Part A - Appendix B

Justification for the presence and contribution classifications for the locally expressed attributes of the OUV of the GBRWHA

Appendix B – Justification for the presence and contribution classification for the local expression of attributes of the OUV of the GBRWHA

This appendix has been prepared to be read in conjunction with the main report (Priority Port of Gladstone Master Planning Local expression of the OUV of the GBRWHA, Rev 3, 30 January 2017, Aurecon), and is not intended to be a standalone report.

Contents

1 Coral reefs

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 relating to coral reefs is summarised in Table 1.1, with respect to the local expression of the OUV of the GBRWHA for the PPG master planned area and surrounds.

Table 1.1 OUV of the GBRWHA: Coral reefs

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Fringing reefs	■ The GBRWHA forms the world's largest coral reef ecosystem, ranging from inshore fringing reefs to mid-shelf reefs, and exposed outer reefs, including examples of all stages of reef development ■ As the world's most complex expanse of coral reefs, the reefs contain some 400 species of corals in 60 genera ■ The reefal structures of the GBRWHA are one of few living structures visible from space ■ The globally significant diversity of reef morphologies in the GBRWHA reflects ongoing geomorphic, oceanographic and environmental processes	■ Species diversity, habitat value and natural beauty of the coral reefs in the GBRWHA are major contributors to the GBR's OUV as a world heritage area	■ Poor	■ Deteriorated	✓	✓	✓	✓
Inshore turbid reefs		■ Extent of coral cover is considered in the assessment of the overall health of coral reefs. Coral cover at inshore reefs of the GBRWHA is declining slighting	■ Poor	■ Deteriorated	-	✓	✓	✓
Coral species diversity and extent		■ GBR is the world's largest coral reef ecosystem, ranging over 14 degrees in latitude and comprising more than 2,900 separate coral reefs	■ Poor	■ Deteriorated	✓	✓	✓	✓

1.1 Fringing reefs

1.1.1 Presence of local attribute

Fringing reefs have a **minor presence** in the PPG master planned area and surrounds based on the following information:

- Fringing reefs are intertidal to subtidal reefs that grow along the mainland or around the margins of continental high islands (Smithers 2011). Fringing reefs on the GBR occur in three main coastal settings (Hopley et al. 2007):
  1. Attached to rocky headlands
  2. In embayments on continental high islands
  3. Adjacent to the beach base on usually linear stretches of sandy coast.
- Of the 2,904 named reefs identified by Hopley et al. (1989) in the Great Barrier Reef area, 758 are fringing reefs
- A wide range of reef habitat types are present within and surrounding the PPG master planned area, including fringing, platform and headland reefs, as well as rubble fields. Most reefs within this area can be classified as fringing reefs (BMT WBM 2009, DHI 2013).
- In a study by BMT WBM (2009), intertidal rocky shores were classified in the Port of Gladstone into three main types (ie fringing, platform and steep headland) on the basis of geomorphological characteristics and stated:

  > *Fringing Reefs – which are defined areas where the supralittoral and upper intertidal zone was predominantly comprised of unconsolidated soft sediment (mud, sand and gravel), and the mid to lower intertidal zone was comprised of reef, either massive/bedrock platform reef, boulder fields or rubble fields. Fringing reefs generally had few intertidal rock pools or lagoons. Most sites surrounding the small islands and fringing western shoreline of Curtis Island were classified as fringing reefs, with mangroves often dominating in areas with soft sediment.* (BMT WBM 2009)

- Mapping by GBRMPA (2009) (refer Figure 1.1) outlines 19 reefs mapped in the region by the Great Barrier Reef Gazetteer most of which are intertidal rocky shores or shallow subtidal reefs. Based on information sourced from various ecological studies undertaken around the PPG master planned areas and surrounds, the GBRMPA mapped reefs (and corresponding reef number) which can be described as fringing reefs include:
  - Turtle Island (23-085)
  - Manning Reef (23-062)
  - Bushy Island Reef (23-086)
  - Curtis Island Reef #3 (23-059D)
  - Pearl Ledge (Facing Island Reef #3) (23-061C)
  - Sable Chief Rocks (23-064)
  - East Point Ledge (Facing Island Reef #5) (23-061E)
  - Facing Island Reef #4 (23-061D)
  - Seal Rocks Reef #1 (23-067A)
  - Seal Rocks Reef #2 (23-067B)
  - Seal Rocks Reef #3 (23-067C)

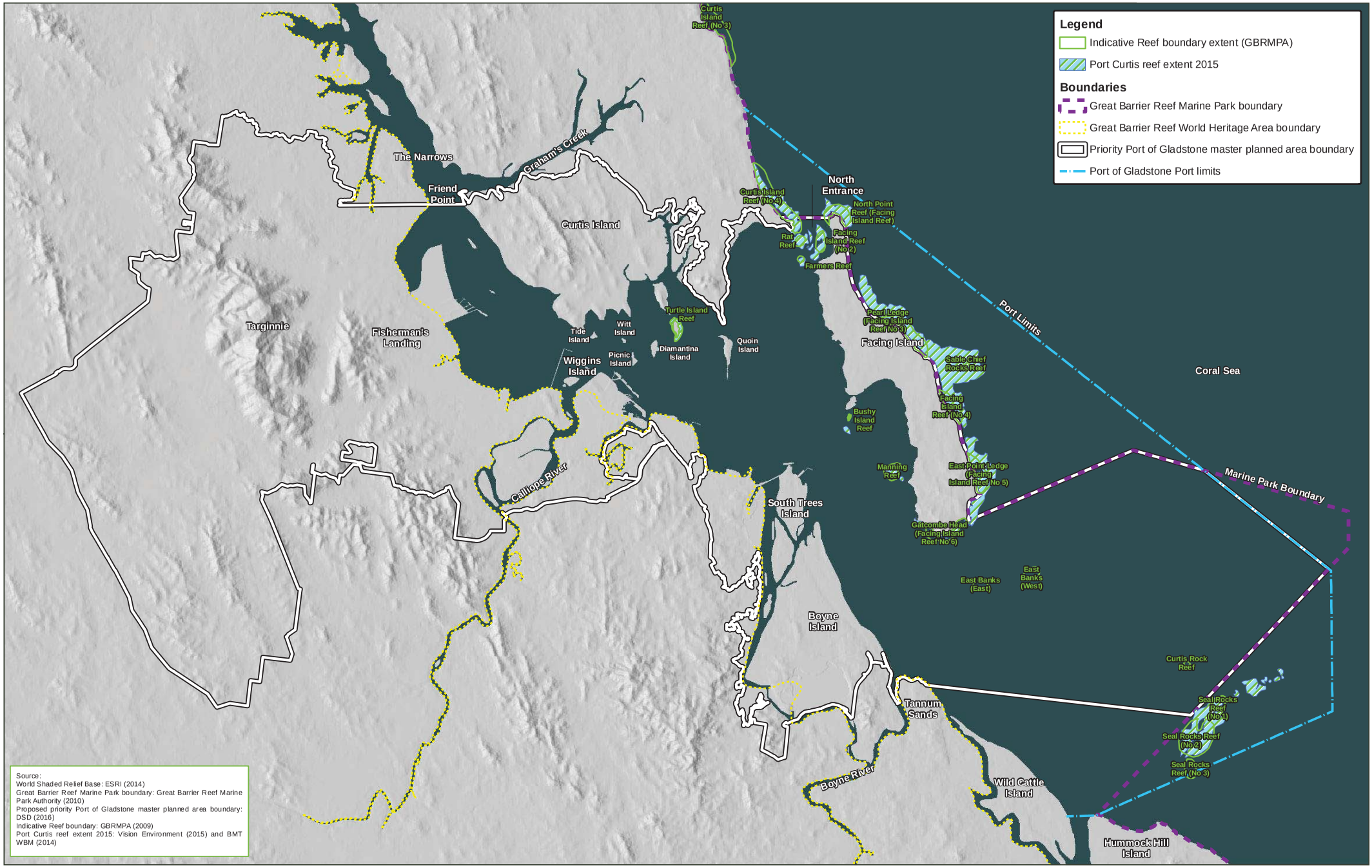

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Figure 1.1: Extent of Reefs

- It should be noted that GBRMPA (2009) mapping does not identify many of the smaller rocky outcroppings that occur within the Port of Gladstone and which are classified as fringing reefs, including Tide Island, Diamantina Island, Quoin Island, Witt Island and Picnic Island (BMT WBM 2009).
- While Facing Island Reef #6 (Gatcombe Head) is described as a 'steep headland reef' (BMT WBM 2009), the description of fringing reefs in the *Geological and geomorphological features of OUV in the GBRWHA* (Whiteway et al. 2014) would suggest that Gatcombe Head (23-061F) could also be described as a fringing reef within this region.
- Conversely most reefs in the North Passage sector were described as platform reefs by BMT WBM (2009)
- Several reef field surveys have recently been conducted in the region such as those undertaken to inform the GPC Biodiversity Offset Strategy (Jones et al. 2015), the Gladstone Health Harbour Partnership (GHHP) '*Development of coral indicators for the Gladstone Harbour Report 2015*' by the Australian Institute of Marine Science (AIMS), and baseline studies by Vision Environment for the GPC Channel Duplication environmental impact statement (EIS). Based on information recorded in these recent field surveys, the majority of fringing coral reef habitat occurs outside of the PPG master planned area boundary (refer Figure 1.1).

1.2 Contribution of the local attribute to the OUV of the GBRWHA

Fringing reefs have a **minor contribution** to criterion vii (aesthetic values and superlative natural phenomena), criterion viii (ongoing geological processes), criterion ix (ecological and biological processes) and to criterion x (biodiversity conservation) of the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

- Fringing reefs are not specifically listed under Commonwealth or state legislation

Local or regional attribute status

- Fringing reefs are not specifically listed under local or regional legislative mechanisms

Notable or iconic attribute value

- Reefs in the region appear to be typical of inshore reefs in the southern GBR region (Ayling et al. 2013)
- More notable examples of fringing reefs occur within the GBRWHA (eg Cairns and the Whitsunday Coast)

Notable or iconic attribute value

- Reefs in the region appear to be typical of inshore reefs in the southern GBR region (Ayling et al. 2013) with coral cover in the Port of Gladstone is consistent with patterns observed at other fringing reefs in the broader region such as Shoalwater Bay, Percy Islands, and Prudhoe Island (BMT WBM 2013)
- More notable examples of fringing reefs are present in the GBRWHA (eg mainland fringing reefs present north of Cairns and along the Whitsunday Coast)

Condition/trend of the attribute

- Reefs within the region have been affected by flood waters and extreme events in recent years (eg 2011 and 2013), with lowered salinities and high turbidity likely to be a major driver in the reduction of coral cover at reef sites (BMT WBM 2014)
- The coral communities in the mid and outer harbour reporting zones were reported as 'very poor' condition when surveyed in 2014 (Thompson, Costello and Davidson 2015)

- Recent analysis of long term datasets shows hard coral cover has significantly declined in the GBR region over the past 30 years up to 2012 (GBRMPA 2014a)
- Recent declines in coral cover are largely the result of a combination of cyclones, crown-of-thorns starfish outbreaks, mass bleaching events, poor water quality from catchments and associated impacts from climate change
- Reef scientists suggest that the long term prospects of all fringing and nearshore reefs on the GBR are poor, as they are subject to a wide range of anthropogenic and natural impacts (Smithers, Hopley and Parnell 2006).

Contribution to attribute sustainability

- Based on bathymetric charts and available remotely sensed imagery it is estimated that there are approximately 900 inshore reefs (Hopley et al. 2007), including both fringing reefs, and nearshore reefs and shoals (ie areas of shallow water, such as those associated with ridges or sandbanks). Of the 2,904 named reefs identified by Hopley et al. (1989), 758 are fringing reefs in the GBR.
- Inshore reef growth in the southern GBR is generally poor, except around the Keppel Islands (Smithers, Hopley and Parnell 2006)

Notable presence of the attribute

- More notable examples of fringing reefs are present in the GBRWHA (eg mainland fringing reefs present north of Cairns and along the Whitsunday Coast)

Significance of attribute to the preservation of the GBRWHA

- The loss of fringing reefs in the PPG master planned area and surrounds would impact the local ecosystem and likely impact other OUV attributes in the area (eg fish species and marine turtles). It is not, however, expected that this would result in the significant decline in the OUV of the GBRWHA.

1.3 Inshore turbid reefs

1.3.1 Presence of local attribute

Inshore turbid reefs have a **minor presence** in the PPG master planned area and surrounds based on the following information:

- Inshore turbid zone reefs include both shore attached (fringing reefs in locations close to the mainland) and non-shore attached shoals (Whiteway et al. 2014). These reefs '*develop under the influence of sediments derived from the mainland or islands, either directly where high levels of terrigenoclastic sediment accumulation or sediment flux occur, or indirectly where turbidity is high because fine-grained sediments are continuously or episodically in suspension'* (Whiteway et al. 2014).
- Several subtidal communities, including reef communities within the Port of Gladstone exist within naturally (and anthropogenically affected) high ambient turbidity conditions and light-limited environments (BMT WBM 2013)
- Recent reef surveys were undertaken in the region to inform the GPC Biodiversity Offset Strategy (Jones et al. 2015) and for the GHHP ('Development of coral indicators for the Gladstone Harbour Report 2015') by the AIMS (Thompson, Costello and Davison 2015).
- Surveys reported in Thompson, Costello and Davison (2015) which recorded inshore turbid reef locations such as Quoin Island, Turtle Island and Diamantina Island (refer Figure 1.1) as containing limited hard substrate and primarily made up of broken rock and occasional small dead coral colonies colonised by a mixed community of macroalgae and small heterotrophic soft corals (Thompson, Costello and Davison 2015).

- Jones et al. (2015) describes reefs west of Quoin Island (eg Turtle Island Reef) as turbid nearshore reefs with low to no living hard coral cover, except for the occasional small Turbinaria colony (Jones et al. 2015)

1.3.2 Contribution of the local attribute to the OUV of the GBRWHA

Inshore turbid reefs have a **minor contribution** to criterion viii (ongoing geological processes), criterion ix (ecological and biological processes) and to criterion x (biodiversity conservation) of the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

- Inshore turbid reefs are not specifically listed under Commonwealth or state legislation

Local or regional attribute status

- Inshore turbid reefs are not specifically listed under local or regional legislative mechanisms

Notable or iconic attribute value

- Reefs in the region appear to be typical of inshore reefs in the southern GBR region (Ayling et al. 2013)
- More notable examples of inshore turbid reefs occur within the GBRWHA (eg Paluma Shoals, Halifax Bay) (Browne, Smithers and Perry 2012)

Condition/trend of the attribute

- Ecological studies suggest that turbid zone reefs are more vulnerable to reef degradation than their clear-water mid- and outer-shelf reef counterparts (Cooper and Fabricius 2007, Fabricius et al. 2007, Fabricius et al. 2008).
- While nearshore reefs are poorly represented in the literature, nearshore shoals represent an important reef type and many have high coral cover (>30%) (Browne et al. 2012)

Contribution to attribute sustainability

- Based on bathymetric charts and available remotely sensed imagery it is estimated that there are approximately 900 inshore reefs (Hopley et al. 2007), including both fringing reefs, and nearshore reefs and shoals, representing approximately a third of the reefs on the GBR
- Inshore turbid reefs in the PPG master planned area and surrounds represent a relatively insignificant area in relation to the GBRWHA

Notable presence of the attribute

- More notable examples of inshore turbid reefs are present in the GBRWHA (eg Paluma Shoals, Halifax Bay) (Browne, Smithers and Perry 2012)

Significance of attribute to the preservation of the GBRWHA

- The loss of inshore turbid reefs in the PPG master planned area and surrounds would impact the local ecosystem and likely impact other OUV attributes in the area (eg fish species and marine turtles). It is not, however, expected that this would result in the significant decline in the OUV of the GBRWHA.

1.4 Coral species diversity and extent

1.4.1 Presence of local attribute

Coral species diversity and extent have a **minor presence** in the PPG master planned area and surrounds based on the following information:

- When compared to reefs in the northern GBR, or at mid-shelf or outer-shelf areas, reefs in this region are generally lower in coral species richness, and tend to be made up of corals along with other benthic organisms (eg algae, sponges) growing on rocks or boulders (Ayling et al. 2012, GBRMPA 2007, DeVantier et al. 2006).
- Several desktop and field surveys in the PPG master planned area and surrounds have recorded coral species that are typical of fringing and inshore turbid coral reefs on the southern inshore GBR
- Coral taxa that are tolerant or semi-tolerant to turbid conditions such as faviids, Turbinaria, poritids, Acropora and soft corals are commonly represented in reefs with the PPG master planned area and surrounds
- Inshore reefs on the GBR such as those in the PPG master planned area and surrounds regularly experience high nutrient concentrations and turbidity can often be dominated by macroalgal communities, which grow in place of corals that have died, or out-compete corals for space on reefs (McCook et al. 2001)
- Mapping by GBRMPA (2009) and recent field surveys (refer Figure 1.1) illustrates that the coral reef areas of the PPG master planned area and surrounds are not extensive.

1.4.2 Contribution of the local attribute to the OUV of the GBRWHA

Coral species diversity and extent have a **minor contribution** to criterion vii (aesthetic values and superlative natural phenomena), criterion viii (ongoing geological processes), criterion ix (ecological and biological processes) and to criterion x (biodiversity conservation) of the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

- This attribute is not specifically listed under Commonwealth or state legislation

Local or regional attribute status

- This attribute is not specifically listed under local or regional legislative mechanisms

Notable or iconic attribute value

- Reefs in the region appear to be typical of inshore reefs in the southern GBR region (Ayling et al. 2013)
- When compared to reefs in the northern GBR, or at mid-shelf or outer-shelf areas, reefs in this region are generally lower in coral species richness

Condition/trend of the attribute

- Reefs within the region have been affected by flood waters and extreme events in recent years (eg 2011 and 2013), with lowered salinities and high turbidity likely to be a major driver in the reduction of coral cover at reef sites (BMT WBM 2014). This has lead to a reduction in coral species richness.
- Recent analysis of long term datasets shows hard coral cover has significantly declined in the great barrier reef region over the past 30 years up to 2012 (GBRMPA 2014a)
- Reef scientists suggest that the long term prospects of all fringing and nearshore reefs on the GBR are poor, as they are subject to a wide range of anthropogenic and natural impacts (Smithers, Hopley and Parnell 2006).

Contribution to attribute sustainability

- Coral species in the PPG master planned area and surrounds represent a relatively insignificant area in relation to the GBRWHA
- The species diversity of reefs in this region are generally limited to those coral taxa that are tolerant or semi-tolerant to turbid conditions such as faviids, Turbinaria, poritids, Acropora and soft corals. As such they contribute little to species diversity over the whole GBRWHA.

Significance of attribute to the preservation of the GBRWHA

- The loss of coral diversity and extent in the PPG master planned area and surrounds would impact the local ecosystem and likely impact other OUV attributes in the area (eg fish species). It is not, however, expected that this would result in the significant decline in the OUV of the GBRWHA.

2 Marine water quality

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 relating to marine water quality is summarised in Table 2.1, with respect to the local expression of the OUV of the GBRWHA for the PPG master planned area and surrounds.

Table 2.1 OUV of the GBRWHA: Marine water quality

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Marine water quality	■ Water quality is a key matter for the management of the OUV of the GBRWHA	■ Physical and chemical processes (including factors which influence water quality) contribute to the health of the GBRWHA and are important attributes which contribute to the OUV of the GBRWHA	■ Good (Physical processes [including sedimentation]) ■ Poor (Chemical processes [including nutrient cycling])	■ Deteriorated (Physical processes [including sedimentation]) ■ Deteriorated (Chemical processes [including nutrient cycling])	-	-	✓	✓

2.1 Presence of local attribute

Marine water quality has a **significant** presence within the PPG master planned area and surrounds based on the following information:

- The Port of Gladstone has three naturally formed connections with the ocean, including The Narrows, the North Entrance between Curtis Island and Facing Island, and the South Channel between Facing Island and Boyne Island (BMT WBM 2014). Previous hydrodynamic studies undertaken in the area describe Port of Gladstone as having an estimated flushing time with the ocean of 19 days (Herzfeld et al. 2004).
- Water types of the Port of Gladstone have been defined based on the long term monitoring of water quality parameters within the area and in accordance with the Australian Water Quality Guidelines (AWQG) (ANZECC/ARMCANZ 2000) and the Queensland Water Quality Guidelines (QWQG) (EHP 2009). Marine and estuarine water types are described in the *Environmental Protection (Water) Policy 2009* (EPP (Water)) and supporting documentation and include the following types within and surrounding the PPG master planned area (refer Figure 2.1):
  - Enclosed coastal waters and lower estuary
  - Open coastal waters
  - Middle estuary
- Figure 2.1 also shows areas mapped as ‘excluded water types’ and ‘marinas, boat harbours or constructed estuaries’, these areas have been excluded from this assessment as they have been modified (eg construction of facilities, reclamation areas, constructed dams) and are not considered to contribute towards the natural heritage criteria of the OUV of the GBRWHA.

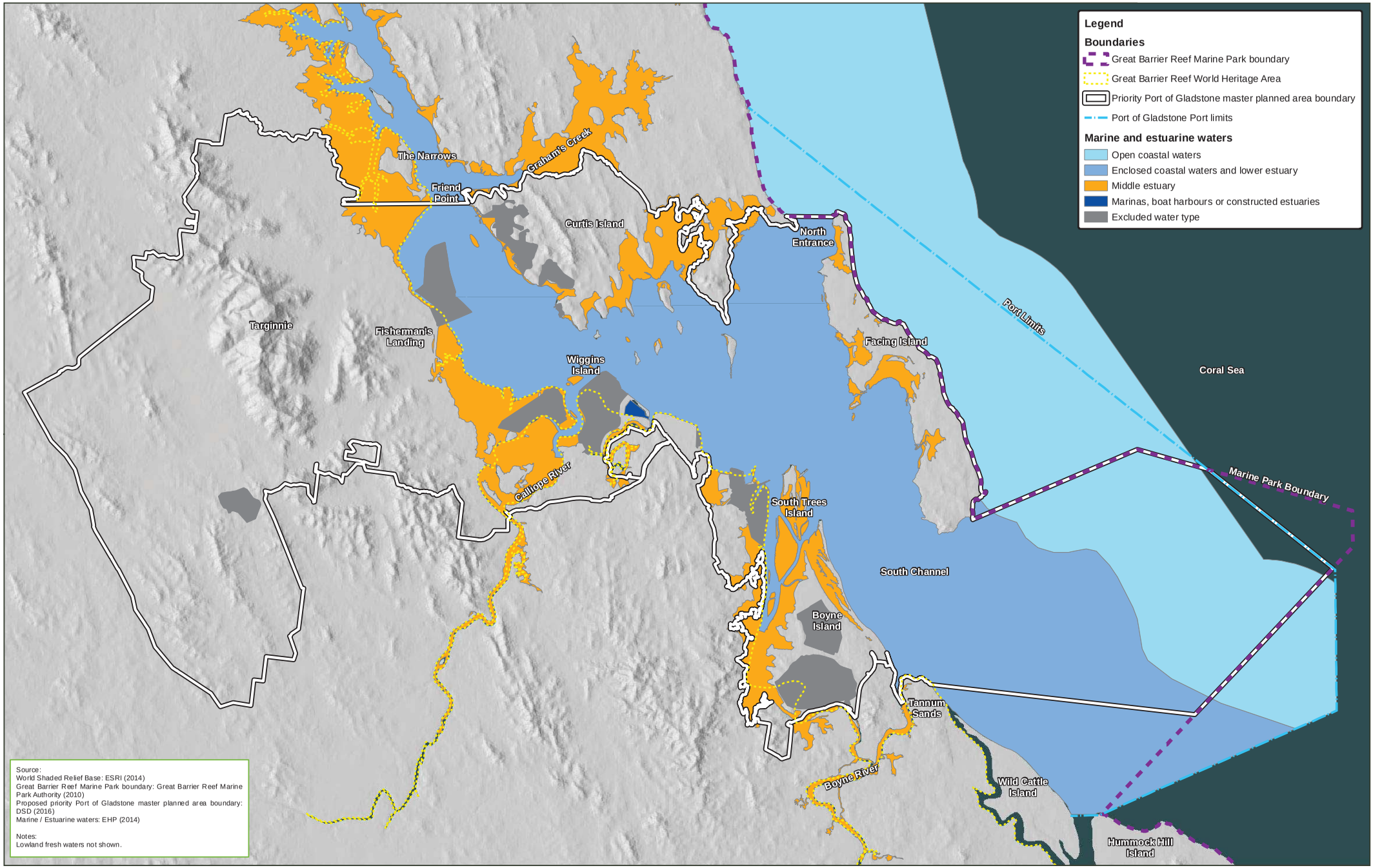

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Figure 2.1: Marine and estuarine water types

- The boundaries of different water types have been mapped using a variety of attributes such as: geographic coordinates; catchment or subcatchment boundaries; highest/lowest astronomical tide; tidal limiting structure (weirs); maritime mapping conventions; coastline; surveyed terrestrial boundaries; altitude and boundaries based on technical investigations.

2.2 Contribution of the local attribute to the OUV of the GBRWHA

The attribute 'marine water quality' has a **moderate contribution** to criterion ix (ecological and biological processes) and to criterion x (biodiversity conservation) of the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

- Queensland waters are protected under the EPP (Water), which is subordinate legislation under the *Environmental Protection Act 1994*
- GBR Marine Park zoning in waters to the north, east and south of the PPG master planned area includes 'general use zone', 'habitat protection zone', 'marine national park zone' and 'conservation park zone'

Local or regional attribute status

- No local or regional legislative mechanisms are afforded to the marine waters within and surrounding the PPG master planned area

Notable or iconic attribute value

- The marine water quality of the PPG master planned area and surrounds is not specifically recognised as a prime example of this attribute in the GBRWHA

Condition/trend of the attribute

- The Great Barrier Reef Outlook Report 2014 states that 'declining marine water quality, influenced by land-based run-off, is recognised as one of the most significant threats to the long-term health and resilience of the Great Barrier Reef' (GBRMPA 2014a)
- In accordance with the AWQG and the QWQG the EPP (Water) describes the marine and estuarine waters of the PPG master planned area and surrounds in terms of management intent/level of protection as 'moderately disturbed' apart from open coastal waters which are 'slightly to moderately disturbed', and The Narrows which are 'high ecological value' (EHP 2014).
- The independent review of the Port of Gladstone states 'continued management of the port as a slightly to moderately disturbed ecosystem (i.e. using the 95 per cent trigger level as per current practice) is consistent with maintaining the OUV of the GBRWHA expressed in the port' (Commonwealth of Australia 2013).

Contribution to attribute sustainability

- The local presence of the attribute contributes to the ongoing sustainability of the attribute more broadly but it is recognised that the waters of the PPG master planned area and surrounds form part of an existing operational port and not a pristine marine water area of high conservation value

Notable presence of the attribute

- More notable, iconic and pristine examples of marine water quality occur in other areas of the GBRWHA (eg Cairns and north to Cape York Peninsula, where the GBRWHA is exposed to fewer freshwater events which can contain pollutants from catchment areas (GBRWHA 2014)).

Significance of attribute to the preservation of the GBRWHA

- Marine water quality is an attribute which underpins the presence of several other OUV attributes in the region. As described in the Independent Review of the Port of Gladstone:

'*The water column is the crucial nurturing and linking habitat within marine ecosystems and between terrestrial and marine ecosystems. Inshore waters are a particularly important marine habitat because natural runoff from the land brings nutrients and trace elements that are essential for productivity of phytoplankton in the water column and of algae, seagrasses and corals attached to the seabed. The primary productivity of phytoplankton in the illuminated upper layers of the water column provides the basis of most marine food chains, feeding microscopic planktonic animals in a complex food web with many links to fish and top predators.'*

'Water quality and the extent, condition and associated communities of seabed habitat for seagrasses and intertidal and subtidal habitat of mangroves are critical marine habitat matters within and beyond the Port of Gladstone. The sheltered inshore waters that sustain seabed and mangrove habitats are important breeding and nursery feeding areas and provide linkages between inshore nursery areas and offshore populations of some fish and invertebrates.'

'Property-wide, the water column is important in terms of impacts from land and nearshore activity on offshore water quality whether these are chronic operational activities (including maintenance dredging and catchment runoff), catastrophic events resulting from accident or incompetence, or occasional severe weather-related events.' (Commonwealth of Australia 2013).

- A significant decline in water quality locally could result in potential impacts to the local expression of other OUV attributes in the region, including (but not limited to):
  - Coral reefs
  - Fish species, diversity and habitat
  - Marine megafauna species habitat
  - Marine turtle habitat
  - Seabird foraging habitat and migratory shorebird habitat
  - Seagrass and macroalgae
  - *Halimeda* algae beds
  - Total species diversity
- Due to the importance of marine water quality to the local expression of other attributes that contribute to the OUV of the GBRWHA, and that water quality is an identified as a management priority for the GBRWHA, the marine water quality attribute is considered to have a moderate contribution to the OUV of the GBRWHA.

3 Fish

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 relating to fish is summarised in Table 3.1, with respect to the local expression of the OUV of the GBRWHA for the PPG master planned area and surrounds.

Table 3.1 OUV of the GBRWHA: Fish

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Fish species and diversity	■ Beneath the ocean surface, there is an abundance and diversity of shapes, sizes and colours; including thousands of species of reef fish which provide a myriad of brilliant colours, shapes and sizes ■ Superlative natural phenomena include significant spawning aggregations of many fish species	■ 1,625 bony fish species have been recorded in the GBR	■ Good (bony fishes)	■ Deteriorated (bony fishes)	✓	-	✓	✓

3.1 Presence of local attribute

Fish have a **minor presence** in the PPG master planned area and surrounds based on the following information:

- Approximately 1,600 species of bony fish have been recorded within the GBR region (GBRMPA 2014a)
- Fish surveys conducted in the PPG master planned area and surrounds have recorded 88 species of estuarine and coastal fish from 2,994 individuals (Currie and Connelly 2004) and 59 species of reef fish from 6,037 individuals (Vision Environment 2015), representing 147 species in total

- Bony fish species which are considered to be vulnerable to threats within the GBRWHA include Blue threadfin salmon (*Eleutheronema tetradactylum*), King threadfin salmon (*Polydactylus macrochir*), Grey mackerel (*Scomberomorus semifasciatus*) and Sawfish (including Freshwater sawfish [*Pristis pristis*], Dwarf sawfish [*Pristis clavata*], Green sawfish [*Pristis zijsron*] and Narrow sawfish [*Anoxypristis cuspidate*]) (GBRMPA 2014b)
- In 2009 to 2010, the total harvest of Threadfin salmon in the GBRWHA was approximately 248 tonnes (GBRMPA 2014a). The annual average harvest of Threadfin salmon for the PPG master planned area and surrounds was approximately 20 tonnes (based on approximately 184 tonnes of Threadfin salmon subject to commercial harvest between 2005 to 2014 for the QFish 'S30' Commercial Fishery 30 minute reporting grid, which encompasses the PPG master planned area and surrounds) (DAF 2015).
- The total harvest of Grey mackerel within the GBRWHA between 2003 and 2008 was 297 tonnes, representing an average annual harvest of approximately 60 tonnes (GBRMPA 2014a). The annual average harvest of Mackerel for the PPG master planned area and surrounds was approximately 36 tonnes (based on approximately 325 tonnes of Mackerel subject to commercial harvest between 2005 to 2014 for the QFish 'S30' Commercial Fishery 30 minute reporting grid, which encompasses the PPG master planned area and surrounds) (DAF 2015).
- There is no quantitative data available on the GBRWHA or global population size of sawfish species however it is understood that population numbers have declined drastically along the east coast of Australia (GBRMPA 2014b)
- Declared Fish Habitat Areas (FHAs) and waterways providing for fish passage (showing connection to the FHAs, and the potential for fish movements throughout the PPG master planned area and surrounds) within the PPG master planned area and surrounds are illustrated in Figure 3.1.

3.2 Contribution of the local attribute to the OUV of the GBRWHA

Fish species and diversity is considered to have a **minor contribution** to criterion vii (aesthetic values and superlative natural phenomena), ix (ecological and biological processes) and x (biodiversity conservation) the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

- Conservation significant and migratory fish species which have the potential to occur within the PPG master planned area and surrounds (based on database searches, refer Appendix C) include the following species:
  - Dwarf sawfish (*Pristis clavata*): vulnerable (EPBC Act), listed migratory (EPBC Act [Bonn convention]), listed marine (EPBC Act), listed as endangered at a global scale by the IUCN
  - Freshwater sawfish (*Pristis pristis*): vulnerable (EPBC Act), listed migratory (EPBC Act [Bonn convention]), listed marine (EPBC Act), listed as critically endangered at a global scale by the IUCN
  - Green sawfish (*Pristis zijsron*): vulnerable (EPBC Act), listed migratory (EPBC Act [Bonn convention]), listed marine (EPBC Act), listed as critically endangered at a global scale by the IUCN
  - Narrow sawfish (*Anoxypristis cuspidate*): Listed migratory (EPBC Act [Bonn convention]), listed as endangered at a global scale by the IUCN
- The PPG master planned area and surrounds are not listed as an area of habitat critical to the survival of threatened fish species, as per applicable recovery plans or conservation advice statements available
- The PPG master planned area and surrounds provides potential habitat for EPBC Act listed marine species (ie species of pipefish and seahorse)

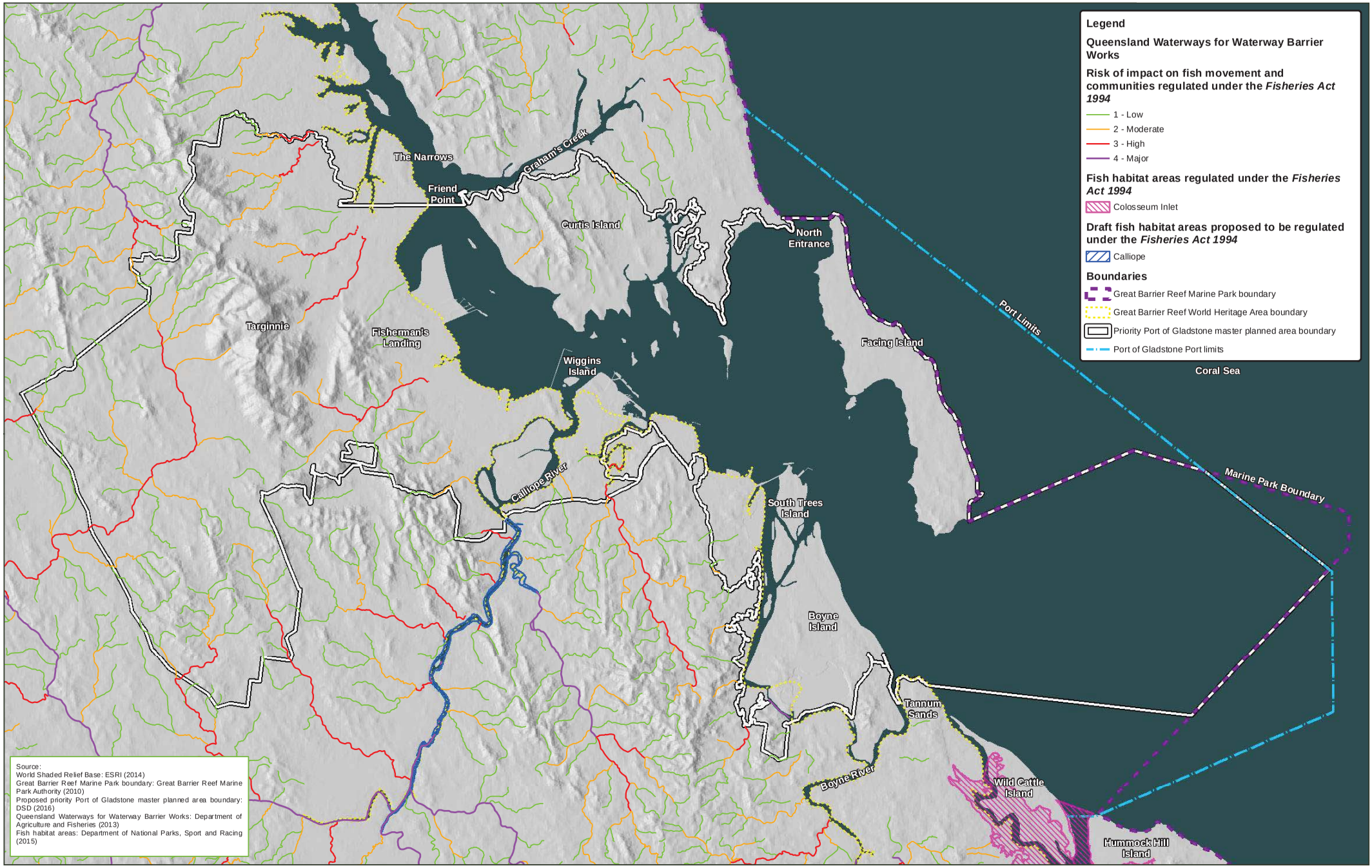

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Figure 3.1: Fish habitat areas and waterways providing for fish passage

Local or regional attribute status

- Declared FHA present within the PPG master planned area and surrounds include the Colosseum Inlet FHA and the proposed Calliope River FHA (refer Figure 3.1).
- All sawfish species are listed as 'no-take species' under the *Fisheries Regulation 2008* (Qld)
- Fish species are protected within the GBR Marine Park (GBRMP) through permit requirements and activity restrictions in zoned areas of the GBRMP. GBRMP zoning surrounding the PPG master planned area includes 'general use zone', 'habitat protection zone', 'marine national park zone' and 'conservation park zone'

Notable or iconic attribute value

- Fish species assemblages in the PPG master planned area and surrounds are not specifically recognised as a prime example or value of the region in key publications (ie retrospective statement of OUV, Outlook Report 2014, Lucas et al. 1997)

Condition/trend of the attribute

- The Great Barrier Reef Outlook Report 2014 (GBRMPA 2014a) records the attribute conditions in the wider GBR to be good for bony fishes. The attribute condition trend in the wider GBR was recorded as deteriorated for bony fishes.

Contribution to attribute sustainability

- Diversity of available habitat contributes to the diversity of fish species (Lucas et al. 1997). The PPG master planned area and surrounds provide habitat for juvenile, sub-adult and adult fish species in the form of nursery grounds and food sources. Habitat areas within the PPG master planned area and surrounds are associated with coral reefs, seagrass meadows, mangrove communities, hard and soft benthic substrates, beach habitats, estuaries, creeks and rivers. Habitat areas for fish species within the PPG master planned area and surrounds are not considered to be unique to the area and are available throughout the GBRWHA.
- Currie and Connelly (2004) identified 147 species of fish within the PPG master planned area and surrounds, representing approximately 9% of the known fish species diversity within the GBRWHA. The PPG master planned area is not considered to represent a large portion of the known fish diversity of the GBRWHA.
- The PPG master planned area and surrounds is not considered likely to have a significant contribution to the Blue threadfin salmon, King threadfin salmon or Grey mackerel, vulnerable fish species within the GBRWHA. Based on commercial fisher harvest data (note with data comparisons made between varying sources and assessment periods), approximately 8% and 20% of the annual catch data for the Threadfin salmon and Mackerel, respectively is sourced from the PPG master planned area and surrounds when compared to the GBRWHA. Note that the approximate estimate of 20% of Mackerel provides a conservative estimate for the Grey mackerel, as the data set contains a variety of Mackerel species

Notable presence of the attribute

- Fish are mobile species with the potential to travel large distances. The fish species present within the PPG master planned area and surrounds are not considered to be unique to the PPG master planned area and surrounds

Significance of attribute to the preservation of the GBRWHA

- The loss of fish habitat areas within the PPG master planned area and surrounds (ie coral reefs, seagrass meadows and mangrove communities) has the potential to have an impact on the species diversity of local fish populations. It is not, however, expected that this would result in the significant decline in the OUV of the GBRWHA.

4 Marine megafauna

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 relating to marine megafauna is summarised in Table 4.1, with respect to the local expression of the OUV of the GBRWHA for the PPG master planned area and surrounds.

Table 4.1 OUV of the GBRWHA: Marine megafauna

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Dugong	■ The GBRWHA provides major feeding grounds for one of the world's largest populations of the threatened Dugong	■ The GBR Dugong population is recognised as contributing to the region's OUV ■ The GBR is home to a globally significant population of dugongs and provides essential habitat and connectivity between populations in the Torres Strait and the waters off south-east Queensland	Poor	Deteriorated	-	-	-	✓
Species of whales	■ At least 30 species of whales and dolphins occur in the GBRWHA	■ Approximately 15 species of whales inhabit the GBR	Good	Improved	-	-	-	✓
Migrating whales	■ The GBRWHA is a significant area for Humpback whale calving	■ Migrating whales are a contributing attribute to the superlative natural phenomena of the GBR	-	-	✓	-	-	-

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Species of dolphins	▪ At least 30 species of whales and dolphins occur in the GBRWHA	▪ Approximately 18 species of dolphins inhabit the GBR ▪ The Australian snubfin dolphin and the Australian humpback dolphin are considered the highest priority dolphin species for management in the GBR region because of their small, localised populations, exposure to high levels of human activity, and suspected population declines	Good	Deteriorated	✓	-	-	✓

4.1 Dugong

4.1.1 Presence of local attribute

Dugong have a **minor presence** in the PPG master planned area and surrounds based on the following information:

- The seagrass meadows within the PPG master planned area and surrounds provide important connectivity habitat between larger Dugong habitat areas at Shoalwater Bay to the north and Hervey Bay to the south (Sobtzick et al. 2013). The seagrass meadows within the PPG master planned area and surrounds are the only known major areas of seagrass between Shoalwater Bay and Hervey Bay (Blair 2012, Sheppard et al. 2006, Sobtzick et al. 2013).
- The density of Dugong within the PPG master planned area and surrounds has been mapped based on the results of aerial surveys and is shown in Figure 4.1 (relative dugong density based on aerial surveys from 1986 to 2005 conducted by James Cook University, modelled by Grech et al. 2011, as cited in Sobtzick et al. 2013).
- As shown in Figure 4.1, the modelling of relative Dugong density (Grech et al. 2011) indicates that the PPG master planned area and surrounds support a range of low (0 Dugongs per km^2), medium (0.0015 - 0.25 Dugongs per km^2) and high (0.25 - 0.5 Dugongs per km^2) dugong density areas based on aerial surveys from 1986 to 2005.
- Based on the review of dugong density modelling by Grech et al. (2011), Sobtzick et al. (2013) estimates that the Gladstone region supports a Dugong population in the low hundreds at most
- The PPG master planned area and surrounds support a relatively small Dugong population, although the area is considered to be regionally significant to the south Queensland Dugong population. The Port of Gladstone area located between Rodds Bay and The Narrows was declared a Dugong Protection Area Zone B (restricted use) in 1997 to recognise the importance of the seagrass habitats available for Dugong populations (Sobtzick et al. 2013).

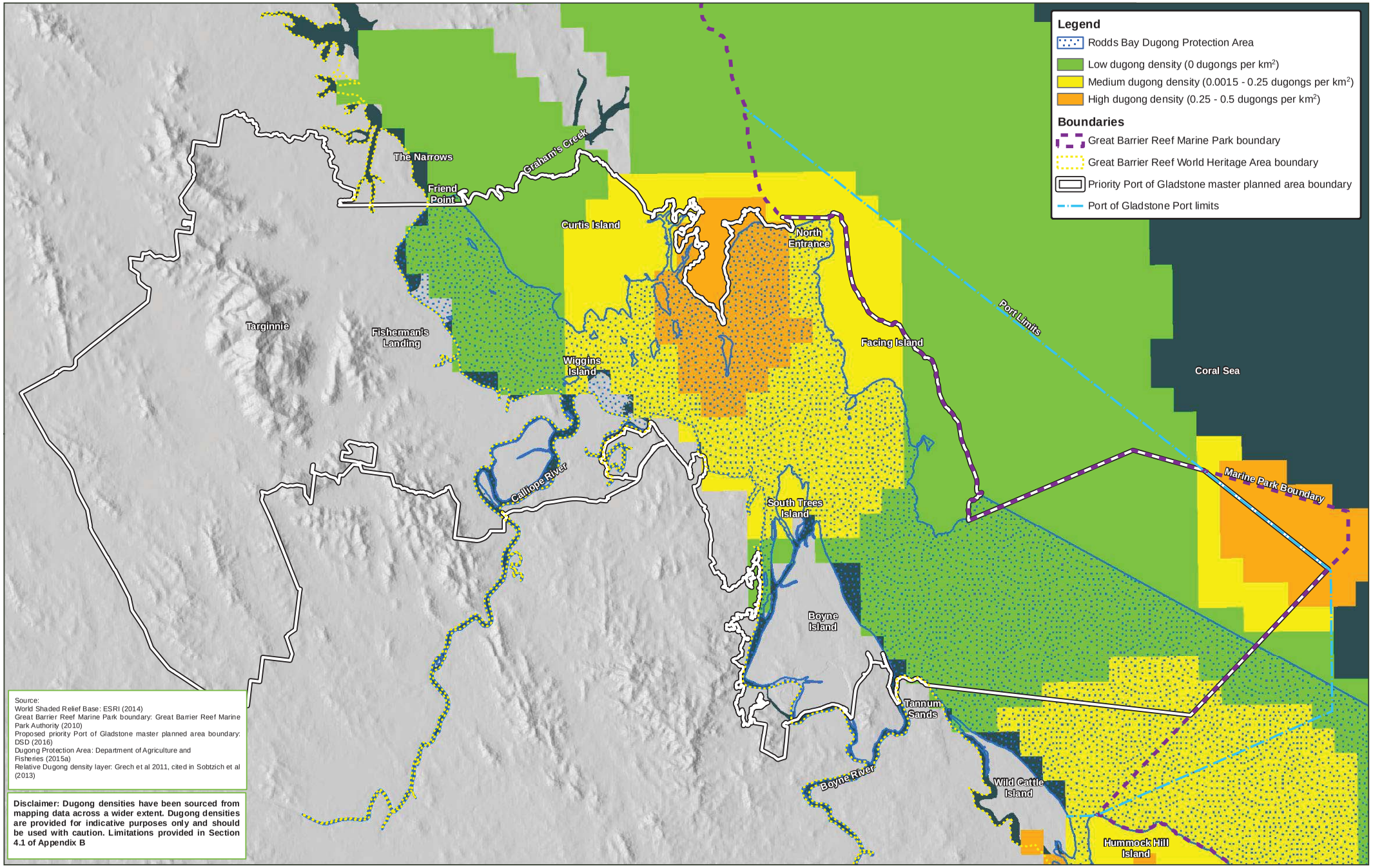

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Figure 4.1: Rodds Bay Dugong Protection Area and relative Dugong density based on aerial surveys (1986 to 2005)

- It is acknowledged that there are limitations to the Dugong density data (as per Sobtzick et al. 2013) that is to be considered in assessing the presence and contribution of the local attribute:
  - Dugong density data presented in Figure 4.1 has been sourced from mapping data across a broader extent than the PPG master planned area. Dugong density data is provided for indicative purposes only, and should be interpreted in consideration of these limitations.
  - The modelling conducted by Grech et al. (2011) illustrates Dugong density data occurring over land, however this is an artefact of the broad-scale nature of the data set. Dugong density should only be interpreted for marine environments.
  - Population size estimates are confounded by large scale animal movements (ie hundreds of kilometres in a few days) (Sobtzick et al. 2013), and as such, aerial surveys are consequently not designed to investigate relative abundance at local spatial scales (ie PPG master planned area and surrounds). It is generally accepted that the results of such surveys underestimate true population sizes, and provide only a standardised minimum estimation (Sobtzick et al. 2013).
  - Dugong distribution patterns and behaviours are recognised to demonstrate seasonal variation, (typically driven by sea surface temperature changes) (Sobtzick et al. 2013). Aerial survey results presented in Figure 4.1 do not account for seasonal variation (ie surveys were conducted in November of each year, during high tide where possible), partially due to logistical constraints associated with the large-scale surveys (Sobtzick et al. 2013).
  - Adequate survey methods for monitoring changes in the size and habitat use of small dugong populations at local scales (eg within the PPG master planned area) are yet to be developed and should be a priority for future research projects (Sobtzick et al. 2013).

4.1.2 Contribution of the local attribute to the OUV of the GBRWHA

Dugong have a **moderate contribution** to the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

- Dugong are not listed as threatened under the EPBC Act, however they are listed under the EPBC Act as marine and migratory, and are subject to the Bonn Convention
- Dugong are listed as vulnerable under the provisions of the *Nature Conservation Act 1992* (Qld) (NC Act)
- Dugong are listed as vulnerable to extinction at a global scale by the International Union for the Conservation of Nature (IUCN)
- There is limited information on the population biology and demographics of Dugong on the east coast of Australia (Blair 2012, Sobtzick et al. 2013). Blair (2012) identified a marked genetic difference between Dugong from the Moreton Bay to Shoalwater region to those from north of the Shoalwater region, suggesting that Moreton Bay to Shoalwater to Moreton Bay may need to be managed separately to the areas to the north.
- Due to the relatively low numbers of Dugong recorded within the PPG master planned area and surrounds, it is not considered that this area represents an important population in isolation, or contributes significantly to the number of Dugong within the GBRWHA. The population is recognised as being regionally important (Sobtzick et al. 2013).
- The PPG master planned area and surrounds are not identified as one of the important Dugong habitat areas within the Queensland Urban Coast (ie extending from Cooktown to the Queensland/New South Wales border), with the most important habitat areas situated within the Moreton Bay and Hervey Bay regions (DoEE 2016a)

Local or regional attribute legislative status

- The Rodds Bay Dugong Protection Area is situated within the PPG master planned area (refer Figure 4.1). The Dugong Protection Area is designed under the provisions of the *Great Barrier Reef Marine Park Regulations 1983* (Cth), *Fisheries Act 1994* (Qld) and the NC Act.

Notable or iconic attribute value

- The Dugong population in the PPG master planned area and surrounds is not specifically recognised as a prime example or value of the region in key publications (ie retrospective statement of OUV, Outlook Report 2014, Lucas et al. 1997)

Condition/trend of the attribute

- The condition is poor and the GBR wide trend is that this attribute is deteriorating

Contribution to attribute sustainability

- As discussed in Section 4.1.1, estimating Dugong population density (resident and/or transient) at a small scale is difficult, with the resultant survey data subject to limitations, such as large scale animal movements and potential count errors, and limited inclusion of seasonal variation which influences the behaviour and movements of Dugong. There is no established survey methodology suitable for investigating relative abundance at local spatial scales (eg Port Curtis/Rodds Bay) (Sobtzick et al. 2013). As a result of these limitations, it is generally accepted that the results of density surveys underestimate true population sizes, and provide only a standardised minimum estimation (Sobtzick et al. 2013).
- Dugong population sizes fluctuate due to animal movements (Marsh and Lawler 2007), therefore it is acknowledged that the number of Dugong present within the PPG master planned area and surrounds will fluctuate over time. As the population is in flux, it is difficult to define the contribution of individual Dugong in the PPG master planned area to the broader population.
- The Outlook Report 2014 reports that in 2011 the estimated number of Dugong between the Daintree River and the southern boundary of the GBRWHA was approximately 600 animals, compared to an estimate of around 2,000 from the previous surveys in 2005 (GBRMPA 2014a)
- On the basis that aerial surveys generally underestimate Dugong population size, Sobtzick et al. (2013) suggest that the Port of Gladstone and Rodds Bay supports a Dugong population in the low hundreds of individuals at the most
- Sobtzick et al. (2013) suggest that the Gladstone region provides important habitat for a relatively small number of Dugong (ie low hundreds at most). However, Sobtzick et al. (2013) recognises that the seagrass meadows in Gladstone are considered to provide an important connective function for Dugong movement and genetic variability.
- As discussed in Section 4.1.1, the seagrass meadows in the Gladstone area are of regional significance as they are the only known major areas of seagrass between Shoalwater Bay and Hervey Bay (Blair 2012, Sheppard et al. 2006, Sobtzick et al. 2013). As such the seagrass meadows within the PPG master planned area and surrounds likely represent important connecting habitat between larger Dugong habitat areas to the north and south.
- Given the significant decline in the number of Dugong in the southern section of the GBRWHA in 2011 (GBRMPA 2014a), there is potential risk that the loss of habitat (ie connective seagrass meadows) within the PPG master planned area and surrounds could contribute to the loss or decline of the population of Dugongs in the southern section of the GBRWHA.

Notable presence of the attribute

- More notable examples of Dugong habitat and numbers of animals occur in Shoalwater Bay, Hervey Bay and Moreton Bay (Blair 2012).

Significance of attribute to the preservation of the GBRWHA

- Loss of habitat within and surrounding the PPG master planned area may impact on the southern population of Dugong. It is not, however, expected that this would result in the significant decline in the OUV of the GBRWHA.

4.2 Species of whales and migrating whales

4.2.1 Presence of local attribute

Whales have a **minor presence** in the PPG master planned area and surrounds based on the following information:

- Whale species which have the potential to occur within the PPG master planned area and surrounds include:
  - Blue whale (*Balaenoptera musculus*)
  - Bryde's whale (*Balaenoptera edeni*)
  - Humpback whale (*Megaptera novaeangliae*)
  - Killer whale (*Orcinus orca*)
  - Minke whale (*Balaenoptera acutorostrata*)
  - Southern right whale (*Eubalaena australis*)
  - Sperm whale (*Physeter macrocephalus*) (GPC 2012)
- Dominant whale species present within the PPG master planned area and surrounds, as recorded between 1980 and 2012 (NCRIS 2015), include:
  - Minke whale (*Balaenoptera acutorostrata*): four individuals
  - Humpback whale (*Megaptera novaeangliae*): 73 individuals
  - Sperm whale (*Physeter macrocephalus*): two individuals
  - One migrating whale species has been recorded on the wildlife databases within the PPG master planned area surrounds as illustrated in . However, this is not considered to be an accurate reflection of the seasonal presence of migrating whales in the region, though it does confirm a recorded sighting on the existing wildlife databases (refer Appendix C).
  - Waters adjacent to the PPG master planned area are known to support Humpback whales on a seasonal basis as part of their migratory movements to core calving habitat (refer Figure 4.3)

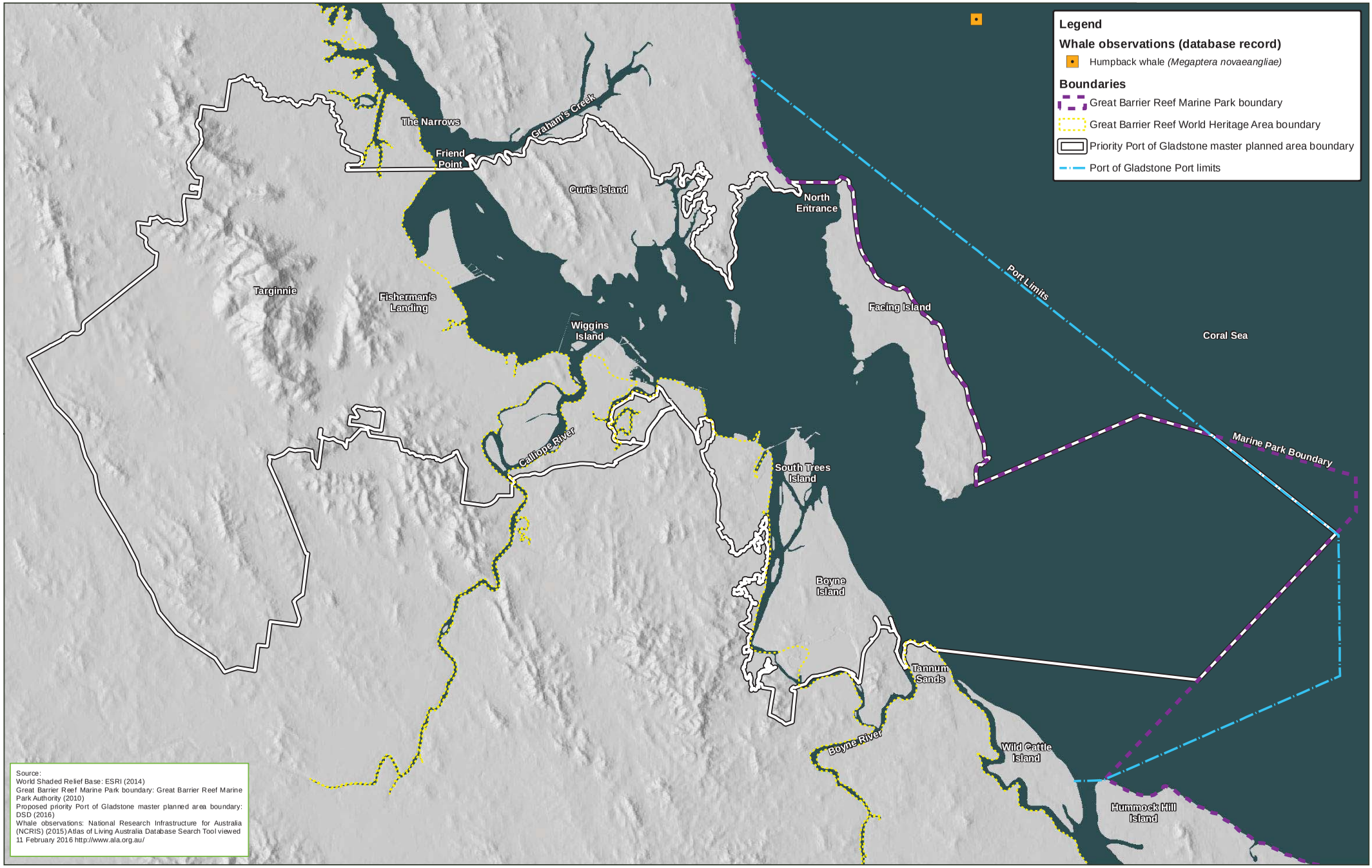

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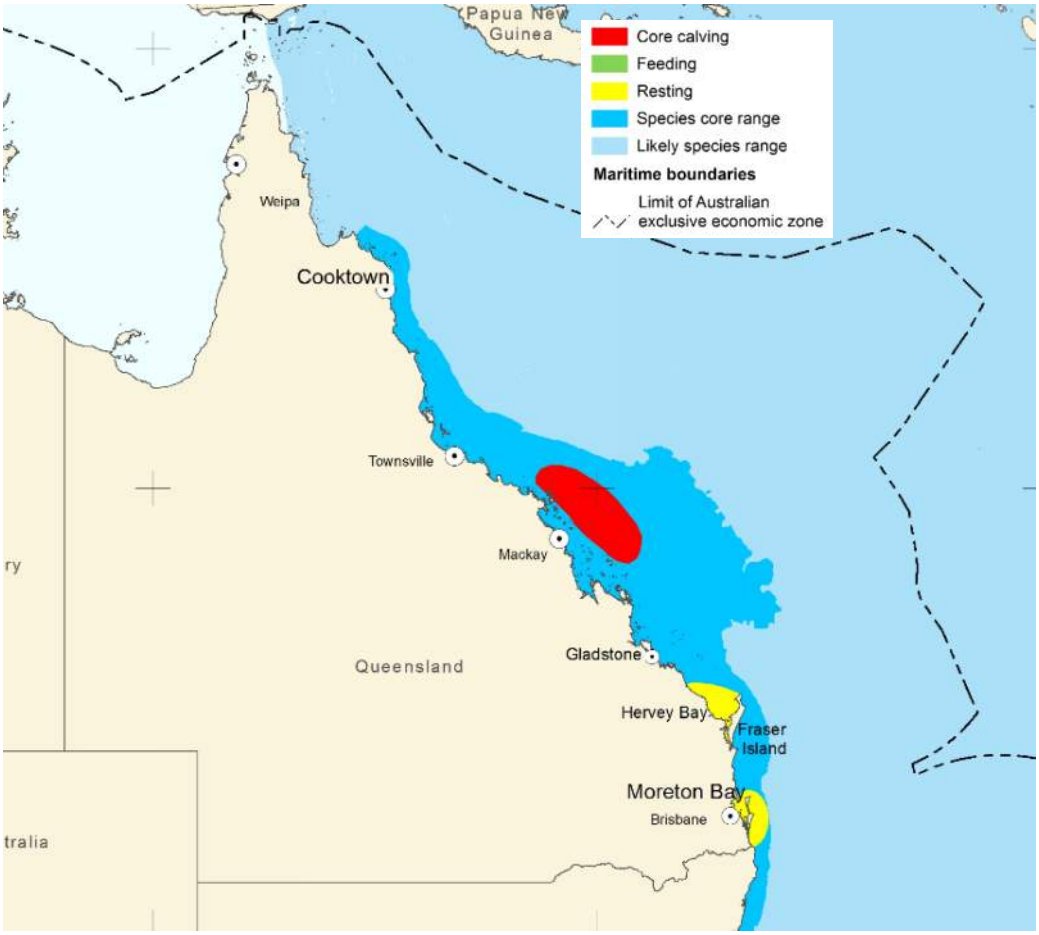
Figure 4.2: Migrating whales



Core calving	Area where the majority of humpback whale calving occurs
Feeding	Area where humpback whales are regularly observed feeding around Australia (excluding Antarctic waters)
Resting	Sheltered area where humpback whales are known to rest during the southern migration
Species core range	Humpback whales travel through this area on a seasonal basis as part of their migratory movements
Likely species range	Humpback whales may be present on a seasonal basis
Notes: While these described areas are indicative of these behaviours, these behaviours are not restricted to these areas and may occur elsewhere	

Figure 4.3 Humpback whale distribution and indicative habitat types

Source: TSSC (2015)

4.2.2 Contribution of the local attribute to the OUV of the GBRWHA

Whales have a **minor contribution** to the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

- Of the whale species with the potential to occur in the PPG master planned area and surrounds, two are listed as endangered under the EPBC Act (Blue and Southern right whales), and one is listed as vulnerable under the EPBC Act (Humpback whale). All species are listed as migratory under the EPBC Act, with the exception of the Minke whale.
- The whales observed within the PPG master planned area and surrounds are considered to be seasonally present within the offshore waters in the vicinity of the Port of Gladstone (GHD 2011a, GHD 2011b). Areas within the PPG master planned area and surrounds are mapped as 'species core range' (refer Figure 4.3) (ie Humpback whales travel through this area during seasonal migrations). The low number of recorded sightings for all species are not expected to represent a significant proportion of the overall species populations known to utilise the GBRWHA.
- Critical habitat has not been defined for many whale species such as the Blue whale (DoE 2015). This is due to the limited knowledge on the distribution and abundance of such species, and to date, the best information relates to biologically important areas where foraging occurs (DoE 2015). There is no foraging habitat within the PPG master planned area or surrounds.

Local or regional attribute status

- No areas in the PPG master planned areas, and surrounds, are specifically protected areas for whales

Notable or iconic attribute value

- The PPG master planned area and surrounds are not specifically recognised within key publications regarding the GBRWHA (ie retrospective statement of OUV, Outlook Report 2014, independent review, Lucas et al. 1997)
- The whales observed within the PPG master planned area and surrounds are considered to be seasonally present within the offshore waters in the vicinity of the Port of Gladstone (GHD 2011a, GHD 2011b)

Condition/trend of the attribute

- Whale populations are rated as being in good condition with a GBR wide trend of improvement. However it is noted that there is a lack of information on the condition of most whale population, however Humpback whale populations are recovering strongly.

Contribution to attribute sustainability

- The whales observed within the PPG master planned area and surrounds are considered to be seasonally present within the offshore waters in the vicinity of the Port of Gladstone (GHD 2011a, GHD 2011b), and based on the low recorded numbers of whales within the area, it is not expected that the area contributes significantly to the ongoing sustainability of whale populations within the GBRWHA. For example, there are 73 records on the wildlife databases for the Humpback whale in the PPG master planned area and surrounds between 1980 and 2012 (refer Appendix C, noting that this may not represent 73 different individuals), whereas the estimated east Australian population for this species is estimated by GBRMPA (2014) to be approximately 14,500. There is limited available population information for the GBRWHA for other whale species.
- Although the PPG master planned area and surrounds are mapped as the species core range, which is mapped extensively throughout the GBRWHA (refer Figure 4.3).

Notable presence of the attribute

- The seasonal presence of whales in the offshore waters surrounding the PPG master planned area are not considered to represent unique or notable examples of habitat for whales
- There are no known core calving, resting or foraging areas mapped in close proximity to the PPG master planned area and surrounds. The nearest aggregation area is located approximately 250 km south east, near Hervey Bay and Fraser Island (a resting area for the species) (refer Figure 4.3).

Significance of attribute to the preservation of the GBRWHA

- The local expression of whales in the PPG master planned area and surrounds does not represent a significant contribution to the OUV of the GBRWHA. It is highly unlikely that the loss of the local expression of this attribute would result in a significant decline in the OUV of the GBRWHA.

4.3 Species of dolphins

4.3.1 Presence of local attribute

Dolphins have a **moderate presence** in the PPG master planned area and surrounds based on the following information:

- Dolphin species which have the potential to occur within the PPG master planned area and surrounds include:
  - Australian humpback dolphin (*Sousa sahulensis*)
  - Australian snubfin dolphin (*Orcaella heinsohni*)
  - Coastal bottlenose dolphin (*Tursiops truncatus s. str.*)
  - Common dolphin (*Delphinus delphis*)
  - Indian ocean bottlenose dolphin (*Tursiops aduncus*)
  - Risso's dolphin (*Grampus griseus*)
  - Spotted dolphin (*Stenella attenuata*)
- Dolphin species which are frequently encountered within the PPG master planned area and surrounds include Australian humpback dolphin, Coastal bottlenose dolphin and the Indian-ocean bottlenose dolphin (Cagnazzi 2013, Cagnazzi 2015).
- Dolphin surveys conducted by Cagnazzi (2015) between 30 April and 4 September 2014 identified the Australian humpback dolphin within the PPG master planned area and surrounds (refer Figure 4.4). The Australian humpback dolphin is considered likely to occur as one population within Australian waters (DoEE 2016).
- The Australian snubfin dolphin was not identified within the PPG master planned area and surrounds during the surveys conducted by Cagnazzi (2015), however was recorded around Port Alma approximately 35 km north of the PPG master planned area and geographically separated by The Narrows and Curtis Island (refer Figure 4.5). The Australian snubfin dolphin is considered unlikely to inhabit the PPG master planned area and surrounds (Cagnazzi 2013, Cagnazzi 2015). The closest species occurrence record recorded in the Atlas of Living Australia for the Australian snubfin dolphin to the PPG master planned area and surrounds is a single individual recorded in 1997, situated on the north coast of Camp Island. Isolated species occurrence recordings have been collected near Bundaberg (recorded in 1994) and Yeppoon (recorded in 1999) (NCRIS 2016). Recent studies suggest that the Australian snubfin dolphin is unlikely to occur in substantial numbers in waters south of The Narrows (Cagnazzi 2013).

- There have been population estimates for the Australian humpback dolphins in Cleveland Bay (50 or less); the Capricorn coast (about 64); Keppel Bay (about 107); and the Port of Gladstone (about 85, denoted as Port Curtis in the Outlook Report 2014) (GBRMPA 2014a). This is approximately 306 individuals, of which approximately 28% are estimated to occur in the Port of Gladstone. Populations of this species are also known to occur south of the region in Great Sandy Strait and Moreton Bay (refer to Figure 4.6). There is almost no understanding of population structures of the Australian humpback dolphin occurring elsewhere in the GBRWHA and surrounding region, although there have been sightings (GBRMPA 2014a).
- The Outlook Report 2014 (GBRMPA 2014a) identifies that changes in population size of the Australian humpback dolphins will not be detectable over a short time period, unless declines are in the order of 20 per cent per year or greater. Therefore, population declines less than 20 per cent per year may result in the population size decreasing to very low levels before a decline is detected (GBRMPA 2014a).
- The other dolphin species generally occur offshore and generally display low site fidelity, instead foraging where large prey aggregations occur (GBRMPA 2014a). There is limited information on the estimated populations of these other species within the GBRWHA and in the PPG master planned area and surrounds.

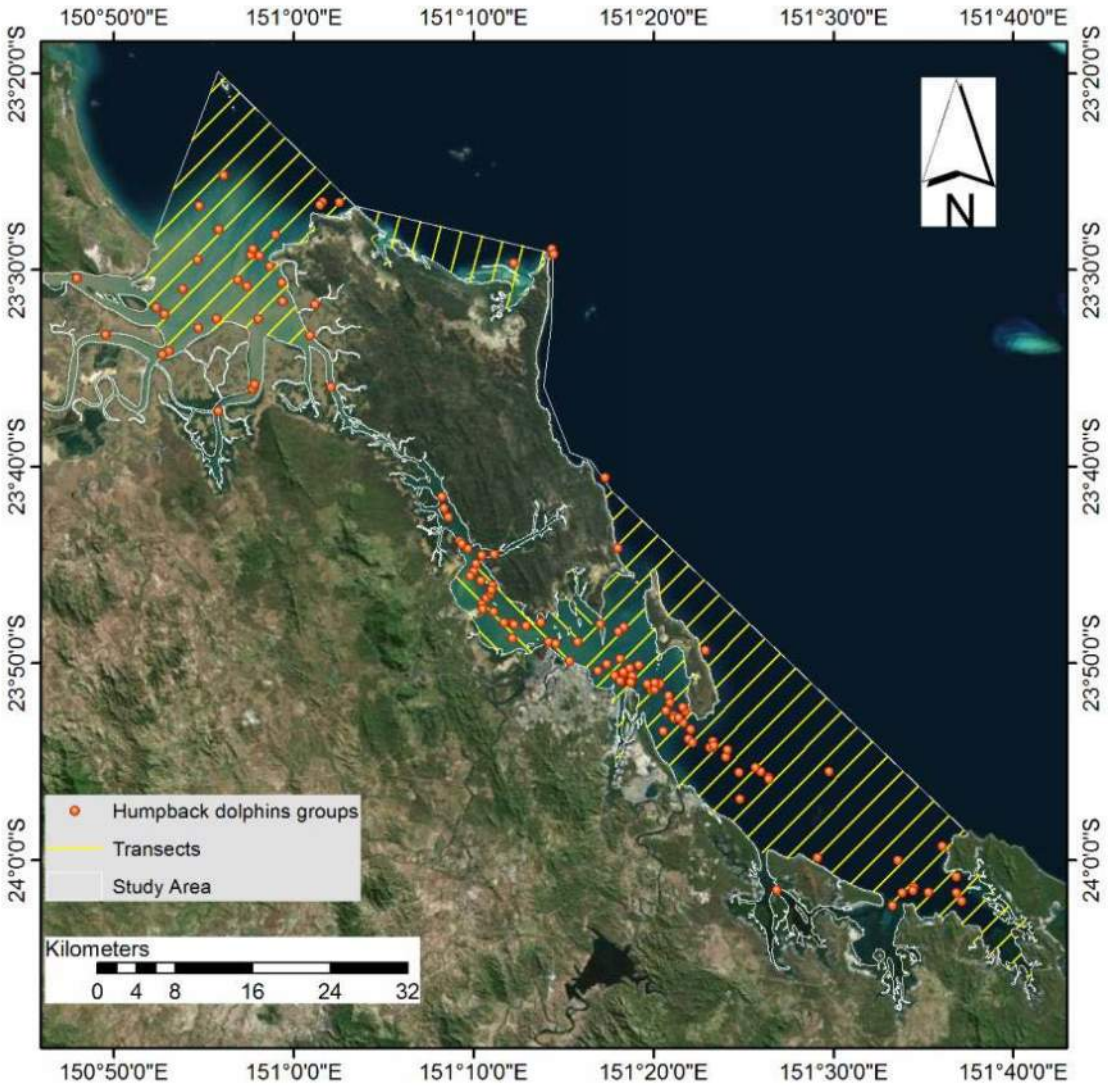


Figure 4.4 Distribution of groups of Australian humpback dolphins during 2014 surveys

Source: Cagnazzi (2015)

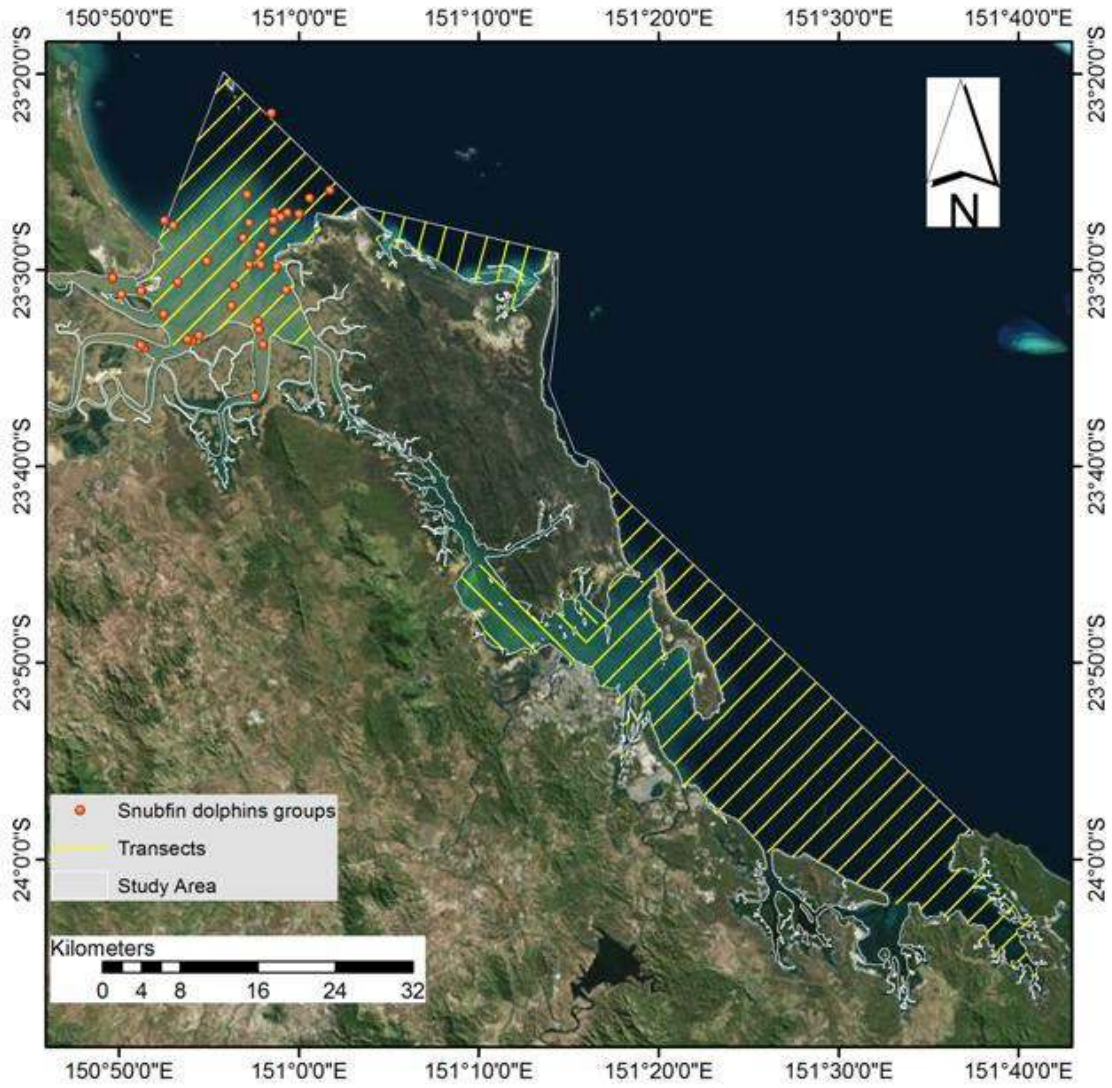


Figure 4.5 Distribution of groups of Australian snubfin dolphins during 2014 surveys

Source: Cagnazzi (2015)

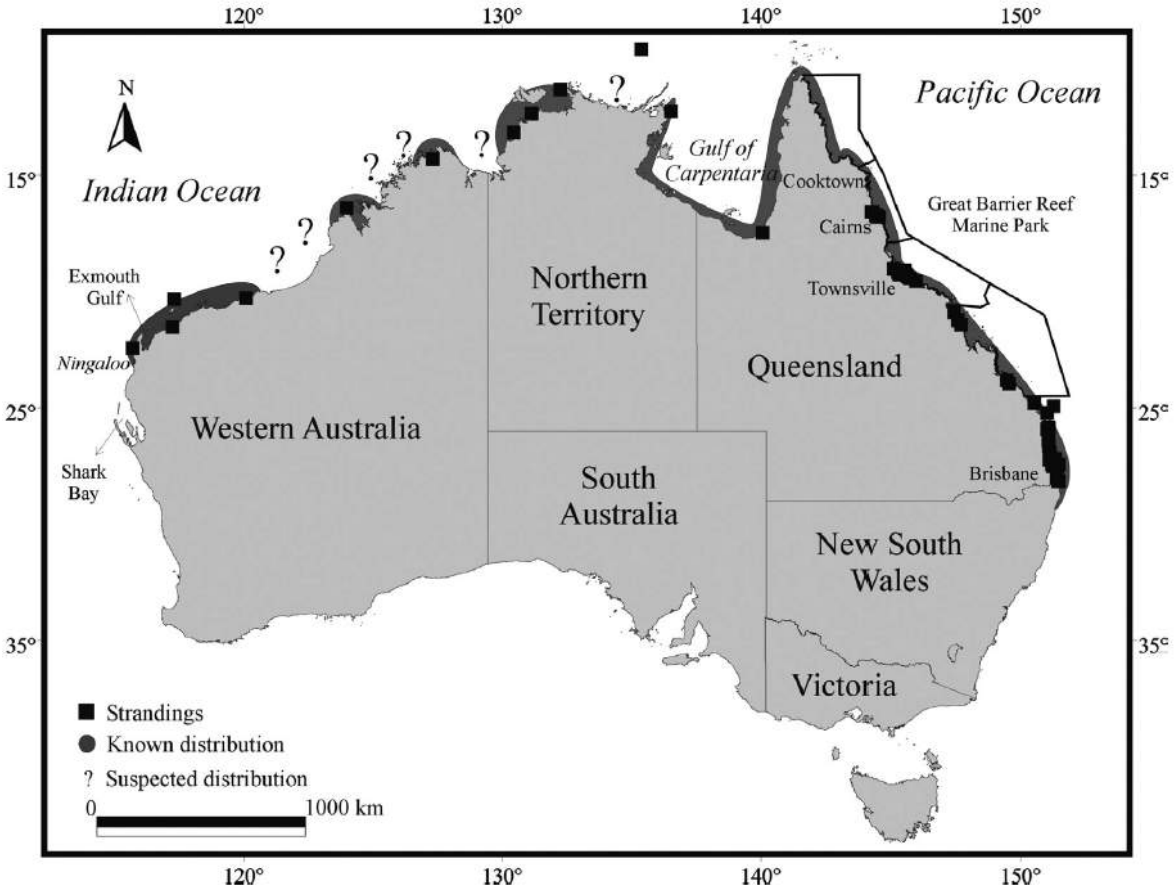


Figure 4.6 Distribution of Australian humpback dolphins in Australian water. The known distribution is based on stranding records and published literature.

Source: Parra et al. (2004).

4.3.2 Contribution of the local attribute to the OUV of the GBRWHA

Dolphins have a **minor contribution** to criterion vii (aesthetic values and superlative natural phenomena) of the OUV of the GBRWHA, and a **significant contribution** to criterion x (biodiversity conservation) of the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

- Of the dolphin species likely to occur within the PPG master planned area and surrounds, none are listed as threatened under the EPBC Act, however, the Australian humpback dolphin is listed as migratory (Bonn Convention) and is listed as vulnerable under the NC Act.
- The western section of Moreton Bay and the lower reaches of the Brisbane River have been identified as potential key habitats for the Australian humpback dolphin (DoEE 2016). No critical habitat has been identified within the PPG master planned area or surrounds.
- There are no overall population estimates for the Australian humpback dolphin in the GBRWHA, however, populations for the Port of Gladstone indicate that the PPG master planned area and surrounds may contain approximately 85 individuals (GBRMPA 2014a).
- Distribution of the Australian humpback dolphin within the GBRWHA occurs in several key locations, including the following areas: Cairns; Cleveland Bay in Townsville; areas near Hamilton Island; and areas in the PPG master planned area and surrounds; Rodds Bay; and Port Alma (refer Figure 4.4 and Figure 4.6).

- Based on the sparse information on population structure of this species (Para et al. 2004), the Port of Gladstone (including the PPG master planned area and surrounds) is considered to be an important location within the GBRWHA for the population of Australian humpback dolphins based on the known distribution of the species.

Local or regional attribute status

- There are no specific dolphin protection areas in the PPG master planned area or surrounds.

Notable or iconic attribute value

- The Outlook Report 2014 recognises the distribution of Australian humpback dolphins in the Port of Gladstone (specifically reported as Port Curtis, however this terminology is no longer widely used). Other published articles, as referenced throughout this section, also recognise the importance of the Port of Gladstone (including the PPG master planned area and surrounds) as being an important location for this species' distribution within the context of the GBRWHA.
- No publications specifically reference the PPG master planned area or surrounds as being a prime example of an area important for the dolphin species known to occur in the GBRWHA.

Condition/trend of the attribute

- The GBR wide condition for dolphins is listed as good in the Outlook Report 2014, with the GBR wide trend listed as deteriorating.
- The Outlook Report specifically identifies the Australian snubfin and Australian humpback dolphins as being the highest priority for management in the GBRWHA due to their 'small, localised populations, exposure to high levels of human activity, and suspected population declines.' (GBRWHA 2014).
- The Australian humpback dolphin is at risk of population declines that may not be detectable if less than a 20 per cent decline in one year, therefore this species requires a particular focus in terms of the OUV of the GBRWHA.

Contribution to attribute sustainability

- The PPG master planned area and surrounds is considered to contribute to the sustainability of the Australian humpback dolphin in the GBRWHA, and its loss may potentially affect the overall population viability, though this is not expected to lead to an immediate and significant population decline.

Notable presence of the attribute

- Refer to above information.

Significance of attribute to the preservation of the GBRWHA

- It is unlikely that the loss of the Australian humpback dolphin from the PPG master planned area and surrounds, would result in a serious decline in the species overall population (ie Australian population), however the loss may potentially affect population viability (though there is limited evidence to support this). There are other centres of distribution for this species outside of the GBRWHA that contribute to the total species population.
- Therefore, it is unlikely that the loss of the Australian humpback dolphin from the PPG master planned area and surrounds would result in a significant decline in the OUV of the GBRWHA.

5 Marine turtles

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 relating to marine turtles is summarised in Table 5.1, with respect to the local expression of the OUV of the GBRWHA for the PPG master planned area and surrounds.

For this section, a rookery is defined as a colony of breeding animals and a nesting beach is defined as a suitable location for nesting for marine turtles (eg may include a rookery, or may only contain scattered nesting sites).

Table 5.1 OUV of the GBRWHA: Marine turtles

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Breeding colonies of marine turtles	■ Cays of the GBRWHA support globally important breeding colonies of marine turtles	■ Breeding colonies of marine turtles on islands and cays, with 38 islands identified as being important nesting sites, including: – Raine Island (Green turtle) – Milman Island (Hawksbill and Green turtles) – Moulter Cay (Green turtle) – Wild Duck Island (Flatback turtle) – Peak Island (Flatback turtle) – Cays of the Capricorn Bunker Group (Loggerhead and Green turtles)	Poor	No consistent trend	✓	-	-	✓
Green turtle breeding	■ Raine Island is the world's largest green turtle breeding area	■ Raine Island supports the world's largest aggregation of nesting green turtles	Poor	No consistent trend	✓	-	-	✓

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Marine turtle rookeries	■ Six of the world's seven species of marine turtle occur in the GBR ■ GBRWHA includes many regionally important marine turtle rookeries	■ Globally significant nesting areas occur in the GBR for four species, including Loggerhead turtle, Green turtle, Hawksbill turtle and the Flatback turtle	Poor	No consistent trend	✓	-	-	✓
Nesting turtles	■ Nesting turtles are a contributing attribute to the superlative natural phenomena of the GBR	■ The GBR includes many regionally important marine turtle rookeries	Poor	No consistent trend	✓	-	-	-

5.1 Presence of local attribute

Breeding colonies of marine turtles, Green turtle breeding, marine turtle rookeries, and nesting turtles have a **moderate** presence within the PPG master planned area and surrounds based on the following information:

- Marine turtles which have been recorded to nest within the PPG master planned area and surrounds include:
  - Flatback turtle (*Natator depressus*)
  - Green turtle (*Chelonia mydas*)
  - Loggerhead turtle (*Caretta caretta*)
- Flatback turtles are the dominant nesting marine turtle species in the PPG master planned area and surrounds, with approximately 20% of Queensland's Flatback turtle population recorded to nest on inshore islands of the Gladstone region (EPA 2003). During the 2014 to 2015 breeding season a moderate sized population with 40 nesting females was recorded on Curtis Island during peak nesting in late November to early December 2014 (Limpus et al. 2015). The southern section of Curtis Island is an index beach for monitoring (Limpus 1971) and consistently records approximately 50 breeding females nesting each season (Hodge et al. 2006). Nesting also occurs in lower numbers at the eastern side of Facing Island, Hummock Hill Island and at Tannum Sands (Limpus 2007).
- Green turtles are the most common species of marine turtle found in the PPG master planned area and surrounds (Limpus 2008a, Limpus et al. 2013). Aerial and boat-based surveys for marine turtles undertaken in the Port of Gladstone in 2008/2009 and 2011 to assess habitat utilisation, recorded a total of 522 turtles with the most commonly observed species being Green turtles (GHD 2009).

- The Green turtle has been recorded nesting within the PPG master planned area and surrounds, nesting on the beaches of Curtis Island and Facing Island (Limpus et al. 2000, Limpus et. al. 2006, Limpus 2008b)
- Loggerhead turtles are known to nest occasionally on the beaches of Curtis and Facing Islands, but not on an annual basis (Limpus et al. 2013)
- The Hawksbill turtle is not considered to have a significant population within the PPG master planned area and surrounds. One recording of a nesting Hawksbill turtle has been recorded for the GBRWHA over a recording period of more than 70 years (GBRMPA 2014b).
- Olive ridley and Leatherback turtles are known to occur in the PPG master planned area and surrounds but are rarely encountered (Limpus et al. 2013). There are no records of Olive ridley turtles nesting in the GBRWHA (GBRMPA 2014a). There is limited census data availability for the Leatherback turtle in Australia and are considered to have low nesting numbers in Australia (GBRMPA 2014a).
- Within the PPG master planned area and surrounds, marine turtle nesting beaches are present on the seaward side of Facing Island, Curtis Island, Tannum Sands and Wild Cattle Island. Marine turtle nesting areas within the PPG master planned area and surrounds are illustrated in Figure 5.1.
- Foraging resources for marine turtles are mapped in Figure 6.1 (Extent of seagrass meadows), Figure 6.2 (Benthic macroalgae) and Figure 1.1 (Reefs).

5.2 Contribution of the local attribute to the OUV of the GBRWHA

Breeding colonies of marine turtles and marine turtle rookeries are considered to have a **moderate contribution** to criterion vii (aesthetic values and superlative natural phenomena) and a **moderate contribution** to criterion x (biodiversity conservation) based on the information below.

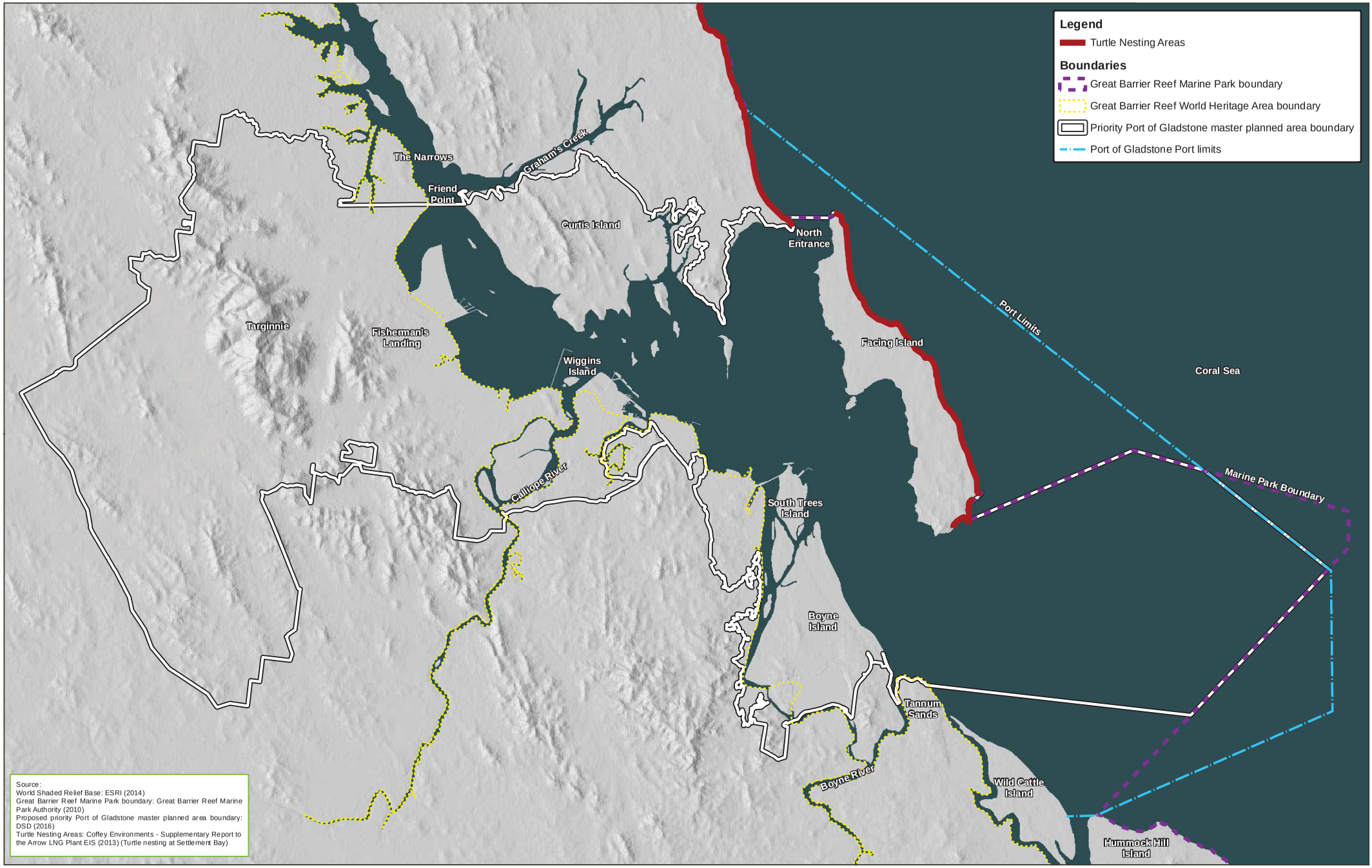
Green turtle breeding and nesting turtles are considered to have a **minor contribution** to criterion vii (aesthetic values and superlative natural phenomena) and a **minor contribution** to criterion x (biodiversity conservation) based on the following information:

Commonwealth or state attribute legislative status

- Marine turtles which nest within the PPG master planned area and surrounds are listed as threatened, migratory species and include:
  - Flatback turtle (*Natator depressus*): vulnerable (EPBC Act, NC Act), listed migratory (EPBC Act [Bonn convention]), listed marine (EPBC Act), listed as data deficient at a global scale by the IUCN
  - Green turtle (*Chelonia mydas*): vulnerable (EPBC Act, NC Act), listed migratory (EPBC Act [Bonn convention]), listed marine (EPBC Act), listed as endangered at a global scale by the IUCN
  - Loggerhead turtle (*Caretta caretta*): endangered (EPBC Act, NC Act), listed migratory (EPBC Act [Bonn convention]), listed marine (EPBC Act), listed as vulnerable at a global scale by the IUCN
- The PPG master planned area and surrounds are not listed as an area of identified habitat critical to the survival of marine turtles species (Environment Australia 2003).

Local or regional attribute status

- There are no specific marine turtle protection areas in the PPG master planned area or surrounds
- Marine turtles are protected within the GBR Marine Park through permit requirements and activity restrictions in zoned areas of the GBR Marine Park. GBR Marine Park zoning surrounding the PPG master planned area includes ‘general use zone’, ‘habitat protection zone’, ‘marine national park zone’ and ‘conservation park zone’.



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Priority Port of Gladstone master planning local expression of OUV of GBRWHA

Figure 5.1: Turtle nesting areas

Notable or iconic attribute value

- The marine turtle populations within the PPG master planned area and surrounds are not recognised as a prime example or value of the region in key publications (ie retrospective statement of OUV, Outlook Report 2014 and Lucas et al. 1997). However, there are recent publications identifying Curtis Island as one of four key rookeries for the Flatback turtle which is the only marine turtle endemic to Australia (refer below information).

Condition/trend of the attribute

- The Great Barrier Reef Outlook Report 2014 (GBRMPA 2014a) records the attribute condition in the wider GBR to be poor for marine turtles. No consistent trend was recorded for marine turtles.

Contribution to attribute sustainability

- Important nesting sites for marine turtles within the GBRWHA include:
  - Raine Island and nearby cays (supports the world's largest aggregation of nesting Green turtles)
  - Milman Island (supports Hawksbill turtles and Green turtles)
  - Bouydong Island (supports Hawksbill turtles)
  - Moulter Cay (supports Green turtles)
  - Wild Duck Island (supports Flatback turtles)
  - Peak Island (supports Flatback turtles)
  - Avoid Island (supports Flatback turtles)
  - Curtis Island (supports Flatback turtles)
  - Cays of the Capricorn Bunker Group (supports Loggerhead turtles and Green turtles) (GBRMPA 2014a)
- Loggerhead turtles and Green turtles are supported by the foraging resources present in the GBRWHA, including the following resources within PPG master planned area and surrounds:
  - The inshore region of the Port of Gladstone provides foraging resources for Green turtles in the form of seagrass meadows, including species *Zostera muelleri*, Halodule and Halophila, mangroves and macroalgae (Limpus 2008a). The seagrass habitat and species types found in the coastal areas of Port of Gladstone are abundant in the wider Fitzroy Natural Resource Management region at Shoalwater Bay, Keppel Islands, Rodds Bay and Hervey Bay (McKenzie et al. 2014) which suggests there remains foraging habitat for Green turtles in the wider GBR region
  - The Loggerhead turtle is a carnivorous species with a diet that includes soft corals, jellyfish, cuttlefish, sea-pens, sea-cucumbers and invertebrates such as gastropods and bivalve molluscs (Chatto 1998). Foraging resources for the Loggerhead turtle are considered to be widespread and readily available across the GBR region
- Marine turtle species which have been recorded to nest within the PPG master planned area and surrounds include:
  - Flatback turtles: Approximately 20% of Queensland's Flatback turtle population are recorded to nest on inshore islands of the Gladstone region (EPA 2003). Limpus et al. (2013) includes South End beach on Curtis Island as one of four key Flatback turtle rookery for eastern Australia
  - Green turtles: Recorded nesting within the PPG master planned area and surrounds, nesting on the beaches of Curtis Island and Facing Island (Limpus et al. 2000, Limpus et. al. 2006, Limpus 2008b)
  - Loggerhead turtles: Recorded to nest occasionally on the beaches of Curtis and Facing Islands (EPA 2003)

- The potential loss of nesting sites for the Flatback turtle within the PPG master planned area and surrounds has the potential to impact on the Flatback turtle populations of the GBRWHA, as approximately 20% of Queensland's Flatback turtle population are recorded to nest on inshore islands of the Gladstone region (EPA 2003)
- Given that the Loggerhead turtle breeding area for eastern Australia is concentrated in the Capricorn-Bunker Group, the Swain Reefs, and the Bundaberg to Wreck Rock area (Lucas et al. 1997), there is potential risk that the loss of foraging habitat within the PPG master planned area and surrounds could contribute to the loss or decline of the population of Loggerhead turtles in the southern section of the GBRWHA.

Notable presence of the attribute

- Curtis Island provides an important nesting beach for the Flatback turtle, which is endemic to the east Australian continental shelf (Limpus et al. 2013). South End beach is listed as one of four key rookeries for this species (Limpus et al. 2013).
- More notable examples of Green turtle nesting within the GBRWHA occur at Raine Island and Moulter Cay (GBRMPA 2014a)
- More notable examples of Flatback turtle nesting within the GBRWHA occur at Peak Island, Wild Duck Island and Avoid Island (GBRMPA 2014a)
- More notable examples of Loggerhead turtle nesting within the GBRWHA occur at the islands and cays of the Capricorn-Bunker group and Swains Reefs (GBRMPA 2014a).

Significance of attribute to the preservation of the GBRWHA

- The loss of nesting habitat on Curtis Island, and in particular the South End beach nesting habitat, would likely have an impact on populations of the Flatback turtle, as it is one of four major rookeries for the species. The loss of nesting sites for this species within the PPG master planned area and surrounds has the potential to result in a significant impact on the OUV of the GBRWHA (ie loss of biodiversity and aesthetic values).
- The loss of nesting sites for marine turtles within the PPG master planned area and surrounds is considered likely to impact on populations of the Flatback turtle and has the potential to impact local populations of the Green turtle and the Loggerhead turtle (ie which form part of the southern GBRWHA population). However, the loss of nesting sites within the PPG mater planned area and surrounds is not considered to have a significant impact on the OUV of the GBRWHA.

6 Seagrass and macroalgae

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 relating to seagrass and macroalgae is summarised in Table 6.1, with respect to the local expression of the OUV of the GBRWHA for the PPG master planned area and surrounds.

Table 6.1 OUV of the GBRWHA: Seagrass and macroalgae

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Seagrass	■ The shallower marine areas of the GBRWHA support many seagrass species	■ 15 species of seagrass occur within the GBRWHA	Poor	Deteriorated	✓	✓	✓	✓
Beds of *Halimeda* algae	■ Extensive beds of Halimeda algae represent active calcification and accretion over thousands of years	■ Halimeda banks comprise large areas of the northern Great Barrier Reef, inshore of the Ribbon Reefs, and are also found further south	Very good	Stable	-	-	✓	-

6.1 Seagrass

6.1.1 Presence of local attribute

The attribute 'seagrass' has a **moderate presence** in the PPG master planned area and surrounds based on the following information:

- Seagrass surveys in the Port of Gladstone and surrounds conducted since 1988 have found that the area contains a diverse array of seagrass meadows
- Seagrass meadows are present (or have previously been identified in) the PPG master planned area and surrounds in both intertidal and subtidal deep water from the Western Basin, Inner harbour, mid harbour and outer harbour, and into the deeper coastal water of the Great Barrier Reef Marine Park (GBRMP). Fifteen species of seagrass occur within the GBRWHA and seven of these have been recorded within the Port of Gladstone (GPC 2012) being:
  - *Cymodocea rotundata*
  - *Halodule uninervis*
  - *Halophila decipiens*
  - *Halophila ovalis*
  - *Halophila spinulosa*
  - *Halophila minor*
  - *Zostera mulleri* subsp. *capricorni*

- Seagrass meadows in the region are ephemeral and changes in seagrass abundance, species composition and biomass will occur over different seasons. Seagrass seasonal cycles are defined according to the climate-induced pattern of growth and senescence (McKenzie 1994, Chartrand et al. 2011). The growing season is defined as July to January, which typifies seagrass' natural increase in biomass and distribution as ideal growth conditions provide a period of opportunistic expansion. The senescent season, from February to June, is typically when seagrasses retract and rely on stores or seeds to get through wet season conditions, including flooding and reduced water quality (Chartrand et al. 2012).
- The total area (composite) of seagrass meadows recorded from previous fine-scale surveys (ie 2002, 2009, 2013 and 2014) are illustrated in Figure 6.1.

6.1.2 Contribution of the local attribute to the OUV of the GBRWHA

The attribute 'seagrass' has a **minor contribution** to criterion vii (aesthetic values and superlative natural phenomena) and to criterion viii (ongoing geological processes), and a **moderate contribution** to criterion ix (ecological and biological processes) and to criterion x (biodiversity conservation) of the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

- All seagrass meadows in Queensland, dormant and alive, are protected under the *Fisheries Act 1994*

Local or regional attribute status

- The seagrass meadows in the waters of the Port of Gladstone are subject to protections under the *Fisheries Act 1994*
- The seagrass communities of the Port of Gladstone and Rodds Bay are the largest major areas of seagrass located between Shoalwater Bay to the north and Hervey Bay to the south. The seagrass species types found in intertidal areas of the PPG master planned area and surrounds are well represented in the wider natural resource management (NRM) region of 'Fitzroy' under the Queensland Government's Reef Water Quality Protection Plan at Shoalwater Bay, Keppel Islands, Rodds Bay and Hervey Bay (McKenzie et al. 2014).
- Seagrasses in the Port of Gladstone region are of particular value as a food source to Dugong, recognised by the declaration of the Rodds Bay Dugong Protection Area (Carter et al. 2015).

Notable or iconic attribute value

- Seagrass meadows occur in moderate abundance within the PPG master planned area and surrounds. More notable and iconic examples of seagrass meadows occur in other areas of the GBRWHA (eg Shoalwater Bay area).
- The seagrass meadows are of value to the region and play a major role in supporting other local OUV attributes in the PPG master planned area and surrounds (eg Dugong, dolphins, marine turtles, fish species and diversity).

Condition/trend of the attribute

- Seagrass abundance and distribution have been declining globally at an ever increasing rate, attributable to both natural and anthropogenic pressures (Waycott et al. 2009). There appears to be a good link between seagrass condition in the Port of Gladstone and major climate events, especially high rainfall and flow events of the Calliope River (McCormack et al. 2013). Above average rainfall and flow from the Calliope River was recorded in 2010, 2011 and 2013, often coinciding with tropical cyclones in the region. These years were characterised by significant declines in seagrass biomass and meadow area and a shift in species composition, and generally being classified as in 'poor' condition. The overall condition of seagrass meadows in the region has improved since 2013.

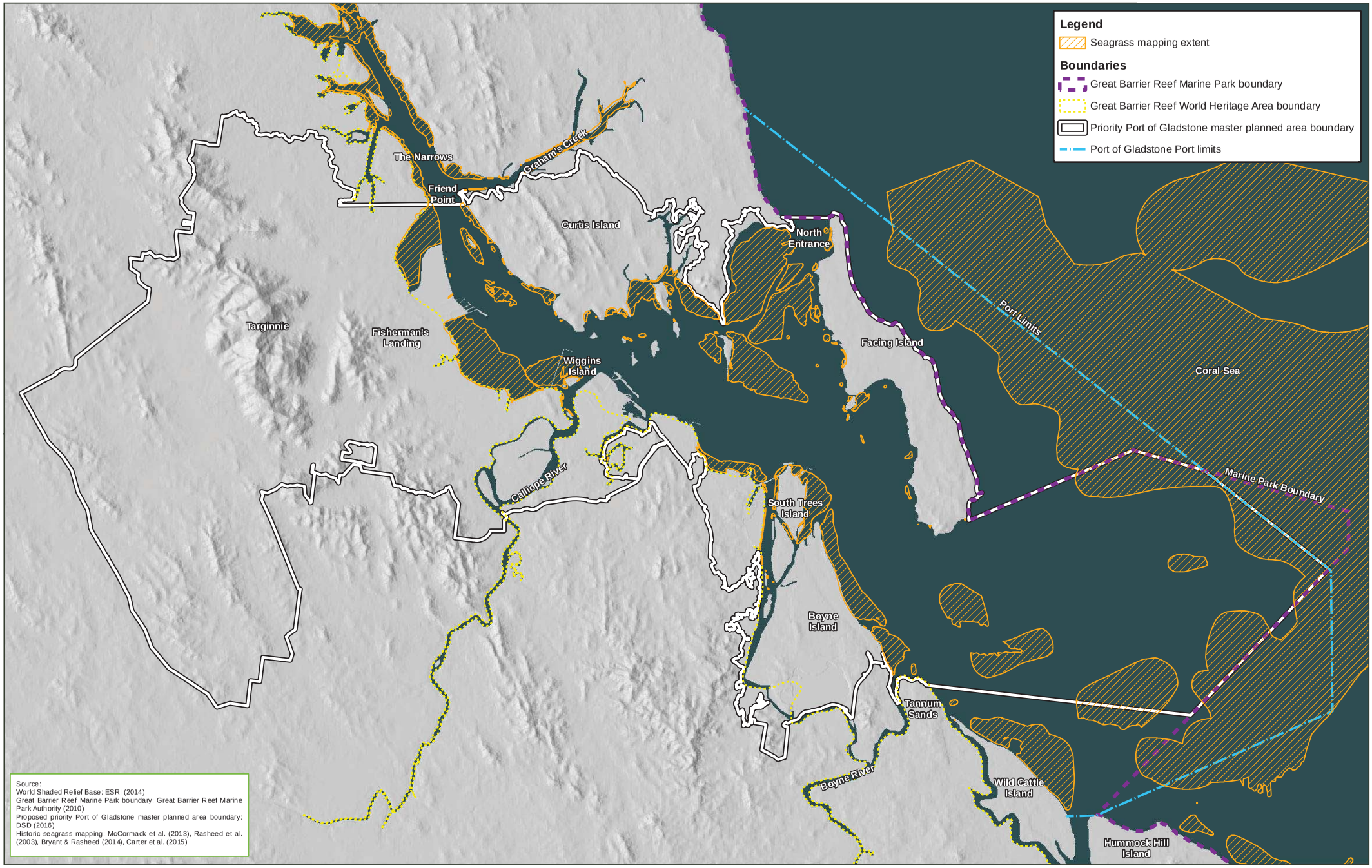

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Figure 6.1: Extent of seagrass meadows

- The Great Barrier Reef Outlook Report 2014 (GBRMPA 2014a) records the attribute condition in the wider GBR to be poor for seagrass. The attribute condition trend was recorded as deteriorated for seagrass.

Contribution to attribute sustainability

- Seagrass contribute to coastal protection by restricting water movement, support of fisheries production, nutrient cycling and particle trapping (Costanza et al. 2014, Hemminga and Duarte 2000)
- As benthic primary producer habitat, seagrasses have important economic value in terms of nursery and feeding habitats for commercial and recreational fisheries species (Watson et al. 1993, Unsworth and Cullen 2010) as well as providing food sources for marine megafauna, including turtles and Dugongs.
- Seagrass meadows display measurable responses to changes in water quality, which make them ideal indicators for measuring the health of ecosystems and the impacts of developments and industries along coastlines (Rasheed et al. 2008).

Notable presence of the attribute

- Seagrass meadows occur in moderate abundance within the PPG master planned area and surrounds. More notable and iconic examples of seagrass meadows occur in other areas of the GBRWHA (eg Shoalwater Bay area).

Significance of attribute to the preservation of the GBRWHA

- The role that seagrass meadows play in supporting a range of other local OUV attributes (eg Dugong, marine turtles, fish species) in the PPG master planned area and surrounds suggests that seagrass meadows have a minor to moderate contribution to the OUV of the GBRWHA.

6.2 *Halimeda* algae

6.2.1 Presence of local attribute

The attribute 'beds of *Halimeda* algae' has a **minor presence** in the PPG master planned area and surrounds based on the following information:

- Broad-scale baseline assessments of benthic communities in the Port of Gladstone (McKenna et al. 2014 have recorded the presence of the erect calcareous algae *Halimeda* in low to low/medium density cover macroalgae regions
- The presence of *Halimeda* was associated with benthic communities of mostly open substrate dominated by sand/shell with low densities of erect macrophytic, erect calcareous and filamentous algae located around three areas on the offshore side of Facing Island (McKenna et al. 2014. It was also recorded in small benthic community around Rodds Peninsula where it was the dominant algae in this region (refer Figure 6.2).

6.2.2 Contribution of the local attribute to the OUV of the GBRWHA

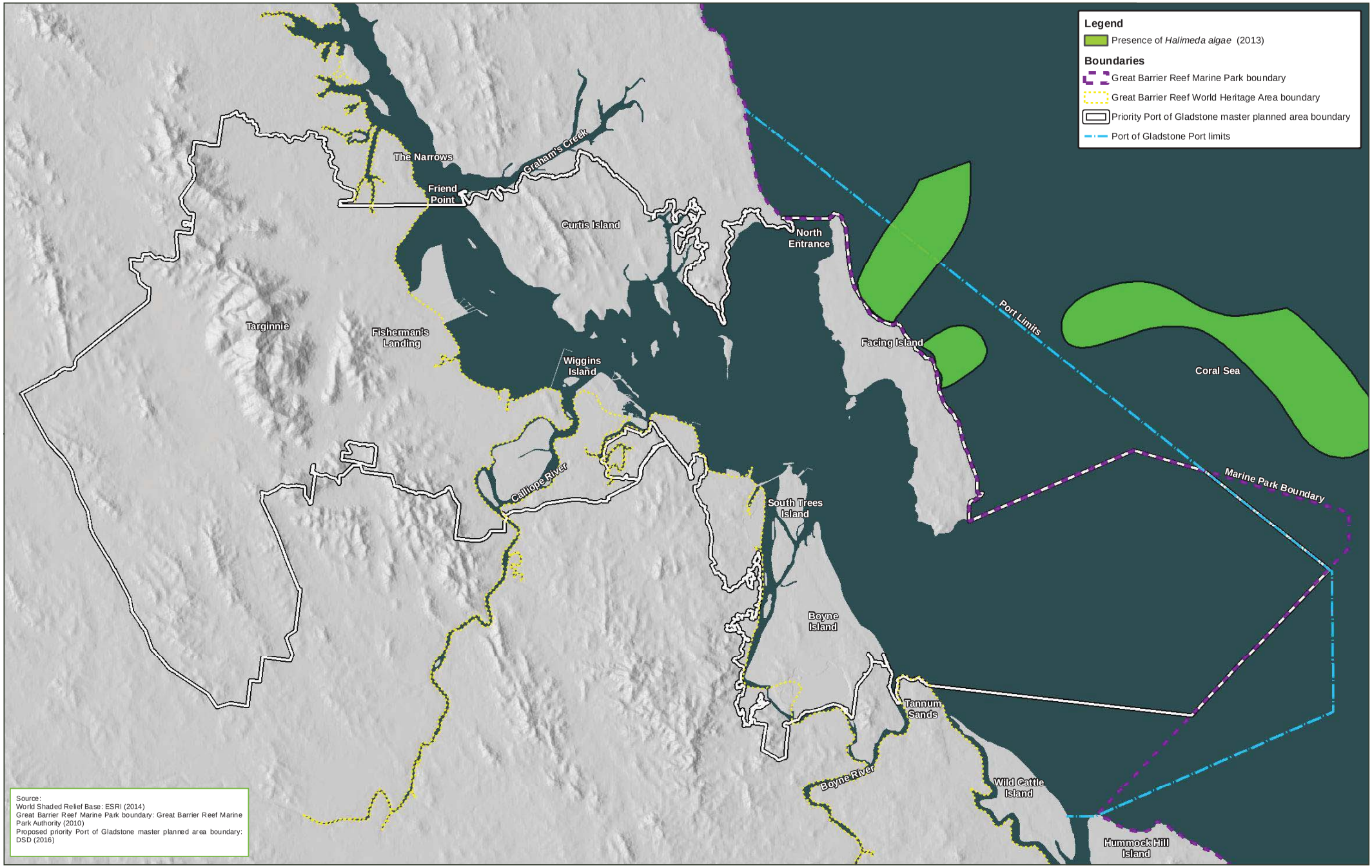
The attribute 'beds of *Halimeda* algae' has a **minor contribution** to criterion ix (ecological and biological processes) of the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

- Macroalgae genus *Halimeda* is not specifically listed under Commonwealth or state legislation

Local or regional attribute status

- Macroalgae genus *Halimeda* is not specifically listed under local or regional legislative mechanisms



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Priority Port of Gladstone master planning local expression of OUV of GBRWHA

Figure 6.2: Presence of *Halimeda algae*

Notable or iconic attribute value

- *Halimeda* in the PPG master planned area and surrounds is not specifically recognised as a prime example or value of the region in key publications (ie retrospective statement of OUV, Outlook Report 2014 and Lucas et al. 1997). *Halimeda* banks in the GBRWHA are generally associated with remote areas and deep water.

Condition/trend of the attribute

- The Great Barrier Reef Outlook Report 2014 (GBRMPA 2014a) records the attribute condition in the wider GBR to be very good for *Halimeda* algae. The attribute condition trend for Halimeda algae was recorded as stable for *Halimeda* algae.

Contribution to attribute sustainability

- The areas where *Halimeda* has been recorded in the PPG master planned area and surrounds are unlikely to contribute significantly to the sustainability of *Halimeda* as a habitat area across the GBRWHA.

Notable presence of the attribute

- The presence of *Halimeda* in the PPG master planned area and surrounds (in 2013) was associated with benthic communities of mostly open substrate dominated by sand/shell with low densities of erect macrophytic, erect calcareous and filamentous algae. *Halimeda* banks in the GBRWHA are generally associated with remote offshore areas and deep water in the northern areas of the GBRWHA (refer Figure 6.3).

Figure 6.3 Locations of *Halimeda* banks

Source: GBRMPA (2014)

Significance of attribute to the preservation of the GBRWHA

- Loss of *Halimeda* algae within and surrounding the PPG master planned area may impact on the local reef communities. It is not, however, expected that this would result in the significant decline in the OUV of the GBRWHA.

7 Seabirds and migratory shorebirds

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 relating to seabirds and shorebirds is summarised in Table 7.1, with respect to the local expression of the OUV of the GBRWHA for the PPG master planned area and surrounds.

Table 7.1 OUV of the GBRWHA: Seabirds and migratory shorebirds

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Seabirds	■ Twenty-two seabird species breed on cays and some continental islands, and some of these breeding sites are globally significant; other seabird species also utilise the area. ■ On many of the cays there are	■ Breeding colonies of seabirds at the following islands and cays supporting breeding populations. Important seabird areas include Raine Island, Michaelmas Cay, islands of the Capricorn-Bunker Group and the cays of the Swain Reefs.	Poor	No consistent trend	✓	-	-	-
		■ 22 seabird species breeding (cays and some continental islands have globally significant breeding sites)	-	-	-	-	-	✓

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
	spectacular and globally important breeding colonies of seabirds	■ Islands and cays within the GBR support breeding populations of 20 seabird species. It is estimated that between 1.4 and 1.7 million seabirds breed throughout the GBR each year. This represents more than 25 per cent of Australia's tropical seabirds, more than 50 per cent of offshore – foraging black noddies and approximately 25 per cent of Wedge-tailed shearwaters, Brown booby, Masked booby and Red-tailed tropic birds. The number of non-breeding birds (birds which use the region for feeding but breed elsewhere) is estimated to be about 425,000, giving a total seabird population that may exceed two million. ■ Key locations include wetlands, shorelines, offshore islands and coral cays.	Poor	-	-	-	✓	-

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Shorebirds and migratory birds	■ 242 species of birds ■ The establishment of vegetation on the cays and continental islands exemplifies the important role of birds, such as the Pied Imperial Pigeon, in processes such as seed dispersal and plant colonisation.	■ 242 species of birds	Poor	-	-	-	-	✓

7.1 Seabirds

7.1.1 Presence of local attribute

For the purposes of this attribute, the assessment of local expression of the seabird attribute was limited to seabirds known to breed in the GBRWHA. This is consistent with the description of the attribute in the Statement of OUV (DoE 2015a), the Outlook Report 2014 (GBRMPA 2014a) and other supporting reports (eg Lucas et al. 1997).

Although there is no breeding habitat within the PPG master planned area and surrounds for the seabird species considered here, there is potential foraging habitat within the master planned area.

Seabirds have a **minor presence** in the PPG master planned area and surrounds based on the following information:

- The offshore and pelagic foraging seabirds known to breed in the Mackay/Capricorn region (refer Figure 7.1) of the GBRWHA include (GBRMPA 2012, GBRMPA 2014a):
  - Wedge-tailed shearwater (*Ardenna pacifica*)
  - Brown booby (Sula leucogaster)
  - Masked booby (*Sula dactylatra*)
  - Lesser frigatebird (*Fregata ariel*)
  - Red-tailed tropic bird (*Phaethon rubricauda*)
  - Black noddy (*Anous minutus*)

- The nearest known seabird breeding colonies to the PPG master planned area and surrounds are situated in the Capricorn-Bunker Group of coral cays and islands (refer Figure 7.1) (GBRMPA 2012, GBRMPA 2014a). The 13 islands and cays in the Capricorn-Bunker Group host breeding colonies for approximately 65.6 per cent of the biomass of breeding seabirds in the GBR (Dyer et al. 2005, GBRMPA 2012, Hulsman et al. 1997).
- These breeding colonies are situated approximately 45 km north east of the PPG master planned area
- Wedge-tailed shearwaters have been recorded travelling between 300 km to 1100 km from breeding colonies to foraging sites (McDuie et al. 2015). Other seabird species, such as the Brown booby, will generally forage in shallow inshore reef waters (Bunce 2015).
- These breeding seabirds may utilise the PPG master planned area and surrounds as foraging habitat, particularly waters from the seaward side of Boyn Island and out toward the GBRMP boundary and the Capricorn-Bunker Group (refer Figure 7.1)
- Of the seabirds listed above, the following species have been recorded as occurring in the PPG master planned area and surrounds on species databases (refer Appendix C):
  - Wedge-tailed shearwater – 1 record
  - Brown booby – 3 records (1 specimen backed)
  - Masked booby – not recorded
  - Lesser frigatebird – 1 record
  - Red-tailed tropic bird – not recorded
  - Black noddy – 2 records

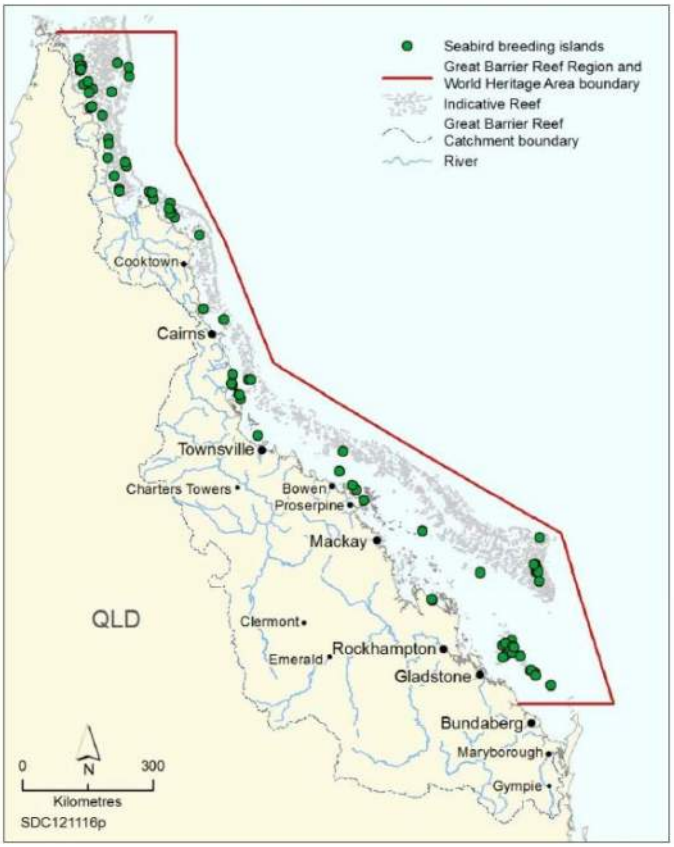


Figure 7.1 Principal seabird breeding islands within the GBRWHA

Source: GBRMPA (2014a)

7.1.2 Contribution of the local attribute to the OUV of the GBRWHA

The seabird attribute is considered to have a **minor contribution** to criterion vii (aesthetic values and superlative natural phenomena), ix (ecological and biological processes) and x (biodiversity conservation) of the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

- The majority of the seabird species that breed in the GBRWHA are listed on international conventions and agreements for the coordination of conservation efforts for migratory species. None of these species are listed under Commonwealth or state legislation as threatened species, however, they are all listed under the EPBC Act as marine species and/or migratory species.
  - Wedge-tailed shearwater – listed on the Japan-Australia Migratory Bird Agreement (JAMBA), EPBC Act Migratory/Marine species
  - Brown booby – listed on JAMBA, Chinese-Australia Migratory Bird Agreement (CAMBA), Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA), and EPBC Act Migratory/Marine species
  - Masked booby – listed on JAMBA, ROKAMBA, and EPBC Act Migratory/Marine species
  - Lesser frigatebird – listed on JAMBA, CAMBA, ROKAMBA, and EPBC Act Migratory/Marine species
  - Red-tailed tropic bird – listed on JAMBA, CAMBA, ROKAMBA, and EPBC Act Migratory/Marine species
  - Black noddy – EPBC Act Marine species
- The potential foraging habitat present within and surrounding the PPG master planned area is not considered critical habitat and low numbers of the species have been recorded within the area. Critical habitat is considered to be the islands and cays supporting breeding colonies which are situated outside of the PPG master planned area and surrounds.

Local or regional attribute status

- The potential foraging habitat for the relevant seabirds is not specifically protected

Notable or iconic attribute value

- The potential foraging habitat and presence of seabirds within the PPG master planned area and surrounds is not specifically recognised in available publications as a prime example of value

Condition/trend of the attribute

- Seabirds are reported as being in 'poor' condition with no consistent trend in the Outlook Report 2014 (GBRMPA 2014a). This report indicates that seabird populations are highly variable between species and there is a lack of long term monitoring data.
- The presence of seabirds within the PPG master planned area is low, and does not allow analysis of the condition/trend of seabirds or the potential foraging habitat within the PPG master planned area and surrounds

Contribution to attribute sustainability

- The potential foraging areas are not considered to be critical/important to sustaining seabird populations due to the potential for seabirds to forage over large distances, combined with the low number or confirmed records for these species in the PPG master planned area and surrounds
- The local presence of seabirds and potential foraging habitat in the PPG master planned area and surrounds does not represent a key aggregation, breeding, feeding or recruitment location

- It is unlikely that the loss or decline of potential foraging habitat would affect the conservation status of these seabirds

Notable presence of the attribute

- The potential foraging habitat within the PPG master planned area and surrounds is not unique, unusual or notable

Significance of attribute to the preservation of the GBRWHA

- It is highly unlikely that the loss of potential seabird foraging habitat from the master planned area and surrounds would result in a significant decline in the OUV of the GBRWHA.

7.2 Shorebirds and migratory birds

7.2.1 Assessment approach

It is acknowledged that migratory shorebirds are generally highly mobile, and may use multiple sites within the PPG master planned area and surrounds during their seasonal migration to the region. As such, it is important to note that the important roost sites discussed experience fluctuations in the number of shorebirds over time. It is therefore important to consider roost sites and potential foraging habitat as a system, rather than in isolation, as roost sites are likely to be utilised where they occur in proximity to suitable foraging habitat.

For the purposes of this assessment, migratory shorebirds survey data has been utilised, however there are a number of resident shorebirds within the PPG master planned area and surrounds.

One of the key information sources referenced for this assessment was a migratory shorebird monitoring review report prepared for GPC by IMEMS (2013). This review summarised results of a series of shorebird surveys in the Curtis Coast region (IMEMS 2013). These surveys targeted five key localities, including the Fitzroy Delta, North Curtis Island, Port Curtis, Colosseum inlet/Mundoolin Rock and Rodds Peninsula. This report reviewed survey data collected and records from the Queensland Wader Study Group (QWSG) from 1993 to 2013, from approximately 188 survey sites throughout the Curtis Coast region.

Annual shorebird monitoring event reports prepared for GPC have also been utilised. This includes data collected from the Port of Gladstone and surrounds from 2013 to 2016 (Wildlife Unlimited 2013, 2014, 2015 and 2016).

For the purposes of this assessment, the definitions for important habitat for migratory shorebirds in the EPBC Act Policy Statement 3.21 Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DoE 2015b) have been adopted, including:

- Internationally important habitat:
  - Regularly supports 1% of the individuals in a population of one species/subspecies of waterbird, or a total abundance of at least 20,000 waterbirds
- Nationally important habitat:
  - Regularly supports 0.1% of the flyway population of a single species of migratory shorebird, or 2,000 migratory shorebirds, or 15 migratory shorebird species

The above definitions include the term ‘regularly support’ in their threshold levels for important habitat. The information below is based on habitat that has been recorded on more than one occasion to exceed a particular threshold. It is the summation of these important roost sites that contribute to the overall habitat value of the PPG master planned area and surrounds.

7.2.2 Presence of local attribute

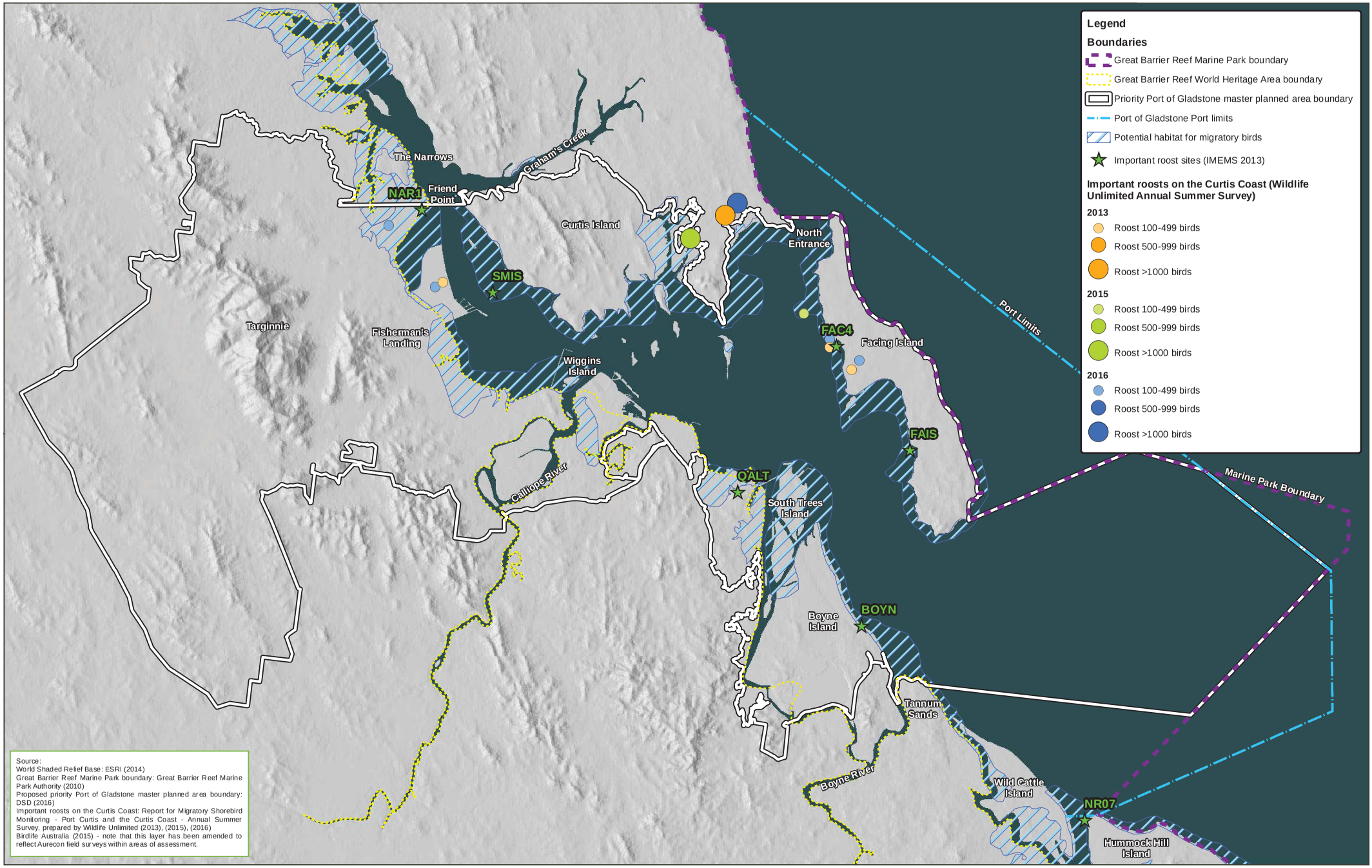
Shorebirds and migratory birds have a **significant presence** in the PPG master planned area and surrounds based on the following information:

- Approximately 11% of the PPG master planned area is mapped as potential shorebird habitat (refer Figure 7.2) (Birdlife Australia 2015). Of the total area of potential shorebird habitat mapped in the GBRWHA, approximately 2.8% is located within the PPG master planned area (Birdlife Australia 2015).
- Shorebird populations which have exceeded 0.1% of total East Asian-Australasian Flyway (EAAF) population within the PPG master planned area for five migratory shorebird species (refer locations of important roost sites as shown in Figure 7.2), as outlined in Table 7.2.

Table 7.2 Important roost sites within the PPG master planned area and surrounds identified in IMEMS (2013) as supporting at least 0.1% of a flyway population

Location of important roost sites with > 0.1% of a EAAF population	Species for which counts of birds on at least one occasion exceed > 0.1% of the EAAF population
■ **NAR1** (1% to 2%) located on the shoreline at Friend Point on Kangaroo Island	■ Eastern curlew (*Numenius madagascariensis*)
■ **SMIS** (1% to 2%) located on Six Mile Island in The Narrows	■ Eastern curlew
■ **QALT** (3% to 6%) (QALT is composed of 10 subareas)	■ Eastern curlew ■ Grey-tailed tattler (*Tringa brevipes*) ■ Terek sandpiper (*Xenus cinereus*)
■ **FAC4** (7% to 10%) located on Facing Island	■ Eastern curlew ■ Grey-tailed tattler ■ Lesser sand plover (*Charadrius mongolus*) ■ Terek sandpiper
■ **FAIS** (1% to 2%) located on Facing Island	■ Terek sandpiper
■ **BOYN** (1% to 2%) located on Boyne Island Beach	■ Lesser sand plover
■ **NR07**(1% to 2%) located at Tiber Point at the entrance to Colosseum Inlet	■ Ruddy turnstone (*Arenaria interpres*)

- Roost sites within the PPG master planned area at the following locations identified through Gladstone monitoring programs as important habitat, including:
  - Friend Point on Kangaroo Island
  - North Passage and South Passage Islands
  - Habitat within the vicinity of Port Central and surrounds (ie refer QALT site on Figure 7.2)
  - Boyne Island Beach
  - Facing Island, on the harbour facing side (refer Figure 7.2)
- Tiber Point at the entrance to Colosseum Inlet within the Curtis Coast region, including the PPG master planned area, contributes approximately 8% of the total population of migratory shorebirds in Queensland with an average population size during monitoring events in excess of 29,500 birds (population size calculated as a sum of the average counts over time for each species) (IMEMS 2013).
- A diverse range of habitat types occur within and surrounding the PPG master planned area, providing foraging and roosting habitat for a range of migratory bird species (refer Figure 7.2)



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Priority Port of Gladstone master planning local expression of OUV of GBRWHA

Figure 7.2: Shorebird habitat and important roosting sites

- One roost site within the Port Curtis region on North Curtis Island (Yellow Patch Estuary, approximately 25 km north of the PPG master planned area) has been recorded to hold more than 1% of the flyway population of Whimbrels (*Numenius phaeopus*) and is therefore considered important habitat (meets the threshold for internationally important habitat, though it is unknown if this site supports this proportion of Whimbrels on a regular basis). Although this site is not within the PPG master planned area and surrounds, species utilising this habitat could potentially utilise roosting/foraging resources in the PPG master planned area and surrounds due to their highly mobile nature.
- There are important shorebird habitats within the PPG master planned area and the surrounds. Shorebirds are likely to utilise habitat throughout these areas and population counts of shorebirds in the PPG master planned area are therefore likely to fluctuate over time (ie birds will not always return to the same roost, and may utilise multiple roosts in one season, refer IMEMS 2013).
- The peak period for migratory shorebirds arriving in Central Queensland for most species recorded from the PPG master planned area and surrounds is from October through to February, however it is noted that many species will be present outside of these peak period. Wildlife Unlimited (2016) presents an indication of peak migration periods and flux periods for migratory shorebirds relevant to the PPG master planned area, for information.

7.2.3 Contribution of the local attribute to the OUV of the GBRWHA

Shorebirds and migratory birds have a **significant contribution** to criterion x (biodiversity conservation) of the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

Species for which important habitat is known to occur within the PPG master planned area and surrounds are listed below, however, other threatened migratory shorebird species are known to occur within the area (refer Appendix C).

- All of these species are listed as migratory/marine under the provisions of the EPBC Act. All are listed on CAMBA and ROKAMBA, and all are listed on JAMBA with the exception of the Grey-tailed tattler
- Eastern curlew – listed as critically endangered under the EPBC Act and vulnerable under the NC Act
- Grey-tailed tattler – not listed as a threatened species under Commonwealth or state legislation
- Terek sandpiper – not listed as a threatened species under Commonwealth or state legislation
- Lesser sand plover – listed as endangered under the EPBC Act
- Ruddy turnstone – not listed as a threatened species under Commonwealth or state legislation
- The Beach-stone curlew (*Esacus magnirostris*), a resident shorebird (ie non-migratory) occurring within the PPG master planned area and surrounds (IMEMS 2013), is listed as vulnerable under the NC Act

Local or regional attribute status

- There are no internationally recognised protection areas established for shorebirds within the PPG master planned area or surrounds (ie Ramsar wetlands)
- As stated above, many migratory shorebirds are protected under international agreements such as CAMBA, JAMBA and ROKAMBA

Notable or iconic attribute value

- No locations within the PPG master planned area or surrounds are specifically noted within key documents (ie retrospective statement of OUV, Outlook Report 2014 and Lucas et al. 1997)

Condition/trend of the attribute

- There are currently no population estimates for shorebirds in the GBRWHA, though it is noted that there are substantial population declines Australia-wide (GBRWHA 2014)

Contribution to attribute sustainability

- As there are currently no shorebird population estimates for the GBRWHA, shorebirds within the Gladstone region and surrounding areas has been assessed relative to the Queensland population estimates (refer Table 7.3 and IMEMS [2013]).
- This indicates that the Gladstone region and surrounds supports more that 10% of the Queensland population for six migratory shorebird species, including 10.9% of the Queensland population of the endangered Lesser sand plover. Approximately 8.6% of Queensland population of the critically endangered Eastern curlew occurs within the Gladstone region and surrounds.
- Figure 7.3 shows the distribution of sighting records of Eastern Curlew species submitted to eBird in the last 10 years. Though there are other areas in the GBRWHA with a higher proportion of records (eg locations near Cairns, Townsville and Airlie Beach), the PPG master planned area and surrounds is considered to make an important contribution to the population within Queensland.

Table 7.3 Percentage of migratory shorebird species State population occurring in the Gladstone region and surrounds

Migratory shorebird species	Percentage of state population within the Gladstone region and surrounds
Bar-tailed godwit	5.5%
Black-tailed godwit	1.4%
Common greenshank	10.3%
Curlew sandpiper	15.6%
Eastern curlew (Critically endangered, EPBC Act)	8.6%
Great knot	2.8%
Greater sand plover	4.4%
Grey-tailed tattler	7.6%
Lesser sand plover (Endangered, EPBC Act)	10.9%
Red-necked stint	11.0%
Ruddy turnstone	12.4%
Sanderling	9.1%
Sharp-tailed sandpiper	4.1%
Terek sandpiper	13.7%
Whimbrel	8.9%

Source: IMEMS (2013)

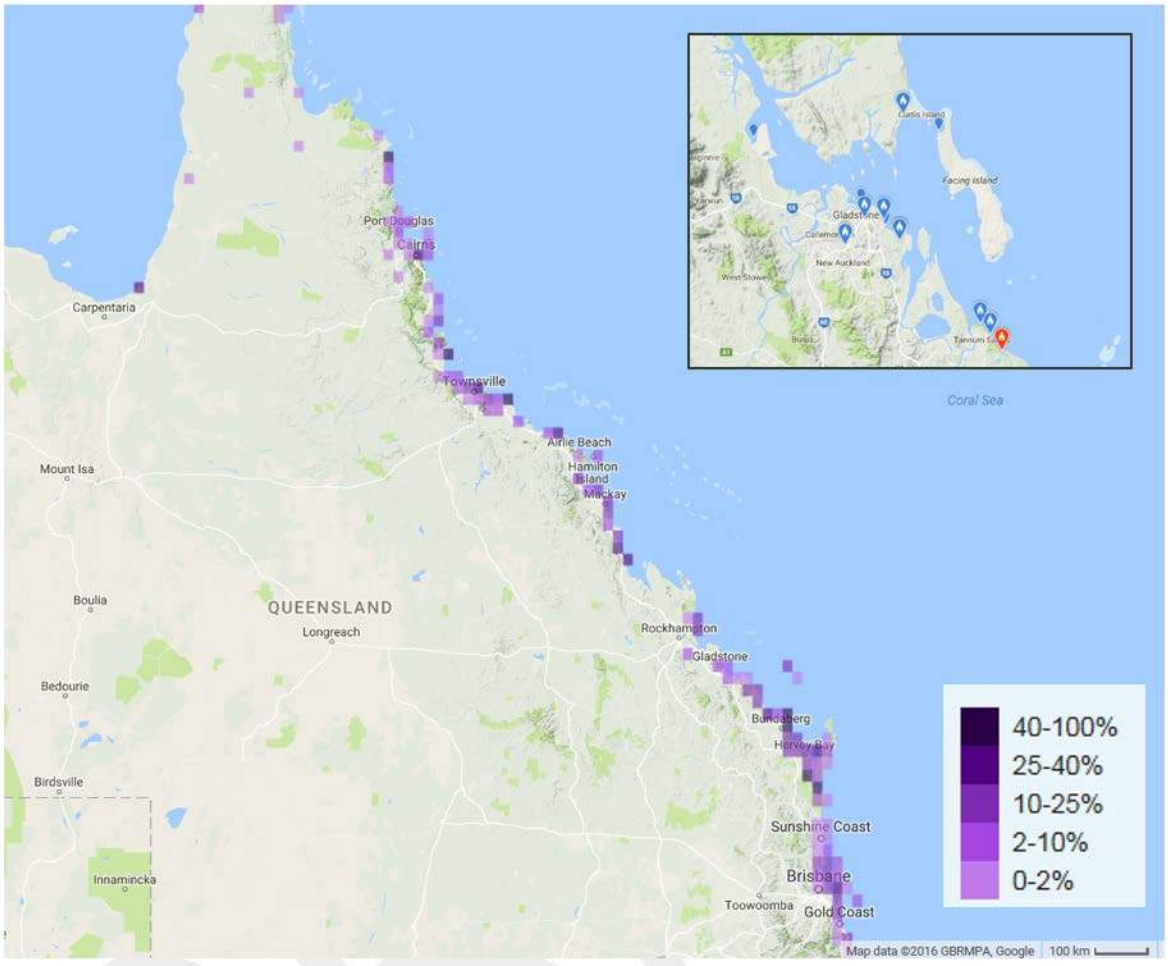


Figure 7.3 Distribution of records of the Eastern curlew submitted to eBird from 2006 to 2016 in Queensland

Source: eBird Australia (2016)

Notable presence of the attribute

- The PPG master planned area and surrounds is not reported as a notable, unique or unusual example of shorebird habitat.
- Although more important shorebird habitat exists within the GBRWHA (ie Ramsar wetlands at Bowling Green Bay and Shoalwater and Corio Bays Area as shown in Figure 7.4), the PPG master planned area and surrounds provides important habitat for a number of migratory shorebirds including threatened shorebirds.

Significance of attribute to the preservation of the GBRWHA

- There is uncertainty around the estimated population numbers of migratory shorebirds and shorebirds within the GBRWHA (GBRMPA 2014a). However it is considered that due to the presence of important habitat and the proportion of the Queensland populations of migratory shorebirds (refer Table 7.3), the PPG master planned area and surrounds contributes significantly to the shorebird attribute of the OUV of the GBRWHA.

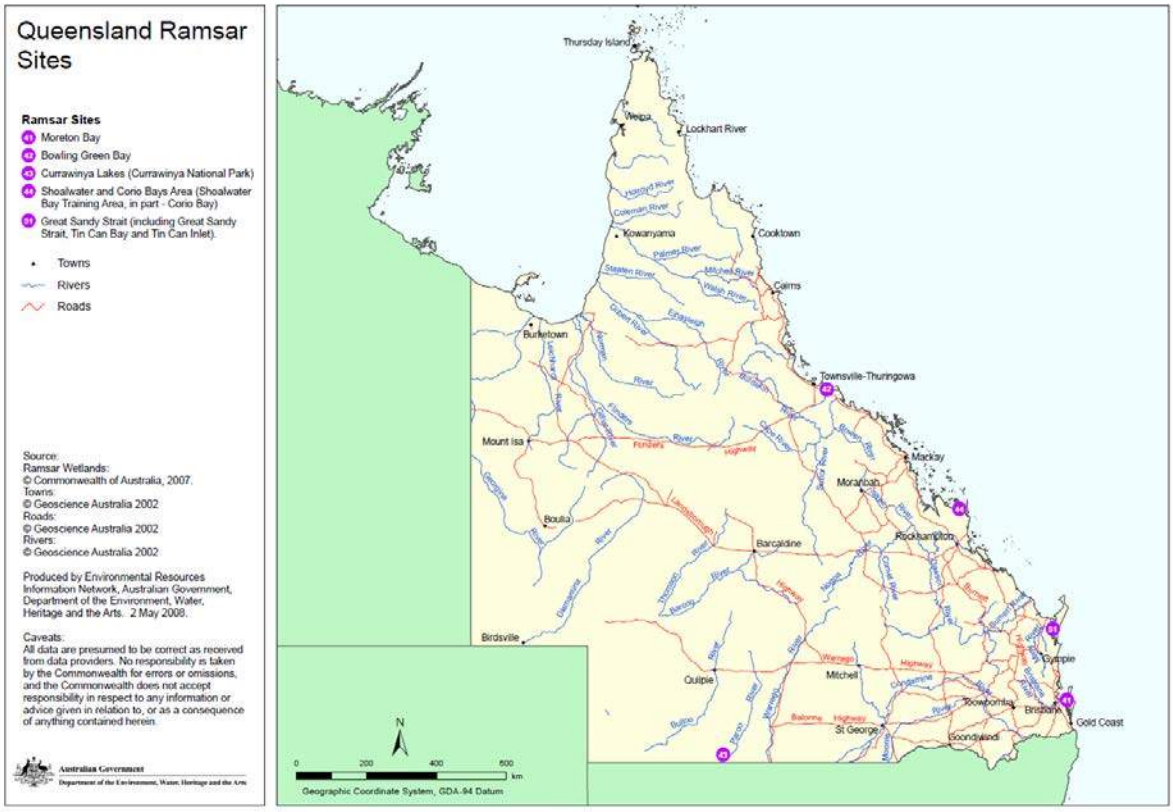


Figure 7.4 Queensland Ramsar wetlands

Source: DEWHA (2008)

8 Flora, fauna and ecological communities

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 relating to flora, fauna and ecological communities is summarised in Table 8.1, with respect to the local expression of the OUV of the GBRWHA for the PPG master planned area and surrounds.

Table 8.1 OUV of the GBRWHA: Flora, fauna and ecological communities

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Threatened and endangered flora and fauna species (including threatened ecological communities)	■ GBRWHA contains a significant number of threatened species	■ Habitats to support species is highly variable with some well-known. Habitats in the southern portion of the GBRWHA have deteriorated, particularly seagrass meadows and reefs	Good	Deteriorated	-	-	-	✓
Vegetated mountains	■ The rugged vegetated mountains on Hinchinbrook Island contribute to the vast mosaic patterns of the GBRWHA	■ Rugged vegetated mountains and lush rainforest gullies of Hinchinbrook Channel and Island	-	-	✓	-	-	-
Mangroves	■ The shallower marine areas of the GBRWHA support half the world's diversity of mangroves species	■ Approximately 2,070 km^2 of mangrove habitat within and adjacent to the GBRWHA	Very good	Stable	✓	✓	✓	✓
Mangrove species diversity		■ 39 mangrove species and hybrids have been recorded in the GBRWHA	Good	Stable	-	-	-	✓

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Vast mangrove forests	■ The vast mangrove forests in Hinchinbrook Channel contribute to the vast mosaic patterns of the GBRWHA	■ Vast mangrove forests at The Narrows considered a notable example of mangrove sequences in the GBRWHA	Good	Stable	✓	-	-	-

8.1 Threatened and endangered flora and fauna species

For the purposes of this attribute, threatened and endangered flora and fauna species attribute were defined by the key threatened species identified within the GBR coastal zone strategic assessment (DSD 2014). The methodology for the selection of this species in the GBR coastal zone strategic assessment is outlined in Section 3.4 of the assessment report ('Methodology for selecting key MNES values'), and included species listed under the EPBC Act that were predicted to occur in the coastal zone assessment area and were likely to be impacted as a result of proposed developments (ie based on development applications and EBPC Act controlled action project referrals).

The mapping from the GBR coastal zone strategic assessment for these key threatened species was reviewed and where species habitat was predicted to occur in the PPG master planned area, the species were included within the contribution assessment for this attribute (ie this report).

Threatened flora and fauna species which have been recorded within the PPG master planned area and surrounds on the Wildlife Online database and the EPBC protected matters search tool are also included within this attribute (DEHP 2017, DoEE 2016b) (refer Appendix C).

Threatened species mapping is provided in the master planning risk assessment (refer Appendix A and B of the master planning risk assessment), based on the best available information. It is acknowledged that the currently available information is 'low precision data' (due to sensitivity of data), includes areas that have been previously cleared/significantly disturbed, or does not contain mapping data for all of the threatened species with potential to occur in the PPG master planned area and surrounds. Table 2.1 in the master planning risk assessment provides a detailed overview of the available environmental value mapping sources, figure references and a description of the limitations of the data sources and mapping provided. This mapping has therefore not been reproduced for the purposes of this report.

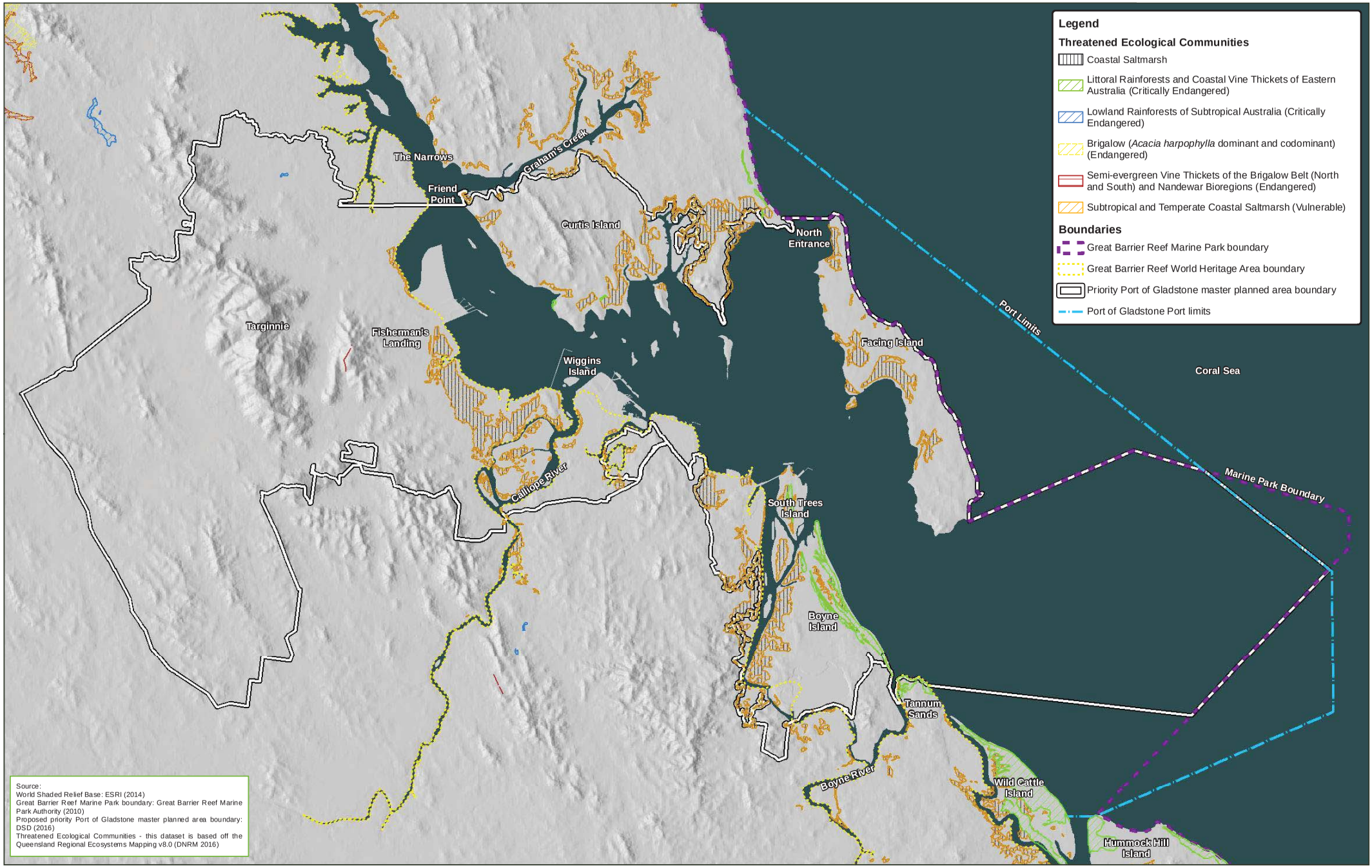
Detailed attribute assessments for a number of threatened and endangered flora and fauna species components are presented in other sections of this document (ie fish species are assessed in Section 3, marine megafauna are assessed in Section 4, seabirds and migratory shorebirds are assessed in Section 7, globally significant marine species are assessed in Section 12).

The assessment of the local expression of the threatened and endangered flora and fauna species attribute includes assessment of the local expression of threatened marine, intertidal and terrestrial flora and fauna species, threatened ecological communities (TEC) and vegetated mountains. The assessment of the local expression of vegetated mountains for this attribute considers mainland environments, with vegetated on islands considered with the continental islands attribute (refer Section 9).

8.1.1 Presence of local attribute

Threatened and endangered flora and fauna species, and TECs have an **moderate presence** and vegetated mountains have a **minor presence** within the PPG master planned area and surrounds based on the following information:

- Key threatened species were identified for the GBR coastal zone as part of the GBR coastal zone strategic assessment (DSD 2014). Potential habitat for four of the key threatened species is mapped within the PPG master planned area and surrounds, including:
  - Water mouse (*Xeromys myoides*). The Water mouse has been recorded within the PPG master planned area and surrounds (DEHP 2017)
  - Yellow chat (*Epthianura crocea macgregori*) (refer master planning risk assessment Appendix B, Figure B.63 for predictive habitat map)
  - Cassowary (*Casuarius casuarius johnsonii*), note that the species is considered unlikely to occur within the PPG master planned area and surrounds, with the PPG master planned area situated approximately 660 km south of the species southern most distribution (Latch 2007)
  - *Samadera bidwillii* (Quassia) (refer master planning risk assessment Appendix B, Figure B.63 for predictive habitat map)
- 18 globally significant marine species have the potential to occur within the PPG master planned area and surrounds
- 20 threatened intertidal and terrestrial flora and fauna species were identified in the Wildlife Online database as occurring within the PPG master planned area and surrounds (EHP 2017). An additional 37 threatened intertidal and terrestrial flora and fauna species were identified in the EPBC Act protected matters search tool as potentially occurring within the PPG master planned area and surrounds (DoEE 2016b) (note that the EPBC Act protected matters search tool results are generated based on predictive habitat mapping, whereas the Wildlife Online database is based on species observation records).
- TECs which are present within the PPG master planned area and surrounds are illustrated in Figure 8.1, and include:
  - 22.82 km^2 of the 'Subtropical and Temperate Coastal Saltmarsh' TEC is mapped within the PPG master planned area and surrounds
  - 0.02 km^2 of the TEC 'Lowland Rainforest of Subtropical Australia' is mapped within the PPG master planned area and surrounds
  - 2.13 km^2 of the TEC 'Littoral Rainforests and Coastal Vine Thickets of Eastern Australia' is mapped within the PPG master planned area and surrounds
- Mount Larcom is a vegetated mountain that is considered to contribute to the vista of the GBRWHA, particularly when viewed from coastal/marine areas.



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Priority Port of Gladstone master planning local expression of OUV of GBRWHA

Figure 8.1: Threatened ecological communities

8.1.2 Contribution of the local attribute to the OUV of the GBRWHA

Threatened and endangered species (including TECs) are considered to have a **moderate contribution** to criterion x (biodiversity conservation) and vegetated mountains are considered to have a **minor contribution** to criterion vii (aesthetic values and superlative natural phenomena) based on the following:

Commonwealth or state attribute legislative status

- Potential habitat for four of the key threatened species identified as part of the GBR coastal zone strategic assessment (DSD 2014) is mapped within the PPG master planned area and surrounds, including:
  - Water mouse (*Xeromys myoides*): vulnerable (EPBC Act, NC Act), listed as vulnerable at a global scale by the IUCN
  - Yellow chat (*Epthianura crocea macgregori*): critically endangered (EPBC Act), endangered (NC Act)
  - Cassowary (*Casuarius casuarius johnsonii*): endangered (EPBC Act, NC Act), listed as vulnerable at a global scale by the IUCN
  - *Samadera bidwillii* (Quassia): vulnerable (EPBC Act, NC Act)
- The PPG master planned area and surrounds are not listed as an area of habitat critical to the survival of the key threatened species listed above, as per applicable recovery plans or conservation advice statements available
- The 20 threatened intertidal and terrestrial flora and fauna species identified in the Wildlife Online database as occurring within the PPG master planned area and surrounds include:
  - 10 flora species
  - 5 bird species
  - 3 mammal species
  - 1 reptile species (DEHP 2017)
- The additional 37 threatened intertidal and terrestrial flora and fauna species identified in the EPBC Act protected matters search tool as potentially occurring within the PPG master planned area and surrounds include:
  - 19 bird species
  - 6 mammal species
  - 7 plant species
  - 5 reptile species (DoEE 2016b)
- 18 globally threatened marine species, listed by the IUCN, have the potential to occur within the PPG master planned area and surrounds (refer Section 12)
- TECs are protected under the provisions of the EPBC Act. The EPBC Act status for the TECs mapped within the PPG master planned area and surrounds includes:
  - Subtropical and Temperate Coastal Saltmarsh TEC: vulnerable
  - Lowland Rainforest of Subtropical Australia TEC: critically endangered
  - Littoral Rainforests and Coastal Vine Thickets of Eastern Australia TEC: critically endangered
- TECs present within the PPG master planned area and surrounds is largely defined by remnant vegetation. Remnant vegetation is protected under the provisions of the VM Act
- Mount Larcom is not currently protected under Commonwealth or state legislation.

Local or regional attribute status

- The PPG master planned area and surrounds include National Parks and Conservation Parks which are protected under the provisions of the NC Act. Areas designated as National Parks or Conservation Park provide protection to any areas of potential threatened species habitat which may be present.
- Essential habitat provides protection for areas of threatened species habitat under the provisions of the VM Act. Essential habitat has been mapped for the following threatened species within the PPG master planned area and surrounds, however the GIS layer that is currently publically accessible does not identify the species for which the habitat was recorded.
- Threatened marine species are protected within the GBRMP through permit requirements and activity restrictions in zoned areas of the GBRMP. GBRMP zoning surrounding the PPG master planned area includes 'general use zone', 'habitat protection zone', 'marine national park zone' and 'conservation park zone'.
- There are no specific TEC protection areas in the PPG master planned area or surrounds
- Mount Larcom is not protected under specific local or regional protection areas.

Notable or iconic attribute value

- The PPG master planned area and surrounds are not specifically recognised as a prime example of potential habitat for the key threatened species or TECs subject to this assessment in key publications (ie retrospective statement of OUV, Outlook Report 2014 and Lucas et al. 1997)
- Mount Larcom is not specifically recognised as a prime example or value of the region in key publications (ie retrospective statement of OUV, Outlook Report 2014 and Lucas et al. 1997).

Condition/trend of the attribute

- The Outlook Report 2014 records the attribute conditions in the wider GBR to be good for populations of species and groups of species. The attribute condition trend in the wider GBR was recorded as deteriorated for populations of species and groups of species.
- The attribute condition and trend was not assessed in the Outlook Report 2014 for terrestrial vegetation communities or for vegetated mountains.

Contribution to attribute sustainability

- 11 key threatened species have been identified within the GBR coastal zone as part of the GBR coastal zone strategic assessment (DSD 2014). Potential habitat has been identified within the PPG master planned area and surrounds for four of the key threatened species (DSD 2014). One of these species, the Southern Cassowary, is considered unlikely to occur within the PPG master planned area and surrounds, with the PPG master planned area situated approximately 660 km south of the species southernmost distribution (Latch 2007).
- 18 globally significant marine species which have the potential to occur within the PPG master planned area (refer Section 12).
- The contribution of the local expression of marine species attributes, including threatened species, within the PPG master planned area and surrounds to the GBRWHA is presented in further detail in other sections of this report, including:
  - Fish: Minor contribution discussed in Section 3
  - Dugong: Moderate contribution discussed in Section 4.1
  - Whales: Minor contribution discussed in Section 4.2
  - Dolphin: Significant contribution (criterion x) discussed in Section 4.3
  - Marine turtles (breeding colonies): Minor to moderate contribution discussed in Section 5

- Marine species diversity (of globally significant species): Moderate contribution discussed in Section 12)

- Diversity of available habitat types contribute to the diversity of species, including threatened species, within an area (Lucas et al. 1997). Vegetation communities and habitats of the Curtis Coast are similar to the major vegetation types in other parts of Central Queensland (GPC 2012). Marine, intertidal and terrestrial habitats within the PPG master planned area and surrounds are not considered to be unique to the area and are available throughout the GBRWHA.
- The GBRWHA supports approximately 111.97 km^2 of Subtropical and Temperate Coastal Saltmarsh TEC. Approximately 22.82 km^2 of subtropical and Temperate Coastal Saltmarsh TEC is present within the PPG master planned area, representing approximately 20% of the TEC within the GBRWHA.
- The GBRWHA supports approximately 129.79 km^2 of Lowland Rainforest of Subtropical Australia TEC. Approximately 0.02 km^2 of Lowland Rainforest of Subtropical Australia TEC is present within the PPG master planned area, representing approximately 0.01% of the TEC within the GBRWHA.
- The GBRWHA supports approximately 22.05 km^2 of Littoral Rainforests and Coastal Vine Thickets of Eastern Australia TEC. Approximately 2.13 km^2 of the Littoral Rainforests and Coastal Vine Thickets of Eastern Australia TEC is present within the PPG master planned area, representing approximately 9.65% of the TEC within the GBRWHA.
- Mount Larcom is not considered to significantly contribute to the OUV of the GBRWHA.

Notable presence of the attribute

- Potential habitat has been mapped in the wider GBRWHA for the threatened species identified as potentially occurring within the PPG master planned area and surrounds (DSD 2014)
- The Subtropical and Temperate Coastal Saltmarsh TEC occurs on the coastal zone south of the northern boundary of the South East Queensland IBRA bioregion (ie areas south of Gladstone) (TSSC 2013). As such, the occurrence of the TEC within the master planned area presents a notable occurrence of the TEC for the GBR region.
- Mount Larcom is not a notable or prime example of a vegetated mountain area within the GBRWHA. A prime example of vegetated mountains in the GBRWHA include the mountainous areas on Hinchinbrook Island.

Significance of attribute to the preservation of the GBRWHA

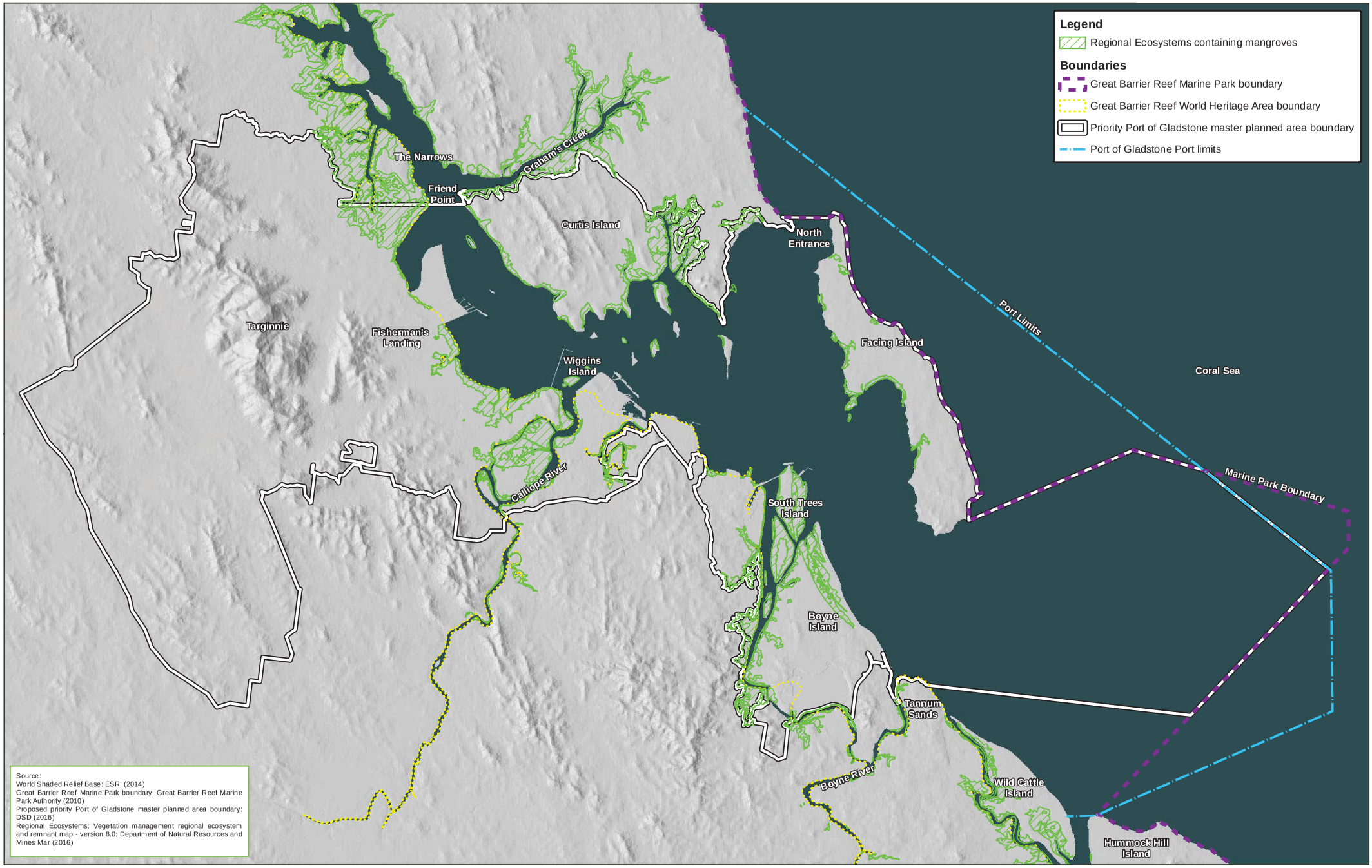
- This assessment of the significance is based on the best available information. It is acknowledged that there are limitations to the current threatened species mapping data sets available for the PPG master planned area and surrounds (eg incomplete data sets, low precision data).
- The threatened species of the GBR coastal zone strategic assessment which have been mapped as potentially occurring within the PPG master planned area and surrounds are not endemic to the PPG master planned area, with areas of potential species habitat mapped in the wider GBRWHA (DSD 2014). The loss of potential threatened species habitat within the PPG master planned area and surrounds is considered likely to impact on local assemblages of the species, however is not considered to result in a significant decline in the OUV of the GBRWHA.
- The Gladstone region represents the northern extent of the Subtropical and Temperate Coastal Saltmarsh TEC, and it is not represented in other areas of the GBRWHA. Potential loss of the TEC within the PPG master planned area and surrounds has the potential to result in a significant decline of the TEC value within the GBRWHA.
- It is unlikely that the loss of values associated with Mount Larcom would result in a significant decline in the OUV of the GBRWHA.

8.2 Mangroves

8.2.1 Presence of local attribute

Mangroves, including mangrove species diversity and vast mangrove forests, have a **minor presence** in the PPG master planned area and surrounds based on the following information:

- Intact, remnant mangrove forests are present within the PPG master planned area and surrounds, associated with:
  - Curtis Island, Facing Island and other inshore islands
  - The Narrows
  - Coastline situated between Fisherman's Landing and Wiggins Island
  - Boyne Island Beach and coastal dunes
  - South Trees Inlet
- Approximately 31.11 km^2 of remnant mangrove forests are present within the PPG master planned area
- 13 mangrove species have been recorded within the PPG master planned area and surrounds (GPC 2012), including:
  - Holly leaf mangrove (*Acanthus ilifolius*)
  - Club mangrove (*Aegialitis annulata*)
  - River mangrove (*Aegiceras corniculatum*)
  - Grey mangrove (*Avicennia marina*)
  - Orange mangrove (*Bruguiera exaristata*)
  - Large-leafed orange mangrove (*Bruguiera gymnorrhiza*)
  - Yellow mangrove (*Ceriops tagal*)
  - Milky mangrove (*Excoecaria agallocha*)
  - Black mangrove (*Lumnitzera racemosa*)
  - Myrtle mangrove (*Osbornia octodonta*)
  - Red mangrove (*Rhizophora stylosa*)
  - Cannonball mangrove (*Xylocarpus granatum*)
  - Cedar mangrove (*Xylocarpus maoluccensis*)
- Remnant mangrove forests present within the PPG master planned area and surrounds are illustrated in Figure 8.2. This includes remnant vegetation communities containing the following REs:
  - RE 11.1.2 – Samphire forbland on marine clay plains
  - RE 11.1.4 – Mangrove low open forest and/or woodland on marine clay plains
  - RE 12.1.2 – Saltpan vegetation including grassland, herbland and sedgeland on marine clay plains
  - RE 12.1.3 – Mangrove shrubland to low closed forest on marine clay plains and estuaries
  - RE 12.1.1 – Swamp She-oak (*Casuarina glauca*) woodland on margins of marine clay plains



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Priority Port of Gladstone master planning local expression of OUV of GBRWHA

Figure 8.2: Regional Ecosystems containing mangrove communities

8.2.2 Contribution of the local attribute to the OUV of the GBRWHA

Mangroves are considered to have a **minor contribution** to vii (aesthetic values and superlative natural phenomena), viii (ongoing geological processes), ix (ecological and biological processes) and x (biodiversity conservation), with mangrove species diversity considered to have a **minor contribution** to x (biodiversity conservation) and vast mangrove forests considered to have a **moderate contribution** to vii (aesthetic values and superlative natural phenomena).

Commonwealth or state attribute legislative status

- Marine plants, including mangroves, are protected under the provisions of the *Fisheries Act 1994*
- Mangrove forests which classify as remnant vegetation are protected under the provisions of the *Vegetation Management Act 1999* (Qld) (VM Act)

Local or regional attribute status

- Mangrove vegetation is not specifically protected under local or regional legislative mechanisms

Notable or iconic attribute value

- The vast mangrove forests at The Narrows are noted by Lucas et al. (2007) as a notable example of mangrove sequences in the GBRWHA

Condition/trend of the attribute

- The Outlook Report 2014 records the attribute conditions in the wider GBR to be very good for mangrove species diversity and abundance and good for mangrove forest habitats
- The attribute condition trend in the wider GBR is recorded as stable for mangrove species diversity and abundance and mangrove forest habitats (GBRMPA 2014a)

Contribution to attribute sustainability

- The remnant mangrove forests present within the PPG master planned area and surrounds do not include Endangered or Of concern Regional Ecosystems. The mangrove communities are well represented in areas outside of the PPG master planned area
- The GBRWHA supports approximately 2069 km^2 of mangrove forests (Lucas et al. 1997). Approximately 31.11 km^2 of remnant mangrove forests are present within the PPG master planned area, representing approximately 1.50% of the GBRWHA mangrove areas
- 39 mangrove species and hybrids have been recorded in the GBRWHA. 14 species of mangrove have been recorded within the PPG master planned area and surrounds (GPC 2012), representing 39% of the known mangrove species within the GBRWHA.

Notable presence of the attribute

- The remnant mangrove vegetation communities present within the PPG master planned area and surrounds are not listed as Endangered or Of concern REs and are considered to be well represented in areas elsewhere within the GBR region
- There are no mangrove species present within the PPG master planned area and surrounds which are at the northern extent of their distribution (GPC 2012). As such, the mangrove species within the PPG master planned area and surrounds are considered to be represented in the GBRWHA

Significance of attribute to the preservation of the GBRWHA

- Loss of mangrove vegetation within and surrounding the PPG master planned area may impact on local mangrove assemblages. It is not, however, expected that this would result in the significant decline in the OUV of the GBRWHA.

9 Continental islands

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 relating to the continental islands is summarised in Table 9.1, with respect to the local expression of the OUV of the GBRWHA for the PPG master planned area and surrounds.

Threatened flora species and ecological communities are discussed in Section 8.1.

Table 9.1 OUV of the GBRWHA: Continental islands

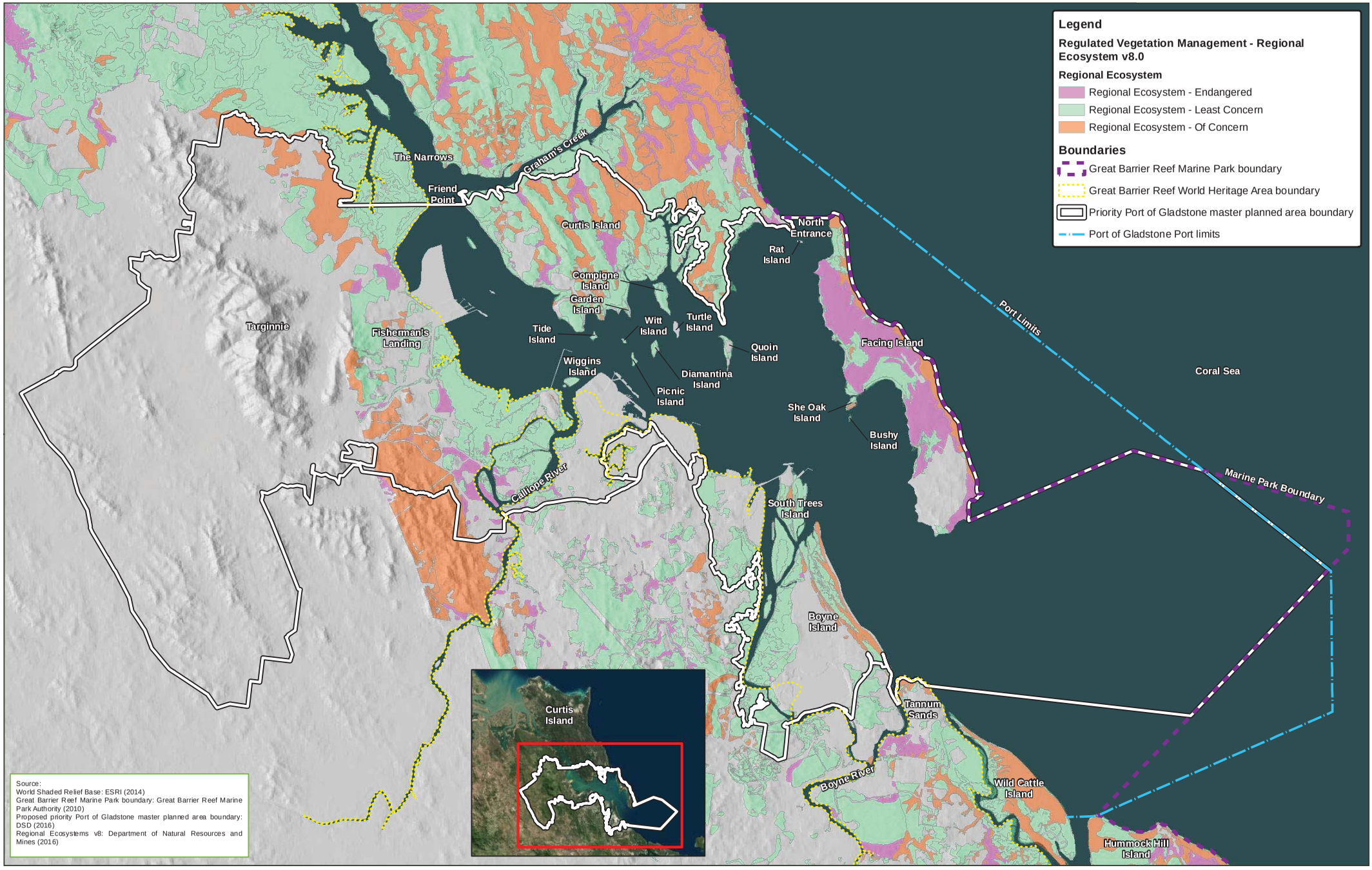
Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Continental islands and green vegetated islands	■ On some continental islands, large aggregations of over-wintering butterflies periodically occur. ■ The processes of geological and geomorpholo gical evolution are well represented, linking continental islands, coral cays and reefs. ■ Ongoing erosion and accretion of coral reefs, sand banks and coral cays combine with similar processes along the coast and around continental islands. ■ Breeding habitat for some seabird species and support	■ Islands that are geologically related to the Australian mainland and were typically formed when rising seas (for example, at the end of an ice age) cut off part of the land from the continent. ■ Inshore islands such as Curtis Island and Magnetic Island and offshore groups such as the Brampton and Lindeman island groups. ■ Pristine and good condition natural environments are considered significant contributions to the OUV include continental islands with vegetation coverage and sandy beaches	Mosaic patterns of reefs, islands and coral cays: Good Green vegetated islands: Good	Mosaic patterns of reefs, islands and coral cays: - Green vegetated islands: Deteriorated	✓	✓	-	-
Vegetation of the continental islands		■ Coral reefs are the cornerstone of the GBR ecosystem and its evolutionary history. Their species diversity, habitat value and natural beauty are major contributors to the Reef's outstanding	Plant species and diversity: Good	Plant species and diversity: Decline	-	-	✓	✓
Plant species diversity and endemism (species being unique to a defined geographic location)					-	-	-	✓

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Green vegetated islands	distinct flora and fauna.	universal value as a world heritage area. The GBR is the world's largest coral reef ecosystem; ranging over 14 degrees in latitude and comprising more than 2900 separate coral reefs. ■ Large and intact areas of coral reefs and cays. ■ The islands and reefs of the Capricorn and Bunker Island group provide an example of an ecosystem that has evolved over millennia, has all stages of reef development and almost all geomorphological evolutionary processes remain intact. ■ The region supports 1000s of species of plants, many of which are endemic to the region. Notable are the vast and diverse mainland mangrove forests and, in places, unique island vegetation.	Mosaic patterns of reefs, islands and coral cays: Good	-	✓	-	-	-

9.1 Presence of local attribute

Continental islands have a **significant presence** in the PPG master planned area and surrounds based on the following information:

- There are a number of continental islands within the PPG master planned area and surrounds (refer Figure 9.1), including:
  - Curtis Island
  - Facing Island
  - Other smaller inshore, vegetated islands such as Quoin Island, Compigne Island, Turtle Island, Diamantina Island, Witt Island, Tide Island, Picnic Island, She Oak Island, Bushy Islet, Rat Island and Garden Island.



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Priority Port of Gladstone master planning local expression of OUV of GBRWHA

Figure 9.1: Continental islands and associated RE mapping

- Curtis Island is the largest continental island within the GBRWHA (by land area).
- The Regional Ecosystem (RE) mapping for the continental islands in Figure 9.1, indicates that there is remnant vegetation communities on many of the islands, including large areas of Endangered RE on Facing Island and moderate extents of Of concern RE on both Facing and Curtis Islands. Interrogation of the DNRM RE data (version 8, 2016) indicates that the vegetation communities represented on the smaller inshore continental islands (eg Quoin Island, Diamantina Island, She Oak Island) are also represented on Curtis and Facing Islands. On this basis, it is considered that these islands are likely to contain habitat for similar types of island flora species and communities.

9.2 Contribution of the local attribute to the OUV of the GBRWHA

The contribution of the local expression of continental islands and vegetated islands to the OUV of the GBRWHA are outlined for each criteria below.

- **Moderate contribution** to criterion vii (aesthetic values and superlative natural phenomena) of the OUV of the GBRWHA
- **Moderate contribution** to criterion viii (ongoing geological processes) of the OUV of the GBRWHA
- **Significant contribution** to criterion ix (ecological and biological processes) of the OUV of the GBRWHA
- **Significant contribution** to criterion x (biodiversity conservation) of the OUV of the GBRWHA.

These contribution ratings are based on the following information:

Commonwealth or state attribute legislative status

- Garden Island is protected as a Regional Park under the NC Act
- Curtis Island is protected as the following categories under the NC Act:
  - National Park – 17.76% of the total area of Curtis Island
  - Regional Park – 12.87% of the total area of Curtis Island

Local or regional attribute status

- Refer above.

Notable or iconic attribute value

- Hinchinbrook and Curtis Islands are identified as having the most diverse terrestrial flora in the GBRWHA (Lucas et al. 1997):
  - Hinchinbrook Island with 600 flora species (approximately 800 km north of the PPG master planned area)
  - Curtis Island with 590 flora species.
- None of the other continental islands in the PPG master planned area and surrounds are reported in key reference documents as being notable or iconic. However this does not discount their local contribution to the continental islands attribute for the PPG master planned area.
- With the exception of Curtis Island, there is limited available information on the flora species diversity on the continental islands in the PPG master planned area and surrounds.

Condition/trend of the attribute

- The Outlook Report 2014 records the attribute conditions in the wider GBR to be good for islands. The attribute condition trend in the wider GBR is recorded as deteriorated for continental islands.

Contribution to attribute sustainability

- As outlined above, Curtis Island is important as it contains a high level of flora species diversity, and represents a key example of the unique island vegetation communities on islands in the GBRWHA. Lucas et al. (1997) reported that 2,195 species of plants, totalling 25% of the total flora for Queensland, had been recorded from the continental islands of the GBRWHA. Other Islands in the PPG master planned area and surrounds are likely to support the similar species (based on the RE mapping), however there is limited available and relevant information for these islands.
- The Curtis Island cliff and shoreline platforms in the southeast of Curtis Island are considered important as they provide information on past geological processes, such as sedimentation during the Carboniferous period (350 to 300 million years ago) (QDEH 1994). Other important geomorphological features of the continental islands in the PPG master planned area and surrounds include:
  - Beach ridge and swale systems on Curtis Island
  - Curtis Island parabolic dunes
  - Facing Island raised coral reef platform (QDEH 1994)
- The above features all contribute to the dynamic coastal processes of erosion, sedimentation and redistribution of sediments. In particular, the erosion of the Curtis Island coastal cliffs are important for the ongoing supply of sediment to the surrounding coast (QDEH 1994).
- The sandy beaches of Curtis and Facing Islands (refer Section 5).

Notable presence of the attribute

- Refer above information.
- Though there are approximately 600 continental islands within the GBRWHA (Lucas et al. 1997), Curtis Island represents a significant and notable example and with commensurate flora species value to Hinchinbrook Island.

Significance of attribute to the preservation of the GBRWHA

- It is considered that Curtis Island significantly contributes to the OUV of the GBRWHA for the values outlined in the above information. The other continental islands in the PPG master planned area and surrounds further support the expression of this attribute at a smaller scale (ie based on small land area).
- In a report to the GBRMPA in 1995 on the floristic diversity of the continental islands within the GBRMPA, Batianoff and Dillewaard (1995) report a total of 590 flora species occurring on Curtis Island. This equates to approximately 57.39% of the total continental island flora species diversity reported by Batianoff and Dillewaard (1995) for the whole of the GBRMP.
- The loss of the OUV attributes on Curtis Island would result in the potential loss of endemic continental island flora species from the southern area of the GBRWHA, which is reported to be dissimilar to other floristic regions within the GBRPM (Batianoff and Dillewaard 1995).

10 Geomorphology

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 relating to the geomorphological attributes is summarised in Table 10.1, with respect to the local expression for the PPG master planned area and surrounds. Presence of local attribute

Table 10.1 OUV of the GBRWHA: Geomorphology

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Beaches	■ The processes of geological and geomorphological evolution are well represented in the GBRWHA, linking continental islands, coral cays and reefs ■ The varied seascapes and landscapes of the GBRWHA have been moulded by changing climates and sea levels, and the erosive	■ Pristine and good condition, natural environments are considered significant contributions to the OUV and would include the continental islands with vegetation coverage and sandy beaches ■ Spectacular white sandy beaches	Good	Stable	✓	-	-	-
Dune systems			Good	Stable	✓	✓	-	-
River deltas		■ Landscapes including continental islands with vegetation cover, mainland coastal mountains, wetlands and mangroves. Sandy beaches and river systems.	Poor	-	✓	✓	✓	✓

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Connectivity: cross-shelf, longshore and vertical	power of wind and water, over long time periods. ■ The globally significant diversity of reef and island morphologies reflects ongoing geomorphic, oceanographic and environmental processes.	■ The region has a total water volume of around 7,200 cubic kilometres. This open water habitat is critical to the healthy functioning of the whole GBR ecosystem. It provides connectivity between other habitats, from the coast to beyond the continental slope. Open water is dominated by microorganisms (plankton) and supports a range of other plants and animals such as invertebrates, fishes, reptiles and marine mammals.	Good	Stable	-	✓	✓	✓

10.1 Presence of local attribute

The presence classifications for geomorphological attributes within the PPG master planned area and surrounds are provided below.

- Beaches have a **minor presence** in the PPG master planned area and surrounds
- Dune systems have a **minor presence** in the PPG master planned area and surrounds
- River deltas a **minor presence** in the PPG master planned area and surrounds
- Connectivity: cross-shelf, longshore and vertical has a **moderate presence** in the PPG master planned area and surrounds.

The above presence classifications are based on the following information:

- The key sandy beaches within the PPG master planned area and surrounds are:
  - Eastern coasts of Curtis Island and Facing Island
  - Boyne Island Beach
- Other smaller beaches are located on the inshore islands
- The parabolic dunes near Cape Capricorn on Curtis Island are viewed as regionally significant examples of landscape formation and evolution and include a natural sand blow at Yellow Patch (north eastern Curtis Island) (QDEH 1994)

- Marine tidal sand deltas occur in the following locations within the PPG master planned area and surrounds:
  - Cape Capricorn (north eastern Curtis Island)
  - At the mouth of the Boyne River
  - Colosseum Inlet (QDEH 1994)
- These sand deltas consist of fine sand sediments transported along the coast by longshore drift, and deposited in the mouths of estuaries (QDEH 1994)
- Fitzroy River Delta is a significant example of a river delta (QDEH 1994). However, it is located approximately 35 km further north along the coast line, and is physically separated from the PPG master planned area by The Narrows. Furthermore, the PPG master planned area is not located within the Fitzroy River basin catchment area. It is therefore not considered to be part of the surrounding areas of the PPG master planned area.
- The Narrows is a key example of cross-shelf connectivity. It is one of only four tidal passages in Australia, it separates Curtis Island from the mainland (QDEH 1994). The only other tidal passage in the GBRWHA is the Hinchinbrook Channel, approximately 800 km north of The Narrows.

10.2 Contribution of the local attribute to the OUV of the GBRWHA

The contribution of the local expression of beaches, dunes, river deltas and connectivity to the OUV of the GBRWHA are outlined for each criteria below.

- **Minor contribution** to criterion vii (aesthetic values and superlative natural phenomena) of the OUV of the GBRWHA
- **Minor contribution** to criterion viii (ongoing geological processes) of the OUV of the GBRWHA
- **Minor contribution** to criterion ix (ecological and biological processes) of the OUV of the GBRWHA
- **Minor contribution** to criterion x (biodiversity conservation) of the OUV of the GBRWHA.

These contribution ratings are based on the following information:

Commonwealth or state attribute legislative status

- The listed attributes are not listed under legislation, however, the beaches and parabolic dunes on Curtis Island are protected under the provisions of the NC Act as National Park or Regional Park areas.

Local or regional attribute status

- Refer above.

Notable or iconic attribute value

- The Narrows is one of only four tidal passages in Australia. The only other tidal passage in the GBRWHA is the Hinchinbrook Channel, approximately 800 km north of The Narrows. The Narrows is noted in Lucas et al. (1997) as containing one of the best sequences of mangrove and salt pan communities in the GBRWHA.
- The local expression of the other attributes is not considered to be notable or iconic.

Condition/trend of the attribute

- The Outlook Report 2014 records the attribute conditions in the wider GBR to as good for beaches, dunes and connectivity, with the trend being stable. The attribute condition for river deltas is listed as poor, with no trend provided.

Contribution to attribute sustainability

- It is unlikely that the loss of the local expression of the geomorphological attributes would adversely impact on the sustainability of the attribute more broadly (ie for the whole of the GBRWHA).
- Though The Narrows is a notable example of a tidal passage (ie one of only four tidal passages in Australia), there are numerous other examples of the connectivity attribute throughout the GBRWHA that are considered to be prime examples and are iconic.

Notable presence of the attribute

- Refer above.

Significance of attribute to the preservation of the GBRWHA

- It is unlikely that the loss of the local expression of the geomorphological attributes from the PPG master planned area and surrounds would result in a significant decline in the OUV of the GBRWHA. However, it is noted that The Narrows is an important feature, situated in the surrounds of the PPG master planned area (refer Section 8.2 for further discussion of The Narrows and important mangrove sequences).

11 Cultural heritage values

As outlined in the methodology for identifying the local expression of OUV within the GBRWHA (Adaptive Strategies et al. 2016), the retrospective statement of OUV for the GBRWHA acknowledges that:

> "*Human interaction with the natural environment is illustrated by strong ongoing links between Aboriginal and Torres Strait Islanders and their sea-country, and includes numerous shell deposits (middens) and fish traps, plus the application of story places and marine totems*" (DoE 2015a).

Therefore, while not directly part of the listing criteria for the GBRWHA, important cultural heritage sites or links that exist within the PPG master planned area and surrounds are considered in the assessment below.

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 are summarised in Table 11.1, with respect to the local expression of the OUV of the GBRWHA for the PPG master planned area and surrounds.

Table 11.1 OUV of the GBRWHA: Cultural heritage values

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Traditional Owner interaction with the natural environment	Human interaction with the natural environment is illustrated by strong ongoing links between Aboriginal and Torres Strait Islanders and their sea-country, and includes numerous shell deposits (middens) and fish traps, plus the application of story places and marine totems.	Indigenous heritage values: Traditional Owners with connections to the GBRWHA maintain their cultural practices and customs. Places of Indigenous heritage values have not been systematically identified and many have deteriorated, especially around developed areas and on islands. Some species of cultural significance are under pressure. Story, language and songlines are being affected by activities in the region	Poor	N/A New assessment, no trend provided	-	-	✓	-

11.1 Presence of local attribute

The attribute 'Traditional Owner interaction with the natural environment' has a **moderate presence** in the PPG master planned area and surrounds based on the following information:

- Figure 11.1 identifies the known cultural heritage artefacts/sites within the PPG master planned area and surrounds.
- There are 353 known cultural heritage artefacts/sites, including:
  - One burial site

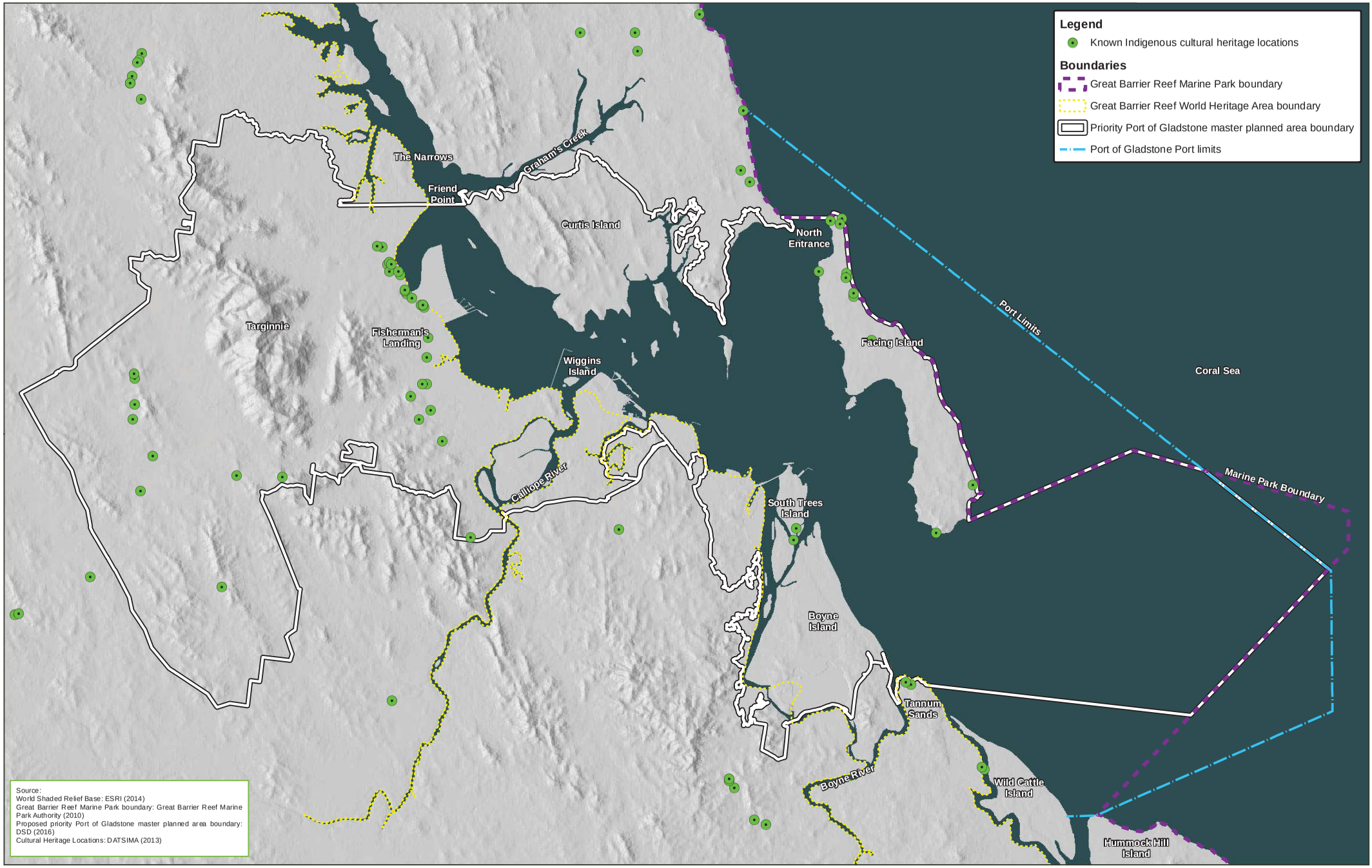

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Figure 11.1: Known Indigenous cultural heritage sites regulated under the *Aboriginal Cultural Heritage Act 2003*

- One stone arrangement
- More than 60 shell middens
- 13 scar trees/carved trees
- Over 250 artefact scatters
- A quarry site

- The PPG master planned area and surrounds contains values in terms of traditional Aboriginal use of land and sea. There are a number of culturally significant sites within the PPG master planned area and surrounds, as well as areas where access to particular areas provides culturally significant opportunities.
- The Port Curtis Coral Coast Indigenous group have formalised their aspirations for sea and country through entering into a Traditional Use of Marine Resource Agreement (TUMRA) (refer Figure 11.2). This TUMRA includes the Capricorn-Bunker Group of reefs, cays and islands, and the PPG master planned area and surrounds.

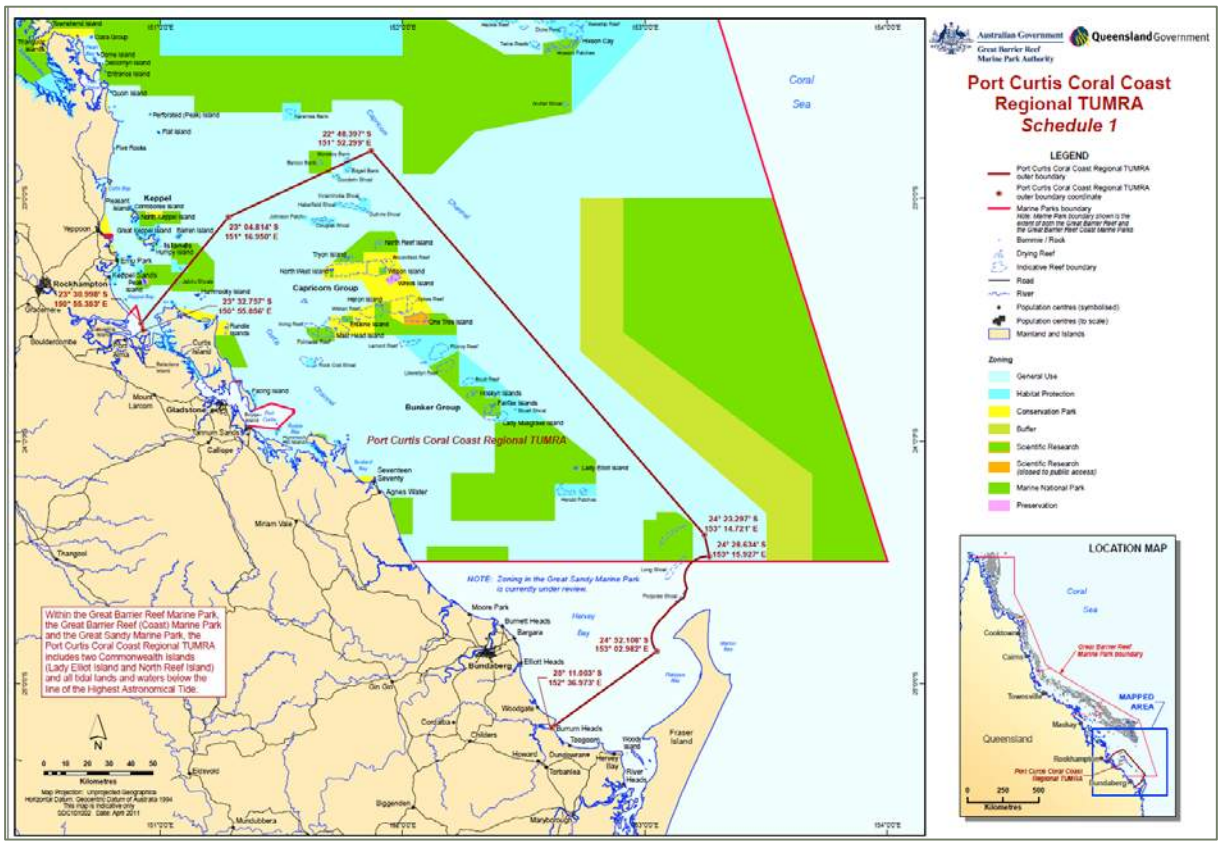

Figure 11.2 Port Curtis Coral Coast Regional TUMRA boundary and the Port of Gladstone

Source: GBRMPA (2011)

11.2 Contribution of the local attribute to the OUV of the GBRWHA

The attribute 'Traditional Owner interaction with the natural environment' has a **moderate contribution** to criterion ix (ecological and biological processes) of the OUV of the GBRWHA based on the following information:

Commonwealth or state attribute legislative status

- Although not listed under legislation, the PPG master planned area and surrounds are covered by a TUMRA which is accredited by GBRMPA and the Queensland Department of National Parks, Sport and Racing.
- The artefacts/sites shown in Figure 11.1 are regulated under the *Aboriginal Cultural Heritage Act 2003* (Qld) (ACH Act). A person who carries out an activity as defined under the ACH Act has a duty of care to take all reasonable and practicable measures to ensure the activity does not harm these sites.

Local or regional attribute status

- Refer above information regarding the TUMRA and the ACH Act.

Notable or iconic attribute value

- The Outlook Report 2014 does not specifically identify sacred sites or other cultural heritage values within the PPG master planned area or surrounds.

Condition/trend of the attribute

- Assessment of cultural heritage values was introduced into the Outlook Reporting for the first time in 2014.
- The Outlook Report 2014 records the attribute conditions in the wider GBR to be poor for sacred sites, sites of particular significance, places important for cultural tradition, stories, songlines, totems, languages, indigenous structure, technology, tools and archaeology. The attribute condition in the wider GBR was recorded as good for cultural practices, observances, customs and lore.
- No trend information is available as this attribute was not assessed in the Outlook Report 2009 (GBRMPA 2009).

Contribution to attribute sustainability

- This is an emerging value in terms of understanding the cultural heritage values of the GBRWHA
- It is not known if the values within the PPG master planned area and surrounds contributed to the ongoing sustainability of the attribute more broadly. It is likely that the loss of the values would result in significant impacts on the preservation of cultural heritage of the Indigenous people represented by the Port Curtis Coral Coast group.

Notable presence of the attribute

- The TUMRA covers the largest area within the GBRWHA
- There are no notable sites included in the Outlook Report 2014 that occur in the PPG master planned area or surrounds.

Significance of attribute to the preservation of the GBRWHA

- It is not known if the loss of the cultural heritage values within the PPG master planned area and surrounds would result in a significant decline of the OUV of the GBRWHA. It is likely that the loss of the values would result in significant impacts on the preservation of cultural heritage of the Indigenous people represented by the Port Curtis Coral Coast group.

12 Marine species diversity

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 relating to marine species diversity is summarised in Table 12.1, with respect to the local expression of the OUV of the GBRWHA for the PPG master planned area and surrounds.

Table 12.1 OUV of the GBRWHA: Marine species diversity diversity

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Diversity supporting marine species (global conservation significance)	■ Globally significant marine faunal groups include over 4,000 species of molluscs, over 1,500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans, and many others ■ Species diversity, especially the endemic species, means the GBRWHA is of enormous scientific and intrinsic importance	■ 25 EPBC Act listed threatened marine species occur within the GBRWHA ■ The GBR is considered vital to the recovery and survival of many threatened marine species	■ Good	■ Deteriorated	✓	-	✓	✓

12.1 Presence of local attribute

For the purposes of this attribute, the assessment of local expression of the marine species diversity attribute included assessment of marine species of global conservation significance which are known to occur in the GBRWHA. Species of global conservation significance were defined as those species listed as vulnerable, endangered or critically endangered on the IUCN red list of threatened species.

Species listings under the IUCN red list do not have statutory or regulatory implications, whereas listings under the EPBC Act require approval from the Commonwealth Minister for the Environment where there are likely to be significant impacts on matters of national environmental significance (ie the EPBC Act listings are statutory and regulatory).

Diversity of globally significant marine species has a **moderate presence** in the PPG master planned area and surrounds based on the following information:

- Marine species of global conservation significance which have the potential to occur within the PPG master planned area and surrounds include:
  - Dugong: **Minor presence** in the PPG master planned area and surrounds. The presence of the Dugong in the PPG master planned area and surrounds is assessed in Section 4.1

- Blue whale and Sperm whale: **Minor presence** in the PPG master planned area and surrounds. The presence of the whales in the PPG master planned area and surrounds is assessed in Section 4.2
- Australian humpback dolphin and Australian snubfin dolphin: **Moderate presence** in the PPG master planned area and surrounds. The presence of the dolphins in the PPG master planned area and surrounds is assessed in Section 4.3
- Marine turtle species: **Moderate presence** in the PPG master planned area and surrounds. The presence of the nesting marine turtles in the PPG master planned area and surrounds is assessed in Section 5. Note that the assessment of the marine turtle attribute in Section 5 considers nesting marine turtles, consistent with the description of the marine turtle attribute in the Statement of OUV (DoE 2015), the Outlook Report 2014 and other supporting reports (eg Lucas et al. 1997). The Hawksbill turtle, Olive ridley turtle and Leatherback turtle are not considered in Section 5.
- Shark and ray species, including Estuary stingray, Whale shark, Great white shark, Shortfin mako shark, Longfin mako shark, Porbeagle, Reef manta ray and Giant manta ray: **Minor presence** in the PPG master planned area and surrounds. The presence of fish species in the PPG master planned area and surrounds is discussed in Section 3. The other shark and ray species have been identified through the review of desktop database searches (Appendix C), the retrospective statement of OUV and the Outlook Report 2014.

12.2 Contribution of the local attribute to the OUV of the GBRWHA

Diversity of globally significant marine species is considered to have a **minor contribution** to criterion vii (aesthetic values and superlative natural phenomena) and criterion ix (ecological and biological processes) and a **moderate contribution** to criterion x (biodiversity conservation) based on the following information.

Commonwealth or state attribute legislative status

- Globally significant marine species which have the potential to occur within the PPG master planned area and surrounds include, but may not be limited to the following species:
  - Dugong: Listed as vulnerable at a global scale by the IUCN
  - Blue whale: Listed as endangered at a global scale by the IUCN
  - Sperm whale: Listed as vulnerable at a global scale by the IUCN
  - Australian humpback dolphin: Listed as near threatened at a global scale by the IUCN
  - Australian snubfin dolphin: Listed as near threatened at a global scale by the IUCN
  - Green turtle: Listed as endangered at a global scale by the IUCN
  - Hawksbill turtle: Listed as critically endangered at a global scale by the IUCN
  - Loggerhead turtle: Listed as vulnerable at a global scale by the IUCN
  - Olive ridley turtle: Listed as vulnerable at a global scale by the IUCN
  - Leatherback turtle: Listed as vulnerable at a global scale by the IUCN
  - Estuary Stingray: Listed as vulnerable at a global scale by the IUCN
  - Whale Shark: Listed as vulnerable at a global scale by the IUCN
  - Great White Shark: Listed as vulnerable at a global scale by the IUCN
  - Shortfin mako shark: Listed as vulnerable at a global scale by the IUCN
  - Longfin mako shark: Listed as vulnerable at a global scale by the IUCN
  - Porbeagle: Listed as vulnerable at a global scale by the IUCN

- Reef manta ray: Listed as vulnerable at a global scale by the IUCN
- Giant manta ray: Listed as vulnerable at a global scale by the IUCN

- Based on the sparse information on population structure of the Australia humpback dolphin (Para et al. 2004), the Port of Gladstone (including the PPG master planned area and surrounds) is considered to be an important location within the GBRWHA for the species' population, based on the known distribution of the species
- The PPG master planned area and surrounds are not listed as an area of habitat critical to the survival of the aforementioned globally significant marine species (with the exception of the Australian humpback dolphin), as per applicable recovery plans or conservation advice statements available.

Local or regional attribute status

- Marine fauna species are protected within the GBR Marine Park through permit requirements and activity restrictions in zoned areas of the GBR Marine Park. GBR Marine Park zoning surrounding the PPG master planned area includes 'general use zone', 'habitat protection zone', 'marine national park zone' and 'conservation park zone'.

Notable or iconic attribute value

- Published articles, including the Outlook Report 2014, recognises the distribution of Australian humpback dolphins in the Port of Gladstone as being an important location for this species' distribution within the context of the GBRWHA
- No publications specifically reference the PPG master planned area or surrounds as being a prime example of an area important for the remaining globally significant marine species which have the potential to occur within the PPG master planned area and surrounds

Condition/trend of the attribute

- The Outlook Report 2014 records the attribute conditions in the wider GBR to be good for populations of species and groups of species. The attribute condition trend in the wider GBR was recorded as deteriorated for populations of species and groups of species.

Contribution to attribute sustainability

- Diversity of available habitat types contribute to the diversity of marine species within an area (Lucas et al. 1997). Marine habitat areas within the PPG master planned area and surrounds are associated with coral reefs, seagrass meadows, mangrove communities, hard and soft benthic substrates and beach habitats. Marine habitat areas within the PPG master planned area and surrounds are not considered to be unique to the area and are available throughout the GBRWHA.
- The GBRWHA supports 25 marine species listed under the EPBC Act as threatened (GBRWHA 2014), however the Outlook Report 2014 does not provide a list of species that comprise the 25 EPBC Act listed threatened marine species.
- Based on the database search results for the PPG master planned area and surrounds (refer Appendix C), there are 18 globally significant threatened species with the potential to occur within the PPG master planned area and surrounds. As the Outlook Report 2014 does not provide detail on the individual threatened marine fauna species that occur within the GBRWHA, it is not possible to compare the PPG master planned area threatened marine species numbers.

Notable presence of the attribute

- The globally significant marine species which have the potential to occur within the PPG master planned area and surrounds are mobile species, with the potential to travel long distances. With the exception of the Australian humpback dolphin, the distribution within the GBRWHA of the aforementioned globally significant marine species is not considered to be unique to the PPG master planned area and surrounds.

Significance of attribute to the preservation of the GBRWHA

- The potential loss of habitat areas within the PPG master planned area and surrounds (ie coral reefs, seagrass meadows and mangrove communities) have the potential to have an impact on the species diversity of globally significant marine species within the local area. It is not, however, expected that this would result in the significant decline in the OUV of the GBRWHA.

13 Total species diversity

The relevant information from the retrospective statement of OUV and the Outlook Report 2014 relating to total species diversity is summarised in Table 13.1, with respect to the local expression of the OUV of the GBRWHA for the PPG master planned area and surrounds.

Table 13.1 OUV of the GBRWHA: Total species diversity

Attribute	Statement of OUV	GBR Outlook Report 2014			Relevant OUV criteria			
		GBR wide: Significant contribution to OUV	GBR wide condition	GBR wide trend	vii	viii	ix	x
Total species diversity	■ The GBRWHA encompasses a globally unique array of ecological communities, habitats and species. This diversity of species and habitats, and their interconnectivity, make the GBR one of the richest and most complex natural ecosystems on earth ■ Biologically the unique diversity of the GBR reflects the maturity of an ecosystem that has evolved over millennia	■ The GBRWHA is one of the world's most diverse ecosystems, with a range of habitats and many thousands of different species ■ Species groups within the GBRWHA include 25 threatened marine species, 76 migratory species, iconic species and at risk species ■ The biodiversity of the GBRWHA is the basis of its OUV recognised in its world heritage listing	Good	Deteriorated	✓	-	✓	✓

13.1 Presence of local attribute

The assessment of local expression of the total species diversity attribute included assessment of marine, intertidal and terrestrial species.

Detailed attribute assessments for a number of total species diversity components are presented in earlier sections of this document (ie fish species are assessed in Section 3, marine megafauna in Section 4, seabirds and migratory shorebirds in Section 7, and threatened species in Section 8).

Diversity of species has a **moderate presence** in the PPG master planned area and surrounds based on the following information:

- Approximately 46% of seagrass species recorded in the GBRWHA have been recorded in the PPG master planned area and surrounds (GBRMPA 2014a, GPC 2012). Seagrass has a moderate presence in the PPG master planned area and surrounds (refer Section 6.1).

- Approximately 36% of mangrove species recorded in the GBRWHA have been recorded in the PPG master planned area and surrounds (GBRMPA 2014a, GPC 2012). Mangroves have a minor presence in the PPG master planned area and surrounds (refer Section 8.2).
- Approximately 9% of fish species recorded in the GBRWHA have been recorded in the PPG master planned area and surrounds (GBRMPA 2014, Currie and Connelly 2004, Vision Environment 2015). Fish species have a minor presence in the PPG master planned area and surrounds (refer Section 3).
- Approximately 47% of whale and dolphin species recorded in the GBRWHA have the potential to occur within the PPG master planned area and surrounds (GBRMPA 2014a). Whales have a minor presence and dolphins have a moderate presence in the PPG master planned area and surrounds (refer Section 4.2 and Section 4.3).
- Approximately 65.6% of the biomass of breeding seabirds in the GBRWHA occur within the Capricorn-Bunker Group of islands and cays, situated approximately 45 km north east of the PPG master planned area (Dyer et al. 2005, GBRMPA 2012, Hulsman et al. 1997). Seabirds have a minor presence in the PPG master planned area and surrounds (refer Section 7.1).
- Approximately 2.8% of potential shorebird habitat mapped in the GBRWHA is located within the PPG master planned area and surrounds. Shorebird populations which have exceeded 0.1% of total East Asian-Australasian Flyway (EAAF) population are present within the PPG master planned area. Shorebirds and migratory birds have a significant presence in the PPG master planned area and surrounds (refer Section 7.2).
- All species of marine turtles species which have been recorded in the GBRWHA have been recorded in the PPG master planned area and surrounds. Marine turtles have a moderate presence in the PPG master planned area and surrounds (refer Section 12).
- Dugong populations utilise habitats within the PPG master planned area and surrounds and have a minor presence in the PPG master planned area and surrounds (refer Section 4.1).
- When compared to reefs in the northern GBR, or at mid-shelf or outer-shelf areas, reefs in the PPG master planned area and surrounds are generally lower in coral species richness, and tend to be made up of corals along with other benthic organisms (eg algae, sponges) growing on rocks or boulders (Ayling et al. 2012, GBRMPA 2007, DeVantier et al. 2006). Coral species diversity have a minor presence in the PPG master planned area and surrounds (refer Section 1.4).
- Approximately 47% of terrestrial flora species recorded in the GBRWHA have been recorded in the PPG master planned area and surrounds (Lucas et al. 1997, DEHP 2017)
- Wildlife Online identified 1,485 intertidal and terrestrial species within the PPG master planned area and surrounds, including 1,018 flora species and 467 fauna species (DEHP 2017).

13.2 Contribution of the local attribute to the OUV of the GBRWHA

Diversity of species is considered to have a **moderate contribution** to criterion vii (aesthetic values and superlative natural phenomena), criterion ix (ecological and biological processes) and criterion x (biodiversity conservation) based on the following information:

Commonwealth or state attribute legislative status

- The diversity of species which occur within the PPG master planned area and surrounds include conservation significant species, listed under the provisions of the EPBC Act, NC Act and/or the IUCN red list of threatened species.

- 20 threatened intertidal and terrestrial flora and fauna species were identified in the Wildlife Online database as being previously recorded within the PPG master planned area and surrounds (DEHP 2017). An additional 37 threatened intertidal and terrestrial flora and fauna species were identified in the EPBC Act protected matters search tool as potentially occurring within the PPG master planned area and surrounds (DoEE 2016b) (note that the EPBC Act protected matters search tool results are generated by predictive habitat mapping opposed to the Wildlife Online database which is based on species observation records).
- 18 globally threatened marine species have the potential to occur within the PPG master planned area and surrounds (refer Section 12).

Local or regional attribute status

- Marine fauna species are protected within the GBR Marine Park through permit requirements and activity restrictions in zoned areas of the GBR Marine Park. GBR Marine Park zoning surrounding the PPG master planned area includes the 'general use zone', 'habitat protection zone', 'marine national park zone' and 'conservation park zone'.
- The PPG master planned area and surrounds include National Parks and Conservation Parks which are protected under the provisions of the NC Act. Areas designated as National Parks or Conservation Park provide protection to any areas of potential habitat for local flora and fauna assemblages.
- All native fauna species are protected under the provisions of the NC Act, providing protection for diverse local fauna assemblages, regardless of the species conservation status.

Notable or iconic attribute value

- The PPG master planned area and surrounds are not specifically recognised as a prime example of potential habitat for flora and fauna species, including key threatened species, in key publications (ie retrospective statement of OUV, Outlook Report 2014 and Lucas et al. 1997).

Condition/trend of the attribute

- The Outlook Report 2014 records the attribute conditions in the wider GBR to be good for populations of species and groups of species. The attribute condition trend in the wider GBR was recorded as deteriorated for populations of species and groups of species.

Contribution to attribute sustainability

- 18 globally significant marine species potentially to occur within the PPG master planned area and surrounds (refer Appendix C).
- Diversity of available habitat types contribute to the diversity of marine species within an area (Lucas et al. 1997). Marine habitat areas within the PPG master planned area and surrounds are associated with coral reefs, seagrass meadows, mangrove communities, hard and soft benthic substrates and beach habitats. Marine habitat areas within the PPG master planned area and surrounds are not considered to be unique to the area and are available throughout the GBRWHA.
- The potential loss of intertidal and terrestrial habitat areas within the PPG master planned area and surrounds has the potential to have an impact on the species diversity within the local area. Vegetation communities and habitats of the Curtis Coast are similar to the major vegetation types in other parts of Central Queensland (GPC 2012), and thus are not considered to be critical to the sustainability of species diversity within the GBRWHA.

Notable presence of the attribute

- The PPG master planned area and surrounds is not considered to represent a notable presence of species diversity within the GBRWHA. The marine, intertidal and terrestrial habitats within the PPG master planned area and surrounds which provide for diverse local species assemblages are not considered to be unique to the PPG master planned area. The habitat resources available within the PPG master planned area and surrounds are represented in other areas within the GBRWHA.

Significance of attribute to the preservation of the GBRWHA

- The Outlook Report 2014 identifies species components which contribute to the total species diversity of the GBRWHA and are considered to be in poor or very poor condition. Those species components which form part of the local expression of OUV attributes in the PPG master planned area and surrounds, and the attributes presence and contribution in the PPG master planned area and surrounds as identified in this report, are provided in Table 13.2. The species diversity components are also provided in Table 13.2, and were assessed as having a deteriorated condition trend within the GBRWHA.
- The PPG master planned area and surrounds has a significant contribution to dolphins within the GBRWHA. With respect to the deteriorated condition trend of dolphins within the GBRWHA, the significant contribution of dolphins within the PPG master planned area and surrounds is considered to be a notable and significant contribution to dolphins within the GBRWHA.
- The contribution of the local expression of attributes in the PPG master planned area and surrounds is minor overall for those species components which, contribute to the total species diversity of the GBRWHA, and have been assessed as being in poor condition or of deteriorated condition trend (GBRMPA 2014a). The PPG master planned area and surrounds is not considered to have a significant contribution to the overall preservation of total species diversity within the GBRWHA.

Table 13.2 Contribution of the local expression of attributes in the PPG master planned area and surrounds which contribute to total species diversity in the GBRWHA and have been assessed as poor condition or of deteriorated condition trend

Species component	Condition	Condition trend	Contribution of the local expression of attributes
Seagrass	Poor	Deteriorated	Minor (criterion vii and viii) Moderate (criterion ix and x)
Corals	Poor	Deteriorated	Minor (criterion vii, viii, ix and x)
Bony fishes	Good	Deteriorated	Minor (criterion vii, iv and x)
Sharks and rays	Poor	Deteriorated	Minor (criterion vii and ix) Moderate (criterion x)
Marine turtles	Poor	No consistent trend	Minor to moderate (criterion vii and x)
Seabirds	Poor	Not assessed	Minor (criterion vii, ix and x)
Shorebirds	Poor	Not assessed	**Significant** (criterion x)
Dolphins	Good	Deteriorated	Minor (criterion vii) **Significant** (criterion x)
Dugongs	Poor	Deteriorated	Moderate (criterion x)

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