.bom.gov.au/water/geofabric/documents/BOM002_Map_Poster_A3_Web.pdf).

The Australian Hydrological Geospatial Fabric (Geofabric) is a specialised Geographic Information System (GIS). It registers the spatial relationships between important hydrological features such as rivers, water bodies, aquifers and monitoring points. The National Topographic Drainage Divisions and River Regions are currently derived from Geofabric version 2. These provide a set of surface water reporting units based on drainage-enforced digital elevation models and are used to depict where water flows and drains across the landscape.

Commonwealth of Australia (2012). Interim Biogeographic Regionalisation for Australia, Version 7 – Swan Coastal Plain, Perth. https://www.environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps

The interim Biogeographic Regionalisation for Australia (IBRA) describes the biogeographic regions within Australia. Subdivisions of IBRA regions provide finer scale regions of the Australian landscape. Vegetation community and land system mapping undertaken by the states and territories have been used to establish IBRA Region and Subregion Boundaries. This information can potentially be used to identify regional ecosystems across Australia.

Commonwealth of Australia (2006). Integrated Marine and Coastal Regionalisation of Australia (IMCRA) Version 4 – Southwest IMCRA province (https://parksaustralia.gov.au/marine/management/resources/scientific-publications/guide-integrated- marine-and-coastal-regionalisation-australia-version-40-june-2006-imcra/)

The Integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0) is a spatial framework for classifying Australia's marine environment into bioregions that make sense ecologically and are at a scale useful for regional planning.

3 - Why is the Site important?

3.1 - Ramsar Criteria and their justification

☑ Criterion 1: Representative, rare or unique natural or near-natural wetland types

Other reasons	The Becher Point Wetlands comprises an example of shrub swamps and seasonal marshes formed in an extensive sequence of inter-dunal depressions that have arisen from seaward advancement of the coastline over recent millennia. This geomorphological sequence of Holocene wetlands is rare in the South-West Coast bioregion and is one of the youngest wetland systems on the Swan Coastal Plain. Examples of this type of geomorphological sequence in equally good condition and within a protected area are considered rare globally (Semeniuk 2007). The conservation values of the wetlands relate to the geomorphic significance of the Site and the respective location of the wetlands along the evolutionary time sequence. When conserved as a representative unit, the relative youth of the wetlands, and the range of wetlands of different ages in association with their geomorphic history, provide important opportunities for research on wetland evolution (V & C Semeniuk Research Group 1991). The Ramsar Site contains 4 wetland types, of which 3 are recognised as Ramsar wetland types: • Seasonal/ intermittent freshwater marshes/ pools on inorganic soils (Ramsar type Ts) • Freshwater, tree dominated wetlands on inorganic soils (Xf) • Shrub dominated wetlands on inorganic soils (W) • Seasonal/ intermittent freshwater marshes/ pools on organic soils (no corresponding Ramsar wetland type on organic soils)

☑ Criterion 2 : Rare species and threatened ecological communities

Optional text box to provide further information	The Becher Point Wetlands Ramsar Site supports one nationally listed threatened ecological community 'Sedgelands in Holocene dune swales of the southern Swan Coastal Plain'. This ecological community is listed nationally as endangered under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). This ecological community is also listed as critically endangered at the State level under the West Australian Biodiversity Conservation Act 2016, where it is known as 'Sedgelands in Holocene dune swales of the southern Swan Coastal Plain (floristic community type 19 as originally described in Gibson et al. 1994)'. The sedgeland community has a restricted distribution and is almost entirely located within linear wetland depressions (swales) occurring between parallel sand ridges of the Rockingham-Becher Plain in southwest Western Australia. The best record of the sedgeland community occurs along a linear transect from the Ramsar site through to the hinterland, which spans the last 8,000 years of the Holocene Epoch (DEC 2011). The sedgeland community within the Ramsar Site is particularly important for the outstanding demonstration of a continuous depositional history of sediment during the last 3,000 years. This sedgeland community occurs in linear damplands and occasionally sumplands, between Holocene dunes. Typical and common native species are the shrubs Acacia rostellifera, Acacia saligna, Xanthorrhoea preissii, the sedges Machaerina juncea, Ficinia nodosa, Lepidosperma gladiatum, and the grass Poa porphyroclados. The Site may support other listed threatened species, but this is a knowledge gap.

3.2 - Plant species whose presence relates to the international importance of the site

Several flora species are key attributes of the "sedgelands in Holocene dune swales of the southern Swan Coastal Plain" threatened ecological community. As these species are not listed as threatened, they have been included under "other noteworthy flora" in section 4.3.1.

3.3 - Animal species whose presence relates to the international importance of the site

1) Percentage of the total biogeographic population at the site

<no data available>

3.4 - Ecological communities whose presence relates to the international importance of the site

Name of ecological community	Community qualifies under Criterion 2?	Description	Justification
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	☑	This community includes Acacia rostellifera, Acacia saligna, Xanthorrhoea preissii, sedges: Machaerina juncea, Ficinia nodosa, Lepidosperma gladiatum, and Poa porphyroclados.	The sedgeland community is nationally listed as Endangered under the Australian Government Environment Protection and Biodiversity Conservation Act (1999)

Optional text box to provide further information

The Site includes approx. 19 hectares of the nationally threatened sedgeland community; this community occurs in linear damplands and occasionally in sumplands, between Holocene dunes. Typical and common native species are the shrubs Acacia rostellifera, Acacia saligna and Xanthorrhoea preissii, the sedges Machaerina juncea, Ficinia nodosa and Lepidosperma gladiatum, and the grass Poa porphyroclados. Several exotic weeds are found in this community but generally at low coverage.

Water regime is the primary abiotic determinant influencing the characteristics of wetland plant communities. Depth, timing and duration of flooding and length of the dry period all affect vegetation composition and distribution (Froend et al. 2004). The sedgelands in the damplands and sumplands of the Holocene dune swales have relatively specific water regime requirements to maintain current biology, and are tolerant to seasonal variations. However, they are vulnerable to changes in long-term climatic patterns with monitoring indicating that the community reverts to a shrubland with terrestrialisation when groundwater declines sufficiently (pers. comm. V. English, DBCA). The typical wetland in which this community type occurs is a dampland that becomes water logged in winter and retains relatively high moisture near the surface of the soil profile in summer. The plant community occasionally occurs in sumplands, which have shallow surface water - generally less than 20cm for up to 2 months of the year. The soils of these wetlands are sands or sandy-loams with a pH of about 8.0. The soils are more saline close to the coast, and this reflects inputs from salt spray. Nutrient levels are similar to those reported for other Quindalup sands (DEC 2011).

More information about this threatened ecological community is available from the Species Profile and Threats database: https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=19

4 - What is the Site like? (Ecological character description)

4.1 - Ecological character

The critical components of the Becher Point Wetlands are:

• Geomorphology: the geomorphology is a particularly important characteristic of the Ramsar Site. The nearshore bathymetry, the cuspate foreland itself, and the beach-ridge plain are crucial components of the wetlands. The size, shape, depth, number and distribution of wetland basins are important to the ecological character of the Site.

• Sediments: including the variable sedimentary stratigraphic sequences and stratigraphic relationships; and wetland sedimentary fills (depth and nature of sediments).

• Hydrology: including recharge by seasonal precipitation; variable water table gradients and hydraulic conductivities; and the water table morphology under the wetlands.

• Hydrochemistry: including wetland groundwater and soil water salinities; nutrient concentrations in groundwater; and pH of wetland groundwater.

• Wetland vegetation: including communities (plant species and physiognomies, threatened species community); and niches with the wetland basin. The distribution of plant communities within and amongst the wetlands of this Site are diverse and dynamic, resulting in mosaics of very different assemblages between wetlands even as little as 20m (or less) apart.

The critical processes of the Site are:

• Regional climatic processes: the wetlands within this system commenced their development at different times during the Holocene period, from 4,500 BP to present. During that time, the climate and rainfall patterns responded to perturbations caused by various astronomical cycles. As a result of these cycles and periodicities, some of the wetlands were initiated during relatively dry/ arid periods and some during relatively wetter/ humid periods.

• Regional and local geomorphological processes: the formation of Becher cuspate foreland and beachridge plain, including nearshore marine and coastal processes, development and progradation of Becher cuspate foreland, formation of beachridge plain, and segmentation of swales.

• Hydrological processes: including the hydrological processes which determined the sequence of wetland formation; the (limited) tidal influence on the site; local perturbations caused by wetland sediments (e.g., shallow plugs that affect groundwater flow); and variations in local hydrological recharge and discharge.

• Sedimentological processes: play a fundamental role in directing, transporting and impeding water flows at a regional scale as well as at the basin and bed scale. They are instrumental in wetland formation, in changing the size and depth of the wetland, contracting it through infilling and burial, or expanding it through dissolution, accretion and bioturbation.

• Evolutionary processes: including physical and biogeochemical changes in wetlands. As a result of the size, shape and depth of each basin, its sedimentary composition, pollen record and extent of plant associations are different. Hydrological and Hydrochemical history are recorded in the structural, compositional, and textural attributes within the sedimentary pile.

• Hydrochemical processes: including seasonal mechanisms that influence salinity, cation concentrations and nutrients in groundwater.

• Wetland processes driven by vegetation: including the effects of plants on sediments, hydrology and hydrochemistry.
(Source: DEC 2009)

4.2 - What wetland type(s) are in the site?

Inland wetlands

Wetland types (code and name)	Local name	Ranking of extent (1: greatest - 4: least)	Area (ha) of wetland type	Justification of Criterion 1
Fresh water > Marshes on inorganic soils >> Ts: Seasonal/ intermittent freshwater marshes/ pools on inorganic soils		2		Rare
Fresh water > Marshes on inorganic soils >> W: Shrub-dominated wetlands		1		Rare
Fresh water > Marshes on inorganic soils >> Xf: Freshwater, tree-dominated wetlands		0		Rare

4.3 - Biological components

4.3.1 - Plant species

Other noteworthy plant species

Phylum	Scientific name	Position in range / endemism / other
TRACHEOPHYTA/MAGNOLIOPSIDA	*Calandrinia oraria*	West Australian priority 3 listed herb which forms part of the threatened sedgeland ecological community
TRACHEOPHYTA/LILIOPSIDA	*Ficinia nodosa*	Forms a key part of the listed threatened sedgeland ecological community
TRACHEOPHYTA/LILIOPSIDA	*Gahnia trifida*	Forms a key part of the listed threatened sedgeland ecological community
TRACHEOPHYTA/LILIOPSIDA	*Juncus kraussii*	Forms a key part of the listed threatened sedgeland ecological community
TRACHEOPHYTA/LILIOPSIDA	*Lepidosperma gladiatum*	Forms a key part of the listed threatened sedgeland ecological community
TRACHEOPHYTA/LILIOPSIDA	*Machaerina juncea*	Forms a key part of the listed threatened sedgeland ecological community
TRACHEOPHYTA/MAGNOLIOPSIDA	*Melaleuca rhaphiophylla*	Forms a canopy in some occurrences of listed threatened sedgeland ecological community

Invasive alien plant species

Phylum	Scientific name	Impacts	Changes at RIS update
TRACHEOPHYTA/MAGNOLIOPSIDA	*Atriplex prostrata*	Potential	unknown
TRACHEOPHYTA/MAGNOLIOPSIDA	*Brassica tournefortii*	Potential	unknown
TRACHEOPHYTA/LILIOPSIDA	*Bromus diandrus*	Potential	unknown
TRACHEOPHYTA/MAGNOLIOPSIDA	*Crassula glomerata*	Potential	unknown
TRACHEOPHYTA/MAGNOLIOPSIDA	*Dischisma arenarium*	Potential	unknown
TRACHEOPHYTA/MAGNOLIOPSIDA	*Pelargonium capitatum*	Potential	unknown
TRACHEOPHYTA/LILIOPSIDA	*Romulea rosea*	Potential	unknown
TRACHEOPHYTA/MAGNOLIOPSIDA	*Sonchus asper*	Potential	unknown
TRACHEOPHYTA/MAGNOLIOPSIDA	*Sonchus oleraceus*	Potential	unknown
TRACHEOPHYTA/MAGNOLIOPSIDA	*Trifolium glomeratum*	Potential	unknown

Optional text box to provide further information

Noteworthy flora:
Conosylis pauciflora subsp. sauciflora is a West Australian priority 4 listed herb which forms part of the threatened sedgeland ecological community. It is not listed in the GBIF dataset.

Eleven plant associations have been identified within the Site (Semeniuk 2007). These associations (and their dominant species) are:
• Low forest: Melaleuca rhaphiophylla, with no understorey or an understorey of Ficinia nodosa
• Sedgeland: Machaerina juncea with an overstorey of Melaleuca teretifolia, and understorey of Centella asiatica and Sporobolus virginicus
• Heath: Melaleuca teretifolia, understorey Centella asiatica
• Heath: Melaleuca viminea, understorey Centella asiatica and Lepidosperma gladiatum
• Heath: Xanthorrhoea preissii, understorey Machaerina juncea and Sporobolus virginicus
• Sedgeland: Machaerina juncea, understorey Centella asiatica and Sporobolus virginicus
• Sedgeland: Lepidosperma gladiatum
• Rushland: Juncus kraussii, understorey Centella asiatica
• Herbland: Centella asiatica
• Sedgeland/ herbland: Machaerina juncea and Centella asiatica
Within the wetland basins, these assemblages form mosaics which are constantly expanding and contracting in size. The composition, however, remains relatively consistent. Identification of pollen throughout the sedimentary profile confirms these species have been present since their inception several thousand years ago (Semeniuk 2007).

Invasive plant species:
Weed species have the potential to alter or disrupt the recycling of chemical compounds and ions between the sediment, water and plants. In times of water deficit, weeds out compete more effectively against the endemic species.
Weeds may compete with native flora and reduce the habitat available for the threatened ecological community. Some of the effects of weed dominance may be far reaching. More research is required.
The following weed species have been recorded from the Site but are not in the GBIF databse:
• Cyperus tenuiflorus (scaly sedge)
• Holcus sp.

4.3.2 - Animal species

Other noteworthy animal species

Phylum	Scientific name	Pop. size	Period of pop. est.	%occurrence	Position in range /endemism/other
CHORDATA/MAMMALIA	*Isoodon obesulus*				Subspecies Isoodon obesulus fusciventer has been recorded at the site. This subspecies is endemic to SW Western Australia
CHORDATA/REPTILIA	*Lerista lineata*				This species is internationally listed (IUCN – endangered) but is unlikely to be wetland dependent.
CHORDATA/REPTILIA	*Morelia spilota imbricata*				Native species from the southern regions of Western Australia and western South Australia
CHORDATA/REPTILIA	*Vermicella calonotus*				Australian endemic species (Neelaps calanotus)

Invasive alien animal species

Phylum	Scientific name	Impacts	Changes at RIS update
CHORDATA/MAMMALIA	*Felis catus*	Potential	unknown
CHORDATA/MAMMALIA	*Mus musculus*	Potential	unknown
CHORDATA/MAMMALIA	*Oryctolagus cuniculus*	Potential	unknown
CHORDATA/MAMMALIA	*Rattus rattus*	Potential	unknown
CHORDATA/MAMMALIA	*Vulpes vulpes*	Potential	unknown

Optional text box to provide further information

Noteworthy fauna:
Noteworthy native fauna of the Site includes the quenda (Isoodon obesulus fusciventer), carpet python (Morelia spilota imbricata), Perth lined lerista (Lerista lineata) and black-striped snake (Neelaps calanotus). At least four species of amphibians and 21 species of reptiles have been recorded at the Site (DCLM 2000). The diversity and abundance of fauna species at the Site, and the importance of the Site for these species is a knowledge gap.

Invasive animal species:
Rabbit burrowing has been observed within the Ramsar Site. A fence around the majority of the Site (the southern end is unfenced) has probably reduced access of feral animals and assists in mitigating damage from off-road vehicles. A detailed survey for invasive species has not been undertaken, however, it is likely that the invasive species listed above occur at the Site.

4.4 - Physical components

4.4.1 - Climate

Climatic region	Subregion
C: Moist Mid-Latitude climate with mild winters	Csa: Mediterranean (Mild with dry, hot summer)

The Ramsar Site has a Mediterranean, sub-humid climate, with cool wet winters and hot dry summers. A seasonal north-south movement of the belt of subtropical high pressure systems controls temperatures, rainfall and wind patterns. Perth's rainfall has declined by 15% since the 1970s, resulting in an average 80% reduction in streamflow, and declining regional groundwater levels. This is likely to be reflected in changes to the vegetation, including terrestrialisation of the groundwater dependent TEC.

According to BoM and CSIRO (2020) climate change projections for Australia's NRM Regions (Southern and South-western Flatlands West), average temperatures will continue to increase in all seasons, with more hot days and warm spells, and fewer frosts projected. Decreasing winter and spring rainfall is projected. Changes to rainfall in other seasons is unclear. There is likely to be increased intensity of extreme rainfall events. A harsher fire-weather climate in the future is likely.

4.4.2 - Geomorphic setting

a) Minimum elevation above sea level (in metres): 0

a) Maximum elevation above sea level (in metres): 10

- Entire river basin ☐
- Upper part of river basin ☐
- Middle part of river basin ☐
- Lower part of river basin ☐
- More than one river basin ☐
- Not in river basin ☑
- Coastal ☐

Please name the river basin or basins. If the site lies in a sub-basin, please also name the larger river basin. For a coastal/marine site, please name the sea or ocean.

The Ramsar Site is located on the beach ridge plains on the coast of south-west Western Australia. It is within 0.2-1.5 km of the Indian Ocean and is not part of a river basin.

4.4.3 - Soil

Mineral ☑

(Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○

Organic ☑

(Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○

No available information ☐

Are soil types subject to change as a result of changing hydrological conditions (e.g., increased salinity or acidification)? Yes ○ No ◉

Please provide further information on the soil (optional)

The Site is situated in the Perth Basin, on the Rockingham-Becher Plain, which is part of the coastal landform unit known as the Quindalup Dunes. The Site is directly underlain by the Safety Bay Sand formation. The Becher cuspate foreland accreted on the Pleistocene surface of the inter-ridge depression between the Spearwood Ridge on the mainland and the nearshore Garden Island Ridge, in response to a falling sea level during the middle to late Holocene period (DEC 2009).

Soils underlying the beachridge plain are comprised of quartzose calcareous sand. The calcareous/ quartzose parent sand (Safety Bay Sand) is a primary source for carbonate material itself, having between 30% and 80% carbonate content as shells and other marine skeletons (Woods 1984; Searle & Semeniuk 1988).

4.4.4 - Water regime

Water permanence

Presence?	Changes at RIS update
Usually seasonal, ephemeral or intermittent water present	unknown

Source of water that maintains character of the site

Presence?	Predominant water source	Changes at RIS update
Water inputs from precipitation	☑	unknown
Water inputs from groundwater	☑	unknown

Water destination

Presence?	Changes at RIS update
Unknown	unknown

Stability of water regime

Presence?	Changes at RIS update
Water levels fluctuating (including tidal)	unknown

Please add any comments on the water regime and its determinants (if relevant). Use this box to explain sites with complex hydrology:

The Site's wetlands are seasonal. There is usually no surface water in summer-autumn. The fresh surface water of winter is derived from both groundwater flow and direct precipitation, and generally is less than 0.3 m deep.

Groundwater, under the Becher cuspate foreland, resides unconfined in the Safety Bay sand and Becher Sand aquifers. The water body is approximately 25m deep at maximum thickness, and its upper surface (the water table) slopes west, northwest and southwest forming a convex surface. The height of the water table varies between 2.8 and 4.2 m AHD. Generally, there is a steepening of the gradient closer to the shorelines. Where the water table intersects the beach ridge plain topography, it has created a specific pattern of wetland distribution which has taken place over 5,000 years.

Groundwater flows have different properties at different locations of the cuspate foreland, exhibiting different water table gradients, hydraulic conductivities, volumes of water and frequencies, in response to rainfall patterns and position of the water table. Between beach ridges on either side of a given wetland, the east and west groundwater flow is low enough to consider most wetlands to be closed hydrological systems during the period of inundation or waterlogging. However, there are flows generated by 10cm differences in piezometric height in the corresponding water tables, which can be quite rapid and frequent. Examples of these flows include: up gradient ridge to wetland, wetland to down gradient ridge, and down gradient ridge back to wetland. Water table gradients between ridge and wetland, when present (early and late winter and spring), are the driving mechanism for flow to, from, or through each wetland.

North to south flow between wetlands in the same swale is negligible.
(Source: DEC 2009)

(ECD) Connectivity of surface waters and of groundwater: The wetland is a groundwater dependent ecosystem. Rainfall recharges the groundwater system, which annually rises to inundate or waterlog the wetland basins.

4.4.5 - Sediment regime

Significant accretion or deposition of sediments occurs on the site ☑

(Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○

Sediment regime unknown ☐

Please provide further information on sediment (optional):

The sediments of the Site are unusual as peat and carbonate mud occur together. The conditions for peat formation and accumulation, and for carbonate mud formation and accumulation are almost mutually exclusive, the former thriving in slightly acidic conditions, and the latter requiring alkaline conditions. The occurrence of the two sediment types at the site indicates very different climatic conditions at the time of formation. The wetland sedimentary piles collectively record regional rises and falls in groundwater and the age structure of the wetlands on the Becher cuspate foreland. The wetland sedimentary sequences record the types of sediment accumulation that have taken place, the rates at which they occurred, and changes in wetland size. Pollen within the sedimentary sequence denotes the succession of plant species which have colonized the wetland and the individual history of response to the climate at each stage of its development (Semeniuk et al 2006).

4.4.6 - Water pH

Circumneutral (pH: 5.5-7.4) ☑

(Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○

Alkaline (pH>7.4) ☑

(Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○

Unknown ☐

Please provide further information on pH (optional):

The chemical composition of the groundwater reflects the nature of the Safety Bay Sand and Becher Sand aquifers and the nature of the wetland sedimentary fills. Groundwater is fresh, rich in cations, low in nutrients and has a pH in the neutral to alkaline range of pH 7.1 - 8.3 for most of the year (DEC 2009).

The chemical composition of the groundwater under the Becher Point Wetlands site is variable throughout the year because of seasonal hydrological dynamics and these processes are well understood. Processes such as dilution, by progressive rainfall over the winter, groundwater rise, downward saturated flow, leaching, and ionic mobility, or precipitation, and concentration by evapo-transpiration and ionic exchange relationships, are active (DEC 2009).

4.4.7 - Water salinity

Fresh (<0.5 g/l) ☑

(Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○

Unknown ☐

Please provide further information on salinity (optional):

The Becher Point Wetlands can be classed as freshwater. The salt content of the groundwater is predominantly below 1,000 ppm, though it varies seasonally from ~250 to 1,000 ppm. For 1-2 months of the year, between December to March (summer to early autumn) and June to July (early winter), groundwater is slightly subhaline. Salinity in interstitial waters ranged from subhaline to hyposaline.
Salinity shifts from freshwater to subhaline or hyposaline levels for short periods in response to leaching of leaf litter and upper layers of sediment in early winter, and then back again under subsequent eluviation by infiltrating meteoric waters in late winter. Then in late spring and summer it increases steadily due to evapo-transpiration. These trends in salinity are mirrored by each cation and by orthophosphate (DEC 2009).

4.4.8 - Dissolved or suspended nutrients in water

Unknown ☑

Please provide further information on dissolved or suspended nutrients (optional):

Levels of orthophosphate in the groundwater are generally low (< 0.1mg/L). Variability in groundwater nutrient concentrations is low, and is related to seasonal events, such as first flush of rain and spring plant growth. Most of the phosphorous is locked in the organic material and carbonate sediments (DEC 2009).

4.4.9 - Features of the surrounding area which may affect the Site

Please describe whether, and if so how, the landscape and ecological characteristics in the area surrounding the Ramsar Site differ from the site itself: i) broadly similar ○ ii) significantly different ◉

Surrounding area has greater urbanisation or development ☑

Surrounding area has higher human population density ☐

Surrounding area has more intensive agricultural use ☐

Surrounding area has significantly different land cover or habitat types ☐

Please describe other ways in which the surrounding area is different:

Directly north of the Ramsar Site is the Kennedy Bay development, which comprises a golf course, boat ramp and residential area. There is a project underway to expand the residential area, add a town centre precinct, and public jetty, scheduled for completion in 2024. See: https://rockingham.wa.gov.au/forms-and-publications/planning-and-building/local-planning/kennedy-bay -master-precinct-plan

4.5 - Ecosystem services

4.5.1 - Ecosystem services/benefits

Regulating Services

Ecosystem service	Examples	Importance/Extent/Significance
Maintenance of hydrological regimes	Groundwater recharge and discharge	High

Cultural Services

Ecosystem service	Examples	Importance/Extent/Significance
Spiritual and inspirational	Aesthetic and sense of place values	Medium
Scientific and educational	Important knowledge systems, importance for research (scientific reference area or site)	High

Supporting Services

Ecosystem service	Examples	Importance/Extent/Significance
Biodiversity	Supports a variety of all life forms including plants, animals and microorganizms, the genes they contain, and the ecosystems of which they form a part	Medium
Soil formation	Accumulation of organic matter	Medium
Nutrient cycling	Storage, recycling, processing and acquisition of nutrients	Medium

Optional text box to provide further information

Ecosystem services include:
• maintenance of hydrological regimes: fresh surficial groundwater area
• recreation and tourism: for nature observation
• spiritual and inspirational: sense of place
• scientific and educational:
• evolutionary sequence
• evolution of independent wetlands
• evolution of wetland vegetation associations
• evidence of Holocene climate
• unique wetland formation
• rare wetland deepening processes
• wetland sedimentological processes
• coastal history
• major scientific study site
• long term monitoring site (> 15 years)
• biodiversity:
• supports a range of wetland plant communities
• supports a nationally threatened plant community
• soil formation:
• accumulation of calcilutite
• accumulation of peat
• nutrient cycling: recycling of chemical elements between plants, water and sediments.

Have studies or assessments been made of the economic valuation of ecosystem services provided by this Ramsar Site? Yes ○ No ○ Unknown ◉

4.5.2 - Social and cultural values

i) the site provides 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) the site has exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland ☐

iii) the ecological character of the wetland depends on its interaction with local communities or indigenous peoples ☐

iv) 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 ☐

<no data available>

4.6 - Ecological processes

<no data available>

5 - How is the Site managed? (Conservation and management)

5.1 - Land tenure and responsibilities (Managers)

5.1.1 - Land tenure/ownership

Public ownership

Category	Within the Ramsar Site	In the surrounding area
Provincial/region/state government	☑	☑

Private ownership

Category	Within the Ramsar Site	In the surrounding area
Other types of private/individual owner(s)	☐	☑

Provide further information on the land tenure / ownership regime (optional):

The Ramsar Site is part of Nature Reserve No. 44077 (Port Kennedy Scientific Park) which is part of the Rockingham Lakes Regional Park.

5.1.2 - Management authority

Please list the local office / offices of any agency or organization responsible for managing the site:

Parks and Wildlife Service, Department of Biodiversity, Conservation and Attractions, Swan Region, Regional Parks Unit, Crawley, Western Australia
https://exploreparks.dbca.wa.gov.au/park/rockingham-lakes-regional-park

Provide the name and/or title of the person or people with responsibility for the wetland:

Regional Parks

Postal address:

Department of Biodiversity, Conservation and Attractions
Parks and Wildlife Service
Locked Bag 104
Bentley Delivery Centre
Western Australia 6983

email: Regional.Parks@dbca.wa.gov.au

E-mail address: wetlands@dbca.wa.gov.au

5.2 - Ecological character threats and responses (Management)

5.2.1 - Factors (actual or likely) adversely affecting the Site's ecological character

Human settlements (non agricultural)

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Housing and urban areas	Low impact	Low impact	☑	unknown	☑	unknown

Water regulation

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Water abstraction	unknown impact	High impact	☑	unknown	☑	unknown

Biological resource use

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Unspecified			☑		☐	

Human intrusions and disturbance

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Recreational and tourism activities	unknown impact	unknown impact	☑	unknown	☑	unknown

Natural system modifications

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Fire and fire suppression	unknown impact	High impact	☑	unknown	☐	unknown

Invasive and other problematic species and genes

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Invasive non-native/ alien species	unknown impact	unknown impact	☑	unknown	☐	unknown

Climate change and severe weather

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Unspecified	unknown impact	unknown impact	☑	No change	☑	unknown

Please describe any other threats (optional):

Threats to the Site may include (but are not limited to):

Onsite threats (and onsite impacts):
• Fire: can result in the destruction of vegetation, invasion of weeds.
• Compaction and cutting up of sediments through off-road vehicle use: perturbation and disruption of wetland sediments.
• Increase in feral animals: loss of native fauna; modification of habitat; grazing of native vegetation.

Offsite threats (and onsite impacts):
• Groundwater abstraction: change to water regime patterns.
• Interruption of groundwater flows: change to recharge mechanisms.
• Increase in groundwater flows: change to shallow nature of wetlands.
• Change of water table gradients: change to local flows in and out of the wetland.
• Excess nutrient loads or introduced contaminants in groundwater.
• Change to hydrochemistry.
• Expansion of weeds.
• Potential change in composition of plant assemblages.
• Increase in acidic groundwater: loss of carbonate material.
• Nearshore dredging south of Becher Point: interruption of longshore drift and onshore accumulation, starving of sediment supply to the shore and beach ridges, and possible erosion of the coast.
• Construction of marinas or groynes near the point: obstruction to longshore drift and morphology of Becher Point, starving of sediment supply to the shore and beach ridges, and possible erosion of the coast.

5.2.2 - Legal conservation status

National legal designations

Designation type	Name of area	Online information url	Overlap with Ramsar Site
Nature Reserve	Crown Reserve 44077		whole

5.2.3 - IUCN protected areas categories (2008)

Ia Strict Nature Reserve ☑

Ib Wilderness Area: protected area managed mainly for wilderness protection ☐

II National Park: protected area managed mainly for ecosystem protection and recreation ☐

III Natural Monument: protected area managed mainly for conservation of specific natural features ☐

IV Habitat/Species Management Area: protected area managed mainly for conservation through management intervention ☐

V Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation ☐

VI Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems ☐

5.2.4 - Key conservation measures

Legal protection

Measures	Status
Legal protection	Implemented

Other:

In Australia, the ecological character of a designated Ramsar Site is protected as a matter of national environmental significance (MNES) under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The Whadjuk people are recognised as the traditional owners of Rockingham Lakes Regional Park (and the Becher Point Ramsar site).

5.2.5 - Management planning

Is there a site-specific management plan for the site? Yes

Has a management effectiveness assessment been undertaken for the site? Yes ○ No ◉

If the site is a formal transboundary site as indicated in section Data and location > Site location, are there shared management planning processes with another Contracting Party?	Yes ○ No ◉

5.2.6 - Planning for restoration

Is there a site-specific restoration plan?	No need identified

5.2.7 - Monitoring implemented or proposed

Refer to the Rockingham Lakes Regional Park Management Plan for management and monitoring actions.

6 - Additional material

6.1 - Additional reports and documents

6.1.1 - Bibliographical references

This RIS has been prepared using information from the draft (unpublished) Becher Point Wetlands Ramsar site Ecological Character Description; the Rockingham Lakes Regional Park Management Plan; past Ramsar Information Sheets; and other key information sources. A full bibliography is included as an attachment under Section 6.1.2 vi.

6.1.2 - Additional reports and documents

i. taxonomic lists of plant and animal species occurring in the site (see section 4.3)
<no file available>

ii. a detailed Ecological Character Description (ECD) (in a national format)
<no file available>

iii. a description of the site in a national or regional wetland inventory
<no file available>

iv. relevant Article 3.2 reports
<no file available>

v. site management plan
<1 file(s) uploaded>

vi. other published literature
<1 file(s) uploaded>

6.1.3 - Photograph(s) of the Site

Please provide at least one photograph of the site:

Becher Point wetlands (photo by Bronwyn Goody) (*Commonwealth of Australia, 22-08-2009*)

Becher Point wetlands (photo by Bronwyn Goody) (*Commonwealth of Australia, 22-08-2009*)

Scarlet runners (Kennedia prostrata) at Becher Point (photo by Bronwyn Goody) (*Commonwealth of Australia, 22-08-2009*)

Interdunal swale at Becher Point (photo by Michael Coote) (*Michael Coote, 11-08-2007*)

6.1.4 - Designation letter and related data

Designation letter
<1 file(s) uploaded>

Date of Designation	2001-01-05