Port of **Mackay**

Appendix C

Matters of National Environmental Significance Significant Impact Assessments

APPENDIX C: MNES SIGNIFICANT IMPACT ASSESSMENTS

C.1: Endangered and vulnerable marine turtles

Assessment against significant impact criteria – endangered and vulnerable marine turtles (note - these species are also listed as migratory)

Scientific Name	Common Name	EPBC Act Status
Caretta caretta	loggerhead turtle	Endangered / Migratory
Chelonia mydas	green turtle	Vulnerable / Migratory
Dermochelys coriacea	leatherback turtle	Endangered / Migratory
Eretmochelys imbricata	hawksbill turtle	Vulnerable / Migratory
Lepidochelys olivacea	Olive Ridley turtle	Endangered / Migratory
Natator depressus	flatback turtle	Vulnerable / Migratory

An overview of 'critical habitat', 'population/important population' and the species interaction in the Port of Mackay for each of the six marine turtles is presented in the table below. The Port provides critical habitat for one species, loggerhead turtle, as per the definition in the *Recovery Plan for Marine Turtles in Australia* (Commonwealth of Australia 2017). There are occasional records of the species nesting in the Mackay region. The area also provides local foraging habitat, including coastal and deeper water seagrass meadows, and reef communities, for transient individuals of all six marine turtle species.

Species	Interaction with project area	Definition of 'critical habitat' in Queensland	'Critical habitat' present in project area	Definition of population/important population'	'Population/important present in project area
Green turtle	Small resident population at Hay Point and the species is likely to be transient in the water adjacent to Port of Mackay as it forages on algae covered reef systems and seagrass meadows. Low density nesting has been observed in the region between November and April.	Islands of the Capricornia- Bunker Group, Bushy Islet, Wreck Rock to Burnett Head	No	An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: Key source populations either for breeding or dispersal; Populations that are necessary for maintaining genetic diversity; and/or Populations that are near the limit of the species range.	The wider population of the species in the region may be part of important genetic stocks, however any transient individuals that may utilise the Port are unlikely to be important. The lack of sightings in the Port in publicly available databases indicate the species, if present, would be in low numbers only. The project area is also not at the limit of the species range. An important population is unlikely to be present.
Flatback turtle	Species has been observed foraging at Hay Point and is likely to be transient in the waters adjacent to Port of Mackay as it forages in the surrounding reef systems or seagrass meadows. Predominant species recorded nesting in the region. Hay Point Beach and Salonika Beach are known to be the most heavily used nesting beaches, with the region supporting between 30-100 turtles annually.	Peak Island, Avoid Island, Wild Duck Island, Curtis Island, Mon Repos, Broad Sound Islands National Park	No		The wider population of the species in the region may be part of important genetic stocks, however any transient individuals that may utilise the Port are unlikely to be important. The lack of sightings in the Port in publicly available databases indicate the species, if present, would be in low numbers only. The project area is also not at the limit of the species range. An important population is unlikely to be present.
Hawksbill turtle	The species has been recorded in the Mackay region and may be a transient visitor in the	Bird Island, Boydong Island, Fife Island, Milman Island, Saunders Island, Aukane Island, Bet Islet (Bara), Bouke (Bak), Dadalai Islet,	No		The project area is outside range for genetic stocks of the species (*Recovery Plan for Marine Turtles in Australia*).

Species	Interaction with project area	Definition of 'critical habitat' in Queensland	'Critical habitat' present in project area	Definition of population/important population'	'Population/important present in project area
	water adjacent to the Port of Mackay as it forages in the surrounding reef systems.	Kabbikane, Mimi, Saddle Island (Ulu), Sassie Island, Zuizin Island, Adolphis Island, Albany Island, Hawkesbury Island (Warral), Lacey Island, Laoyak Island, Little Adolphis Island (Smol Muri), Woody Wallace Island, Poll Islet (Guiya), Dugong Islet (Atub), Cap Islet (Mukar), Two Brothers Island (Gebar), Mt Adolphus Island (Muri) plus a 20 km radius around each location			The lack of sightings in the Port in publicly available databases indicate the species, if present, would be in low numbers only. The project area is also not at the limit of the species range. An important population is unlikely to be present.
Olive Ridley turtle	While the species has been recorded in the Mackay area there is only one record in Wildnet. The Mackay region is not known nesting area. Likely a transient visitor.	None in Queensland	No	A 'population' is an occurrence of the species in a particular area. Occurrences include but are not limited to: A geographically distinct regional population, or collection of local populations, or A population, or collection of local populations, that occurs within a particular bioregion	The project area is outside range for genetic stocks of the species (*Recovery Plan for Marine Turtles in Australia*). ALA database identifies a couple of records of the species nesting in Old Museum Park, behind the Marina, however this is assumed to be an inaccurate location as is isolated from sandy beaches. Regardless, high numbers of the species have not been recorded in the project area. The project area is also not at the limit of the species range. An important population is unlikely to be present.
Loggerhead turtle	Species has been observed foraging at Hay Point and is likely to be transient in the waters adjacent to Port of Mackay as it forages in the surrounding reef	Coastal beaches from the Elliot River to Bustard Head, Swain Reefs Tryon, Capricornia- Bunker Group, Pumistone Passage to Double Island Point plus a 20 km radius around each location	Yes		The project area is within the Southwestern Pacific genetic stock range of the of the species (*Recovery Plan for Marine Turtles in Australia*), which runs from the Northern Territory through to NSW-

Species	Interaction with project area	Definition of 'critical habitat' in Queensland	'Critical habitat' present in project area	Definition of population/important population'	'Population/important present in project area
	systems or seagrass meadows. There are occasional records of the species nesting in the region.				Victorian border. ALA database does not show any records of the species in the Mackay area however Jacobs (2016) identifies the species has occasionally been sighted in the region. Regardless, high numbers of the species have not been recorded in the project area. The project area is also not at the limit of the species range. An important population is unlikely to be present.
Leatherback turtle	Recorded in the Mackay region and may be a transient visitor in the water adjacent to the Port of Mackay as it forages in the surrounding reef systems. Only a single record of leatherback turtle nesting in Mackay, with none recorded nesting since 1993.	None in Queensland	No		The project area is near a small number (0-10 females) of Australian genetic stock range of the species although the species hasn't been recorded nesting in Queensland since 1996 (*Recovery Plan for Marine Turtles in Australia*). The species range extends around the coastline of Australia. ALA database does not show any records of the species near the Port with one historic record (1985) to the north of Dolphin Heads. Regardless, high numbers of the species have not been recorded in the project area. The project area is also not at the limit of the species range. An important population is unlikely to be present.

Significant impact assessment for endangered species – Loggerhead, Leatherback and Olive Ridley

Significant impact criteria	Significant impact?	Response to criteria
Lead to a long-term decrease in the size of a population	No	The project area is identified in the Marine Turtle Recovery Plan (Commonwealth of Australia 2017) as critical habitat for the loggerhead turtle, which is known to nest on beaches in the Mackay region. The study area provides some local foraging habitat for individuals of all three endangered species, including surrounding reef systems and low-density seagrass. Direct impacts to coral communities or seagrass meadows as a result of dredging are not anticipated. These habitats are not present in the dredge area or DMPA. Modelling and monitoring show changes in water quality (increase in turbidity/SSC) are unlikely, with the majority of suspended sediment being retained within the Port during dredging. Only short-term impacts expected at the DMPA, any increase in turbidity is likely to be localised, minor and temporary. Sediment deposition patterns are not anticipated to vary from what is normally seen in the project area. Only a very small area of potential nesting habitat is available within the port, regardless, no impact on nesting habitat is likely.
Reduce the area of occupancy of the species	No	'Area of occupancy' (AOO) is defined as the area within a species extent of occurrence (EOO) which is occupied by the species (IUCN 2012). There will be no reduction of onshore area or underwater area associated with dredging and disposal. Direct and indirect impacts to seagrass meadows and coral reefs are highly unlikely. The dredging works are not anticipated to reduce the opportunity for loggerhead individuals to nest, as the species is already known to occur in the areas around the high trafficked operational port. The species will also still have access to other nesting beaches within the Mackay region.
Fragment an existing population into two or more populations	No	The populations of the three endangered species comprise various different stocks and range in the number of nesting females. The dredge campaigns will consist of one dredging vessel, which will be similar to other large commercial vessels that operate in the Port of Mackay. The endangered turtle species are still known to utilise the waters around the Port, regardless of the high traffic and consequently dredge campaigns are unlikely to restrict movement and fragment populations.
Adversely affect habitat critical to the survival of a species	No	As per the *Recovery Plan for Marine Turtles* the project area contains critical habitat for the loggerhead turtle only. Direct impacts to coral communities or seagrass meadows as a result of dredging are not anticipated as these habitats are not present in the Port or DMPA. Indirect impacts to water quality (turbidity and sedimentation) are unlikely as monitoring and modelling show the majority of suspended sediment being retained within the Port during dredging and only short-term impacts at the DMPA. Any increase in turbidity and sedimentation are likely to be localised, minor and temporary.
Disrupt the breeding cycle of a population	No	The loggerhead turtle is known to nest on beaches in the Mackay region, however only in low numbers. The *Recovery Plan for Marine Turtles* does not show the Mackay region as a nesting area, which are concentrated on offshore islands and to the south of Rockhampton. Peak nesting for the species occurs during December, which is outside of the time period that maintenance dredging is historically undertaken. Despite the dredge operating 24 hours a day, artificial lighting will be negligible in the context of the operating port and is unlikely to disrupt loggerhead individuals during the time of key nesting activities (e.g. approaching beaches after dusk and into the night). Given the low number of nesting turtles in the area and the intermittent and temporary nature of

Significant impact criteria	Significant impact?	Response to criteria
		maintenance dredging, it is not anticipated to disrupt the breeding cycle of any endangered turtle species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	There will be no reduction of onshore area or underwater area associated with dredging and disposal. Direct and indirect impacts to seagrass meadows and coral reefs are highly unlikely. Increased artificial lighting will be concentrated in the dredge areas and will generally come from a single dredge vessel. The increase in light will be negligible compared to that generated by the operating port. Increased levels of underwater noise will be minimal, as generally only one dredge will be operating for short durations.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	No	The proposed dredge operates on the Queensland coastline and consequently is unlikely to result in any invasive species. Any other dredge would be assessed for invasive marine species to ensure the risk is as low as reasonably practical. The risk will also be managed and impact avoided though ongoing early monitoring programs, including collaboration with Biosecurity Queensland, and vigilant washdown procedures. Additionally, dredge vessels contracted to undertake the maintenance dredging will be required to implement best practice hygiene protocols for management of ballast water.
Introduce disease that may cause the species to decline	No	As above
Interfere with the recovery of the species	No	The proposed dredging will not impede the success of any of the recovery objective listed in the *Recovery Plan for Marine Turtles*. Dredging can be a key threat to marine turtles due to injury/mortality via interaction with the vessel and/or habitat removal/degradation. Best practice dredging methods including the use of turtle exclusion devices and marine fauna monitoring will be implemented to reduce interactions with the vessel. As discussed in detail above, impacts to habitat within the Port of Mackay are expected to be localised, minor and temporary and not impact marine turtles directly or indirectly.

Significant impact assessment for vulnerable species – Green, hawksbill and flatback

Significant impact criteria	Significant impact?	Response to criteria
Lead to a long-term decrease in the size of a population	No	The project area provides some local foraging habitat for individuals of all three vulnerable species, including surrounding reef systems and low-density seagrass. The green and flatback turtles are known to nest on beaches in the Mackay region, but the area is not considered critical habitat and it is unlikely to support important populations of the species. Direct impacts to foraging habitat including coral communities or seagrass meadows as a result of dredging are not anticipated. These habitats are not present in the dredge area or DMPA. Indirect impacts to water quality (turbidity and sedimentation) are unlikely due monitoring and modelling showing the majority of suspended sediment being retained within the Port during dredging and only short-term impacts at the DMPA. Any increase in turbidity and sedimentation is likely to be localised, minor and temporary.
Reduce the area of occupancy of the species	No	'Area of occupancy' (AOO) is defined as the area within a species extent of occurrence (EOO) which is occupied by the species (IUCN 2012). There will be no reduction of onshore area or underwater area associated with dredging and disposal. Direct and indirect impacts to seagrass meadows and coral reefs are highly unlikely. The dredging works are not anticipated to reduce the opportunity for green and flatback turtle individuals to nest, as the species are already known to occur in the areas around the high trafficked operational Port. Regardless, the species will still have access nesting beaches within the Mackay region, including the beaches within the Port.
Fragment an existing population into two or more populations	No	The populations of the three vulnerable species comprise various different stocks and range in the number of nesting females. The dredge campaigns will typically consist of one dredging vessel, which will be similar to other large commercial vessels that operate in the Port of Mackay. The vulnerable turtle species are still known to utilise the waters around the Port, regardless of the high traffic Port and consequently dredge campaigns are unlikely to restrict movement and fragment populations.
Adversely affect habitat critical to the survival of a species	No	As per the Recovery Plan for Marine Turtles (Commonwealth of Australia 2017) the project area does not contain critical habitat for the three vulnerable turtles. Direct impacts to coral communities or seagrass meadows as a result of dredging are not anticipated. Indirect impacts to water quality (turbidity and sedimentation) are unlikely due monitoring and modelling showing the majority of suspended sediment being retained within the Port during dredging and only short-term impacts at the DMPA.
Disrupt the breeding cycle of a population	No	The green and flatback turtles are known to nest on beaches in the Mackay region, however only in low numbers. The Recovery Plan for Marine Turtles (Commonwealth of Australia) shows the area between Bowen and the Sunshine Coast as a hot spot for green turtle nesting. Similar nesting distribution is shown for flatback turtle although tending to be more northern, extending from Bundaberg to Townsville. Green and flatback turtle nesting usually occurs November – January. Despite the dredge operating 24 hours a day, artificial lighting will be negligible in the context of the operating port and is unlikely to disrupt green and flatback individuals during the time of key nesting activities (e.g. approaching beaches after dusk and into the night). Given if the species uses the Port for nesting it would sporadic and in low numbers and the intermittent and temporary nature of maintenance dredging, it is not anticipated to disrupt the breeding cycle of any vulnerable turtle species.

Significant impact criteria	Significant impact?	Response to criteria
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	There will be no reduction of onshore area or underwater area associated with dredging and disposal. Direct and indirect impacts to seagrass meadows and coral reefs are highly unlikely. Increased artificial lighting will be concentrated in the dredge areas and will generally come from a single dredge vessel. The increase in light will be negligible compared to that generated by the operating Port. Increased levels of underwater noise will be minimal, as generally only one dredge will be operating for short durations.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	No	The proposed dredge operates on the Queensland coastline and consequently is unlikely to result in any invasive species. Any other dredge would be assessed for invasive marine species to ensure the risk is as low as reasonably practical. The risk will also be managed and impact avoided though ongoing early monitoring programs, including collaboration with Biosecurity Queensland, and vigilant washdown procedures. Additionally, dredge vessels contracted to undertake the maintenance dredging will be required to implement best practice hygiene protocols for management of ballast water.
Introduce disease that may cause the species to decline	No	As above
Interfere with the recovery of the species	No	The proposed dredging will not impede the success of any of the recovery objective listed in the Recovery Plan for Marine Turtles. Dredging can be a key threat to marine turtles due to injury/mortality via interaction with the vessel and/or habitat removal/degradation. Best practice dredging methods including the use of turtle exclusion devices. Marine fauna monitoring will be implemented to reduce interactions with the vessel. As discussed in detail above, impacts to non-critical habitat within the Port of Mackay and at the DMPA are expected to be localised, minor and temporary and not impact turtles.

C.2: Vulnerable marine mammal species

Assessment against significant impact criteria –vulnerable species (note -this species is also listed as migratory)

Scientific Name	Common Name	EPBC Act Status
Megaptera novaeangliae	Humpback whale	Migratory

Humpback whales migrate through the study area June to October, peaking in August (Jacobs 2016). Jacobs (2016) report females with calves were relatively common within the Port of Hay Point port limits during monitoring from 2009 to 2011, and the offshore area to the east of Mackay is thought to be an important breeding area for the humpback whale (DAWE, 2021a). The species core range extends along the eastern coast of Australia to north of Cooktown (TSSC 2015). As such, humpback whales migrating through the waters off the coast of Mackay, including the project area, could be considered to be part of a larger 'important population' and the offshore area, outside the project area potentially 'critical habitat'.

Significant impact assessment for vulnerable species – Humpback whale

Significant impact criteria	Significant impact?	Response to criteria
Lead to a long-term decrease in the size of a population	No	The project area is well outside of the area thought to be important for calving (80 km offshore) and does not support important feeding grounds. Additionally, direct impacts to humpback whale from vessel strike is considered low as the dredge vessel operates at very slow speeds. Modelling and monitoring show changes in water quality (increase in turbidity/SSC) are unlikely, with the majority of suspended sediment being retained within the Port during dredging. Only short-term impacts expected at the DMPA, any increase in turbidity is likely to be localised, minor and temporary. Sediment deposition patterns are not anticipated to vary from what is normally seen in the project area. Indirect impacts from increased turbidity are unlikely.
Reduce the area of occupancy of the species	No	As above.
Fragment an existing population into two or more populations	No	Transfer of dredged material from the Port of Mackay to the proposed disposal area will not fragment humpback whale populations that migrate through the area.
Adversely affect habitat critical to the survival of a species	No	The Port of Mackay, the DMPA and the area in between is not habitat critical to the survival of the species. The area of dredge plume is also not known to be critical habitat. Regardless, modelling and monitoring show changes in water quality (increase in turbidity/SSC) are unlikely, with the majority of suspended sediment being retained within the Port during dredging. Only short-term impacts are expected at the DMPA, any increase in turbidity is likely to be localised, minor and temporary. Sediment deposition patterns are not anticipated to vary from what is normally seen in the project area. Impacts to critical habitat, and the waters they migrate through, from increased turbidity are unlikely.
Disrupt the breeding cycle of a population	No	The project area is well outside of the area thought to be important for calving (80 km offshore) and does not support important feeding grounds.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	The Port of Mackay, the DMPA and the area in between is not habitat critical to the survival of the species. The area of dredge plume is also not known to be critical habitat. Regardless, modelling and monitoring show changes in water quality (increase in turbidity/SSC) are unlikely, with the majority of suspended sediment being retained within the Port during dredging. Only short-term impacts are expected at the DMPA, any increase in turbidity is likely to be localised, minor and temporary. Sediment deposition patterns are not anticipated to vary from what is normally seen in the project area. Impact to the waters through which the species migrates, from increased turbidity is unlikely.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	No	The proposed dredge operates on the Queensland coastline and consequently is unlikely to result in any invasive species. Any other dredge would be assessed for invasive marine species to ensure the risk is as low as reasonably practical. The risk will also be managed and impact avoided though ongoing early monitoring programs, including collaboration with Biosecurity Queensland, and vigilant washdown procedures. Additionally, dredge vessels contracted to undertake the maintenance dredging will be required to implement best practice hygiene protocols for management of ballast water.
Introduce disease that may cause the species to decline	No	As above
Interfere with the recovery of the species	No	Humpback whale populations have increased in recent years (DAWE 2021a) and short duration of infrequent dredging unlikely to interfere substantially with recovery of species. Regardless, impacts to important feeding grounds or core calving areas are unlikely.

C.3: Migratory marine species

Assessment against significant impact criteria –migratory marine species

Scientific Name	Common Name	EPBC Act Status
Crocodylus porosus	Salt-water Crocodile	Migratory
Dugong dugon	Dugong	Migratory
Manta alfredi	Reef manta ray	Migratory
Manta birostris	Giant manta ray	Migratory
Orcaella heinsohni	Australian snubfin dolphin	Migratory
Sousa chinensis	Indo-pacific humpback dolphin	Migratory

The salt-water crocodile in known to inhabit creek and estuaries of the study area. Dugong have been recorded in the Mackay region and likely to be transient in the waters adjacent to Port of Mackay as it moves to preferred foraging areas of seagrass meadows.

Manta ray species have previously been reported (anecdotally) in shark nets off Mackay. Both species may occur in the inshore waters adjacent to the project area. Manta ray feed on plankton species, and likely to include the species found within the Port of Mackay.

Australian snubfin dolphin may occur in the shallow and coastal estuarine waters adjacent to the project area. The Indo-pacific humpback dolphin has been recorded in the waters off Hay Point (Jacobs 2016) and may be a transient visitor in the project area. Inshore dolphin species are known to utilise a variety of inshore coastal habitats for foraging including mangroves, sandy bottom estuaries, and embankments, rocky and/or coral reefs. Australian snubfin dolphins have been recorded near seagrass meadows (Parra 2006).

Significant impact assessment for migratory marine species – Salt-water Crocodile, dugong, reef manta ray, giant manta ray, Australian snubfin dolphin, Indo-pacific humpback dolphin

Significant impact criteria	Significant impact?	Response to criteria
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	No	The saltwater crocodile is known to inhabit the creeks and estuaries in the region. Wetland and riparian habitat are not present in the Port or DMPA. There is no riparian connection between the Port and wetland habitats. Dugongs are known to occur in the waters off Mackay. They are not known to forage in the Port or DMPA due to the low abundance of seagrass. Modelling and monitoring show changes in water quality (increase in turbidity/SSC) are unlikely, with the majority of suspended sediment being retained within the Port during dredging. Only short-term impacts expected at the DMPA, any increase in turbidity is likely to be localised, minor and temporary. Sediment deposition patterns are not anticipated to vary from what is normally seen in the project area. Indirect impacts to wetland habitats and seagrass meadows from increased turbidity are unlikely. Direct and indirect impacts to preferred habitat for inshore dolphins will not occur. These habitats are not present in the Port or DMPA and indirect impacts from reduction in water quality (increased turbidity and sedimentation) will be localised, minor and temporary. The extent to which manta ray use the Port and DMPA is not known however, impact to plankton species on which they forage from reduced water quality (increased turbidity and sedimentation) is likely to be localised, minor and temporary.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	No	The proposed dredge operates on the Queensland coastline and consequently is unlikely to result in any invasive species. Any other dredge would be assessed for invasive marine species to ensure the risk is as low as reasonably practical. The risk will also be managed and impact avoided though ongoing early monitoring programs, including collaboration with Biosecurity Queensland, and vigilant washdown procedures. Additionally, dredge vessels contracted to undertake the maintenance dredging will be required to implement best practice hygiene protocols for management of ballast water.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	No	Port of Mackay and DMPA does not support core habitat for saltwater crocodile, dugong or inshore dolphin species, and indirect impacts to these habitats from maintenance dredging is unlikely. Disruption to the life cycle of these species is unlikely. Some local, minor and temporary on the abundance and species richness of plankton, manta ray food source, may be anticipated, and possibly direct impacts to individuals during the dredge event. However short duration of infrequent dredging is unlikely to seriously disrupt the life cycle of the species.

C.4: Critically endangered and endangered migratory shorebird species

Assessment against significant impact criteria – critically endangered and endangered migratory shorebird species

Scientific Name	Common Name	EPBC Act Status
Limosa lapponica baueri	Bar-tailed Godwit (western Alaskan)	Vulnerable
Calidris ferruginea	Curlew sandpiper	Critically Endangered
Eretmochelys imbricata	Eastern curlew	Critically Endangered
Calidris tenuirostris	Great knot	Critically Endangered
Charadrius mongolus	Lesser sand plover	Endangered
Calidris canutus	Red knot	Endangered

There is no species-specific policy guidance as to what constitutes 'habitat critical to the survival of' migratory shorebirds. Therefore, what constitutes 'important habitat' as outlined in *EPBC Act Policy Statement 3.21 - Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoEE 2017) has been used as a surrogate to define 'critical habitat'.

The region is known to support 23,000 shorebirds annually (Jacobs 2016), and the beaches to the north and south of the Port provide shorebird habitat, including the six critically endangered and endangered shorebirds listed above. Detailed local species-specific population information and the extent to which shorebirds utilise the beaches and small intertidal area within the bounds of the Port itself is not available. However, as a precautionary approach it is assumed threatened migratory shorebirds would be occasional visitors to the small area of habitat within the confines of the Port. And, to this end, these individuals may contribute to the greater population in the region that comprise to 0.1% or more of a flyway population of a single species. As such, the very limited area of potential habitat within the Port may constitute an 'important habitat', and therefore as a precautionary approach, is considered 'critical habitat' in the significant impact assessment below.

Significant impact assessment for critically endangered and endangered species – Bar-tailed godwit (western Alaskan), curlew sandpiper, eastern curlew, great knot, lesser sand plover, red knot

Significant impact criteria	Significant impact?	Response to criteria
Lead to a long-term decrease in the size of a population	No	There are a number of significant shorebird feeding and roosting sites in the study area. The Mackay and Hay Point region is known to support over 23,000 shorebirds annually. No feeding or roosting locations will be directly impacted by dredging activities. Indirect impacts are restricted to localised, minor and short-term increase in turbidity and sedimentation in intertidal zones, within the Port. Monitoring and modelling show that SSCs will be within the range of ambient conditions of the naturally turbid environment of an operating Port, with no discernible differences.
Reduce the area of occupancy of the species	No	As above. There will be no reduction in availability of intertidal areas and adjacent beaches associated with dredging and disposal.
Fragment an existing population into two or more populations	No	Direct impacts on shorebird populations will not result. The dredging vessel will operate in a similar vicinity to existing number of large vessels that operate daily at the Port of Mackay and consequently is unlikely to fragment populations of this species.
Adversely affect habitat critical to the survival of a species	No	Indirect impacts are restricted to localised, minor and short-term increase in turbidity and sedimentation in intertidal zones, within the Port. Monitoring and modelling show that SSCs will be within the range of ambient conditions of the naturally turbid environment of an operating Port, with no discernible differences. The proposed activity is highly unlikely to affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	No	Indirect impacts are restricted to localised, minor and short-term increase in turbidity and sedimentation in intertidal zones, within the Port that is highly unlikely to affect shorebird feeding and roosting sites. The dredging is with an existing operating Port, subject to existing ongoing activity.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	There will be no direct impacts to this species. Indirect impacts are restricted to localised, minor and short-term increase in turbidity and sedimentation in intertidal zones, within the Port that is highly unlikely to affect shorebird feeding and roosting sites.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	No	The proposed dredge operates on the Queensland coastline and consequently is unlikely to result in any invasive species. Any other dredge would be assessed for invasive marine species to ensure the risk is as low as reasonably practical. The risk will also be managed and impact avoided though ongoing early monitoring programs, including collaboration with Biosecurity Queensland, and vigilant washdown procedures. Additionally, dredge vessels contracted to undertake the maintenance dredging will be required to implement best practice hygiene protocols for management of ballast water.
Introduce disease that may cause the species to decline	No	As above
Interfere with the recovery of the species	No	The lack of direct and indirect impacts means that interference with the recovery of any of the species is highly unlikely. There are no recovery plans for these six species however, the proposed maintenance dredging will not interfere with conservation and management actions identified in the species Conservation Advices in the context of an

		existing operating Port and the limited potential habitat available within the bounds of the Port.

C.5: Migratory shorebird species

Assessment against significant impact criteria –migratory shorebird species

Scientific Name	Common Name	EPBC Act Status
Sternula albifrons	Little tern	Migratory

There is no species-specific policy guidance as to what constitutes 'habitat critical to the survival of' migratory shorebirds. Therefore, what constitutes 'important habitat' as outlined in *EPBC Act Policy Statement 3.21 - Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoEE 2017) has been used as a surrogate to define 'critical habitat'.

The region is known to support 23,000 shorebirds annually, and the beaches to the north and south of the Port provide shorebird habitat, including the little tern. Detailed local species-specific population information and the extent to which the little tern utilise the beaches and small intertidal area within the bounds of the Port itself is not available. However, as a precautionary approach it is assumed the little tern would be an occasional visitor to the small area of habitat within the confines of the Port. And, to this end, these individuals may contribute to the greater population in the region that comprise 0.1% or more of a flyway population of the species. As such, the very limited area of potential habitat within the Port may constitute 'important habitat', and therefore is considered 'critical habitat' in the significant impact assessment below.

Significant impact assessment for migratory shorebird species – Little tern

Significant impact criteria	Significant impact?	Response to criteria
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	No	There will be no direct impacts to this species. Indirect impacts are restricted to localised, minor and short-term increase in turbidity and sedimentation in intertidal zones, within the Port. Monitoring and modelling show that SSCs will be within the range of ambient conditions of the naturally turbid environment of an operating Port, with no discernible differences. The dredging vessel will operate in a similar vicinity to existing number of large vessels that operate daily at the Port of Mackay and consequently is unlikely to isolate an area of important habitat for the little tern.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	No	The proposed dredge operates on the Queensland coastline and consequently is unlikely to result in any invasive species. Any other dredge would be assessed for invasive marine species to ensure the risk is as low as reasonably practical. The risk will also be managed and impact avoided though ongoing early monitoring programs, including collaboration with Biosecurity Queensland, and vigilant washdown procedures. Additionally, dredge vessels contracted to undertake the maintenance dredging will be required to implement best practice hygiene protocols for management of ballast water.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	No	There will be no direct impacts to this species. Indirect impacts are restricted to localised, minor and short-term increase in turbidity and sedimentation in intertidal zones, within the Port that is highly unlikely to affect shorebird feeding and roosting sites. The dredging is with an existing operating Port, subject to existing ongoing activity. The small area of potential habitat is unlikely to be ecologically significant proportion of the population.