Summary

1.1 Summary description

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|  | The Bowling Green Bay Ramsar site is located on the central coast of Queensland, 52km southeast of Townsville and 21km northeast of Ayr. The wetland complex includes a diverse number of wetland types comprising palustrine, riverine, estuarine and marine wetlands. Complex patterns of saltmarsh and saltwater couch grasslands back onto thin fringes of low *Rhizophora* mangrove communities in the intertidal zone. The site contains one of the largest mangrove and saltmarsh habitats along the Great Barrier Reef Coast (Goudkamp and Chin 2006). The ‘dry tropic’ mangrove communities at the site are uncommon in north-eastern Australia (Kelly and Lee Long, 2011, unpublished). The site incorporates the mountainous areas of Cape Cleveland, parallel dune systems, low-lying coastal plains and the large pro-grading sandspit of Cape Bowling Green.  The wetlands support a significant diversity and abundance of species including turtles, shorebirds and other waterbirds. Several of these species are listed as threatened at international, national and/or state levels.  The site is recognised as a network site under the East Asian-Australasian Flyway Partnership and supports at least 3 migratory shorebirds at >1% of the flyway population. The site is high value for fisheries with important fish and crustacean nurseries. Some species depend on the site for certain stages of their life-cycle.  The site meets criteria 1, 2, 3, 4, 6, 7 & 8:  1: The site includes rare and representative wetland types  2: It supports at least 7 internationally threatened species and 1 threatened ecological community  3: It supports up to 870 species  4: It supports critical habitats for migratory shorebird feeding and roosting; nesting habitat for marine turtles; and diadromous fish migration  6: It supports >1% of the flyway population of sharp-tailed sandpiper, red-necked stint and common tern  7: It supports endemic and diadromous fish species, and a wide range of morphologies  8: It is a nursery site for fish and crustaceans.  The site holds cultural, spiritual and provisioning values for the Bindal people and other First Nations People and is important for scientific research, conservation and nature observation activities. The wetlands are recognised for important ecosystem services such as regulating hydrology (Ramsar Convention 2018; Kelly and Lee Long, 2011, unpublished) and assimilating nutrients (Department of Environment 2016; Herbert et al. 2015) before run-off enters the Great Barrier Reef lagoon. |

Data & location

2.1 Formal data

2.1.1 Name and address of the compiler of this RIS

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|  | Manager, Wetlands  Queensland Department of Environment and Science  GPO Box 2454,  Brisbane, QLD 4001  Australia  Email: [wetlands@des.qld.gov.au](mailto:wetlands@des.qld.gov.au)  Phone: +61 13 74 68 |

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

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|  | 1999 -2022 |

2.1.3 Name of the Ramsar Site

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|  | Bowling Green Bay |

2.1.5 Changes to the ecological character of the Site

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|  | While there has been no notifiable change to ecological character, the site is subject to a changing climate. Australia has warmed by just over 1°C since 1910, with most warming since 1950. Further increases in temperature are projected, with more extremely hot days and fewer extremely cool days over the coming decades under all emissions scenarios. Warming over Australia is expected to be slightly higher than the global average. Oceans around Australia have warmed by around 1°C since 1910, contributing to longer and more frequent marine heatwaves. Sea levels are rising around Australia, increasing the risk of inundation and the oceans are acidifying (BOM, 2018). These conditions will affect the critical components, processes and services of the Ramsar site and the resilience and adaptive capacity of the site will be tested.  Cape Bowling Green Bay sandspit is continuing to erode on it’s eastern side. The implications and trajectories are being investigated. |

Changes in the application of the Criteria, since the previous RIS for the site.

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|  | At the date of Ramsar listing (1993), the site was considered to meet Criterion 5, however, the site does not and likely never did meet this Criterion. This update removes Criterion 5, but this does not change the ecological character of the site. This update also gives recognition to the site meeting Criteria 7 and 8; which were not included in the original nomination.    The Bowling Green Bay Ramsar site is part of a larger wetland complex that includes the Wongaloo Swamp Aggregation and other nationally important wetlands to the south and south-west of the site. At the time of listing, rice farms adjacent to the wetland complex likely attracted large numbers of the herbivorous magpie geese (*Anseranas semipalmata*), provided an important area for invertebrates and small vertebrate prey important for brolgas (*Grus rubicunda*) (Milton et. al., 2014). Subsequent cessation of rice farming is likely to have significantly reduced the attraction for feeding waterbirds. A recent study (Driscoll et al., 2012) indicates that while the larger wetland complex regularly supports >20,000 waterbirds (including 60,000 in August 2011), and that many waterbirds move into and out of the Ramsar site, the Ramsar site itself is not likely to regularly support more than 20,000 waterbirds.    The original RIS included information that recognised the site’s importance to fish and their habitat. These features are still relevant and are now captured under Criteria 7 and 8 to reflect changes to the Ramsar criteria since the original listing. |

2.2 Site location

2.2.1 Defining the Site boundaries

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|  | The Bowling Green Bay Ramsar site encompasses fully or partly (subject to the exclusions listed below) the following protected area parcels:   * Bowling Green Bay National Park (gazetted on the 13/12/2019) as shown on Lot 1 on AP9205; * Bowling Green Bay National Park (gazetted on the 13/12/2019) as shown on Lot 2 on AP9205; * Bowling Green Bay National Park (gazetted on the 13/12/2019) as shown on Lot 3 on AP9205; * Bowling Green Bay National Park (gazetted on the 13/12/2019) as shown on Lot 5 on AP9205; * Bowling Green Bay Conservation Park (gazetted on the 13/12/2019) as shown on Lot 3 on AP9206; * Bowling Green Bay Conservation Park (gazetted on the 13/12/2019) as shown on Lot 4 on AP9206.   In addition, the Bowling Green Bay Ramsar site encompasses (subject to the exclusions listed below) the area:   * of Crocodile Creek below the low water mark and south of closure line 2 through to (and within) protected area parcel lot 1 on plan AP9205. * located seaward of the relevant above-mentioned protected area parcels through to the low water mark between: * closure line 1 and extending generally ENE along the coast until its intersect with closure line 3; * latitude 19°11'12.6"S and extending generally SSE along the coast until its intersect with closure line 4; * closure line 5 and extending generally SSE along the coast until its intersect with closure line 6; * closure line 7 and extending generally SE along the coast until its intersect with closure line 8; * closure line 9 and extending generally E along the coast until its intersect with closure line 10; * closure line 11 and extending generally E and then north along the coast until its intersect at latitude 19°19'49.45"S; * latitude 19°19'49.45"S and extending generally SSE along the coast until its intersect with closure line 12.   *Bowling Green Bay Closure Lines:*   * *Closure line 1: a line extending due N through to the low water mark from the intersect of the seaward cadastral boundary of lot 1 on plan AP9205 with longitude 146°55'43.0"E (at or about latitude 19°17'52.7"S);* * *Closure line 2: a line extending generally ENE across the mouth of Crocodile Creek from the intercept of the seaward boundary (western bank of Crocodile Creek) of lot 1 on plan AP9205 with longitude 146°56'58.9"E (at or about latitude 19°17'46.8"S) through to the intercept of the seaward boundary (eastern bank of Crocodile Creek) of lot 1 on plan AP9205 with latitude 19°17'37.7"S (at or about longitude 146°57'38.6"E).* * *Closure line 3: a line extending generally NW at a bearing of 300°6'48.0" through to the low water mark from the seaward cadastral intersection of lot 1 on plan AP9205 and lot 17 on plan USL38599 (at or about 19°16'31.4"S, 146°58'54.6"E)* * *Closure line 4: a line extending generally ENE at a bearing of 69°56'28.22" through to the low water mark from the seaward intersection of lot 1 on plan AP9205 and lot 35 on plan EP1474 (at or about 19°15'9.6"S, 147°3'28.8"E).* * *Closure line 5: a line extending generally SE at a bearing of 133°38'53.7" through to the low water mark from the seaward intersection of lot 1 on plan AP9205 and lot 35 on plan EP1474 (at or about 19°16'21.8"S, 147°3'4.1"E).* * *Closure line 6: a line extending generally NE at a bearing of 45°14'18.0" through to the low water mark from the seaward intersection of lot 1 on plan AP9205 and reserve parcel lot 77 on plan K103257 (at or about 19°21'34.7"S, 147°4'53.7"E).* * *Closure line 7: a line extending generally NE at a bearing of 44°12'8.2" through to the low water mark from the seaward intersection of lot 1 on plan AP9205 and reserve parcel lot 77 on plan K103257 (at or about 19°21'47.3"S, 147°5'6.7"E).* * *Closure line 8: a line extending generally NE at a bearing of 48°54'37.5" through to the low water mark from the seaward intersection of lot 1 on plan AP9205 and state land parcel lot 1 on plan USL44284 (at or about 19°23'1.2"S, 147°6'35.5"E).* * *Closure line 9: a line extending due W through to the low water mark from the seaward intersection of lot 5 on plan AP9205 with latitude 19°24'39.95"S (at or about longitude 147°8'12.3"E).* * *Closure line 10: a line extending due E through to the low water mark from the seaward intersection of lot 5 on plan AP9205 with latitude 19°25'57.95"S (at or about longitude 147°14'48.9"E).* * *Closure line 11: a line extending due W through to the low water mark from the seaward intersection of lot 5 on plan AP9205 with latitude 19°25'57.95"S (at or about longitude 147°15'32.2"E).* * *Closure line 12: a line extending generally E at a bearing of 85°29'52.38" through to the low water mark from the seaward intersection of lot 5 on plan AP9205 and state land parcel lot 19 on plan SP213960 (at or about 19°26'16.2"S, 147°28'30.6"E).*   The Bowling Green Bay Ramsar site excludes the following:   * The portion of the Bowling Green Bay National Park within the locality of Cape Cleveland as shown on lot 1 on plan AP9205 located north of latitude 19°11'12.6"S; * The portion of the Bowling Green Bay National Park as shown on lot 1 on plan AP9205 that was previously identified as lot 8 on plan AP13574 (as gazetted on the 4/06/2010); * Reserve parcel lot 76 on plan E12435; * The portion of the Bowling Green Bay National Park as shown on lot 3 on plan AP9205 that is west of the Bruce Highway; * The portion of the Bowling Green Bay National Park as shown on Lot 5 on Plan AP9205 that was previously identified as Lot 8 on Plan AP13574 (as gazetted on the 4/06/2010); * The portion of the Bowling Green Bay National Park within the locality of Alva as shown on lot 5 on plan AP9205 located to the north of latitude 19°19'49.45"S; * The area defined as the Great Barrier Reef Marine Park (Commonwealth Government); * Any dedicated road, railway, or parcels with a tenure type of freehold, lands lease, or reserve within the area described at the time this description was written.   All coordinates, meets and bounds are based upon the Geocentric Datum of Australia 2020. |

2.2.2 General location

a) In which large administrative region does the site lie?

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|  | Burdekin Shire (population 17, 916 in 2014) in Queensland (<http://www.abs.gov.au>). |

b) What is the nearest town or population centre?

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|  | Ayr (population: 9, 178 in 2017) is located 21 km to the southwest; and Townsville (population: 192,988 in 2017) is located 52km northwest of the Ramsar site. |

2.2.3 For wetlands on national boundaries only

Not applicable

2.2.4 Area of the Site

Official area, in hectares (ha):

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|  | 36, 623 |

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

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|  | 36, 623 |

2.2.5 Biogeography

Biogeographic regions

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| **Regionalisation scheme(s)** | **Biogeographic region** |
| Udvardy's Biogeographical Provinces | 6.1.1, Australian Realm, Queensland Coastal (Udvadry, 1975) |
| Bailey's Ecoregions | Province - Seasonally Humid Mixed (Evergreen and Deciduous) Forests (89) (Bailey ) |
| WWF Terrestrial Ecoregions | Tropical and Subtropical Moist Broadleaf Forest – Queensland Tropical Rainforests (terrestrial) (WWF) |
| Marine Ecoregions of the World (MEOW) | Central and Southern Great Barrier Reef (143) |
| Freshwater Ecoregions of the World (FEOW) | Eastern Coastal Australia (807) (FEOW) |
| Other | North East Coast – Ross River |

Other biogeographic regionalisation scheme

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|  | Australian Hydrological Geospatial Fabric- Topographic Drainage Divisions and River Regions (BOM, 2012): North East Coast - Ross River (http://www.bom.gov.au/water/about/riverBasinAuxNav.shtml)  Interim Biogeographic Regionalisation for Australia version 7 (IBRA7) (Commonwealth of Australia, 2012): Terrestrial: North East Coast (drainage division), Brigalow Belt North (biogeographic region) (https://www.environment.gov.au/system/files/pages/5b3d2d31-2355-4b60-820c-e370572b2520/files/ibra-regions.pdf ))  Interim Marine and Coastal Regionalisation for Australia (IMCRA version 4, June 2006): Northeast (provincial scale bioregion), Lucinda Mackay Coast (meso scale marine bioregion) (<https://www.environment.gov.au/system/files/resources/2660e2d2-7623-459d-bcab-1110265d2c86/files/imcra4.pdf>) |

Why is the Site important?

3.1 Ramsar Criteria and their justification

[x] Criterion 1: Representative, rare or unique natural or near-natural wetland types

Hydrological services provided

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|  | The Bowling Green Bay wetlands are rare in the Northeast Coast Drainage Division and the Northeast Province bioregion (Davis et al. 2014). The site is important as it hosts a unique wetland complex (Milton et al. 2014) that is one of the most expansive (Davis et al. in E. Wolanski (ed), 2014) and diverse wetland complexes on the east coast of tropical Australia (Great Barrier Reef Marine Park Authority 2013). The hydrological patterns (freshwater, tidal and oceanographic) prevailing over the site’s geomorphologic and topographic formations drive wetland extent and the diverse, mosaic nature of the coastal wetlands (Kelly and Lee Long, 2011, unpublished). Wetland types include rocky marine shores (D), estuarine waters (F), intertidal mud and sand flats (G) and freshwater tree-dominated wetlands (Xf). The complex and dynamic interplay of freshwater and saline systems over this large wetland system, is uncommon in Australia’s Northeast Coast Drainage Division (Kelly and Lee Long 2011, unpublished). The wetlands and associated geomorphological features remain largely intact and in near-natural state (Davis et al. in E. Wolanski (ed), 2014; Davis et al. 2014).    The Ramsar site is generally representative of tropical coastal wetland systems within Australia’s Northeast Coast Drainage Division and the Northeast Province of the Integrated Marine and Coastal Regionalisation of Australia (IMCRA) (Kelly and Lee Long, 2011, unpublished). The only other system of similar size and complexity is at Broadsound St Lawrence; however, this system has a markedly different species composition and lacks the freshwater habitats of the Bowling Green Bay Ramsar site (Kelly and Lee Long, 2011, unpublished).    The extensive wetland complex is low-lying and broad, having a wide zone of mixing between marine, estuarine and freshwater areas (Kelly and Lee Long 2011, unpublished). This type of hydrological mixing contributes to an unusual surface and groundwater flow regime resulting in an uncommon and unpredictable wetland behaviour (Lukacs pers. com. 2009). The tidal range can reach more than 10km inland across a very broad coastal zone, transgressing the site (Davis et al. 2014). This means that the wetlands in the area are subject to extreme periods of tidal and/or freshwater inundation multiple times a year, creating the dynamic marine-freshwater mosaic (Davis et al. in E. Wolanski (ed), 2014).    High inter-annual variability of water input and quality (including salinity) also characterise the site. Short, medium and long-term flood cycles directly influence the biology and ecology of the wetland biota and are crucial to maintaining the diverse mosaic of coastal wetlands at the site. The largeness of the site is likely to play a role in buffering it from impacts associated with large upstream agricultural areas (Kelly and Lee Long, 2011, unpublished) including water extraction, irrigation (Walking the Landscape 2018) and groundwater recharge. |

Other ecosystem services provided

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|  | The large extent and complexity of wetland types in the coastal zone is regionally important for fisheries species, nutrient assimilation, flood control, cyclone protection and the trapping and stabilisation of sediments along watercourses and in areas adjacent to the Great Barrier Reef lagoon (Bruinsma, 2001).  The site supports an extensive area of blue carbon ecosystems (salt marsh and mangrove) which contribute to mitigation of and adaptation to climate change. Mangroves and tidal marshes have a role in carbon sequestration (Lovelock et al. 2017). Mangroves and saltmarsh stretch across large parts of the Ramsar site. The mangrove forests are vital for the region’s coastline, particularly during cyclone activity as they help control coastal erosion, protect the land from strong winds, tidal surges and heavy rainfall. (Qld Wetlands Project, Bowling Green Bay – A wetland of international importance) |

[x] Criterion 2 : Rare species and threatened ecological communities

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|  | The Bowling Green Bay Ramsar site supports a number of nationally and internationally threatened fauna (WildNet 2018). There are at least 4 animal species listed as endangered, 6 vulnerable and 10 near threatened under the international IUCN Red List (Red List). Amongst the site’s Red Listed species there are a number of species protected at the national level under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) e.g. the vulnerable green turtle (*Chelonia mydas*), the flat back turtle (*Natator depressus*) and many shorebird species. As many as 18 species are protected under Queensland’s *Nature Conservation Act 1992* including the vulnerable dugon (*Dugong dugon*), Australian snubfin dolphin (*Orcaella heinsohni*) and the Australian humpback dolphin (*Sousa sahulensis*).  The seaward boundary of the Ramsar site only goes to low water mark, however, it is important to note that the wider Bowling Green Bay itself provides valuable habitat for dugong and is listed as a Dugong Protection Area under Queensland’s *Fisheries Act 1994*. Additionally, Bowling Green Bay has been recently included in the Hinchinbrook to Round Hill Important Marine Mammal Area (IMMA) for it’s importance as habitat for dugong and the Australian snubfin and humpback dolphins (Marine Mammal Protected Areas Task Force n.d.).  The site provides a diversity of wetland habitats supporting the feeding and/or roosting requirements of at least 12 migratory shorebirds species that are either internationally and/or nationally threatened or near threatened, including the:  • Great knot (*Calidris tenuirostris*) - EPBC Act critically endangered and Red List endangered;  • Eastern curlew (*Numenius madagascariensis*) - EPBC Act critically endangered and Red List endangered;  • Australian painted snipe (*Rostratula australis*) - EPBC Act critically endangered and Red List endangered;  • Curlew sandpiper (*Calidris ferruginea*) - EPBC Act critically endangered and Red List near threatened;  • Bar-tailed godwit (*Limosa lapponica*) - EPBC Act vulnerable and Red List near threatened.    The connected network of low tide foraging areas and high tide roost sites is necessary for sustaining the shorebird populations (Rogers et al. 2006, Zarikov and Milton 2009, Buelow and Sheaves 2015) listed under the EPBC Act and the Red List.    There are three Red Listed plant species, including *Acacia crassicarpa* (vulnerable) and two species of lower risk. However, the IUCN has not assessed most of the plant species at the site. The site hosts the EPBC Act endangered Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions. |

[x] Criterion 3 : Biological diversity

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|  | The site is home to a large number of species, up to 870 have been recorded, highlighting the biodiverse nature of the site (Wildnet 2020). At least 384 plants, and 486 animals, representing as many as 18 mammals, 39 reptiles, 8 amphibians, 275 birds, 105 fish and 41 invertebrate species. Of the bird species, many are wetland indicator species (Wetland*Info* 2020). Many species of native fauna are wetland dependent. There are at least 31 species listed under the Queensland *Nature Conservation Act 1992* as special least concern (SL). Many SL species are subject to international agreements such as Japanese-Australia Migratory Bird Agreement (JAMBA), Chinese-Australia Migratory Bird Agreement (CAMBA), Republic of Korea and Australia Migratory Bird Agreement (RoKAMBA) and the Convention on Migratory Species (CMS).    The 9 Ramsar wetland types at the site form a complex mosaic of estuarine, marine and freshwater wetlands, which support a diverse assemblage of flora and fauna. Studies undertaken by Alsterberg et al. (2017) suggest that ecosystems comprising high habitat diversity also exhibit a high number of ecosystem functions, which together support a greater species richness than ecosystems with less habitat diversity. Buelow et al. (2017) has observed a positive correlation between high habitat and high species diversity in birds within the coastal region of Townsville.    The coastal mosaic that characterises much of the site has a key role in supporting connectivity i.e. linking habitats across the site in space and time thereby making a significant contribution to the biological diversity of the site. Utilisation of connected habitats within coastal ecosystem mosaics is crucial to the life histories of a broad range of fisheries species (Sheaves 2009) and bird species in coastal areas such as the Townsville region (Buelow 2017).    The extensive area and intact nature of the Bowling Green Bay Ramsar site and the habitats within also cater well for site robustness and biodiversity. For example, the species-area relationship is a well-known ecological concept, i.e. as ecosystem size increases so does species richness (Lomolino 2000).    The site is regionally significant due to the extent of available nesting and feeding habitat for migratory shorebirds and waterbirds (palustrine and tidal mud/sand flat habitat, mangroves) and the limited choice of suitable alternatives within the bioregion (Kelly and Lee Long, 2011, unpublished).    The wetlands in Bowling Green Bay experience drier conditions than areas to the north and south, and therefore support a composition of flora and fauna species that is significant for the North East Coast Drainage Division and the Northeast IMCRA Province, including an extensive area of dry tropic mangroves, uncommon in the region (Kelly and Lee Long, 2011, unpublished). |

[x] Criterion 4 : Support during critical life cycle stage or in adverse conditions

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|  | The wetland complex provides critical habitat for the roosting and feeding of at least as many as 94 species of waterbirds including at least 21 species of migratory shorebird that use the East Asian-Australasian Flyway. The site is listed as a Flyway Network Site (EAAF089). Annual aggregations of shorebirds, waterbirds and seabirds include the black-tailed godwit (*Limosa limosa*), western Alaskan bar-tailed godwit (*Limosa lapponica baueri*), red-necked stint (*Calidris ruficollis*), common tern (*Sternula hirundo*) and white-winged black tern (*Chlidonias leucopterus*).    There are at least 35 migratory species listed under the EPBC Act at the site. These species are also protected under various international agreements such as the Convention on Migratory Species (CMS), Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA) and/or Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA). Additionally, the site contains at least 5 species protected from illegal trade under the CITES Agreement. Each summer, migratory shorebirds spend the non-breeding season and part of their northward and southward journey within the Ramsar site (approx. Sept-April). In addition, presence of substantial numbers of migratory shorebirds at the site during their breeding season suggests that first-year birds may depend on the site in that season.    Shorebirds feed on benthic invertebrates at low tide, on exposed intertidal habitats within the site. At high tide, when foraging areas are submerged, shorebirds will congregate at roosting areas (Rogers et al. 2006a) including the sandspit, freshwater swamps, the bay foreshore and mouths of the Barratta and Barramundi Creeks. Waterbirds including herons, egrets and geese roost at the site while feeding in adjacent agricultural areas. Little egret and eastern great egret occur either dispersed or in large colonies in mangroves in lower estuaries of coastal creeks/rivers and melaleuca swamps close to marine plain swamps (Kelly and Lee Long, 2011, unpublished).    Extensive seagrass meadows in the adjacent Bowling Green and Cleveland Bays (Sheltinga and Heydon 2005) are important feeding/foraging areas for green turtles (*Chelonia mydas*) and dugongs (*Dugong dugon*) that visit the site. The sandspit provides nesting habitat for green and flatback (*Natator depressus*) turtles. The site likely provides foraging habitat for olive ridley (*Lepidochelys olivacea*) and loggerhead turtles (*Caretta caretta*) (Ian Bell pers. com. 2018), and for Australian humpback dolphins (*Sousa sahulensis*) and Australian snubfin dolphins (*Orcaella heinsohni*) (Justin Meager pers. com. 2021) which are nearshore specialists that forage on wetland dependent nekton (Parra and Jedensjo 2014 ) At least 11 diadromous fishes use the site to migrate between the sea and estuarine/freshwater areas during their lifecycles. Barramundi (*Lates calcarifer*) needs free passage down the river to the sea to spawn (Froese and Pauly 2017). Other species such as the blue catfish (*Neoarius graeffei*) live in the sea and migrate to fresh water to breed. The flyspecked hardyhead (*Craterocephalus stercusmuscarum*) and the spangled perch (*Leiopotherapon unicolor*) complete their entire lifecycle in fresh water. |

[ ] Criterion 5 : >20,000 waterbirds

Overall waterbird numbers\*

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Start year\*

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End year\*

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Source of data:

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[x] Criterion 6 : >1% waterbird population

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|  | Townsville BirdLife and Queensland Parks and Wildlife Service have conducted surveys together since 1995 (Milton et al. 2014). There are, however, limited data to evaluate whether specific waterbird species regularly occur at the site in numbers >1% of their total population as very few "complete surveys" of the site have been conducted. A lot of survey work has focused on a few roost sites. It is possible that many waterbird species have been underestimated for the site.  Hansen et al. (2016) has been used for determining which species meet the 1% threshold. In the absence of a Hansen estimate, the Waterbird Population Estimate Fifth edition (WPE5) was used. Of the many shorebirds frequenting the site, the following species have been observed as meeting 1% thresholds:   * Sharp-tailed sandpiper (*Calidris acuminata*) – in November 2011, population counts of 1,448 from 2 roost sites as in Driscoll et al., (2012) exceeded the Hansen 1% threshold of 850. Note the WPE5 population estimate for this species is 1600. More recent counts of 1500 from Queensland Wader Study Group (2021) also meet the Hansen et al (2016) 1% threshold. * Red-necked stint (*Calidris ruficollis*) – in January 2011, population counts of 6,403 from 2 roost sites as in Driscoll et al. (2012) exceeded the Hansen 1% threshold of 4,750. Note the WPE5 population estimates for this species is 3200. More recent counts of 4303 from Queensland Wader Study Group (2021) almost meet the Hansen et al (2016) 1% threshold while very definitely meeting the WPE% population estimate. * Common tern (*Sterna hirundo*) - In November 2011, population counts of 710 taken by Townsville BirdLife from 5 roost sites (Driscoll et al. 2012) exceeded the 1% threshold from WPE5 of 460.   Lesser sand plover (*Charadrius mongolus*) count data from 5 roost sites, of 330, from Milton et al. (2014) does not meet the Hansen 1% threshold of 1800. Note the WPE5 has divided this species into two populations (subspecies), i.e. *mongulus* and *stegmanii* with 1% thresholds of 260 and 130 respectively. While the count data from Milton et al. (2014) does not identify which population/subspecies has been counted, it would appear by logic that the lesser sand-plover meets the WPE5 1% threshold. Note, more recent counts of 170 were recorded by the Queensland Wader Study Group (2021), however the subspecies was also not determined for this survey.  At the time of listing, the black-tailed godwit (*Limosa limosa*) was noted as present at the site in internationally significant numbers, however this has not been the case since then (Milton et. al. 2014). While the great knot (*Calidris tenuirostris*) was reported at the site in internationally significant numbers during 2011-12 (Milton et al. 2014) the population (i.e. 2,925) does not meet the Hansen et al. (2016) 1% threshold of 4,450. Note however, the WPE5 population estimate for this species is 2900, which this species does meet. More recent counts of great knot by the Queensland Wader Study Group (2021) were down, i.e. at 664 individuals.  Large populations of waterbirds were present at the site at the time of listing, including magpie goose (*Anseranas semipalmata*) and brolga (*Grus rubicunda*). However, most of the freshwater wetlands that attract these and other waterbirds generally occur outside the Ramsar site. It is unclear whether large populations of magpie goose or brolga ever occurred within the site boundary (Milton et al. 2014). Since listing, there has been limited data collected on waterbirds for the site. Although it would appear from the survey work that most of the waterbirds are outside the site, the wetlands do form a continuous complex, which is important for supporting the movement of waterbirds into and out of the site boundary (Driscoll et al. 2012). |

[x] Criterion 7 : Significant and representative fish

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|  | The site supports largely intact coastal wetlands with a wide zone of mixing amongst estuarine, marine and freshwater habitats. Habitat diversity and structural complexity combined with the site’s large extent supports many fish species, some of them endemic to Australia including the spangled perch (*Leiopotherapon unicolor*), flyspecked hardyhead (*Craterocephalus stercusmuscarum*) and sleepy cod (*Oxyeleotris lineolata*) as well as the Queensland endemic eastern rainbow fish (*Melanotaenia splendida*) (Wetland*Info* 2018; WildNet 2018). The large extent of estuarine areas including mudflats, saltpans, saltmarshes, estuarine creeks, and mangrove communities provide areas of habitat important for the critical life-cycle stages of aquatic species (Kelly and Lee Long, 2011 unpublished). Adkins et al. (2016) highlights the importance of shallow-coastal habitats for providing multiple ecological functions (e.g. nursery, foraging and refugia) for different life-cycle stages of fish, including the larval and juvenile stages of development.  Fish assemblages at the site include a range of diadromous species having various life-cycle characteristics. Diadromous species require free passage for migration between the sea and estuarine/freshwater areas during the course of critical life-cycle stages such as spawning and accessing nursery grounds. For example, the economically important barramundi (*Lates calcarifer*) relies on both fresh and salt water to complete its lifecycle, whilst the bull shark (*Carcharhinus leucas*) and the blue threadfin (*Eleutheronema tetradactylum*) (WildNet 2018) are born in freshwater/estuaries and drift into the sea as larvae before migrating back to freshwater to grow into adults and spawn. Other species found at the site such as the flyspecked hardyhead (*Craterocephalus stercusmuscarum*) and the spangled perch (*Leiopotherapon unicolor*) (Wetland*Info* 2018; WildNet 2018) are potamodromous completing their life cycle entirely within freshwater.  The site supports a range of morphologies, reproductive types and ecological niches, i.e. live-bearing, egg-releasing, hermaphroditic protogyny and protandry, benthic, demersal, pelagic and planktivorous, herbivorous, omnivorous, predatory, scavenging and excavating fish (Kelly and Lee Long, 2011 unpublished). These fish communities support a diverse and complex range of ecosystem components and processes, such as multiple food web interactions, algal grazing, bioturbation, re-cycling and the breakdown of materials (Kelly and Lee Long, 2011, unpublished). The oceanographic and tidal hydrodynamic processes within and surrounding the site facilitate breeding migrations, larval transport and recruitment of finfish and crustaceans (Kelly and Lee Long, 2011, unpublished). The site partially overlaps with the Cleveland Bay (FHA-071) and Bowling Green Bay (FHA-007) declared Fish Habitat Areas, which is testament of the site’s value as fisheries habitat. |

[x] Criterion 8 : Fish spawning grounds, etc.

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|  | Much of the site is estuarine, comprising mangroves, mudflats, unconsolidated soft bottoms and saltmarshes which are productive fish nurseries. The site is significant to fisheries in the Northeast Province bioregion for production of large stocks of barramundi, mangrove jack, mud crab and baitfish (Davis et al. in E. Wolanski (ed), 2014). Estuaries function as migratory conduits for species to access marine, estuarine and freshwater habitats. Oceanographic and tidal hydrodynamic processes in and around the site facilitate breeding migrations, larval transport and recruitment of finfish, turtles and crustaceans into nursery areas (Davis et al. in E. Wolanski (ed), 2014).    Many estuarine waterways, mainly creeks dissect the site. Barramundi Creek and the Haughton River which flow through the site are of high and moderate fisheries value respectively (Bruinsma 2001). The estuarine conditions support growth of saltmarsh and mangroves. These highly valued communities provide food, shelter, breeding and nursery areas for fisheries species (Bruinsma 2001). Beumer et al. (1997) notes that interactions between soil, water and air within salt marshes can produce optimal conditions for fisheries species to feed, grow and reproduce. Shallow pools within saltmarshes provide transitory feeding habitat for invertebrates, larvae and juvenile fishes (Zeller 1998).    The highly productive mangrove areas support nursery functions for species such as banana prawns (*Penaeus merguiensis),* mangrove jack (*Lutjanus argentimaculatus*), estuary cod (*Epinephelus* spp.), barramundi (Lates calcarifer), tarpon (*Megalops* spp.) and although rare, the Queensland groper (*Epinephelus lanceolatus*). The mangroves and associated habitats also provide prey for piscivorous fishes and at least eight species of juvenile sharks (Simpfendorfor and Milward, 1993). Estuarine areas within the tropical estuaries of Northeast Australia provide valuable habitat for Moses perch (*Lutjanus russelli*) (Sheaves and Moloney 2001) and blue threadfin (*Eleutheronema tetradactylum*).    Intertidal mudflats provide valuable habitat for benthic invertebrates, which are a key food source for fisheries species and provide a valuable feeding ground for waterbirds and shorebirds (Erftemeijer and Lewis 1999) in Bruinsma (2001). The hard substrate of rocky shores off Cape Cleveland allows for attachment of algae and sessile invertebrates (Zeller 1998) which have a role in the food chain for fisheries species. Zooplankton are also a component of the food chain (Martin 2017). In summer, baitfish feed on zooplankton in the highly productive mangrove estuaries and river mouths within the site (Kelly and Lee Long, 2011, unpublished). Baitfish aggregations have been recorded off the tip of Cape Bowling Green during Autumn. The baitfish found in and around the Ramsar site are considered to be some of the most significant baitfish resources in the Northeast IMCRA bioregion (Davis et al. in E. Wolanaski (ed), 2014). |

[ ] Criterion 9 : >1% non-avian animal population

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

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| **Scientific name**\* | **Common name** | **Criterion 2** | **Criterion 3** | **Criterion 4** | **IUCN Red List**[[1]](#footnote-1) | **CITES Appendix I** | **Other status** | **Justification** |
| Acacia crassicarpa | Northern wattle | [x] | [x] | [ ] | VU | [ ] | *Nature Conservation Act 1992* - LC | Listed as Vulnerable on Red List |

Optional text box to provide further information on plant species of international importance:

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

Note: Table1% occurrence values are based on Hansen et al. (2016)

| **Phylum** | **Scientific name**\* | **Common name** | **Species qualifies under criterion** | | | | **Species contributes under criterion** | | | | **Pop. Size**[[2]](#footnote-2) | **Period of pop. Est.**4 | **% occurrence**4 | **IUCN Red List**[[3]](#footnote-3) | **CITES Appendix I** | **CMS Appendix I** | **Other Status** | **Justification** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **4** | **6** | **9** | **3** | **5** | **7** | **8** |
| Birds | | | | | | | | | | | | | | | | | | |
| Chordata/Aves | Actitis hypoleucos | Common sandpiper |  | [x] |  |  | [x] |  |  |  |  |  |  |  |  |  | National (EPBC Act) - marine; migratory CMS, JAMBA, CAMBA, JAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species  Wetland indicator species; Wetland dependent species. Non-breeding migratory species. |
| Chordata/Aves | Arenaria interpres | Ruddy turnstone | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 4 | 1996 |  | LC | [ ] | [x] | National (EPBC Act) - marine, migratory (CMS,JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species; Non-breeding migratory species;  The EAAF population estimate for this species is 30,000 individuals (based on Hansen et al. 2016 estimates).  Note: although the species occurs at the site, it does not meet the Hansen 1% threshold of 300. Count data from Driscoll et al., 2012 (Table 6) was compared to the 1% Hansen et al. 2016 threshold. Count was taken from just 1 roost site so may be an underestimate.  Note: the Wetlands International (2012) flyway WPE5 1% threshold is 290 individuals.. |
| Chordata/Aves | Calidris acuminata | Sharp-tailed sandpiper | [ ] | [x] | [x] | [ ] | [x] | [ ] | [ ] | [ ] | 1448  1500  Mean  **1474** | 2011  2021 | 1.7 | LC | [ ] | [x] | National (EPBC Act)– marine, migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species; Non-breeding migratory species; Roosting and feeding occurs;  The EAAF population estimate for this species is 85,000 individuals (based on Hansen et al. 2016 estimates).  Note, although the count data from Driscoll et al., 2012 (Table 6) and Milton et al. 2014 (Table 4.) and Queensland Wader Study Group (2021) exceed the 1% Hansen et al., 2016 threshold of 850; it is not clear whether the site regularly exceeds this threshold. Driscoll and Milton counts taken from 2 roost sites so may be an underestimate. Counts from Queensland Wader Study Group (2021) were across 12 roost sites.  Note the Wetlands International (2012) flyway WPE5 1% threshold is 1600 individuals. |
| Chordata/Aves | Calidris alba | Sanderling | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 15  4  Mean  **10** | 1998  2021 |  | LC | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA  QLD NCA (*Nature Conservation Act 1992*) – SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; wetland dependent species; non-breeding migratory species;  The EAAF population estimate for this species is 30,000 individuals (based on Hansen et al. 2016 estimates).  Note: although the species occurs at the site, it does not meet the 1% threshold. Mean count data was compared to 1% Hansen et al., 2016 threshold of 300.  Note the Wetlands International (2012) flyway WPE5 1% threshold is 220 individuals.. |
| Chordata/Aves | Calidris canutus | Red knot | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 251  6  Mean  **129** | 2010  2021 |  | NT | [ ] | [x] | National (EPBC Act) – EN; marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA),  QLD NCA (*Nature Conservation Act 1992*) - EN | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species; non-breeding migratory species;  The EAAF population estimate for this species is 110,000 individuals (based on Hansen et al. 2016 estimates).  Note: although the species occurs at the site, it does not meet the 1% threshold. Mean count data was compared to 1% Hansen et al., 2016 threshold of 1100. Counts 1 maybe an underestimate.  Note the Wetlands International (2012) flyway WPE5 1% threshold estimates for subspecies *piersma*i and *rogersi* are 560 and 540 individuals respectively |
| Chordata/Aves | Calidris ferruginea | Curlew sandpiper | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 660  822  Mean  **741** | 1999  2021 |  | NT | [ ] | [x] | National (EPBC Act) – CE; marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) – CR | Nationally (EPBC) and State (NCA) listed threatened species.  Wetland indicator species; Wetland dependent species; Non-breeding migratory species; Note: although the species occurs at the site, it does not meet the 1% threshold. Mean count data were compared to the 1% Hansen et al., 2016 threshold of 900. Counts maybe an underestimate.  Note the WPE5 1% threshold is 1400. |
| Chordata/Aves | Calidris ruficollis | Red-necked stint | [ ] | [x] | [x] | [ ] | [x] | [ ] | [ ] | [ ] | 6403  4303  Mean  **5353** | 2011  2021 | 1.3 | NT | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature* *Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed threatened species.  Wetland indicator species; Wetland dependent species; Non-breeding migratory species; Roosting and feeding occurs;  The EAAF population estimate for this species is 475,000 individuals (based on Hansen et al. 2016 estimates).  Regularly exceeds 1% Hansen et al. 2016 population threshold; Mean count data was compared to 1% threshold from Hansen et al., (2016) of 4750. Counts maybe an underestimate.  Note: Wetlands International (2012) flyway WPE5 1% threshold is 3200 individuals. |
| Chordata/Aves | Calidris tenuirostris | Great knot | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 2925  664  Mean  **1795** | 2012  2021 |  | EN | [ ] | [x] | National (EPBC Act) – CE; marine; migratory (CMS,JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - CR | Nationally (EPBC) and State (NCA) listed threatened species. Internationally listed threatened species (IUCN). Wetland indicator species; Wetland dependent species; Non-breeding migratory species; Roosting and feeding occurs.  The EAAF population estimate for this species is 425,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species does occur at the site, it does not regularly exceed the 1% threshold of 4250. Mean count data was compared to Hansen et al. 2016 1% threshold. Counts may be an under estimate.  Note the Wetlands International (2012) flyway WPE5 1% threshold is 2900 individuals.  Note the WPE5 1% threshold is 2900. |
| Chordata/Aves | Charadrius mongolus | Lesser sand-plover | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 330  170  Mean  **250** | 2011  2021 |  | LC | [ ] | [x] | National (EPBC Act) – EN; marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - EN | Nationally (EPBC) and State (NCA) listed threatened species.  The EAAF population estimate for this species is between 180,000-275,000 individuals (based on Hansen et al. 2016 estimates.  Wetland indicator species; Wetland dependent species; Non-breeding migratory species; Note: although the species occurs at the site, it does not meet the 1% threshold of 1800. Mean count data was compared to 1% threshold from Hansen et al., 2016.  Counts may be an under estimate.  Note the Wetlands International (2012) flyway WPE5 1% thresholds are subspecies *mongolus* and *stegmanni* are 260 and 130 individuals respectively |
| Chordata/Aves | Charadrius leschenaultii | Greater sandplover | [x] | [x] |  |  | [x] |  |  |  | 230 | 2021 |  | LC |  |  | National (EPBC Act) – VU; marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA).  QLD NCA (*Nature Conservation Act 1992*) –VU | Nationally (EPBC) and State (NCA) listed threatened species.  Wetland indicator species |
| Chordata/Aves | Chlidonias leucopterus | White-winged tern; | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | LC | [ ] | [x] | National (EPBC Act) – marine; migratory (JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - LC | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent; Non-breeding migratory species; Note: although the species occurs at the site, it does not meet the 1% threshold. Anecdotal evidence suggests the species visits the site in large aggregations to feed and roost. |
| Chordata/Aves | Ephippiorhynchus asiaticus | Black-necked stork | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | NT | [ ] | [ ] | QLD NCA (*Nature Conservation Act 1992*) – LC | State listed species.  Wetland indicator species; Wetland dependent species. |
| Chordata/Aves | Esacus magnirostris | Beach stone-curlew | [x] | [x] | [ ] | [ ] | x] | [ ] | [ ] | [ ] | 3 | 2021 |  | NT | [ ] | [ ] | National (EPBC Act) – marine  QLD NCA (*Nature Conservation Act 1992*) – VU | Nationally (EPBC) and State (NCA) listed species.  Wetland dependent species; Resident shorebird; Has been recorded in small numbers on occasion. Failure to detect during a survey does not mean that the species does not still occur at the site (Driscoll et al. 2012) |
| Chordata/Aves | Gelochelidon nilotica | Gull-billed tern | [ ] | [x] | [ ] | [ ] | x] | [ ] | [ ] | [ ] | 31 | 2011 |  | LC | [ ] | [ ] | National (EPBC Act) – marine; migratory (CAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland dependent species. Note: although the species occurs at the site, there was no 1% threshold to compare against. This count was recorded as part of a complete site survey. |
| Chordata/Aves | Hirundapus caudacutus | White-throated needletail | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | LC | [ ] | [ ] | National (EPBC Act) – marine; migratory (JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - VU | Nationally listed (EPBC) and State (NCA) listed threatened species  Non-breeding migratory species |
| Chordata/Aves | Hydroprogne caspia | Caspian tern | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 21 | 2012 |  | LC | [ ] | [ ] | National (EPBC Act) – marine; migratory (JAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species  Wetland indicator species. The site has suitable breeding habitat on spits, banks, ridges and beaches. Note: although the species occurs at the site, it does not meet the 1% threshold. Count data from Milton et al., 2014 (Table 4) was compared to 1% threshold from WPE5 viewed 29 July 2019 This count was recorded as part of a complete site survey |
| Chordata/Aves | Limicola falcinellus | Broad-billed sandpiper | [ ] | [x] | [ ] | [ ] | x] | [ ] | [ ] | [ ] | 22  23  **Mean**  23 | 1995  2021 |  |  | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) – SL. On Red List as LC | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species; Non-breeding migratory species.  The EAAF population estimate for this species is 30,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species occurs at the site, it does not meet the 1% threshold of 300. Mean count data was compared to the 1% threshold from Hansen et al., (2016). Count data maybe an underestimate. |
| Chordata/Aves | Limosa lapponica spp. baueri | Subspecies bar-tailed godwit (western Alaskan) | [x] | [x] | [ ] | [ ] | x] | [ ] | [ ] | [ ] | 2103  244 | **1996**  **2021**  **Mean**  1174 |  | NT | [ ] | [x] | National (EPBC Act) – VU; marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - VU | Nationally (EPBC) and State (NCA) listed threatened species.  Wetland indicator species. Wetland dependent species; Non-breeding migratory species; Roosting and feeding occurs.  The EAAF population estimate for this species is 325,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species occurs at the site, it does not meet the 1% threshold of 3250. Mean count data was compared to the 1% Hansen et al. (2016) threshold.  Note the Wetlands International (2012) flyway WPE5 1% threshold of 1300 individuals is met for this species, however given the age of the count data, this species has not been recognised as meeting Criterion 6. |
| Chordata/Aves | Limosa limosa | Black-tailed godwit | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 1047 | 2011 |  | NT | [ ] | [ ] | National (EPBC Act)– marine; migratory (JAMBA, CAMBA, ROKAMBA)  QLD NCA (Nature Conservation Act 1992) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species; Non-breeding migratory species; Roosting and feeding.  The EAAF population estimate for this species is 160,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species occurs at the site, it does not meet the 1% threshold of 1600. Count data from Driscoll et al., 2012 (Table 6) was compared to the 1% Hansen et al. 2016 threshold.  Note the Wetlands International (2012) flyway WPE5 1% threshold is 1400 individuals. |
| Chordata/Aves | Numenius madagascariensis | Far eastern curlew | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 97  5  **Mean**  51 | 2009  2021 |  | EN | [ ] | [x] | National (EPBC Act) – CE; marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - EN | Nationally (EPBC) and State (NCA) listed threatened species. Internationally listed threatened species (IUCN).  Wetland indicator species; Wetland dependent species; Non-breeding migrant;  The EAAF population estimate for this species is 35,000 individuals (based on Hansen et al. 2016 estimates  Note: although the species occurs at the site, it does not meet the 1% threshold of 350. Mean count was compared to 1% threshold from Hansen et al., 2016. Count data may be an underestimate. Note the Wetlands International (2012) flyway WPE5 1% threshold is 320 individuals. |
| Chordata/Aves | Numenius minutus | Little curlew | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 6 | 1995 |  | LC | [ ] | [x] | National (EPBC Act),– marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Non-breeding migratory species.  The EAAF population estimate for this species is 110,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species occurs at the site, it does not meet the 1% threshold of 1100. Count data from Driscoll et al., 2012 (Table 6) was compared to 1% threshold from Hansen et al., 2016. Count data was taken from 2 roost sites so may be an underestimate.  Note the Wetlands International (2012) flyway WPE5 1% threshold is 1800 individuals. |
| Chordata/Aves | Numenius phaeopus | Whimbrel | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 76  81  **Mean**  79 | 2008  2021 |  | LC | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species; Non-breeding migratory species.  The EAAF population estimate for this species is 65,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species occurs at the site, it does not meet the 1% threshold of 650. Mean count data was compared to 1% threshold from Hansen et al., 2016.  Note the Wetlands International (2012) flyway WPE5 1% threshold is 550 individuals. |
| Chordata/Aves | Onychoprion anaethetus | Bridled tern | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | LC | [ ] | [ ] | National (EPBC Act) – marine; migratory (JAMBA, CAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Migratory species that will breed in Queensland but preference is for offshore islands. |
| Chordata/Aves | Pandion cristatus | Eastern osprey | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  |  | [ ] | [ ] | National (EPBC Act) – marine; migratory (CMS)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species; Migratory |
| Chordata/Aves | Calidris pugnax | Ruff |  | [x] |  |  | [x] |  |  |  |  |  |  |  |  |  | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) – SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species |
| Chordata/Aves | Plegadis falcinellus | Glossy Ibis | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | LC | [ ] | [ ] | National (EPBC Act) – marine; migratory (CMS)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species; Migratory |
| Chordata/Aves | Pluvialis fulva | Pacific golden-plover | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 38 | 2000 |  |  | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species. Wetland dependent species; Non-breeding migratory species;  The EAAF population estimate for this species is 120,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species occurs at the site, it does not meet the 1% threshold of 1200. Count data from Driscoll et. al., 2012 (Table 6) and Milton et. al., 2014 (Table 4) was compared to 1% threshold from Hansen et al., 2016. Count data was taken from only 2 roost sites so maybe an underestimate.  Note the Wetlands International (2012) flyway WPE5 1% threshold is 1000 individuals. |
| Chordata/Aves | Pluvialis squatarola | Grey plover | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 116  166  **Mean**  141 | 2001  2021 |  | LC | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species; Roosting and feeding occurs; Virtually all of the grey plovers that spend the non-breeding season in Australia are female, making Australia crucial for the survival of the species.  The EAAF population estimate for this species is 80,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species occurs at the site, it does not meet the 1% threshold of 800. Mean count data was compared to 1% threshold from Hansen et al., 2016.  Note the Wetlands International (2012) flyway WPE5 1% threshold is 1000 individuals. |
| Chordata/Aves | Ardenna pacificus  Puffinus pacificus | Wedge-tailed shearwater | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  |  | [ ] | [ ] | National (EPBC Act) – marine, migratory (JAMBA)  QLD NCA (*Nature Conservation Act 1992*) – VU. Listed as LC in Red List | Nationally listed (EPBC) and State (NCA) listed threatened species  Migratory breeding and non-breeding. |
| Chordata/Aves | Rhipidura rufifrons | Rufous fantail | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | LC | [ ] | [ ] | National (EPBC Act) – marine, migratory (CMS; JAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Migratory; The site has suitable habitat for feeding including swamps and mangroves. |
| Chordata/Aves | Rostratula australis | Australian painted snipe | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | EN | [ ] | [ ] | National (EPBC Act) – EN; marine  QLD NCA (Nature Conservation Act 1992) - EN | Nationally (EPBC) and State (NCA) listed threatened species. Internationally listed threatened species (IUCN).  Wetland indicator species; Wetland dependent species; Possible breeding habitat (Marchant & Higgins 1993) |
| Chordata/Aves | Sterna dougallii | Roseate tern | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | LC | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Migratory species; Site has suitable habitat for roosting including zone on the upper sections of beaches, above the high-water mark (but still in the wash-zone) on banks, spits and bars.  Note Wetlands International (2012) flyway WPE5 1% threshold is 460 individuals. |
| Chordata/Aves | Sterna hirundo | Common tern | [ ] | [x] | [x] | [ ] | [x] | [ ] | [ ] | [ ] | 710 | 2011 | 1.7 | LC | [ ] | [ ] | National (EPBC Act) – marine; migratory (JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Non-breeding migrant species; Roosting and feeding; Count data from Milton et al., 2014 (Table 4) were compared to 1% threshold from WPE viewed 29 July 2019. Count data was taken from 5 roost sites so maybe an underestimate.  Note WPE5 1% threshold is 460. |
| Chordata/Aves | Sterna sumatrana | Black-naped tern | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | LC | [ ] | [ ] | National (EPBC Act) – marine; migratory (JAMBA, CAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland Indicator species; Site has sandy beaches which may be suitable for breeding. Migratory |
| Chordata/Aves | Sternula albifrons sinensis | Little tern | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 579  782  **Mean**  681 | 2011  2021 |  | LC | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Migrations undertaken through the site as part of life cycle. Feeding and roosting at site. Anecdotal accounts of the site regularly support 1,000 individuals. Mean count data was compared to the 1% WPE5 threshold is 1000 viewed 29 July 2019. |
| Chordata/Aves | Sula dactylatra | Masked booby | [x] | [x] |  |  | [x] |  |  |  |  |  |  | LC |  |  | National (EPBC Act)–EN; marine; migratory (CMS)  QLD NCA (Nature Conservation Act 1992) – SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species. Wetland dependent species. |
| Chordata/Aves | Sula leucogaster | Brown booby | [x] | [x] |  |  | [x] |  |  |  |  |  |  | LC |  |  | National (EPBC Act)–EN; marine; migratory, JAMBA, CAMBA, ROKAMBA  QLD NCA (Nature Conservation Act 1992) – SL | Nationally listed (EPBC) threatened species and State (NCA) listed species.  Wetland indicator species. Wetland dependent species |
| Chordata/Aves | Thalasseus bergii | Greater crested tern | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 15 | 2021 |  | LC | [ ] | [ ] | National (EPBC Act) – marine; migratory JAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Migratory species; Site has banks of sand suitable for breeding.  Uncertain of which subspecies to compare with the WPE5 estimates. |
| Chordata/Aves | Tringa brevipes | Grey-tailed tattler; Gray-tailed Tattler | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 125  35  **Mean**  80 | 1998  2021 |  | NT | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Non-breeding migratory species;  The EAAF population estimate for this species is 70,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species occurs at the site, it does not meet the 1% threshold of 700. Mean count was compared to 1% Hansen et al., 2016 threshold.  Note the Wetlands International (2012) flyway WPE5 1% threshold is 440 individuals. |
| Chordata/Aves | Tringa glareola | Wood sandpiper | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 179 | 2008 |  | LC | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species. Wetland dependent species; Non-breeding migratory species;  The EAAF population estimate for this species is 130,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species occurs at the site, it does not meet the 1% threshold of 1300. Count data from Driscoll et al., 2012 (Table 6) and Milton et. al., were compared to 1% Hansen et al., 2016 threshold.  Note the Wetlands International (2012) flyway WPE5 1% threshold is 1000 individuals. |
| Chordata/Aves | Tringa incana | Wandering tattler | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | LC | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Non-breeding migrant |
| Chordata/Aves | Tringa nebularia | Common greenshank | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 39  25  **Mean**  32 | 2009  2021 |  | LC | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species; Non-breeding migratory species;  The EAAF population estimate for this species is 110,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species occurs at the site, it does not meet the 1% threshold of 1100. Mean count was compared to 1% Hansen et al., 2016 threshold. Note the Wetlands International (2012) flyway WPE5 1% threshold is 1000 individuals.. |
| Chordata/Aves | Tringa stagnatilis | Marsh sandpiper | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] | 65  491  Mean  278 | 2011  2021 |  | LC | [ ] | [x] | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species; Non-breeding migratory species;  The EAAF population estimate for this species is 130,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species occurs at the site, it does not meet the 1% threshold of 1300. Mean count data from was compared to 1% threshold from Hansen et al., 2016.  Note the Wetlands International (2012) flyway WPE5 1% threshold is 10,000 individuals. |
| Chordata/Aves | Xenus cinereus | Terek sandpiper |  | [x] |  |  | [x] |  |  |  | 2 | 2021 |  |  |  |  | National (EPBC Act) – marine; migratory (CMS, JAMBA, CAMBA, ROKAMBA)  QLD NCA (*Nature Conservation Act 1992*) - SL | Nationally (EPBC) and State (NCA) listed species.  Wetland indicator species; Wetland dependent species; Non-breeding migratory species  The EAAF population estimate for this species is 50,000 individuals (based on Hansen et al. 2016 estimates.  Note: although the species occurs at the site, it does not meet the Hansen et. al (2016) 1% threshold of 500 nor the WPE5 estimate of 500.  Counts were across 12 sites but may be an underestimate. |
| Fish, Mollusc and Crustacea | | | | | | | | | | | | | | | | | | |
| Chordata/Actinopterygii | Acanthopagrus pacificus | Pikey bream | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species Marine; brackish; demersal; Oceanodromous |
| Chordata/Actinopterygii | Acanthurus grammoptilus | Fine lined surgeon fish |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; marine; reef associated |
| Chordata/Actinopterygii | Ambassis agassizii | Agassiz's glassfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species Australian endemic Freshwater, demersal; Potamodromous |
| Chordata/Actinopterygii | Ambassis agrammus | Pale river perch |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; freshwater, brackish, demersal |
| Chordata/Actinopterygii | Ambassis burensis | Buru glassfish |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; freshwater; brackish; demersal |
| Chordata/Actinopterygii | Ambassis gymnocephalus | Barehead perchlet | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species; Amphidromous |
| Chordata/Actinopterygii | Ambassis vachelli | Telkara perchlet |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; marine; freshwater; demersal; oceanodromous |
| Chordata/Actinopterygii | Amniataba caudavittata | English wyandotte;yellowtailed perch;yellowtail grunter;yellowtail trumpeter |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; marine; freshwater; brackish; benthopelagic. |
| Chordata/Actinopterygii | Amniataba percoides | Barred grunter | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species Australian endemic, freshwater, benthopelagic; Potamodromous |
| Chordata/Actinopterygii | Anguilla reinhardtii | Marbled eel | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine, freshwater, brackish, demersal, diadromous (catadromous) |
| Chordata/Actinopterygii | Anodontostoma chacunda | Bony bream gizzard shad |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; marine; freshwater; brackish; pelagic-neritic; anadromous |
| Chordata/Actinopterygii | Arothron manilensis | Narrow-lined puffer;narrow-lined pufferfish; |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; marine; brackish; reef associated |
| Chordata/Actinopterygii | Arrhamphus sclerolepis | Northern snubnose garfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; pelagic-neritic; Amphidromous |
| Chordata/Actinopterygii | Atherinomorus endrachtensis | Endracht hardyhead | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species, marine; brackish; reef-associated |
| Chordata/Elasmobranchii | Carcharhinus leucas | Cub shark | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | NT | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; reef-associated; Amphidromous |
| Chordata/Actinopterygii | Chanos chanos | milkfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species Marine; freshwater; brackish; benthopelagic; Amphidromous |
| Chordata/Actinopterygii | Chelmon rostratus | angelfish;banded longsnout butterflyfish; |  |  |  |  | [x] |  | [x] | [x] |  |  |  | LC |  |  |  | Wetland dependent species; Marine; brackish; reef-associated; non-migratory |
| Chordata/Actinopterygii | Chelonodon patoca | Milkspot toadfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species Marine; freshwater; brackish; reef-associated; diadromous (anadromous) |
| Chordata/Actinopterygii | Craterocephalus stercusmuscarum | Flyspecked hardyhead; Freshwater hardyhead; | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species Australian endemic Freshwater, pelagic; Potamodromous |
| Chordata/Actinopterygii | Crenimugil buchanani | Bluespot mullet | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; pelagic-neritic; diadromous (catadromous) |
| Chordata/Actinopterygii | Drombus globiceps | Kranji drombus | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; demersal; Amphidromous |
| Chordata/Actinopterygii | Drombus ocyurus | Blue, marked drombus | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species, marine; brackish; demersal |
| Chordata/Actinopterygii | Eleutheronema tetradactylum | Blue threadfin | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland indicator species, Amphidromous |
| Chordata/Actinopterygii | Ellochelon vaigiensis | Diamondscale mullet | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; reef-associated; diadromous (catadromous) |
| Chordata/Actinopterygii | Encrasicholina devisi | Gold anchovy; Blue anchovy; | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species, marine; brackish; reef-associated |
| Chordata/Actinopterygii | Epinephelus lanceolatus | Queensland groper | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species; no take species in Queensland |
| Chordata/Actinopterygii | Escualosa thoracata | White sardine | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; pelagic-neritic; Amphidromous |
| Chordata/Actinopterygii | Eubleekeria jonesi | Jones’ ponyfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species Amphidromous |
| Chordata/Actinopterygii | Fowleria variegata | Multi-spotted cardinal-fish;peppered cardinalfish; |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; Marine; reef-associated. |
| Chordata/Actinopterygii | Gazza minuta | Toothed ponyfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; brackish; demersal |
| Chordata/Actinopterygii | Gerres oyena | Silver biddy | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; brackish; reef-associated |
| Chordata/Actinopterygii | Giuris margaritacea | Snakehead gudgeon | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine, freshwater, brackish, demersal, Amphidromous |
| Chordata/Actinopterygii | Glossamia aprion | Stinker; Soldier fish; Queensland mouthbrooder; Mouth almighty | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species, freshwater, benthopelagic |
| Chordata/Actinopterygii | Halichoeres nigrescens | Bubblefin wrasse; diamond wrasse; |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  | LC |  |  | Wetland dependent; foraging; marine; reef-associated. |
| Chordata/Actinopterygii | Hephaestus fuliginosus | Black bream; Northern grunter; Sooty grunter | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species Australian endemic, freshwater, benthopelagic |
| Chordata/Actinopterygii | Herklotsichthys castelnaui | Southern herring | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; pelagic-neritic |
| Chordata/Actinopterygii | Hyporhamphus neglectissimus | Australian neglected halfbeak;black-tipped garfish; |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent; marine; pelagic-neritic. |
| Chordata/Actinopterygii | Hypseleotris compressa | Empire gudgeon | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, freshwater, demersal; Potamodromous |
| Chordata/Actinopterygii | Istiblennius meleagris | Peacock blenny; peacock rockskipper; |  |  |  |  | [x] |  | [x] | [x] |  |  |  | LC |  |  |  | Wetland dependent species; marine; brackish; reef-associated |
| Chordata/Actinopterygii | Lates calcarifer | Barramundi | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species Diadromous; Distribution Susan River (Hervey Bay) and further north; coastal marine; estuarine and freshwater habitats; adults mainly in estuaries (mangroves and river mouths); juveniles extend up rivers into freshwater |
| Chordata/Actinopterygii | Leiognathus equulus | Common ponyfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; demersal; |
| Chordata/Actinopterygii | Leiopotherapon unicolor | Spangled perch | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species endemic to Australia, freshwater; brackish; demersal; Potamodromous |
| Chordata/Actinopterygii | Lutjanus argentimaculatus | Mangrove Jack | [ ] | [x] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; brackish; reef-associated; Oceanodromous |
| Chordata/Actinopterygii | Lutjanus russellii | Mose's perch | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; demersal; diadromous (catadromous) |
| Chordata/Actinopterygii | Marilyna pleurosticta | Banded toadfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; demersal; diadromous (anadromous) |
| Chordata/Actinopterygii | Melanotaenia splendida | Eastern rainbow fish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species Queensland endemic, freshwater, benthopelagic |
| Chordata/Actinopterygii | Mugil cephalus | Bright mullet | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; benthopelagic; diadromous (catadromous) |
| Chordata/Actinopterygii | Nematalosa come | Hairback herring | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; pelagic-neritic |
| Chordata/Actinopterygii | Nematalosa erebi | Bony bream | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species Australian endemic, freshwater, brackish, pelagic, Potamodromous |
| Chordata/Actinopterygii | Neoarius graeffei | Blue salmon catfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species, marine, freshwater, brackish, demersal, diadromous (anadromous) |
| Chordata/Actinopterygii | Neosilurus ater | Black catfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species, freshwater, demersal |
| Chordata/Actinopterygii | Nuchequula gerreoides | Ornate ponyfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species, marine; brackish; demersal; Amphidromous |
| Chordata/Actinopterygii | Oxyeleotris lineolata | Sleepy cod; Sleepy cod | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species Australian endemic, freshwater, demersal |
| Chordata/Actinopterygii | Parablennius intermedius | False tasmanian blenny;horned blenny |  |  |  |  | [x] |  | [x] | [x] |  |  |  | LC |  |  |  | Wetland dependent species; marine; brackish; benthopelagic |
| Chordata/Actinopterygii | Paramugil georgii | Fantail mullet; silver mullet; |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Endemic to Australia; wetland dependent species; marine; freshwater; brackish; demersal; catadromous |
| Chordata/Actinopterygii | Periophthalmodon freycineti | Giant mudskipper; great mud-hopper |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; marine; brackish; demersal |
| Chordata/Actinopterygii | Pisodonophis cancrivorus | Burrowing snake eel; estuary snake eel |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; marine; freshwater; brackish; reef-associated; anadromous |
| Chordata/Actinopterygii | Planiliza subviridis | Green back mullet; Thick-zipped mullet | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; demersal; diadromous (catadromous). |
| Chordata/Actinopterygii | Poecilia reticulata | Barbados millions; guppies |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; freshwater; brackish; benthopelagic |
| Chordata/Actinopterygii | Pomadasys argenteus | Silver javelin grunter | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; freshwater; brackish; coastal inshore waters (open bays and estuaries) |
| Chordata/Actinopterygii | Pomadasys kaakan | Barred javelin | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species; marine; brackish; reef-associated |
| Chordata/Actinopterygii | Porochilus rendahli | Rendahl's catfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species; Australian endemic; freshwater, demersal |
| Chordata/Actinopterygii | Pseudomugil signifer | Pacific blue-eye | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species Freshwater; brackish; benthopelagic; Endemic to Australia |
| Chordata/Actinopterygii | Sardinella albella | Blacktip sardinella; deep-bodied sardine; |  |  |  |  | [x] |  | [x] | [x] |  |  |  | LC |  |  |  | Wetland dependent species; marine; reef-associated |
| Chordata/Actinopterygii | Scatophagus argus | Argusfish; argus fish; butterfish |  |  |  |  | [x] |  | [x] | [x] |  |  |  | LC |  |  |  | Wetland dependent species; marine; freshwater; brackish; reef-associated; amphidromous |
| Chordata/Actinopterygii | Scomberomorus commerson | Spanish mackeral | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | NT | [ ] | [ ] |  | Wetland indicator species Oceanodromous; Juveniles are highly dependent on estuarine and foreshore nursery and feeding areas (McPherson in L.E. Williams (ed.), 1997) |
| Chordata/Actinopterygii | Scomberomorus queenslandicus | Doggie mackerel | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; brackish; pelagic-neritic; Oceanodromous |
| Chordata/Actinopterygii | Scomberomorus semifasciatus | Broad-barred mackerel; Broadbanded mackerel | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; brackish; pelagic-neritic; Oceanodromous |
| Chordata/Actinopterygii | Secutor ruconius |  |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; marine; freshwater; brackish; demersal; amphidromous |
| Chordata/Actinopterygii | Selenotoca multifasciata | Striped scat; Spotbanded scat; Southern butterfish; Banded scat; Barred scat | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species |
| Chordata/Actinopterygii | Siganus guttatus |  |  |  |  |  | [x] |  | [x] | [x] |  |  |  | LC |  |  |  | Wetland dependent species; marine; brackish; reef-associated |
| Chordata/Actinopterygii | Siganus lineatus | Goldenlined spinefish; golden-lined spinefoot |  |  |  |  | [x] |  | [x] | [x] |  |  |  | LC |  |  |  | Wetland dependent species; marine; reef-associated |
| Chordata/Actinopterygii | Sillago analis | Golden-lined sillago; goldenlined sillago |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; marine; brackish; demersal; non-migratory |
| Chordata/Actinopterygii | Sillago burra | Western trumpeter whiting |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species  Not in the Ramsar database |
| Chordata/Actinopterygii | Sillago ciliata | Sand whiting |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species |
| Chordata/Actinopterygii | Sillago sihama | Northern whiting; silver whiting; sand smelt | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; brackish; reef-associated; Amphidromous; Near the shore. Shallow water along beaches, sandbars, mangrove creeks, estuaries |
| Chordata/Actinopterygii | Sphyraena jello | Slender barracuda; Slender sea pike | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species, marine; brackish; reef-associated; Oceanodromous |
| Chordata/Actinopterygii | Stolephorus carpentariae | Gulf of Carpenteria anchovy | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; brackish; pelagic-neritic |
| Chordata/Actinopterygii | Stolephorus indicus | Indian anchovy | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species, marine; brackish; pelagic-neritic; Oceanodromous |
| Chordata/Actinopterygii | Stolephorus nelsoni | Nelson's anchovy |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; marine; pelagic-neritic |
| Chordata/Actinopterygii | Strongylura krefftii | Freshwater longhorn | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | DD | [ ] | [ ] |  | Wetland dependent species, freshwater; brackish; pelagic |
| Chordata/Actinopterygii | Taeniamia melasma | Blackspot cardinal fish |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species |
| Chordata/Actinopterygii | Taeniamia melasma | Blackspot cardinalfish |  |  |  |  | [x] |  | [x] | [x] |  |  |  |  |  |  |  | Wetland dependent species; marine; reef-associated |
| Chordata/Actinopterygii | Terapon jarbua | Crescent grunter | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species; marine; freshwater; brackish; demersal; diadromous (catadromous) |
| Chordata/Actinopterygii | Thryssa hamiltonii | Hamilton's thyrssa | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  | LC | [ ] | [ ] |  | Wetland dependent species; marine; brackish; pelagic-neritic; Amphidromous |
| Chordata/Actinopterygii | Toxotes chatareus | Seven-spot archerfish; Largescale archerfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species. Mainly occurs in brackish mangrove estuaries but also penetrates freshwater rivers and small stream |
| Chordata/Actinopterygii | Zenarchopterus buffonis | Northern River garfish | [ ] | [ ] | [ ] | [ ] | [x] | [ ] | [x] | [x] |  |  |  |  | [ ] | [ ] |  | Wetland dependent species, marine; brackish; reef-associated |
| Others | | | | | | | | | | | | | | | | | | |
| Chordata/Reptilia | Caretta caretta | Loggerhead turtle | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | VU | [ ] | [x] | National (EPBC Act) – VU; marine; migratory (CMS)  QLD (*Nature Conservation Act 1992*) – EN | Wetland dependent. Foraging. |
| Chordata/Reptilia | Chelonia mydas | green turtle | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | EN | [x] | [x] | National (EPBC Act) – VU; marine; migratory (CMS)  QLD (*Nature Conservation Act 1992*) – VU | Wetland dependent species |
| Chordata/Reptilia | Crocodylus porosus | estuarine crocodile | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | LC | [x] | [x] | National (EPBC Act) – marine; migratory (CMS)  QLD (*Nature Conservation Act 1992*) - VU | Wetland dependent species |
| Chordata/Reptilia | Lepidochelys olivacea | Olive ridley turtle | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  | VU | [ ] | [x] | National (EPBC Act) – VU; marine; migratory (CMS)  QLD (*Nature Conservation Act 1992*)- EN | Wetland dependent species |
| Chordata/Reptilia | Natator depressus | Flatback turtle | [x] | [x] | [ ] | [ ] | [x] | [ ] | [ ] | [ ] |  |  |  |  | [x ] | [] | National (EPBC Act) – VU; marine; migratory (CMS)  QLD (*Nature Conservation Act 1992*) – VU | Wetland dependent species |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mammals | | | | | | | | | | | | | | | | | | |
| Chordata/ | Dugong dugon | Dugong | [x] | [x] | [ ] | [ ] | [x] | [ ] | [] | [] |  |  |  | VU | [ ] | [ ] | National (EPBC Act) - marine; migratory (CMS)  QLD (*Nature Conservation Act 1992*) – VU | Wetland dependent species, marine; brackish  Grazing seagrass |
|  | Orcaella heinsohni | Australian snubfin dolphin | [x] | [x] |  |  | [x] |  |  |  |  |  |  | VU |  |  | National (EPBC Act) - migratory (CMS)  QLD (*Nature Conservation Act 1992*) – VU | Wetland dependent species  Foraging |
|  | Sousa sahulensis | Australian humpback dolphin | [x] | [x] |  |  | [x] |  |  |  |  |  |  | VU |  |  | National (EPBC Act) - migratory (CMS)  QLD (*Nature Conservation Act 1992*) – VU | Wetland dependent species  Foraging |

Optional text box to provide further information on animal species of international importance:

|  |  |
| --- | --- |
|  | The Bowling Green Bay Ramsar site provides diverse faunal assemblages that are significant in the North East Coast Drainage Division and the Northeast IMCRA Province. The estuarine wetlands that fringe the northern and southern coasts of Cape Cleveland, Cape Bowling Green, up the Haughton River and other creeks are particularly important at providing habitat for migratory birds, fish, benthic invertebrate species and estuarine crocodiles. The Cape Bowling Green Sandspit (formed as a result of sand transported northward by longshore sediment transport at a time when the Burdekin River discharged in the vicinity of Kalamia Creek) is critical as a high tide migratory shorebird roost site as well as providing nesting habitat for marine turtles (Kelly and Lee Long, 2011, unpublished).    The site also has species of crabs, prawns, shrimp, crayfish and worm as follows: *Tubuca* spp.: *Istiophoridae* spp.; *Penaeus* spp. (tiger prawn); *Fenneropenaeus* spp. (banana prawn); Atyidae family (atyiid shrimp); *caridina* shrimp; *Cherax* sp. (freshwater crayfish family); Parastacidae family (Paratacid crayfish family); Oligochaeta subclass (Oligochaete worm subclass). *Neoarius* spp. and *Hypseleotris* spp. also occur at the site.    Additionally, the site is habitat for *Geijera salicifolia* (brush wilga) which is listed as Near Threatened under the Red List and Least Concern under the Queensland *Nature Conservation Act 1992*. |

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** |
| Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions | [x] | Semi-evergreen vine thicket on coastal alluvial plains (RE 11.3.11x1). A groundwater dependent ecosystem located on coastal alluvial plains (Accad et al 2008). 18 ha exists | National (EPBC Act) – Endangered Vegetation Management Act 1999 – Endangered. It is mostly located within the Brigalow Belt Bioregion (North and South) and Nandewar Bioregions and is a groundwater dependent ecosystem closely linked to wetlands habitats. |
|  |  |  |  |

Optional text box to provide further information

|  |  |
| --- | --- |
|  | Semi-evergreen vine thicket (SEVT) is considered an extreme form of dry seasonal subtropical rainforest. It occurs in areas with a subtropical, seasonally dry climate on soils of high to medium fertility and is generally characterised by the prominence of trees with microphyll sized leaves (2.5–7.5cm long) and the frequent presence of swollen-stemmed “bottle trees” (*Brachychiton australis, B. rupestris*) as emergents from the vegetation. The thickets typically have an uneven canopy 4–9m high with mixed evergreen, semi-evergreen and deciduous emergent tree species 9–18m high. Vines, twining or scrambling plants are prominent.  Semi-evergreen vine thickets are widely scattered with a common structure (architecture) but considerable regional variation in floristic associations.  Within the Brigalow Belt Bioregions, semi-evergreen vine thickets have been fragmented, reduced in area and degraded through land clearing and agricultural/grazing practices. |

What is the Site like?

4.1 Ecological character

|  |  |
| --- | --- |
|  | Seven critical ecosystem services contribute to the ecological character of the site. 24 critical components and processes support these services. The ecological services (refer to Kelly and Lee Long, 2011, unpublished) are summarised below:  Significant, representative wetlands: The site is generally representative and particularly distinctive within the Northeast Coast Drainage Division and the Northeast IMCRA Province (marine bioregion) for its diversity and extent of, brackish and freshwater wetland types, far reaching flood tide, and for nutrient assimilation and sediment stabilization to adjacent and downstream areas.  Threatened wetland species: The site supports key threatened and protected species such as turtles, several waterbird, shorebird species, and a threatened ecological community.  Wetland biodiversity: The site supports a regionally significant diversity of wetland biota and food webs, including finfish, crustaceans, marine reptiles, waterbirds, shorebirds, soft bottom communities, mangroves and saltmarshes.  Migratory shorebirds and seabirds: The site regularly supports 1% of the population of at least one species of migratory shorebird in any year.  Waterbird feeding and breeding: The site provides habitat for waterbirds reliant on freshwater. Most waterbirds however, breed and feed in the adjacent freshwater wetlands.  Fish stocks: The site supports recreationally/commercially significant fish stocks by providing (a) nursery sites for earlier life history stages (b) foraging sites for larger fishes (c) export of nutrients to adjacent waters and (d) producing prey species (e.g. species such as banana prawns that use mangrove lined estuaries as nurseries then migrate to near shore waters).  Science, conservation and recreation: The site is an important reference site and resource for scientific, conservation and nature observation activities in relation to coastal wetlands of the tropics.  The critical components and processes underpinning the ecosystem services are numerous and complex, reflecting the diversity and extent of wetland types that transition from fresh to brackish and marine systems. The wetland components that contribute to ecological character include a mixture of palustrine (freshwater and brackish swamps dominated by the bulkuru sedge, *Eleocharis* spp.), coastal dune and swale systems, mangrove and saltmarsh tidal wetlands, intertidal sand and mudflats, freshwater and estuarine streams, creeks and riverine habitats.  The wetlands also support diverse and abundant flora and fauna, including threatened and migratory species, regionally significant baitfish aggregations and fisheries stocks. The Ramsar site is crucial to large populations of waterbirds, marine reptiles and mammal species for protection, foraging and breeding. A large sandspit at Cape Bowling Green, and several smaller coastal spits also provide critical habitat for several wetland fauna species that migrate, roost and/or nest.  The processes most critical to supporting the ecosystem services include:  • climate: in particular rainfall and temperature  • hydrological processes (tidal and freshwater), high inter-annual variability in water input, surface flow, inundation, salinity and water quality  • geomorphic and oceanographic processes including transport and mixing of marine sediments, interplay of marine and inland fluvial influences  • energy and nutrient dynamics – nutrient cycling (nitrogen, phosphorus), carbon cycling, decomposition, oxidation-reduction  • biological – primary production, herbivory, predation, migration, reproduction (includes on-and-off-site processes) and trophic food webs  • viable migration pathways for waterbirds and site networks in the Flyway (external to the site) |

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

Marine or coastal wetlands

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Wetland types (code and name)** | **Local name** | **Ranking of extent (1: greatest - 4: least)** | **Area (ha) of wetland type** | **Justification of Criterion 1** |
| D: Rocky marine shores | Seagrass meadows, tropical/subtropical macroalgae | 0 | 50.5 | Representative |
| E: Sand, shingle or pebble shores | Sand bars, spits, sandy inlets, dune systems | 0 | 474.7 | Representative |
| F: Estuarine waters | Permanent water of estuaries and estuarine systems of deltas | 4 | 1,159.3 | Representative |
| G: Intertidal mud, sand or salt flats | Tidal flats and mudflats | 1 | 15,052.6 | Representative |
| H: Intertidal marshes | Saltmarshes & saltpans | 3 | 2,238.5 | Representative |
| I: Intertidal forested wetlands | Mangroves | 2 | 11,500.5 | Representative |

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** |
| Saline, brackish or alkaline water > Lakes >> R: Seasonal/ intermittent saline/ brackish/ alkaline lakes and flats | e.g. Bulkuru sedgelands on old marine plains | 3 | 45.6 | Representative |
| Fresh water > Marshes on inorganic soils >> Ts: Seasonal/ intermittent freshwater marshes/ pools on inorganic soils | e.g. Bulkuru sedgelands on old alluvial plains | 2 | 119.1 | Representative |
| Fresh water > Marshes on inorganic soils >> Xf: Freshwater, tree-dominated wetlands | e.g. Melaleuca swamps | 1 | 1,557 | Representative |

Other non-wetland habitat

|  |  |
| --- | --- |
| **Other non-wetland habitats within the site** | **Area (ha) if known** |
|  |  |

Habitat connectivity

|  |  |
| --- | --- |
|  | Connectivity between freshwater and estuarine habitats in parts of the site has been altered due to expansion of irrigated agriculture commencing in the 1960s. Water resource development across the lower Burdekin River catchment has considerably altered the underlying function of the system including losses of lateral and longitudinal wetland connectivity (Tait and Veitch, 2007).  In the lower coastal reaches between the Barratta Creek and Sheep Station Creek, the flow is now perennial due to the supplementation of flows by the Lower Burdekin Water and Irrigation Area drainage (Burrows *et al.,* 2012) which facilitates instream habitat connectivity.  Inspite of changes to hydrology, the lower Burdekin is a high integrity floodplain stream system (WetlandCare, 2004). Barratta Creek has extremely high values for wildlife and fish habitat as the creek is fringed by substantial setbacks that include features such as back levee swamps and adjoining floodplain wetlands; these features fall within several thousand hectares of remnant habitat that provides a corridor connecting wildlife from the rangelands to the coast (WetlandCare, 2004). According to Davis et al. (2014) the Barratta Creek riparian corridor is likely to provide critical habitat for the *vulnerable* bare rumped sheathtail bat (*Saccolaimus saccolaimus nudicluniatus*) under the National *Environment Protection Biodiversity Conservation Act 199*9 (EPBC Act).  Aquatic weeds, however, pose a threat to aquatic biodiversity on the Burdekin floodplain because of the impact that weed chokes have on habitat connectivity for aquatic species. Weed chokes significantly affect physical connectivity as well as water quality to the point where dissolved oxygen is so low as to create a water quality-based barrier to fish passage (Burrows *et al.,* 2012). Control of weed chokes will maintain habitat connectivity instream. |

4.3 Biological components

4.3.1 Plant species

Other noteworthy plant species

| **Scientific name** | **Common name** (optional) | **Position in range / endemism / other** (optional) |
| --- | --- | --- |
| *Acanthus ilicifolius* |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| *Acrostichum speciosum* | Mangrove fern | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Aegialitis annulata* | Club mangrove | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Aegiceras corniculatum* | River mangrove | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Avicennia marina subsp. eucalyptifolia* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Bruguiera exaristata* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Bruguiera gymnorhiza* | Black mangrove | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Bruguiera parviflora* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| Ceratopteris thalictroides |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Ceriops australis* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Ceriops tagal* | Yellow mangrove | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| Corchorus hygrophilus |  | QLD (Nature Conservation Act 1992) VU |
| *Crinum pedunculatum* | River lily; swamp lily | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| Cyperus alopecuroides |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Cyperus polystachyos* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| Cyperus scariosus |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Cynometra iripa* | Wrinklepod mangrove | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Eclipta prostrata* | white eclipta | Wetland indicator species |
| *Eleocharis dulcis* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Eleocharis spiralis* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Excoecaria agallocha* | Milky mangrove | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Fimbristylis ferruginea* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Fimbristylis polytrichoides* |  | Wetland indicator species |
| *Fuirena umbellata* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Heritiera littoralis* | Beach tulip mangrove; Looking-glass mangrove | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Ludwigia octovalvis* | Willow primrose | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Ludwigia peploides subsp. montevidensis* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Lumnitzera racemosa* |  | Wetland indicator species |
| *Marsilea mutica* | Nardoo | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Melaleuca dealbata* | Swamp tea tree | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Monochoria cyanea* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Osbornia octodonta* | Myrtle mangrove | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Pemphis acidula* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Persicaria attenuata* | Hairy knotweed | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Rhizophora apiculata* | Tall-stilted mangrove | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Rhizophora lamarckii* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Rhizophora stylosa* | Red mangrove | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Ruppia maritima* | Sea tassel | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Salsola kali* | Common saltwart | Wetland indicator species |
| Sannantha papillosa |  | QLD (Nature Conservation Act 1992) EN |
| *Sarcocornia quinqueflora subsp. quinqueflora* |  | Wetland indicator species |
| *Scyphiphora hydrophyllacea* | Yamstick mangrove | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Sesuvium portulacastrum* | Sea purslane | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Sonneratia alba* | Mangrove apple | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Sphenoclea zeylanica* |  |  |
| *Sporobolus virginicus* | Sand couch | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Suaeda australis* | Seablite | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Suaeda arbusculoides* | Seablite | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Tecticornia australasica* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Tecticornia pergranulata* |  | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |
| *Xylocarpus moluccensis* | Cedar mangrove | QLD (*Nature Conservation Act 1992*) - LC  Wetland indicator species |

Invasive alien plant species

| **Scientific name** | **Common name** | **Impacts** | **Changes at RIS update** |
| --- | --- | --- | --- |
| Alternanthera philoxeroides | Alligator Weed | Potentially | No change |
| Andropogon gayanus | Gamba grass | Potentially | unknown |
| Annona glabra | Pond Apple | Potentially | No change |
| Brachiaria mutica | Para grass | Potentially | No change |
| Cenchrus ciliaris | Buffel grass | Potentially | No change |
| Chromolaena odorata | Siam weed | Potentially | No change |
| Cryptostegia grandiflora | Rubber Vine | Potentially | Decrease |
| Echinochloa polystachya | Aleman grass | Potentially | No change |
| Eichhornia crassipes | Hyacinth | Potentially | No change |
| Hymenachne amplexicaulis | Olive hymenachne | Actually (minor impacts) | Increase |
| Lantana camara | Lantana | Potentially | No change |
| Panicum maximum | Guinea grass | Potentially | No change |
| Parkinsonia aculeata | Jerusalem thorn | Potentially | No change |
| Parthenium hysterophorus | Parthenium weed | Potentially | No change |
| Salvinia adnata | Salvinia | Potentially | No change |
| Themeda quadrivalvis | Grader grass | Potentially | No change |
| Vachellia nilotica indica | Prickly Acacia | Potentially | Decrease |
| *Ziziphus mauritiana* | Chiney apple | Potentially | Decrease |

Optional text box to provide further information

|  |  |
| --- | --- |
|  | Nutrient inputs derived from agricultural areas appear to be contributing to the eutrophication of freshwater wetlands and have assisted the domination of exotic pasture grass species such as para grass (*Brachiaria mutica*) and guinea grass (*Panicum maximum*) in the emergent vegetation zone (Kelly and Lee Long 2011). More recent information suggests olive hymenachne (*Hymenachne amplexicaulis*) is still a threat to bulkuru within the site, however, para grass (*Brachiaria mutica*) is the dominant weed species in this wetland type (Billy O’Grady pers comm 2021). Freshwater weeds have increased since the 2019 flood (Billy O’Grady pers. comm 2021). Other weeds have become less prevalent e.g. rubber vine, chiney apple and prickly acacia on the marine plain (Marty McLaughlin pers. comm. 2019). |

4.3.2 Animal species

Other noteworthy animal species

| **Phylum/Class** | **Scientific name** | **Common name** | **Pop. size** (optional) | **Period of pop. est.** (optional) | **% occurrence** (optional) | **Position in range /endemism/other** (optional) |
| --- | --- | --- | --- | --- | --- | --- |
| Chordata/Aves | Accipiter cirrocephalus | Collared sparrowhawk |  |  |  | QLD (*Nature Conservation Act 1992*) LC |
| Chordata/Aves | Acrocephalus australis | Australian reed warbler |  |  |  | QLD (*Nature Conservation Act 1992*) - LC ; Wetland indicator species |
| Chordata/Aves | Anas gracilis | Grey teal |  |  |  | QLD (*Nature Conservation Act 1992*) - LC ; Wetland indicator species |
| Chordata | Anas superciliosa | Pacific black duck |  |  |  | QLD (*Nature Conservation Act 1992*) - LC Wetland indicator species |
| Chordata/Aves | Anous minutus | Black noddy |  |  |  | QLD (*Nature Conservation Act 1992*) - LC Wetland indicator species |
| Chordata/Aves | Anous stolidus | Common noddy |  |  |  | QLD (*Nature Conservation Act 1992*) - SL Wetland indicator species |
| Chordata/Aves | Anseranas semipalmata | Magpie goose |  |  |  | National (EPBC Act) - marine; QLD (*Nature Conservation Act 1992*) – LC Small amount of nesting at site. Freshwater wetlands surrounding the site are considered a main stronghold for species in Eastern Australia |
| Chordata/Aves | Aquila audax | Wedge-tailed eagle |  |  |  | QLD (*Nature Conservation Act 1992*) - LC |
| Chordata/Aves | Ardea alba  Aredea modesta | Eastern great egret |  |  |  | National (EPBC Act) -– marine; QLD (*Nature Conservation Act 1992*) – LC Wetland indicator species |
| Chordata/Aves | Ardea pacifica | White-necked heron |  |  |  | QLD (*Nature Conservation Act 1992*) – LC Wetland indicator species |
| Chordata/Aves | Ardea ibis | Cattle egret |  |  |  | QLD (*Nature Conservation Act 1992*) – LC Wetland indicator species |
| Chordata/Aves | Ardea intermedia | Intermediate egret |  |  |  | QLD (*Nature Conservation Act 1992*) – LC Wetland indicator species |
| Chordata/Aves | Ardeotis australis | Australian bustard |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Aviceda subcristata | Pacific baza |  |  |  | (QLD) *Nature Conservation Act 1992*) – LC Wetland indicator species |
| Chordata/Aves | Aythya australis | Hardhead |  |  |  | QLD (*Nature Conservation Act 1992*)- LC ; Wetland indicator species |
| Chordata/Aves | Butorides striata | Striated heron |  |  |  | QLD (*Nature Conservation Act 1992*)- LC ; Wetland indicator species |
| Chordata/Aves | Cacatua sanguinea | Little corella |  |  |  | QLD(*Nature Conservation Act 1992*) - LC |
| Chordata/Aves | Calidris subminuta | Long-toed stint |  |  |  | QLD (*Nature Conservation Act 1992*)- SL ; Wetland indicator species |
| Chordata/Aves | Charadrius ruficapillus | Red-capped plover |  |  |  | National (EPBC Act)- marine; QLD (*Nature Conservation Act 1992*) – LC Wetland indicator species |
| Chordata | Chenonetta jubata | Australian wood duck |  |  |  | QLD (*Nature Conservation Act 1992*)- LC ; Wetland indicator species |
| Chordata/Aves | Chroicocephalus novaehollandiae | Silver gull |  |  |  | QLD (*Nature Conservation Act 1992*)- LC ; Wetland indicator species |
| Chordata/Aves | Circus approximans | Swamp harrier |  |  |  | QLD (*Nature Conservation Act 1992*)- LC ; Wetland indicator species |
| Chordata/Aves | Cygnus atratus | Black swan |  |  |  | QLD (*Nature Conservation Act 1992*)- LC ; Wetland indicator species |
| Chordata/Aves | Dendrocygna eytoni | Plumed whistling duck |  |  |  | QLD (*Nature Conservation Act 1992*) – LC Wetland indicator species |
| Chordata/Aves | Dendrocygna arcuata | Wandering whistling duck |  |  |  | QLD (*Nature Conservation Act 1992*) – LC Wetland indicator species |
| Chordata/Aves | Egretta garzetta | Little egret |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Egretta picata | Pied heron |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Egretta sacra | Eastern reef egret |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Egretta novaehollandiae | White-faced heron |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Elseyornis melanops | Black-fronted dotteral |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Erythrogonys cinctus | Red-kneed dotterel |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Falco berigora | Brown falcon |  |  |  | QLD (*Nature Conservation Act 1992*) - LC |
| Chordata/Aves | Falco cenchroides | Nankeen Kestrel |  |  |  | QLD (*Nature Conservation Act 1992*) - LC |
| Chordata/Aves | Falco longipennis | Australian hobby |  |  |  | QLD (*Nature Conservation Act 1992*) - LC |
| Chordata/Aves | Falco peregrinus | Peregrine falcon |  |  |  | QLD (*Nature Conservation Act 1992*) – LC CITES Appendix I |
| Chordata/Aves | Grus rubicunda | Brolga |  |  |  | QLD (*Nature Conservation Act 1992*)- LC Wetland indicator species |
| Chordata/Aves | Haematopus longirostris | Pied oystercatcher |  |  |  | QLD (*Nature Conservation Act 1992*)- LC Wetland indicator species |
| Chordata/Aves | Haliaeetus leucogaster | White-bellied sea eagle |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Haliastur indus | Brahminy kite |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Haliastur sphenurus | Whistling kite |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | [*Himantopus himantopus*](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=870) | Black-winged stilt |  |  |  | National (EPBC Act)– Marine  QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Irediparra gallinacea | Comb-crested jacana |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Lophoictinia isura | Square-tailed kite |  |  |  | QLD (*Nature Conservation Act 1992*) - LC |
| Chordata/Aves | Milvus migrans | Black kite |  |  |  | QLD (*Nature Conservation Act 1992*) - LC |
| Chordata/Aves | Morus serrator | Australasian gannet |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Myiagra cyanoleuca | Satin flycatcher |  |  |  | QLD (*Nature Conservation Act 1992*) - SL |
| Chordata/Aves | Myiagra rubecula | Leaden flycatcher |  |  |  | QLD (*Nature Conservation Act 1992*) - LC |
| Chordata/Aves | Nettapus coromandelianus | Cotton pygmy-goose |  |  |  | National (EPBC Act)- marine; QLD (*Nature Conservation Act 1992*) – LC Wetland indicator species |
| Chordata/Aves | Nettapus pulchellus | Green pygmy-goose |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Ninox connivens | Barking boobook owl |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Ninox rufa queenslandica | Rufous owl (subspecies queenslandica) |  |  |  | QLD (*Nature Conservation Act 1992*) - LC |
| Chordata/Aves | *Nycticorax caledonicus* | Nankeen night-heron |  |  |  | QLD (*Nature Conservation Act 1992*) – LC  Wetland indicator species |
| Chordata/Aves | Platalea regia | Royal spoonbill |  |  |  | QLD (*Nature Conservation Act 1992*) – LC Wetland indicator species |
| Chordata/Aves | Platycercus adscitus | Pale-headed rosella |  |  |  | QLD (*Nature Conservation Act 1l92*) - LC |
| Chordata/AVES | Pelecanus conspicillatus | Australian pelican |  |  |  | National (EPBC Act)– Marine; QLD (*Nature Conservation Act 1992*) – LC  Wetland Indicator species |
| Chordata/Aves | Poephila cincta cincta | Black-throated finch subspecies white-rumped) |  |  |  | National (EPBC Act)– EN; QLD (*Nature Conservation Act 1992*) – EN CITES Appendix II |
| Chordata/Aves | Recurvirostra novaeholandiae | Red-necked avocet |  |  |  | National (EPBC Act) Marine; QLD (*Nature Conservation Act 1992*)-LC  Wetland indicator species |
| Chordata/Aves | Symposiachrus trivirgatus | Spectacled monarch |  |  |  | QLD (*Nature Conservation Act 1992*)- SL |
| Chordata/Aves | Tadorna radjah | Radja shelduck |  |  |  | National (EPBC Act) – marine; QLD (*Nature Conservation Act 1992*) - LC |
| Chordata/Aves | *Thalasseus bengalensis* | Lesser crested tern |  |  |  | QLD (*Nature Conservation Act 1992*)- LC  Wetland indicator species |
| Chordata/Aves | Threskiornis molucca | Straw-necked ibis |  |  |  | QLD (*Nature Conservation Act 1992*) – LC Wetland indicator species |
| Chordata/Aves | Todiramphus sordidus | Torresian kingfisher |  |  |  | QLD (*Nature Conservation Act 1992*) – LC Wetland indicator species |
| Chordata/Aves | Vanellus miles | Masked lapwing |  |  |  | QLD (*Nature Conservation Act 1992*) - LC ; Wetland indicator species |
| ARTHROPODA/CRUSTACEA | Tubuca polita | Pink fiddler crab |  |  |  | Wetland dependent species |
| ARTHROPODA/CRUSTACEA | Tubuca seismella | Fiddler crab |  |  |  | Wetland dependent species |
| ARTHROPODA/CRUSTACEA | Tubuca signata | Fiddler crab |  |  |  | Wetland dependent species |
| Chordata/Mammalia | Rhinolophus philippinensis | Large-eared horseshoe bat |  |  |  | National (EPBC Act) VU; QLD (*Nature Conservation Act 1992*)-EN |
| Chordata/Mammalia | Hipposideros diadema reginae | Diadem leaf-nosed bat |  |  |  | QLD (*Nature Conservation Act 1992*) - NT |
| Chordata/Mammalia | Dasyurus hallucatus | Northern quoll |  |  |  | National (EPBC Act)– EN Red List EN |
| Chordata/Amphibia | Litora fallax | Eastern dwarf treefrog |  |  |  | Wetland indicator species. Has a partial aquatic life  QLD (Nature Conservation Act 1992) – LC |
| Chordata/Amphibia | Litoria gracilenta | Graceful treefreg |  |  |  | Wetland indicator species. Lives an entirely aquatic life  QLD (Nature Conservation Act 1992) – LC |
| Chordata/Amphibia | Platyplectrum ornatum | Ornate burrowing frog |  |  |  | Wetland indicator species. Only requires aquatic environment for early life stages of egg and tadpole.  QLD (Nature Conservation Act 1992) - LC |
| Chordata/Reptilia | Morelia spilota | Carpet python |  |  |  | QLD (*Nature Conservation Act 1992*) - LC |

Invasive alien animal species

| **Phylum/class** | **Scientific name** | **Common name** | **Impacts** | **Changes at RIS update** |
| --- | --- | --- | --- | --- |
| Chordata/FISHA | Oreochromis mossambicus | Mozambique mouthbrooder; | Actually (minor impacts) | No change |
| Chordata/Aves | Acridotheres tristis | Common myna | Potentially | Unknown |
| Chordata/Aves | Columba livia | Common pigeon | Potentially | Unknown |
| Chordata/Mammalia | Felis catus | Domestic cat | Potentially | No change |
| Chordata/Actinopterygii | Gambusia holbrooki | Gambusia | Potentially | Unknown |
| Chordata/Reptilia | Hemidactylus frenatus | House gecko | Potentially | Unknown |
| Chordata/Aves | Lonchura punctulata | Nutmeg mannikin | Potentially | Unknown |
| Chordata/Mammalia | Oryctolagus cuniculus | European rabbit | Potentially | No change |
| Chordata/Aves | Passer domesticus | House sparrow | Potentially | Unknown |
| Chordata/Amphibia | Rhinella marina | Cane toad | Potentially | No change |
| Chordata/Aves | Streptopelia chinensis | Spotted dove | Potentially | Unknown |
| Chordata/Mammalia | Sus scrofa | Wild pigr | Actually (minor impacts) | No change |
| Chordata/Actinopterygii | Trichopodus trichopterus | Three spot gourami | Potentially | Unknown |
| Chordata/Mammalia | Vulpes vulpes | Red fox | Actually (minor impacts) | No change |

Optional text box to provide further information

|  |  |
| --- | --- |
|  | There are also a number of insect wetland indicator species that have been recorded at the site including: mayfly spp.; sand fly sp.; damselfly spp.; midge sp.; caddis fly spp.; and the whirliegig beetle.  Tilapia is a major emerging pest threat that has established in river and dam systems in Queensland, including estuarine environments. Tilapia competes with native fish species, preys upon their eggs and fry and other food sources such as small invertebrates. Native fish species dependant on coastal wetlands are susceptible to tilapia through predation and competition for food and habitat (Kelly and Lee Long 2011).  Damage to wetland vegetation by feral pigs is common (Kelly and Lee Long 2011). Feral pigs and dogs are predating turtle eggs and/or modifying nesting habitat exposing eggs to thermal mortality (Ian Bell pers. com 2021). The feral red fox can be a serious predator, taking eggs and killing chicks (Department of Sustainability and Environment, 2001). Other feral animal species at the site include; rabbits (*Oryctolagus cuniculus*); cats (*Felus catus*) and cane toads (*Rhinellamarinus*) (Kelly and Lee Long 2011). |

4.4 Physical components

4.4.1 Climate

|  |  |
| --- | --- |
| **Climatic region** | **Subregion** |
| A: Tropical humid climate | Aw: Tropical savanna (Winter dry season) |

If changing climatic conditions are affecting the site, please indicate the nature of these changes:

|  |  |
| --- | --- |
|  | Rainfall in the Haughton River and Burdekin River catchments are highly variable from year to year and can be influenced by tropical cyclones and monsoonal activity. Rainfall averages suggest a distinct wet and dry season, with the wet season generally November to April and the dry June to October. High rainfall intensities during the wet season cause large local run-off events. Rainfall at Ayr DPI Research Station averaged over 64 years is 945 mm per annum (Bureau of Meteorology n.d). Average temperatures range between 29.2 °C maximum and 18 °C minimum recorded over 63 years (Bureau of Meteorology n.d).  Over the last 30 years, changes to the climate and weather of the monsoonal north east region have included:  • Growing season rainfall averages have decreased  • Three-monthly rainfall totals leading into the dry season have increased slightly  • Evaporation rates have increased  • There have been more hot days, with more consecutive days above 42 °C.  (BOM Regional Weather and Climate Guide, 2019) |

4.4.2 Geomorphic setting

a) Minimum elevation above sea level (in metres)

|  |  |
| --- | --- |
|  | 0 |

a) Maximum elevation above sea level (in metres)

|  |  |
| --- | --- |
|  | 558 |

b) Position in landscape/river basin:

[ ] 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

[x] 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 site adjoins the Coral Sea which lies in the South Pacific Ocean. The site contains sections of two drainage basins which lie within the North East Coast Drainage Division. These are the Haughton Basin and the Ross Basin. |

4.4.3 Soil

[x] Mineral

Changes at RIS update (Update)

[x] No change / [ ] Increase / [ ] Decrease / [ ] Unknown

.

.

.

[x] Organic

Changes at RIS update (Update)

[x] 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 / [x] No

.

|  |  |
| --- | --- |
|  | A large area of the site is comprised of muds and silts of Quaternary age which are replaced further inland by the soils and sediments of the coastal plain (Hopely 1970). According to Murtha (1982), the soils largely correspond to local elevation and parent material. The origins of the mountainous soils of Cape Cleveland and Feltham Cone are largely from course-grained granitic parent materials (Hopely 1970). These are mostly thin sandy soils although there are occasional red soils (Hopely 1970). Seawater inundation has not affected these higher soils.  Soils deposited by the Burdekin and Haughton River systems have built the land of the lower Burdekin region. The soil pattern is complex, consisting of sands and clay (Dalla Pozza, 2005). The origins of the lower floodplain soils tend to be marine sediments ranging from highly permeable sand on levees to heavy uniform cracking clays of low permeability. The Haughton River valley has clay bound Cainozoic deposits which extend from Mount Elliot to the Burdekin Delta (Kelly and Lee Long, 2011, unpublished), i.e. water is held within or on the surface of a clay and is not free to move (PetroWiki 2013). Many of the soils on the coastal plain reflect the influence of smectites in their propensity for cracking on drying and swelling on rehydration. Soils rich in smectite can undergo volume changes by as much as 30% in response to wetting and drying (Barak et al., 2018).  It is thought that a series of beach ridges between Cape Cleveland and the Haughton River arose during a lengthy period of deposition during the Pleistocene (Hopely 1970). Quaternary sand dunes on the western side of Bowling Green Bay to the north of the Haughton River estuary are extensive in area. The sand dune soils vary in degree and profile development (Hopely 1970). Most are freely draining coarse texture sands however, weakly developed podzols sometimes occur in swales (Hopely 1970).  Murtha (1982) characterised the mangrove forest soils and sediments as largely “dark brown muds of unknown depth” although there are also mangroves occurring on sandy soils in the region. Landwards from the mangrove forests of the coastal plain, soil sequences reflect the influence of increasing elevation and changing salinity.  Large areas of saline soils occur on the saltpans, and saline duplex soils (solonchaks) on the saltwater couch plains, including dark brown saline muds and mangrove peats. Strongly gleyed, dark grey cracking clays occur in brackish marsh. In the northern part of the site, small areas of saltpan occur around tidal inlets and creeks (Murtha 1982). Small areas of dark duplex soils occur as islands within the saltpans (Murtha 1982). These soils are inundated by tides (the frequency of which varies) and rainwater often for lengthy periods (Murtha 1982). Strongly gleyed, dark grey cracking clays can occur on the margins of saltpans in minor depressions. The presence of gleying is evidence of long periods of inundation or wetness and is characterized by greying, bluish or greenish colors (Agriculture Victoria 2019). |

4.4.4 Water regime

Water permanence

|  |  |
| --- | --- |
| **Presence?** | **Changes at RIS update** |
| Usually permanent water present | Unknown |
| 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 rainfall | [x] | No change |
| Water inputs from groundwater | [ ] | No change |
| Marine water | [ ] | No change |

Water destination

|  |  |
| --- | --- |
| **Presence?** | **Changes at RIS update** |
| Feeds groundwater | No change |
| To downstream catchment | No change |
| Marine | No change |

Stability of water regime

|  |  |
| --- | --- |
| **Presence?** | **Changes at RIS update** |
| Water levels fluctuating (including tidal) | increase |

Comments on water regime and its determinants (if relevant), and sites with complex hydrology:

|  |  |
| --- | --- |
|  | The hydrological regime of the site is complex and not well understood (Davis et al., 2014). Irrigation is a critical feature of the wider area (Walking the Landscape 2018) because the region lacks sufficient consistent and/or predictable rainfall (Perna et al. 2012). There is a good understanding of the impact of the Burdekin Haughton Water Supply (BHWSS) on groundwater. The groundwater levels have been steadily trending upwards (Petheram et al. 2008) particularly since 1990 (McMahon et al. 2012) and this is being managed by the Queensland Government.  There are two main underground aquifers storing groundwater on the lower Burdekin flood plain (Davis et al. 2014). Recharge of these aquifers is driven mainly by rainfall. The older aquifers are deeper (15-45 meters) and extend from the slopes of Mt Elliott across the Haughton River to the Burdekin delta (Lenahan and Bristow 2010). The younger shallower aquifers occur around the Haughton Riverbed (Davis et al. 2014). There is a poor understanding of the natural variability of groundwater in the lower Burdekin (Davis et al. 2014). Additionally, given the large fluctuations in groundwater levels resulting from extraction as well as enhanced recharge from irrigation, it is hard to predict groundwater flow paths (Bristow, 2016).  The site is drained seaward into Bowling Green Bay by the Haughton River, three larger (Barramundi, Barratta and Sheep Station Creeks) and many small creeks (Lewis et al. 2006). Two large creeks (Cocoa Ck and Alligator Ck) and a number of minor creeks discharge into Cleveland Bay at the north-western end of the site. Drainage of the mountainous area to the south of Cape Cleveland and Feltham Cone occurs via seasonally active creeks into Cleveland and Bowling Green Bays.  Barratta Creek originates in the Leichardt Ranges starting as a small stream (Davis et al. 2014) and further down becomes a functioning part of the Burdekin-Haughton floodplain (Environment Australia 2001). During large flood events, Burdekin River floodwaters flow into the Barratta system (Davis et al. 2014). Davis et al. (201) highlights a “notable hydrologic feature of the area is due to local topography (i.e. high river bank levees)”; they indicate that much of the overland flow between the Haughton and Burdekin Rivers ends up in the Barratta Creek system before flowing into Bowling Green Bay. Veitch et al. (2007) notes that the increased magnitude of the discharge in Barratta Creek is likely to be a result of changes to drainage associated with development of the BHWSS. |

Connectivity of surface waters and of groundwater

|  |  |
| --- | --- |
|  | Surface water and groundwater systems appear connected across the coastal floodplain. The coastal environment of Bowling Green Bay experiences semi-diurnal tides (two high and two low tides each day), with the highest astronomical tide of 2.25 metres above mean sea level and mean high water springs of 1.15 metres above mean sea level (Davis et al., 2014). The tidal range is between three to four metres (Davis et al., 2014). Consequently, marine and estuarine influences can extend as far as 10 km inland enabling hydrological interactions between tidal and freshwater systems (Davis et al. 2014) thereby facilitating connectivity amongst these water systems.  In general, groundwater flows north toward the coast (Davis et al, 2014). On site, the groundwater is close to, or at ground level in many parts of the floodplain (DES, 2018). The Burdekin coastal floodplain groundwater systems underlie a geographic area of about 1600 km2 (McMahon 2004; Fass et al. 2007). Holocene sediments comprise the shallowest portions of the unconfined aquifer system and are in direct hydraulic connection with the Burdekin River (McMahon 2004; Petheram et al. 2008). There is a hydrological connection between the deeper groundwater of the Pleistocene sediments and the shallower Holocene units (Davis et al. 2014).  During the dry season, floodplain groundwater elevation can exceed surface water elevation and during wet season high flow events, river water is higher than floodplain groundwater, producing a reversal in the direction of flow from the river to groundwater (Bristow, 2016). The coastal floodplain is largely inundated during floods and some parts are frequently connected (DES, 2018). Kelly and Lee Long. (2011 unpublished) indicate that the entire lower Burdekin can become a floodplain during periods of high flow, with the different catchments being barely distinguishable.  Note also that according to Brizga et al. (2006) Sheep Station Creek is reliant on groundwater. |

Stratification and mixing regime

|  |  |
| --- | --- |
|  | The Ramsar site is characterised by a broad mixing zone between marine, estuarine and freshwater areas that only occurs at this scale at one other location (Broadsound) in the Northeast Drainage Division. |

4.4.5 Sediment regime

[x] Significant erosion of sediments occurs on the site

Changes at RIS update (Update)

[x] No change / [ ] Increase / [ ] Decrease / [ ] Unknown

.

.

.

[x] Significant accretion or deposition of sediments occurs on the site

Changes at RIS update (Update)

[x] No change / [ ] Increase / [ ] Decrease / [ ] Unknown

.

.

.

[x] Significant transportation of sediments occurs on or through the site

Changes at RIS update (Update)

[ ] No change / [ ] Increase / [x] Decrease / [ ] Unknown

.

.

.

[x] Sediment regime is highly variable, either seasonally or inter-annually

Changes at RIS update (Update)

[x] No change / [ ] Increase / [ ] Decrease / [ ] Unknown

.

.

.

[ ] Sediment regime unknown

|  |  |
| --- | --- |
|  | The Ramsar site falls within the Ross and Haughton Catchments which fall within the broader Burdekin region. According to the Reef Water Quality Report Card (2019) for the Burdekin region, the fine sediment load leaving catchments showed a cumulative reduction of 18.5% to June 2019, a modelled average annual reduction of 0.1% (approximately 3.1 tonnes) from July 2018 to June 2019. Please see, [Reef Water Quality Report Card | Reef 2050 Water Quality Improvement Plan (reefplan.qld.gov.au)](https://reportcard.reefplan.qld.gov.au/home?report=target&year=5e858f29194b0655bc3c3111&measure=FS&area=Bu)  According to the Reef Water Quality Report Card (2019) for the Ross Catchment, there was no report card grade for sediment.  According to the Reef Water Quality Report Card (2019) for the Haughton Catchment, there was no report card grade for sediment.  The Burdekin and Haughton Rivers supply large quantities of sand and clay sediments to the coast during flood events (Davis et al. 2014). Coastal and oceanographic processes including tide and wind driven currents, water levels, waves and mixing facilitate transport, mixing and deposition of sediments in the bay and along shore (Davis et al. 2014). These terrigenous sediments deposited in the nearshore zone gradually build coastal landforms. In general, sand deposits occur on beaches and spits and the fine sediments gradually settle as muds in the pro-delta seaward of the river mouth in Upstart Bay and north to Bowling Green Bay. According to Davis et al 2014, the Bowling Green Bay sand spit has been pro-grading at its tip over the last 50 years. Hopely (1970) estimates that the spit length has increased at a rate of 20m/year over 1960-70. According to Fleming et al. (1981), present conditions in Bowling Green Bay are dependent on the integrity of the Bowling Green sand spit.  It has been found that the majority of the bulk sediment (clay, silt and sand) exported from the Burdekin River delivered over the past 1,000 years was deposited in Upstart Bay near the river mouth (Lewis et al., 2014). |

Water turbidity and colour

|  |  |
| --- | --- |
|  |  |

Light - reaching wetland

|  |  |
| --- | --- |
|  | N/A |

Water temperature

|  |  |
| --- | --- |
|  | N/A |

4.4.6 Water pH

[ ] Acid (pH<5.5)

Changes at RIS update (Update)

[x] No change / [ ] Increase / [ ] Decrease / [ ] Unknown

.

.

.

[x] Circumneutral (pH: 5.5-7.4 )

Changes at RIS update (Update)

[x] No change / [ ] Increase / [ ] Decrease / [ ] Unknown

.

.

.

[x] Alkaline (pH>7.4)

Changes at RIS update (Update)

[x] No change / [ ] Increase / [ ] Decrease / [ ] Unknown

.

.

.

[ ] Unknown

|  |  |
| --- | --- |
|  |  |

4.4.7 Water salinity

[x] Fresh (<0.5 g/l)

Changes at RIS update (Update)

[ ] No change / [ ] Increase / [ ] Decrease / [x] Unknown

.

.

.

[x] Mixohaline (brackish)/Mixosaline (0.5-30 g/l)

Changes at RIS update (Update)

[ ] No change / [ ] Increase / [ ] Decrease / [x] Unknown

.

.

.

[x] Euhaline/Eusaline (30-40 g/l)

Changes at RIS update (Update)

[ ] No change / [ ] Increase / [ ] Decrease / [x] Unknown

.

.

.

[x] Hyperhaline/Hypersaline (>40 g/l)

Changes at RIS update (Update)

[ ] No change / [ ] Increase / [x] Decrease / [ ] Unknown

.

.

.

[ ] Unknown

|  |  |
| --- | --- |
|  | Water salinity varies across the Ramsar site as it encompasses a range of wetland habitats. The rivers and creeks in the Ramsar site are largely estuarine (WetlandMaps 2021). There are few areas of naturally freshwater wetlands at the Ramsar site compared to estuarine. Some of the once seasonally dry wetlands areas are now subject to elevated and perennial freshwater inflows (Waltham et al. 2020, Waltham and Fixler 2017, Burrows et al. 2012) arising from upstream-irrigated agriculture (GBRMPA 2013, NQ Dry Tropics 2016). For example, the upper estuarine reaches of both Barratta and Barramundi Creeks been recorded having depressed salinities (Burrows et al. 2012, Sheaves and Johnston 2009) resulting from excessive freshwater flow from irrigation off site.  The coastal floodplain groundwater system however, has exhibited increased salinity (NQ Dry Tropics 2016) since regular monitoring began in the 1960s (Lenahan and Bristow 2010). According to Bristow and Lenahan (2010) the increased groundwater salinity of the Burdekin coastal floodplain aquifer results from of a combination of evapotranspiration of irrigation water, displacement of unsaturated zone solutes, enhanced mixing with relict seawater and seawater intrusion. |

Dissolved gases in water

|  |  |
| --- | --- |
|  | Variable |

4.4.8 Dissolved or suspended nutrients in water

[x] Eutrophic

Changes at RIS update (Update)

[ ] No change / [ ] Increase / [ ] Decrease / [x] Unknown

.

.

.

[x] Mesotrophic

Changes at RIS update (Update)

[ ] No change / [ ] Increase / [ ] Decrease / [x] Unknown

.

.

.

[x] Oligotrophic

Changes at RIS update (Update)

[ ] No change / [ ] Increase / [ ] Decrease / [x] Unknown

.

.

.

[x] Dystrophic

Changes at RIS update (Update)

[ ] No change / [ ] Increase / [ ] Decrease / [x] Unknown

.

.

.

[ ] Unknown

|  |  |
| --- | --- |
|  | The Reef Water Quality Report Card (2019) indicates the modelled average annual loads leaving the catchments in the Burdekin Region for the following:   * dissolved inorganic nitrogen – the dissolved inorganic nitrogen load leaving catchments showed a cumulative reduction of 31.2% to June 2019, a modelled average annual reduction of 4.5% (approximately 40 tonnes) from July 2018 to June 2019. * particulate nitrogen – the particulate nitrogen load leaving catchments showed a cumulative reduction of 16.8% to June 2019, a modelled average annual reduction of 0.4% (approximately 12 tonnes) from July 2018 to June 2019. * particulate phosphorus – the particulate phosphorus load leaving catchments showed a cumulative reduction of 17.3% to June 2019, a modelled average annual reduction of 0.3% (approximately 6 tonnes) from July 2018 to July 2019. According to the Reef Water Quality Report Card (2019) for the Ross Catchment, the following Grades were assigned: * Dissolved inorganic nitrogen – Grade E (very poor) with 0% reduction * There was no data for particulate nitrogen and particulate phosphorous * According to the Reef Water Quality Report Card (2019) for the Haughton Catchment: * Dissolved inorganic nitrogen – Grade A (very good) 5% reduction * There was no data particulate nitrogen and particulate phosphorous.   See [Reef Water Quality Report Card | Reef 2050 Water Quality Improvement Plan (reefplan.qld.gov.au)](https://reportcard.reefplan.qld.gov.au/home?report=target&year=5e858f29194b0655bc3c3111&measure=FS&area=Bu) for further information.  Despite reductions in dissolved and particulate nutrients reported in the Reef Report Card (2019), there is evidence of eutrophic effects from nutrients within the drainage channels and discharge swamp areas. Nutrient inputs and excess irrigation water inputs from agricultural areas appear to be contributing to the eutrophication of freshwater wetlands and has resulted in the domination of exotic pasture grass species such as para grass (*Brachiaria mutica*), olive hymenachne (*Hymenachne amplexicaulis*) and aleman grass (*Echinochloa polystachya*) in the emergent vegetation zone. Information that is more recent suggests olive hymenachne is becoming a greater threat to bulkuru (*Eleocharis dulcis*) within the site than para grass. |

Dissolved organic carbon (ECD)

|  |  |
| --- | --- |
|  | Variable |

Redox potential of water and sediments (ECD)

|  |  |
| --- | --- |
|  | Variable |

Water conductivity (ECD)

|  |  |
| --- | --- |
|  | Variable |

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 / [x] ii) significantly different

.

If the surrounding area differs from the Ramsar Site, please indicate how: (Please tick all categories that apply)

[ ] Surrounding area has greater urbanisation or development

[ ] Surrounding area has higher human population density

[x] 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:

|  |  |
| --- | --- |
|  | The surrounding area has a long history of agricultural development, including sugar cane, rice, horticulture and aquaculture. Sugar cane farming and grazing are the dominant land use in the lower Burdekin River, Haughton River, Barratta Creek, Sheep Station Creek and Hughes Creek catchments immediately upstream of the Ramsar site. Intensive agricultural land use surrounding the site has modified the natural state of many creeks and wetlands. |

4.5 Ecosystem services

4.5.1 Ecosystem services/benefits

Provisioning Services

|  |  |  |
| --- | --- | --- |
| **Ecosystem service** | **Examples** | **Importance/Extent/Significance** |
| Food for humans | Sustenance for humans (e.g., fish, molluscs, grains) | Low  The Ramsar site’s wetlands both directly produce food for humans (e.g. barramundi, banana prawns and mudcrabs) and indirectly produce food by supplementing adjacent fisheries (e.g. nutrient export, producing prey species or providing foraging habitat). |

Regulating Services

|  |  |  |
| --- | --- | --- |
| **Ecosystem service** | **Examples** | **Importance/Extent/Significance** |
| Maintenance of hydrological regimes | Groundwater recharge and discharge | Medium  Groundwater is stored in two main underground aquifers. Older, deeper aquifers extend from the slopes of Mount Elliot across the Haughton River to the Burdekin delta, while younger and shallower aquifers occur around the Haughton River bed. The main sources of groundwater are unconsolidated sediments associated with the Burdekin Delta – Haughton River valley area (Kelly and Lee Long, 2011, unpublished) |
| Maintenance of hydrological regimes | Storage and delivery of water as part of water supply systems for agriculture and industry | Low  The surrounding area is under agricultural production. Two schemes in the area manage water use; these are the Burdekin Haughton Water Supply Scheme and the Burdekin Irrigation Area. They involve sourcing groundwater with water distribution via a complicated system of dams, weirs, balancing storages, water recycling pits, pump channels, waterways, lagoons and groundwater recharge pits (Walking the Landscape 2018) |
| Pollution control and detoxification | Water purification/waste treatment or dilution | High  Wetlands can act as a sediment trap, transport, and store and transform certain excesses of organic and inorganic wastes through distribution, assimilation, transport and chemical re-composition (Clouston 2002; Adame and Lovelock 2011). |
| Climate regulation | Local climate regulation/buffering of change | High  The relatively natural condition of the Ramsar site contributes to climate regulation.  Wetlands are also known to play a role in localised climate regulation (Marsden et al. 2012) |
| Climate regulation | Regulation of greenhouse gases, temperature, precipitation and other climactic processes | Medium  Mangrove forests play an important role in the carbon cycle by sequestering and storing carbon dioxide (Lovelock et al. 2014). |
| Hazard reduction | Coastal shoreline and river bank stabilization and storm protection | High  Sand banks, dunes, mangroves and rocky shores in the site provide a barrier to storm surges and protection from large waves that can erode headlands and beaches and threaten coastal communities (Barbier 2016).  Vegetation, in general, helps prevent the erosion of soils through root structure and by providing ground cover. |
| Hazard reduction | Flood control, flood storage | High  There are many ways that ecosystems buffer human society from extreme events, including the ability of rivers, dams, floodplains and soils to store and disperse water in times of high rainfall.  The extensive coastal wetlands of the Ramsar area help mitigate impacts of flooding. |

Cultural Services

|  |  |  |
| --- | --- | --- |
| **Ecosystem service** | **Examples** | **Importance/Extent/Significance** |
| Recreation and tourism | Nature observation and nature-based tourism | Medium  Wetlands within the Ramsar site provide a spectrum of leisure opportunities such as tourism and outdoor pursuits. |
| Recreation and tourism | Recreational hunting and fishing | High  Wetlands within the Ramsar site provide a spectrum of leisure opportunities such as tourism and outdoor pursuits. |
| Spiritual and inspirational | Inspiration | Medium |
| Spiritual and inspirational | Cultural heritage (historical and archaeological) | This site has not been assessed for its cultural heritage significance at an international scale.  The site has cultural value to local Indigenous Bindal people. It provides important examples of indigenous use and cultural integration with natural wetland systems |
| Spiritual and inspirational | Contemporary cultural significance, including for arts and creative inspiration, and including existence values | High |
| Spiritual and inspirational | Spiritual and religious values | Medium  The site is important to local indigenous Bindal people |
| Spiritual and inspirational | Aesthetic and sense of place values | Medium  Shared places provide opportunities for people to develop a sense of belonging, commitment, identity and community.  A range of ecosystem services, geographic and socio-economic variables will contribute to an individual's sense of place (e.g. geography, climate, cultural and religious values, level of previous interaction with nature, time living in the area, personal relationships and socio-economic position - to name just a few). |
| Scientific and educational | Educational activities and opportunities | High  The site has much to offer educational institutions interested teaching about the natural environment. |
| Scientific and educational | Important knowledge systems, importance for research (scientific reference area or site) | High  Offers a critical service for scientific and conservation activities of the natural wetland system in the northern Brigalow Belt (wetland processes). It is particularly important regarding research on the impacts of agricultural and water management systems on coastal wetland systems in eastern Queensland. |
| Scientific and educational | Major scientific study site | High  The site has great potential as a major scientific study site. |

Supporting Services

|  |  |  |
| --- | --- | --- |
| **Ecosystem service** | **Examples** | **Importance/Extent/Significance** |
| Biodiversity | Supports a variety of all life forms including plants, animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part | High  There are a range of natural and near-natural wetland types that provide supporting habitat for biodiversity within the Ramsar site (refer section 3.1) |
| Soil formation | Sediment retention | High  The wetlands in the Ramsar area assist in stabilising the sands and soils. Mangrove forests play an important role in sediment retention and the accumulation of organic matter (Adame et al. 2010). |
| Nutrient cycling | Storage, recycling, processing and acquisition of nutrients | Mangrove communities, saltmarsh, seagrass and other wetlands of the Ramsar area support nutrient capture, recycling and storage.  Mangrove forests play an important role in nitrogen fixation and de-nitrification (Adame and Lovelock 2011). |
| Pollination | Support for pollinators | Medium  Pollination is critical to the reproduction of most wild plants and the production of food for consumption by animals and humans (Schulp et al. 2014).  Plants benefit from pollination, out-crossing with other plants to maintain genetic diversity. This contributes to the resilience of an ecosystem and its capacity to continue to perform its functions and provide continuous benefits to humans. |

Optional text box to provide further information)

|  |  |
| --- | --- |
|  | Please see Additional material 6.1.2. (iii) 4.5. |

Other ecosystem service(s) not included above:

|  |  |
| --- | --- |
|  |  |

Please make a rough estimate of the approximate number of people who directly benefit from the ecological services provided by this site (estimate at least in orders of magnitude: 10s, 100s, 1000s, 10 000s etc.):

Within the site:

|  |  |
| --- | --- |
|  | 1000s |

Outside the site:

|  |  |
| --- | --- |
|  | 100 000s |

Have studies or assessments been made of the economic valuation of ecosystem services provided by this Ramsar Site?

[ ] Yes / [x] No / [ ] Unknown

.

.

Where economic studies or assessments of economic valuation have been undertaken at the site, it would be helpful to provide information on where the results of such studies may be located (e.g. website links, citation of published literature):

|  |  |
| --- | --- |
|  |  |

4.5.2 Social and cultural values

|  |  |
| --- | --- |
|  | The social and cultural values of the site have not been assessed for international importance.  There is one registered native title claim over Bowling Green Bay Ramsar site; the Bindal People #2.  Cultural heritage surveys have revealed archaeological sites such as burial sites and shell middens in the coastal beach ridges and dune systems at Cape Cleveland. Ancient rock art and scarred trees (bark used for bowls etc.) exist in the mountainous areas of Cape Cleveland. Cape Cleveland and Cape Bowling Green offer important fishing and bush tucker (*Eleocharis* tubers and water drinking supply, mangrove molluscs) for traditional owners. |

4.6 Ecological processes

Primary production

|  |  |
| --- | --- |
|  | Primary productivity is central to the growth of the major wetland flora habitats – mangroves, saltmarsh & seagrass. These plant species provide the basal sources supporting local and regional marine/estuarine and freshwater food webs. Mangrove primary production varies between communities, with influencing factors such as soil nutrient status, redox potential, salinity, temperature, light intensity, associated fauna and tidal flushing. The site supports critical primary productivity for the biodiversity of flora and fauna found within and outside the Ramsar site (Kelly and Lee Long, 2011, unpublished).  Mangrove and saltmarsh vegetation are the notable macrophyte vegetation units covering much of the coastal upper intertidal flats within the Ramsar site. These mangrove systems provide critical habitat and primary productivity supporting regionally outstanding stocks of baitfish and fisheries species. Saltcouch (*Sporobolus virginicus*) is a critical primary producer providing nutritional support to wetland food webs (Kelly and Lee Long, 2011, unpublished). |

Nutrient cycling

|  |  |
| --- | --- |
|  | Nitrogen and phosphorous cycling are part of the critical ecological processes that occur in the Ramsar site and are supporting services necessary for the production of many other ecosystem services (Kelly and Lee Long, 2011, unpublished). |

Carbon cycling

|  |  |
| --- | --- |
|  | Carbon cycling is part of the critical ecological processes that occur in the Ramsar site associated with natural wetland systems. Carbon inputs into the system include minor and large volumes of aquatic and terrestrial weeds during medium (5-year ARI) and large (20-year ARI) floods (Kelly and Lee Long, 2011, unpublished).  *Animal reproductive biology*  The following key fauna complete critical phases of breeding at the site:   * fish spawning * nesting freshwater and marine turtles * nesting waterbirds (Kelly and Lee Long, 2011, unpublished). |

Animal reproductive productivity

|  |  |
| --- | --- |
|  | See Additional material 6.1.2. (iii). |

Vegetational productivity, pollination, regeneration processes, succession, role of fire, etc.

|  |  |
| --- | --- |
|  | N/A |

Notable species interactions, including grazing, predation, competition, diseases and pathogens

|  |  |
| --- | --- |
|  | N/A |

Notable aspects concerning animal and plant dispersal

|  |  |
| --- | --- |
|  | N/A |

Notable aspects concerning migration

|  |  |
| --- | --- |
|  | Shorebirds, turtles, fish decapods and estuarine crocodiles are some of the wetland species which migrate through, in or around the Ramsar site to complete their lifecycle. The migration ecology, migratory pathways and ecological networks all need to remain viable to ensure populations can visit Bowling Green Bay from elsewhere (Kelly and Lee Long, 2011, unpublished).  For migratory shorebirds, foraging and roosting habitat in the Ramsar site is essential during the stationary non-breeding period (approx. Nov-Mar), but also during migration to and from northern hemisphere breeding grounds. Access to a network of undisturbed roost sites and high-quality feeding areas is particularly important, shortly before, during, and shortly after migration when individuals face exceptionally high energetic demands. Additionally, Kingsford and Norman (2002) note that many tropical waterbird species in Australia exhibit local migrations including away from inundated floodplains during the wet season and to remnant refuge wetlands in the dry season.  Australia is party to bilateral agreements for migratory bird conservation with Japan, China and the Republic of Korea. Australia is also a member of the East Asian-Australasian Flyway Partnership and a signatory to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). |

Pressures and trends concerning any of the above, and/or concerning ecosystem integrity

|  |  |
| --- | --- |
|  | Loss of external habitat and hunting is severely threatening shorebird migration in other parts of the East Asian Australasian Flyway.  Shorebird populations face several threats, including habitat loss and degradation from sea level due to climate change, coastal development, human disturbance, predation and disturbance by domestic and feral animals, and the introduction of exotic plants to important nesting locations. Migratory shorebirds are particularly susceptible to disturbance and habitat degradation before, during, and after migration when their energy and food requirements are extremely high as they prepare for, undertake, or recover from long migration journeys (Colwell 2010). Non-migratory shorebirds, on the other hand, are highly sensitive to disturbance during the breeding season when caring for eggs and young.  Migratory shorebird declines are occurring despite relatively high levels of habitat protection in Australia (Dhanjal-Adams et al 2016), suggesting that factors outside Australia, including loss of intertidal habitats upon which they depend, are key contributors the decline (Lisson et al 2017; Clemens et al 2016; Studds et al. 2017). Many species use the East Asian-Australasian Flyway stop over at the Yellow Sea tidal mudflats in China, North Korea and South Korea to rest and refuel during migration. This threatened ecosystem has shrunk by more than 65 per cent in the past 50 years with much of the remainder impacted by pollution and degradation, such as algal blooms, discharge of heavy metals and pesticides, and spread of exotic plants. Of the nine migratory shorebird species studied by Studds et al. (2017), those with the greatest reliance on Yellow Sea stopover sites have shown the greatest population declines (Studds et al. 2017). Nonetheless, coastal development and human disturbance within Australia can cause declines in local abundance (Stigner et al. 2016), which could have important cumulative effects at the species level, highlighting the importance of habitat protection. |

How is the Site managed?

5.1 Land tenure and responsibilities (Managers)

5.1.1 Land tenure/ownership

Public ownership

|  |  |  |
| --- | --- | --- |
| **Category** | **Within the Ramsar Site** | **In the surrounding area** |
| Local authority, municipality, (sub)district, etc. | [ ] | [x] |
| Provincial/region/state government | [x] | [x] |
| National/Federal government | [ ] | [ X] |
| Public land (unspecified) | [x] | [ ] |
|  |  |  |

Private ownership

|  |  |  |
| --- | --- | --- |
| **Category** | **Within the Ramsar Site** | **In the surrounding area** |
| Commercial (company) | [ ] | [x] |
| Other types of private/individual owner(s) | [ ] | [x] |
|  |  |  |

Other

|  |  |  |
| --- | --- | --- |
| **Category** | **Within the Ramsar Site** | **In the surrounding area** |
|  |  |  |

Further information:

|  |  |
| --- | --- |
|  | The Queensland Government manages the terrestrial components of the site as part of the Bowling Green Bay National and Conservation Parks. The Queensland Government also manages the Great Barrier Reef Coast Marine Park component of the Ramsar site between mean high water springs and low water mark as per the Bowling Green Bay Ramsar site boundary description. The Great Barrier Reef Marine Park adjacent to the Ramsar site is managed by the Australian Government.    Activities such as sand extraction, hobby farming and rural residential occur on freehold land at Cape Cleveland outside the Ramsar site. The Australian Institute of Marine Science is situated on the Bowling Green Bay side of Cape Cleveland outside the Ramsar site. |

5.1.2 Management authority

|  |  |
| --- | --- |
|  | Queensland Department of Environment and Science – www.des.qld.gov.au  Queensland Department of Agriculture and Fisheries – www.daf.qld.gov.au |

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

|  |  |
| --- | --- |
|  | Manager, Wetlands Team, Queensland Department of Environment and Science |

Postal address:

|  |  |
| --- | --- |
|  | Queensland Department of Environment and Science  GPO Box 2454  Brisbane QLD 4001 |

E-mail address:

|  |  |
| --- | --- |
|  | info@des.qld.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** |
| Unspecified development | Low impact |  | [x] | No change | [x] | No change |

Water regulation

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Factors adversely affecting site** | **Actual threat** | **Potential threat** | **Within the site** | **Changes** | **In the surrounding area** | **Changes** |
| Canalisation and river regulation | Medium impact |  | [ ] | No change | [x] | No change |
| Water releases | Medium impact |  | [x] | No change | [x] | No change |
| Salinisation | Low impact |  | [x] | No change | [x] | No change |
| Water abstraction | Low impact |  | [ ] | No change | [x] | No change |

Agriculture and aquaculture

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Factors adversely affecting site** | **Actual threat** | **Potential threat** | **Within the site** | **Changes** | **In the surrounding area** | **Changes** |
| Marine and freshwater aquaculture |  | Low impact | [ ] | No change | [x] | No change |
| Annual and perennial non-timber crops | High impact |  | [ ] | No change | [x] | No change |
| Livestock farming and ranching | Low impact |  | [ ] | No change | [x] | No change |

Energy production and mining

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Factors adversely affecting site** | **Actual threat** | **Potential threat** | **Within the site** | **Changes** | **In the surrounding area** | **Changes** |
| Mining and quarrying | Medium impact |  | [ ] | No change | [x] | No change |

Transportation and service corridors

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Factors adversely affecting site** | **Actual threat** | **Potential threat** | **Within the site** | **Changes** | **In the surrounding area** | **Changes** |
| Utility and service lines (e.g., pipelines) | Low impact |  | [x] | No change | [x] | No change |
| Roads and railroads | Low impact |  | [x] | No change | [x] | No change |

Biological resource use

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Factors adversely affecting site** | **Actual threat** | **Potential threat** | **Within the site** | **Changes** | **In the surrounding area** | **Changes** |
| Fishing and harvesting aquatic resources | High impact |  | [x] | No change | [x] | No change |

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 | Medium impact |  | [x] | No change | [x] | No change |

Natural system modifications

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Factors adversely affecting site** | **Actual threat** | **Potential threat** | **Within the site** | **Changes** | **In the surrounding area** | **Changes** |
| Dams and water management/use | Medium impact |  | [ ] | No change | [x] | No change |
| Fire and fire suppression | Low impact |  | [x] | No change | [x] | No change |
| Unspecified/others | Medium impact |  | [x] | No change | [x] | No change |
| Vegetation clearance/ land conversion | Low impact |  | [ ] | No change | [x] | No change |

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 | Medium impact |  | [x] | No change | [x] | No change |

Pollution

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Factors adversely affecting site** | **Actual threat** | **Potential threat** | **Within the site** | **Changes** | **In the surrounding area** | **Changes** |
| Agricultural and forestry effluents | High impact |  | [x] | No change | [x] | No change |

Climate change and severe weather

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Factors adversely affecting site** | **Actual threat** | **Potential threat** | **Within the site** | **Changes** | **In the surrounding area** | **Changes** |
| Droughts | Medium impact |  | [x] | No change | [x] | No change |
| Storms and flooding | Medium impact |  | [x] | No change | [x] | No change |
| Temperature extremes | Low impact |  | [x] | No change | [x] | No change |
| Habitat shifting and alteration |  | Low impact | [x] | No change | [x] | No change |

Further information:

|  |  |
| --- | --- |
|  | **Threats within the site**  The majority of threats manifested at the Bowling Green Bay Ramsar site originate off site. The Burdekin Haughton Water Supply Scheme (BHWSS) and Lower Burdekin Water Board (LBWB) have significantly modified the hydrology of the Barratta and Haughton sub-basins draining into the site. Even though Maughan et. al., (2006) notes that many of the hydrological threats were present when the site was listed, other threats are more recent, such as the spread of hymenachne into the lower reaches (since 2008-2009 floods) and an increase in freshwater aquatic weeds. Other weeds have become less prevalent e.g. rubber vine and prickly acacia on the marine plain.    Within the site, habitat for shorebirds and important nesting sea turtles on sandy beaches; southern Bowling Green Bay and Cape Bowling Green Bay are vulnerable to erosion from severe storm events.    **Threats external to the site**  Extensive modification of land surrounding the site from agricultural activities has occurred with approximately 80,000 hectares under intensive irrigation. Sugar cane is the predominant crop and represents approximately one quarter of Australia’s sugar crop. Agriculture poses a number of potential threats to the ecological character of the area including impacts from altered hydrology such as disruption to landscape connectivity, reduced water quality and impacts from pest species. Instream structures and barriers to fish passage in the lower Burdekin can impact ecological functioning of aquatic habitats (Great Barrier Reef Marine Park 2013) affecting connectivity and fish life cycles. At the time of the site’s listing, many of these threats were already present. Since implementation of the Reef Water Quality Protection Plans (2003, 2009, and 2013) and more recently the Reef 2050 Water Quality Improvement Plan (2017-2022) there has been some improvement in agricultural practices in reef catchments. See Additional material 6.1.2. (iii) 5.2.  Queensland Government has been working with local irrigators to develop a coordinated response to mitigate risks associated with rising groundwater, part of which involves steps to improve irrigation practices. This is further aided by government funding which supports improvements in farming practices that capture run-off in the Lower Burdekin.  There are suggestions of a potential breach at the Bowling Green Bay sandspit. This matter is being investigated by the Queensland Government to determine whether sediment supply to the sandpit is being affected by natural or anthropogenic processes. The area at breach risk is outside of the Ramsar site at present time.  Climate change is likely to be a threat to the site in the future. As the global climate continues to warm, the region (Monsoonal North East) is projected to experience:  • an increase in average temperatures in all seasons  • more hot days and warm spells  • increased intensity of extreme rainfall events  • rising mean sea level, and the height of extreme sea-level events will also increase  • fewer but more intense tropical cyclones  Natural variability may mask or enhance any long-term human induced trend, particularly in the next 20 years and for rainfall. (CSIRO and Bureau of Meteorology n.d).  *International issues*  Migratory shorebirds and waterbirds are also at risk from external threats of habitat loss in east Asia. |

5.2.2 Legal conservation status

Global legal designations

|  |  |  |  |
| --- | --- | --- | --- |
| **Designation type** | **Name of area** | **Online information url** | **Overlap with Ramsar Site** |
|  |  |  |  |

Regional (international) legal designations

|  |  |  |  |
| --- | --- | --- | --- |
| **Designation type** | **Name of area** | **Online information url** | **Overlap with Ramsar Site** |
|  |  |  |  |

National legal designations

|  |  |  |  |
| --- | --- | --- | --- |
| **Designation type** | **Name of area** | **Online information url** | **Overlap with Ramsar Site** |
| Conservation Park | Bowling Green Bay Conservation Park | <https://parks.des.qld.gov.au/__data/assets/pdf_file/0032/167918/bowling-green-bay-rpms.pdf> | whole |
| Fish Habitat Area | Bowling Green Bay FHA - 007 | <https://parks.des.qld.gov.au/management/managed-areas/fha/area-plans/bowlinggreen>  <https://parks.des.qld.gov.au/__data/assets/pdf_file/0027/151983/bowlinggreen.pdf> | partly |
| Fish Habitat Area (Cleveland Bay) | Cleveland Bay FHA - 071 | <https://parks.des.qld.gov.au/management/managed-areas/fha/area-plans/cleveland>  <https://parks.des.qld.gov.au/__data/assets/pdf_file/0027/150777/cleveland.pdf> | partly |
| National Park | Bowling Green Bay National Park | <https://parks.des.qld.gov.au/__data/assets/pdf_file/0033/167964/bowling-green-bay-national-park-2000.pdf> | partly |
| State Marine Protected Area | The Great Barrier Reef Coast Marine Park | <https://www.qld.gov.au/environment/coasts-waterways/marine-parks/about/gbrc> | partly |

Non-statutory designations

|  |  |  |  |
| --- | --- | --- | --- |
| **Designation type** | **Name of area** | **Online information url** | **Overlap with Ramsar Site** |
| Important Bird Area | East Asian-Australasian Flyway Partnership site: Bowling Green Bay EAAF089 - Australia | <http://www.eaaflyway.net/about/the-flyway/flyway-site-network/bowling-green-bay-eaaf089-australia/> | partly |

5.2.3 IUCN protected areas categories (2008)

[ ] Ia Strict Nature Reserve

[ ] Ib Wilderness Area: protected area managed mainly for wilderness protection

[x] 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

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

5.2.4 Key conservation measures

Legal protection

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| --- | --- |
| **Measures** | **Status** |
| Legal protection | Implemented |

Habitat

|  |  |
| --- | --- |
| **Measures** | **Status** |
| Catchment management initiatives/controls | Implemented |
| Improvement of water quality | Implemented |
| Habitat manipulation/enhancement | Implemented |
| Faunal corridors/passage | Implemented |
| Re-vegetation | Implemented |
|  |  |

Species

|  |  |
| --- | --- |
| **Measures** | **Status** |
| Control of invasive alien plants | Implemented |
| Control of invasive alien animals | Implemented |
| Threatened/rare species management programmes | Implemented |

Human Activities

|  |  |
| --- | --- |
| **Measures** | **Status** |
| Management of water abstraction/takes | Implemented |
| Regulation/management of wastes | Implemented |
| Livestock management/exclusion (excluding fisheries) | Implemented |
| Fisheries management/regulation | Implemented |
| Harvest controls/poaching enforcement | Implemented |
| Regulation/management of recreational activities | Implemented |
| Communication, education, and participation and awareness activities | Implemented |
| Research | Implemented |

Other: (This field is limited to 3000 characters)

|  |  |
| --- | --- |
|  | In Australia, the ecological character of a Ramsar site is protected as a Matter of National Environmental Significance (MNES) under the Environment Protection and Biodiversity Conservation Act 1999. |

5.2.5 Management planning

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Link to site-specific plan or other relevant management plan:

|  |  |
| --- | --- |
|  | http://www.nprsr.qld.gov.au/managing/plans-strategies/pdf/bowling-green-bay-national-park-2000.pdf  <https://parks.des.qld.gov.au/__data/assets/pdf_file/0032/167918/bowling-green-bay-rpms.pdf> |

URL of site-related webpage (if relevant):

|  |  |
| --- | --- |
|  | <https://parks.des.qld.gov.au/parks/bowling-green-bay> |

5.2.6 Planning for restoration

Is there a site-specific restoration plan?

|  |  |
| --- | --- |
|  | There is no site specific restoration plan, however various restoration activities undertaken outside the site provide benefits to the site. Projects include:  • The NQ Dry Tropics led Reducing fine sediments by maintaining and restoring Burdekin stream banks and coastal wetlands project (2018 - 2022). This project works with community in the Lower Burdekin to reduce sediments and other pollutants flowing through the Ramsar site. Works focus on stream bank and wetland restoration.  • The NQ Dry Tropics led Connecting cane farmers to their local wetlands project (2016 - 2019). This pilot project aims to improve the quality of water flowing through the Ramsar site by increasing the uptake of improved practices.  • The NQ Dry Tropics led Systems Repair project (2013 - 2018).This project aims to improve ecological functioning of priority coastal wetlands by managing invasive species, biodiverse plantings and protecting and enhancing existing native vegetation.  • The NQ Dry Tropics led Landscape Resilience project (2014 - 2018). This project engages land managers to improve their knowledge and understanding of wetland functions and create linkages between individual practices and their impacts on wetlands downstream.  • Wongaloo-Bowling Green Bay Park rehabilitation and management  • Burdekin Shire Council – Aquatic Weed Control  • Environment Restoration Fund – this project (2019 - 2023) will focus on improving the condition and values of the Bowling Green Bay Ramsar Site through the removal and mitigation of threats, raising awareness of the wetland and the establishment of a robust monitoring program. The improvement to the condition and values of the Bowling Green Bay Ramsar site will also have benefits to fish passage and contribute to improving the health of the Great Barrier Reef World Heritage Area.  • Please also refer to the [Wetlands Project Search Tool](https://wetlandinfo.des.qld.gov.au/wetlands/resources/tools/wetland-project/) on Wetland*Info* for further information on various on-ground projects in the Burdekin region. |

5.2.7 Monitoring implemented or proposed

|  |  |
| --- | --- |
| **Monitoring** | **Status** |
| Water regime monitoring | Implemented |
| Water quality | Implemented |
| Birds | Implemented |

Please indicate other monitoring activities:

|  |  |
| --- | --- |
|  | Paddock to Reef Integrated Monitoring, Modelling & Reporting Program  Reef 2050 Water Quality Improvement Plan 2017-2022  Reef 2050 Long-Term Sustainability Plan  Creek to Coral Community Monitoring  Climate change resilience of threatened shorebirds in Queensland’s Ramsar Wetlands (granted 2020)  Natural Values Health Check (annual 2021 onwards)  Bowling Green Bay Pest Management Strategy (expiry 2025)  Environmental Flows Assessment Program (EFAP) (statewide)  Water Resource Plan (Burdekin Basin) 2007  Groundwater Ambient Network (GWAN) – Water quality (statewide)  Groundwater Water Level Network (statewide)  Long term Historical Trend Water Quality Monitoring Data (statewide)  Queensland wetland extent change mapping (statewide)  Surface water Monitoring Network (statewide) |

Additional material

6.1 Additional reports and documents

6.1.1 Bibliographical references

(This field is limited to 3000 characters)

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| --- | --- |
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1. [↑](#footnote-ref-1)
2. Percentage of the total biogeographic population at the site. These fields are only compulsory to justify criteria 6 & 9 [↑](#footnote-ref-2)
3. [↑](#footnote-ref-3)