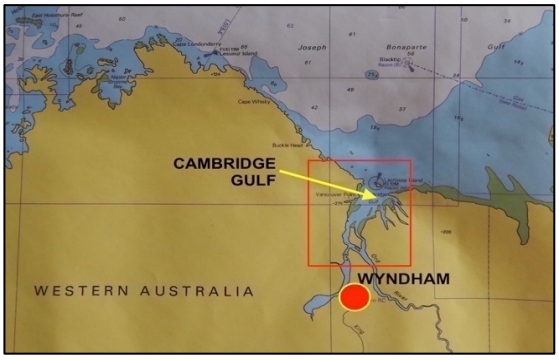
EPBC Referral Report No. 7

Boskalis Cambridge Gulf Marine Sand Proposal
Western Australia

COMMONWEALTH MATTERS



Prepared for Boskalis Australia Pty Ltd by EcoStrategic Consultants

In support of Project Referral under Part 7 of Commonwealth *Environment Protection & Biodiversity Conservation Act*

(a State-aligned version of this report was also submitted in referral under the WA EP Act)

OCTOBER 2024

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CONTENTS

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REFERRAL REPORTS

This report is part of a larger set of documents submitted as part of Boskalis Australia's referral under Part 7 of the Commonwealth *Environment Protection & Biodiversity Conservation Act* (EPNC Act), as listed in the table below.

A similar set of reports was also submitted as part of referral of the same proposal under section 38 of the Western Australia (WA) *Environmental Protection Act* (EP Act), with some differences to specifically address State requirements.

Doc No.	**Electronic File Names (PDFs)** (except Doc No.s 9 & 10 which are Excel files). As required, these file names are how the reports are referenced in the online referral submitted via the EPBC Act Business Portal https://epbcbusinessportal.environment.gov.au
0	List of EPBC Referral Reports - Boskalis Cambridge Gulf
1	EPBC Referral Report No. 1 - Boskalis Cambridge Gulf - *Description of Proposed Action & Regulatory Framework*
2	EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Setting & Existing Environment* Includes in same document: • Annex 3 - *Drop Camera Video Extracts* • Annex 4 - *Dry Season Sample Point Specs* • Annex 5 - *Wet Season Sample Point Specs* • Annex 6 - *Benthic Taxa per Sample Point - Dry Season Maps* • Annex 7 - *Benthic Taxa per Sample Point - Wet Season Maps* • Annex 8 - *Benthic Taxa per Sample Point - Dry Season Graphs* • Annex 9 - *Benthic Taxa per Sample Point - Wet Season Graphs* • Annex 11 - *Sediment Contamination Assessment* • Annexes 1, 2, 10, 12, 13 and 14 are submitted as separate documents as listed below.
3	EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 1 - *Sand Assessment*
4	EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 2 - *MScience BCH Methods*
5	EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 10 - *Aerial Drone Lidar Report*
6	EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 12 - *Cape Domett Turtle Data Report*
7	EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 13 - *Marine eDNA Report*
8	EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 14 - *Marine Mega-fauna Surveys Report* Includes in same document: • Appendix 1 - *MMF Sightings Master Data Tables* • Appendix 2 - *MMF Images* • Appendix 3 - *MMF Sighting Locations* • Appendices 4 and 5 are submitted as separate Excel files as listed below.
9	EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 14 - *Appendix 4 - Species Obs Data - Dry Season* (Excel)
10	EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 14 - *Appendix 5 - Species Obs Data - Wet Season* (Excel)

Doc No.	**Electronic File Names (PDFs)** (except Doc No.s 9 & 10 which are Excel files). As required, these file names are how the reports are referenced in the online referral submitted via the EPBC Act Business Portal https://epbcbusinessportal.environment.gov.au
11	EPBC Referral Report No. 3 - Boskalis Cambridge Gulf - *Traditional Owner Matters* Includes in same document: • Annex 1 - *BAC Native Title Determination Map* • Annex 2 - *MG Native Title Determination Map* • *Annex 3 - Letter from BAC* • *Annex 4 - Letter from MG*
12	EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments* Includes in same document: • Annex 1 - *Main Datasets Used to Inform Impact Assessments* • Annex 2 - *Shipping & Oil Spill Risk Assessment* • *Annex 3 - Plume Mitigation Capability Statement* • *Annex 4 - Marine Mega-fauna Capability Statement*
13	EPBC Referral Report No. 5 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Initial Report* • Includes in same document Annex 1 - *Supplementary Technical Note.* • Annex 2 is submitted as a separate document as listed below.
14	EPBC Referral Report No. 5 - Boskalis Cambridge Gulf - Annex 2 - *Factual Data Report* (NOTE: Superseded by *Updated Factual Data Report* - see Doc No. 19, Referral Report No. 8 - Annex B below).
15	EPBC Referral Report No. 6 - Boskalis Cambridge Gulf - *Consultation* • Includes in same document Annex 1 - *List of Meeting Minutes*
16	**[THIS REPORT]** EPBC Referral Report No. 7 - Boskalis Cambridge Gulf - *Commonwealth Matters* • Includes in same document Annex 1 - *PMST Report for POA & 10 Km Buffer*
17	EPBC Referral Report No. 8 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Full Modelling Report* • Appendices and Annexes are submitted as a separate document each, as listed below.
18	EPBC Referral Report No. 8 - Boskalis Cambridge Gulf - *Appendices* Includes: • Appendix A - *Model Calibration and Validation Plots* • Appendix B - *Hydrodynamic and Wave Impact Plots* • Appendix C - *Sediment Transport Impact Plots* • Appendix D - *Sediment Plume Modelling Results*
19	EPBC Referral Report No. 8 - Boskalis Cambridge Gulf - *Annexes* Includes: • Annex A - *Independent Expert Review* • Annex B - *Updated Factual Data Report*

ACRONYMS

AMSA	Australian Maritime Safety Authority
BC Act	WA Biodiversity Conservation Act
BIA	Biologically Important Area
BKA	Boskalis Australia Pty Ltd
BWM Convention	International Convention for the Control & Management of Ships' Ballast Water & Sediments
CG	Cambridge Gulf
CMS	Convention on Migratory Species
COLREGS	International Regulations for Preventing Collisions at Sea
DAFF	Commonwealth Department of Agriculture, Fisheries & Forestry
DBCA	WA Department of Biodiversity, Conservation & Attractions
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment & Water
DEMIRS	WA Department of Energy, Mines, Industry Regulation & Safety
DPLH	WA Department of Planning, Lands & Heritage
EIS	Environmental Impact Statement (under EPBC Act)
EPA	WA Environmental Protection Authority
EP Act	WA Environmental Protection Act
EPBC Act	Commonwealth *Environment Protection & Biodiversity Conservation Act*
IMO	International Maritime Organization
MARPOL	International Convention for the Prevention of Pollution from Ships
MNES	Matters of National Environmental Significance (under Commonwealth EPBC Act)
OPMs	Other Protected Matters
PMST	(Commonwealth) Protected Matters Search Tool
PER	Public Environment Report (under EPBC Act)
Ramsar	Convention on Wetlands of International Importance
SPV	Sand Production Vessel
SWEK	Shire of Wyndham & East Kimberley
TO	Traditional Owner
TSHD	Trailer Suction Hopper Dredger
WA	Western Australia (State of)

PROJECT LOCATION

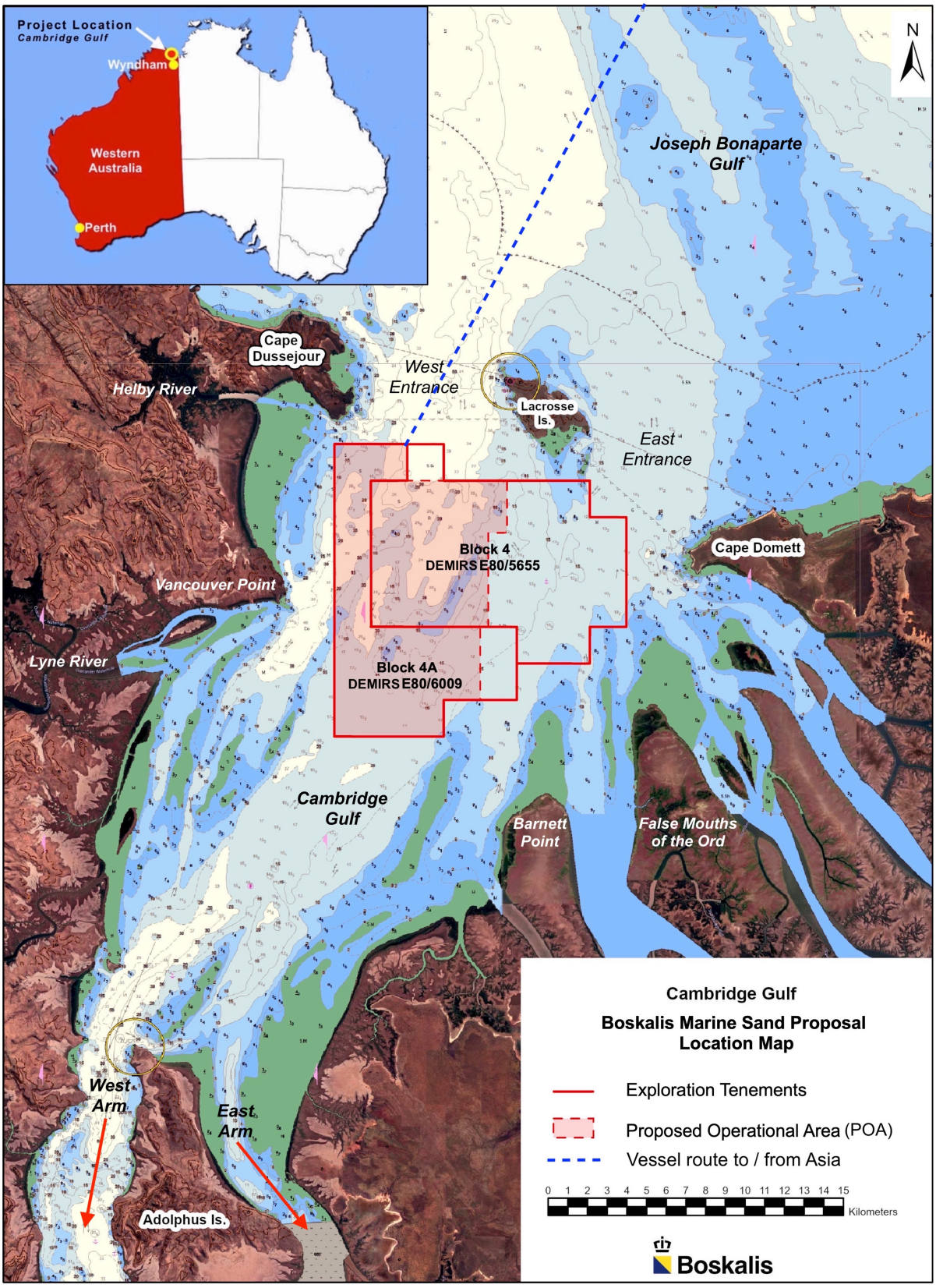


FIGURE 1: *Location of the proposed action in Cambridge Gulf near Wyndham in the northeast of Western Australia.*

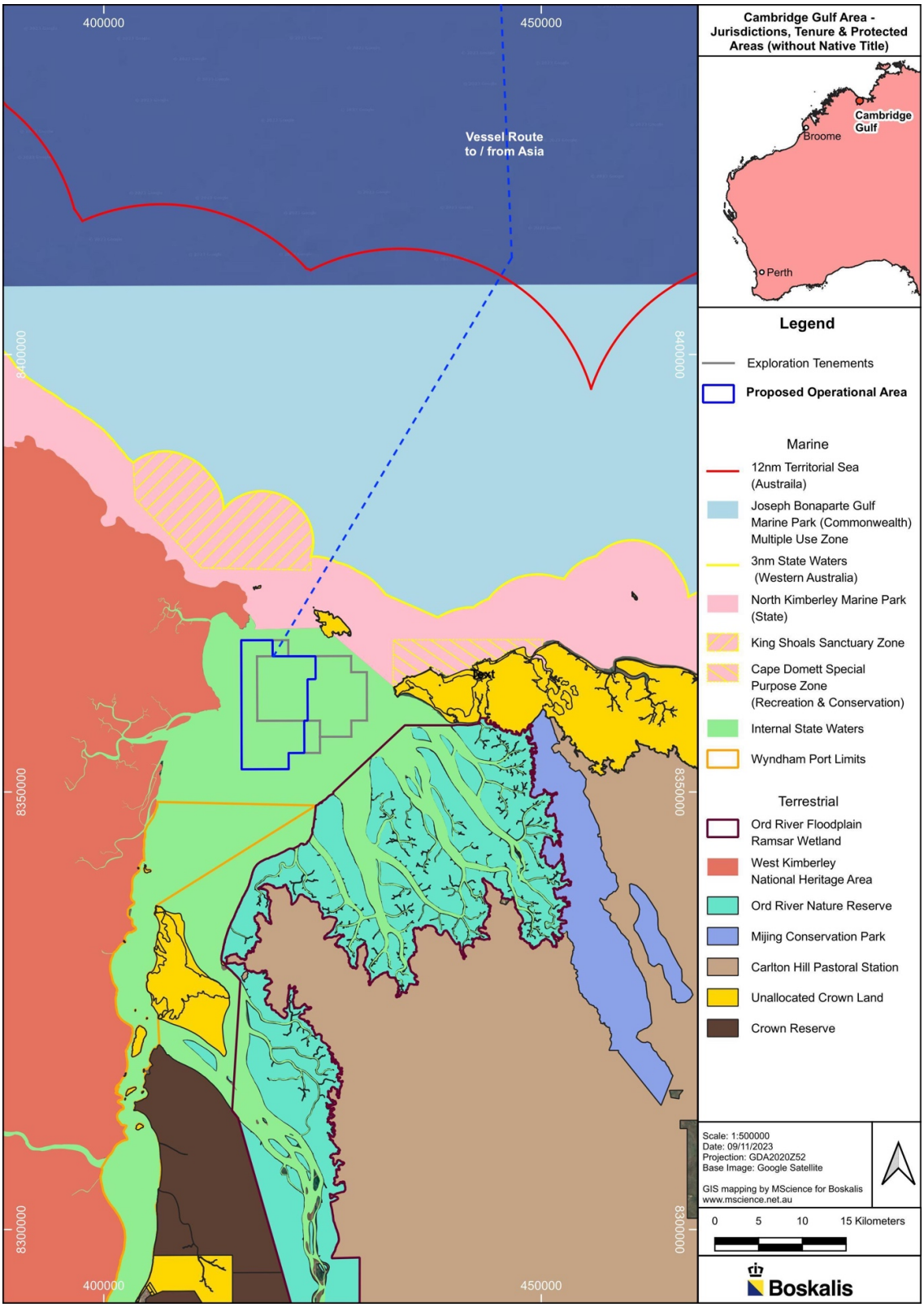


FIGURE 2: *Jurisdictions and tenure in the vicinity of the proposed operational area (POA) and the indicative route for the Sand Production Vessel (SPV) to/from Asia.*

EXECUTIVE SUMMARY

1. Boskalis Australia Pty Ltd (BKA) is assessing the feasibility of developing a marine sand-sourcing operation (the proposed action) in Cambridge Gulf (CG) near Wyndham in the northeast of Western Australia (WA) (Figure 1). BKA currently holds two sand exploration tenements in CG under the WA *Mining Act*, as the basis for the proposed action.

2. To support its assessment BKA has undertaken a wide range of comprehensive studies since 2018. These studies find that the proposed action is feasible and viable and unlikely to cause significant environmental impacts, as defined under the WA *Environmental Protection Act* (EP Act) and the Commonwealth *Environmental Protection & Biodiversity Conservation Act* (EPBC Act). Given these findings and the fact that the proposal is subject to the WA *Mining Act,* including the comprehensive environmental assessment and management framework under that Act, as well as a range of other environmental regulatory requirements, BKA considers that the proposed action may not require an assessment process under the WA EP Act or Commonwealth EPBC Act.

3. Never-the-less, as a responsible company with stringent environmental and social policies, BKA has committed to self-referring the proposal to both the State and the Commonwealth under their respective Acts, for their determination of what further environmental assessments might be required, if any. If it is determined that assessment is required under both Acts, BKA will seek a joint process under the WA environmental assessment system, which is accredited by the Commonwealth.

4. Subject to the outcomes of the State and Commonwealth EPBC Act referral processes, BKA plans to apply to the WA Department of Energy, Mines, Industry Regulation & Safety (DEMIRS) to convert a reduced part of the two Exploration Tenements to a single Mining Tenement, shown as the 'proposed operational area' (POA) on Figures 1 and 2.

5. *The purpose of this report is to support BKA's self-referral under the EPBC Act, by describing Commonwealth environmental matters under the EPBC Act, including Matters of National Environmental Significance (MNES), as they relate to the proposal.*

6. Separate referral documents have submitted to the WA EPA under the WA EP Act in accordance with the State referral requirements on format, structure etc, however the technical content and findings are the same.

7. This report is supported by the suite of reports listed under Referral Reports above. These and other supporting reports are cited where relevant throughout the sections below, and need to be referred to for the scientific and technical bases for the findings presented in this report.

8. A search of the EPBC Act Protected Matters Search Tool (PMST) (Annex 1) found that the POA is located within the general biological range of several threatened species and several migratory species, which are defined as MNES. The PMST search also found that a 10 km buffer around the POA overlaps with the range of some additional MNES species.

9. Due to the low resolution of biogeographical range data that supports the PMST, many of the species listed as likely to be present are actually highly unlikely to be in those areas. Large whale species, large shark species, wholly-pelagic offshore species, shore-based bird-species, fully land-based bird species and even some small terrestrial mammals are listed in PMST as being within CG – when local scale data and knowledge of habitat preferences versus environmental conditions in CG indicate that this is highly unlikely or even impossible. This is addressed for each species in the report where relevant.

10. The PMST search found that CG is within an inter-nesting buffer Biologically Important Area (BIA) for Flatback Turtles (*Natator depressus*) and a breeding, calving, feeding and resting BIA for the Australian Snubfin Dolphin ((*Orvaella heinsohni).*

11. The PMST search found that the 10 km buffer around the POA overlaps slightly with three area-based MNES, the West Kimberley National Heritage area (the eastern boundary of which follows the west coast of CG), the Ord River Floodplain Ramsar site located on the eastern side of CG, and Commonwealth waters including the Joseph Bonaparte Gulf Marine Park located offshore from CG.

12. The potential for the proposed sand-sourcing operation to cause significant impacts on the identified MNES is systematically assessed in accordance with the EPBC Act significant impact criteria for each MNES type, as per the Commonwealth Significant Impact Guidelines[1], considering the nature, scope, scale and duration of the proposed operation, and the application of the impact mitigation hierarchy of avoid, minimize, offset and rehabilitate impacts.

13. *This assessment finds that the proposed action does not pose a risk of significant impact on any of the identified MNES, as defined by the Commonwealth Significant Impact Guidelines.*

[1] www.dcceew.gov.au/environment/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance

1. BRIEF DESCRIPTION OF THE PROPOSED ACTION

Brief summary only - for details of the proposed action please refer EPBC Referral Report No. 1 - Boskalis Cambridge Gulf - *Description of Proposed Action & Regulatory Framework*.

1. Boskalis Australia Pty Ltd (BKA) is assessing the feasibility of developing a marine sand sourcing operation (the proposed action) in Cambridge Gulf (CG) near Wyndham in the northeast of Western Australia (WA) (Figure 1). The sand in CG is derived from natural terrestrial sources via river inputs. The sand would be exported to Asian markets for use in construction projects. In proposing CG, BKA has screened alternatives as outlined in Section 18 of EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments*.

2. The proposed action is subject to the WA *Mining Act* including the comprehensive environmental assessment and management framework under that Act. BKA currently holds two exploration tenements in CG, E80/5655 (Block 4) and E80/6009 (Block 4A) (Figures 1 and 2). Based on sand distribution, the proposed operational area (POA) is the western part of Block 4 and all of Block 4A (Figure 1 & 2). Key facts relating to the proposal include:

    a) Project lifespan: Up to 15 years from commencement of operations.

    b) Zero coastal or land-based development: The proposal does not involve the construction and operation of any shore-based facilities and does not involve the alteration of the coastline in any way. It will be a 100% vessel-based operation.

    c) Marine area: The POA is located in the central part of the main body of CG where there is a significant seabed sand resource, covering an area of ~100 km^2 as shown on Figures 1 and 2. Water depths within the area average -25 m MSL. The seabed within and around the POA comprises highly-dynamic sand-waves with very little biota and no significant benthic communities, due to the constantly moving substrate, strong tidal currents (>2 m/s), constantly high suspended sediments and permanent lack of benthic light.

    d) Single vessel: The proposed operation will involve a Sand Production Vessel (SPV) based generally on the design of a large Trailer Suction Hopper Dredger (TSHD) (Figure 3). It will be an internationally-registered vessel subject to all relevant regulatory requirements of the International Maritime Organization (IMO) and the Australian Maritime Safety Authority (AMSA). While design is conceptual, indicative specifications are Length Overall (LoA) of ~350 m, draft of ~19 m, sand capacity 75K m^3 to 125K m^3 and crew of ~25. There will be no refuelling or waste discharges in CG.

    e) Zero activity in CG for 86% of time: The SPV will self-load sand in CG for one to two days every two weeks. It will then sail to the sand delivery port in Asia and return to CG two weeks later to repeat the cycle. This means that the SPV will only operate in CG for 52 days per year, or 14% of the time. There will be zero operational activity in CG for 86% of the time during the project's lifespan of up to 15 years.

    f) Sand volumes: Exploration surveys indicate that there is a minimum of 300 million m^3 of sand in the POA and likely several times more. There are several orders of magnitude higher volumes of sand throughout CG overall. It is proposed to export up to 70 million m^3 of sand. This is a maximum of only 23% of the minimum volume of 300 million m^3 of sand estimated to occur in the POA, and a much smaller % of the volume of sand throughout CG overall.

    g) Low footprint each loading cycle: During each one- to two-day sand loading cycle, the SPV will work over an area of ~0.5 km^2 within the POA, with a draghead width of ~6 m. The SPV will remove a layer of approximately 40 cm of sand from the seabed during each loading cycle.

    h) End of project seabed condition: At the end of the 15-year project timeframe, if the proposed 70 million m^3 of sand is exported, the area within the POA will be on average <1m deeper than the pre-project seabed. It will still comprise sand with similar seabed morphology, dynamics and habitat features as before sand sourcing.

    i) No significant environmental impacts: Overall, due to the above factors and other factors as assessed in EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments*, and with the implementation of best-practice impact prevention and mitigation measures, the proposed action is unlikely to cause significant environmental impacts. If the proposal proceeds, BKA will support research and monitoring to improve environmental protection and biodiversity conservation in the area, in cooperation with relevant stakeholders including TOs (see EPBC Referral Report No. 4).

    j) Economic benefits & TO support: The proposed action will generate a range of economic benefits, including payment of State royalties, payment of voluntary royalties to TO groups, up to 40-50 local jobs, service contracts and business opportunities with priority focus on TOs, and support for local Indigenous Ranger groups and community development. Both TO groups in the area, Balanggarra and Miriuwung-Gajerrong, have issued letters of support for the proposed action (see Annexes 4 & 5 of EPBC Referral Report No. 3 - Boskalis Cambridge Gulf - *Traditional Owner Matters*).

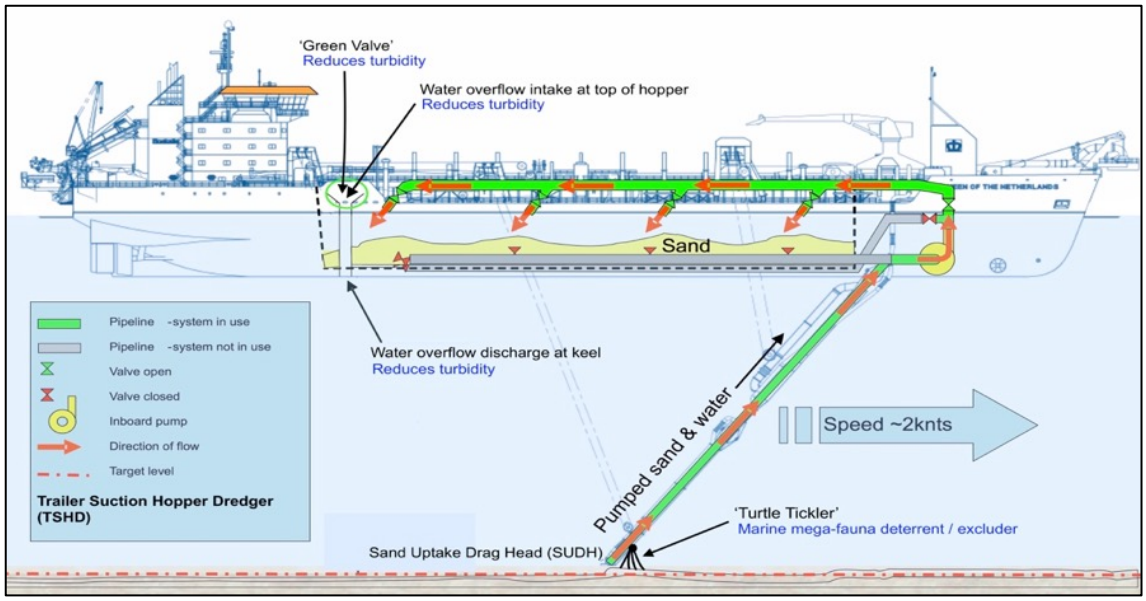


FIGURE 3: *The proposed sand sourcing operation will involve a single Sand Production Vessel (SPV) based on the design of a large Trailer Suction Hopper Dredger (TSHD) – but designed and built specifically for this project.*

2. PURPOSE OF THIS REPORT

1. To support its assessment of the feasibility of the proposed action BKA has undertaken a wide range of environmental, engineering, economic and other studies since 2018. These studies find that the proposed action is feasible and viable and unlikely to cause significant environmental impacts, as defined under the WA *Environmental Protection Act* (EP Act) and the Commonwealth *Environmental Protection & Biodiversity Conservation Act* (EPBC Act). The findings are presented in EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments* and the supporting reports listed above.

2. Despite the low likelihood of significant environmental impacts, as a responsible company with stringent environmental and social policies, BKA has committed to self-referring the proposed action to the WA Environmental Protection Authority (EPA) under section 38 of the EP Act, and to the Commonwealth under Part 7 of the EPBC Act, for their determination of what further environmental assessments might be required, if any. If it is determined that assessment is required under both Acts, BKA will seek a joint process under the WA environmental assessment system, which is accredited by the Commonwealth.

3. As outlined in section 1 the proposed action is subject to the WA *Mining Act,* including the comprehensive environmental assessment and management framework under that Act. Subject to the outcome of the State and Commonwealth referral processes, BKA plans to apply to the WA Department of Energy, Mines, Industry Regulation & Safety (DEMIRS) to convert part the two Exploration Tenements to a single Mining Tenement, excluding the eastern half of Block 4 due to the lack of sand in that area, and covering the proposed operational area only (POA), as shown on Figures 1 and 2.

4. *The purpose of this report is to support BKA's self-referral under the Commonwealth EPBC Act, by describing Commonwealth environmental matters under the EPBC Act, including Matters of National Environmental Significance (MNES), as they relate to the proposed action.*

5. Separate referral documents are submitted to the WA EPA under the WA EP Act in accordance with the State referral requirements, however the technical content and findings are the same. This report is supported by the suite of reports listed under Referral Documents above, and in particular the scientific and technical assessments contained in:

   - EPBC Referral Report No. 1 - Boskalis Cambridge Gulf - *Description of Proposed Action & Regulatory Framework.*
   - EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Setting & Existing Environment.*
   - EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments.*
   - EPBC Referral Report No. 5 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Initial Report.*
   - EPBC Referral Report No. 8 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Full Modelling Report.*

6. These and other supporting reports are cited where relevant throughout the sections below, and need to be referred to for the scientific and technical bases for the findings presented in this report.

3. OVERALL JURISDICTIONAL SETTING

1. A detailed description of the jurisdictional and regulatory setting applicable to the proposed action is contained in EPBC Referral Report No. 1 - *Description of the Proposed Action & Regulatory Framework*. This section presents a brief description of the jurisdictional setting only, in order to provide some context for the assessment of Commonwealth protected matters in the following sections.

2. As shown on Figures 2, 4 and 5, Cambridge Gulf (CG) and BKA's proposed operational area (POA) are located within the State Internal Waters of WA (landward of the Territorial Sea Baseline), and are thus subject to the full jurisdiction of the State of WA. The area is also within the sovereign territory of Australia and subject to relevant Commonwealth laws.

3. To seaward of CG is the State North Kimberly Marine Park, which extends from the Territorial Sea Baseline seaward to the 3 nm State limit, also within the jurisdiction of WA. Seaward of the 3 nm State limit are Commonwealth waters of the Commonwealth Joseph Bonaparte Gulf Marine Park.

4. The Port of Wyndham is located ~80 km upstream from the main body of CG and is under the jurisdiction of the Kimberley Ports Authority (KPA). The POA is not within the declared port area (the seaward extent of the port limits is shown on Figure 4). The local Government for the area is the Shire of Wyndham & East Kimberley (SWEK), with its main office in Kununurra.

5. As shown on Figure 4, the coast and hinterland on the western side of CG are Native Title lands of the Balanggarra peoples, which includes marine areas of the State Marine Park out to 3 nm. The coast and hinterland on the eastern side of CG are Native Title lands of the Mirriuwung-Gajerrong peoples, which includes marine areas within the 'False Mouths of the Ord River', which are part of the State Ord River Nature Reserve. There is no Native Title determination over marine waters within the main body of CG, including the POA (see also EPBC Referral Report No. 3 - Boskalis Cambridge Gulf - *Traditional Owner Matters)*.

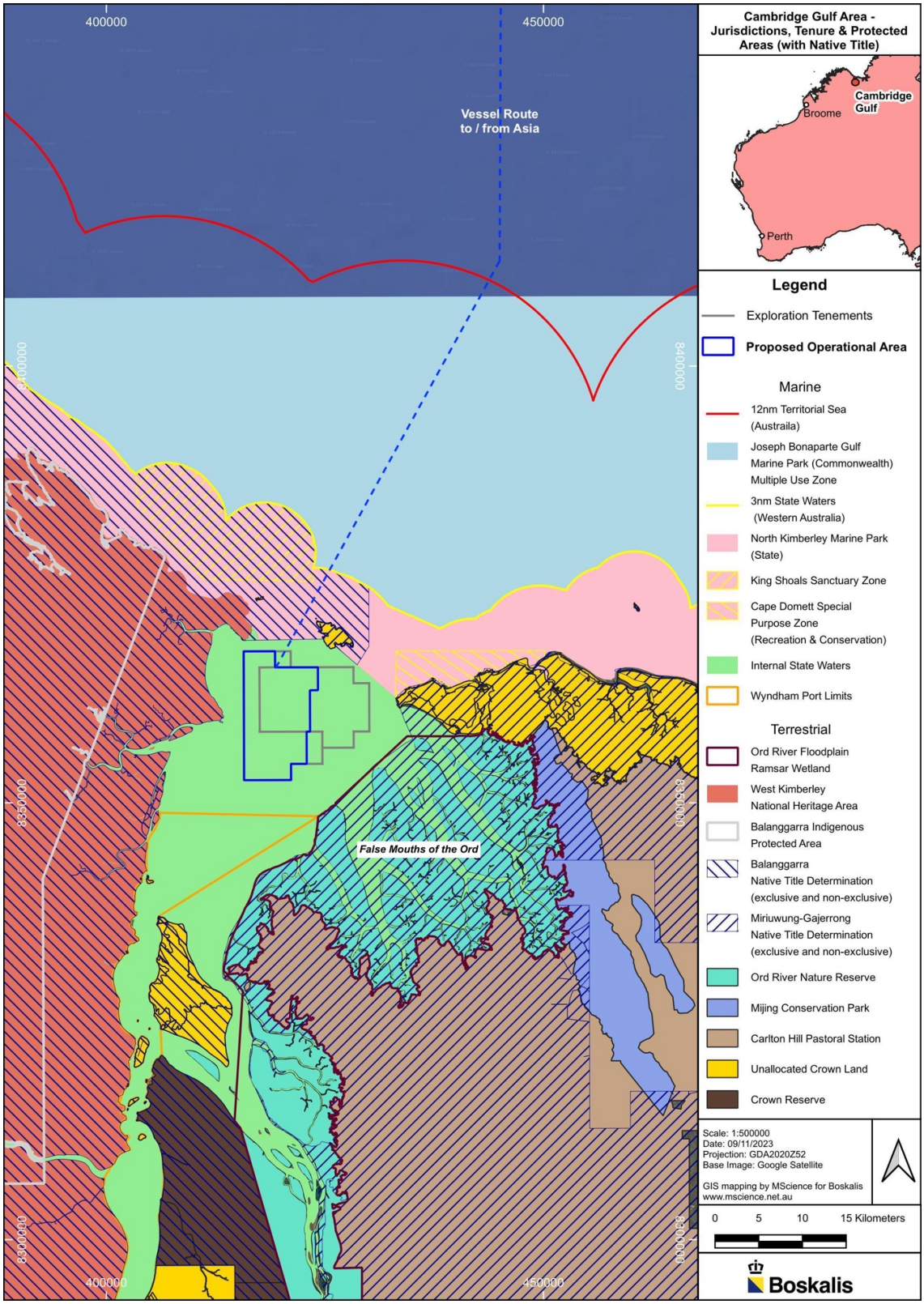


FIGURE 4: *Jurisdictions and tenure in the area including Native Title.*

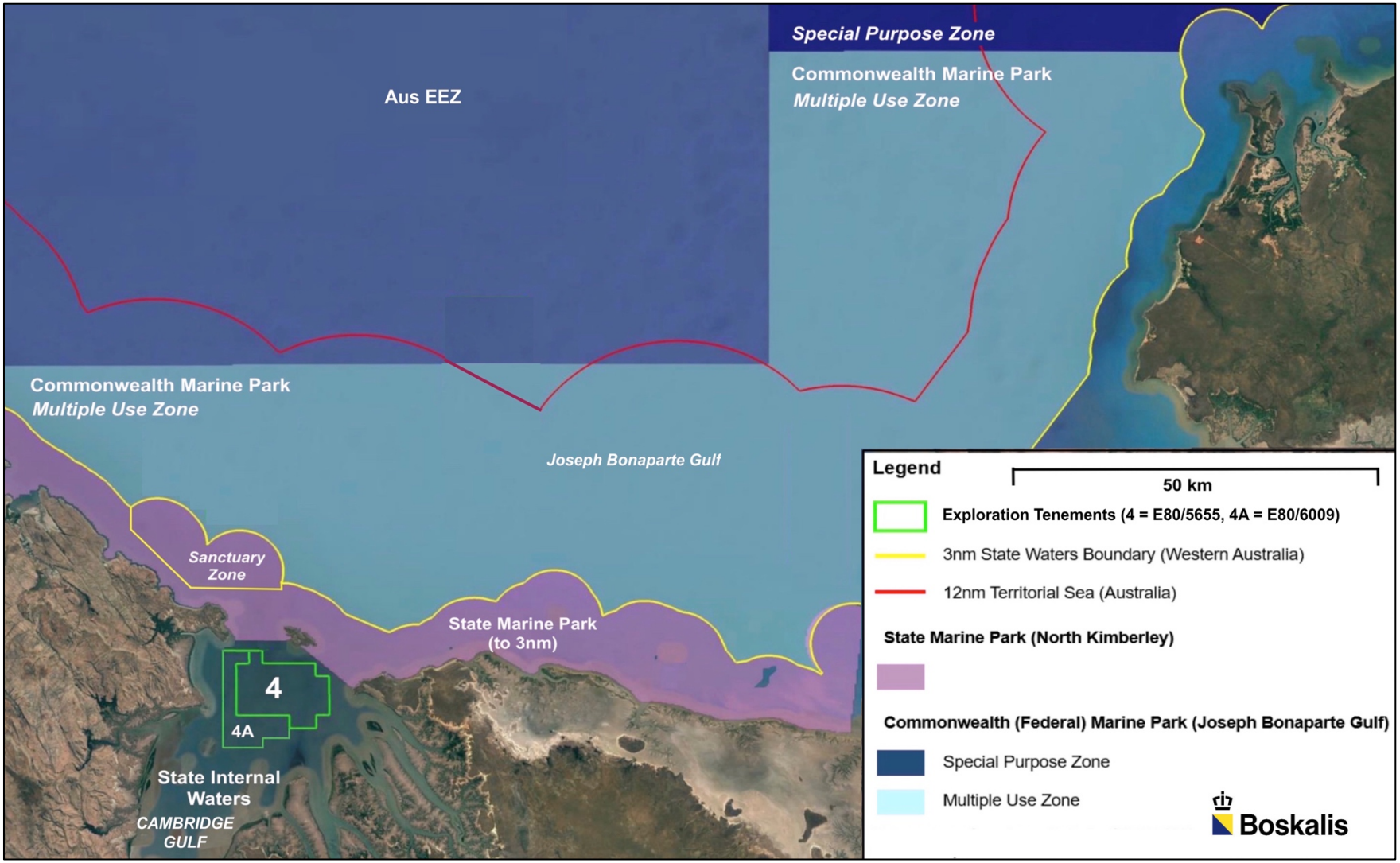


FIGURE 5: *Marine jurisdictions in and around CG.*

4. THE EPBC ACT, MNES & OTHER PROTECTED MATTERS

4.1 The EPBC Act

1. The primary national environmental law in Australia is the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act), administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) (www.dcceew.gov.au). The objectives of the EPBC Act are:

    a) protection of the environment, especially defined Matters of National Environmental Significance (MNES) (see section 4.2 below),

    b) promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources,

    c) conservation of biodiversity,

    d) protection and conservation of heritage,

    e) a co-operative approach to the protection and management of the environment involving governments, the community, land-holders and indigenous peoples; and

    f) co-operative implementation of Australia's international environmental responsibilities.

2. The EPBC Act applies throughout the Australian jurisdiction, which includes all States and Territories and marine waters out to the outer limits of Australia's Exclusive Economic Zone (EEZ) or continental shelf (whichever extends further). It can also apply to Australian individuals, corporations, entities, vessels and aircraft beyond the EEZ or continental shelf.

3. The EPBC Act does not exclude or limit the concurrent operation of any State or Territory law. The Act applies in *addition to*, and not *instead of* State and Territory law.

4. The EPBC Act is divided into two volumes, with Volume 1 being relevant to this assessment. Some of the main provisions of Volume 1 include, *inter alia:*

    a) A prohibition on taking any action that causes, will cause or is likely to cause significant impact on MNES (see section 4.2 below), unless such action is approved by the Commonwealth Minister for the Environment or another prescribed approval (criteria for 'significant impact' for each MNES are laid out in guidelines[2]).

    a) Procedures for referring a proposed action to the Commonwealth, and for assessing whether or not a proposed action requires assessment and approval, including consideration of whether it may cause significant impact to MNES (if a proposed action is deemed to require assessment and approval, it becomes a controlled action).

    b) The level and type of assessment required for a controlled action, ranging from preliminary documentation, to a Public Environment Report (PER), to an Environmental Impact Statement (EIS) to an Inquiry with Commissioners, and their procedures and processes.

    c) Arrangements for bilateral agreements between the Commonwealth and States, under which EPBC Act assessments and approvals can be undertaken by the States.

    d) Procedures for listing threatened ecological communities, threatened species and migratory species (which once listed, become MNES).

    e) Procedures for listing other marine species for protection (which once listed, are protected under the EPBC Act but are not necessarily classed as MNES).

    f) Provisions for the protection of all whales and other cetacean species (in addition to those listed as MNES).

5. The EPBC Act defines offences, penalties and strict liability under its various provisions, including for individuals and corporations (civil penalties up to $5.5 million or criminal penalties up to seven years imprisonment).

[2] www.dcceew.gov.au/environment/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance

4.2 Matters of National Environmental Significance (MNES)

1. The EPBC Act, Chapter 2, Part 3, Division 1 lists ten MNES as follows:

    a) World Heritage sites.

    b) National Heritage sites.

    c) Wetlands of international importance (Ramsar sites) (designated under the *Convention on Wetlands of International Importance* signed at Ramasr, Iran in 1971).

    d) Listed threatened ecological communities (classed as Critically Endangered, Endangered, Vulnerable or Conservation Dependent) (list issued by the Minister and updated periodically[3]).

    e) Listed threatened species (classed as Critically Endangered, Endangered, Vulnerable or Conservation Dependent) (list issued by the Minister and updated periodically[4]).

    f) Listed migratory species (protected by international conventions, list issued by the Minister and updated periodically[5]).

    g) Nuclear actions, including uranium mines.

    h) Commonwealth marine areas – all Australian waters from the 3 nm State limit out to the outer limits of Australia's Exclusive Economic Zone (EEZ) or continental shelf - whichever extends further.

    i) The Great Barrier Reef Marine Park.

    j) Protection of water resources from coal seam gas and coal mining.

2. As outlined under 4.1 above, the Act creates offences for actions that have, will have, or are likely to have a significant impact on MNES. The Act also requires that when there is potential for a project (an 'action') to cause significant impact on MNES, it may be classified as a controlled action, the environmental assessment requirements of the Act are triggered, and a Commonwealth Environmental Approval (EA) must be applied for.

4.3 Other Protected Matters (OPMs)

1. In addition to defining and protecting MNES, the EPBC Act also protects a range of other environmental resources and values (referred to in this report as Other Protected Matters or OPMs). These include *inter alia*:

    a) Commonwealth Lands.

    b) Commonwealth Heritage.

    c) Listed Marine Species (in addition to those listed as MNES).

    d) Whale and Other Cetacean Species (in addition to those listed as MNES).

    e) Critical Habitats.

    f) Commonwealth Reserves - Terrestrial.

    g) Australian Marine Parks.

2. While the presence of OPMs in or near the footprint of a proposed action does not potentially trigger the EPBC Act assessment and approval process in the same way that MNES can, the fact that they are protected under the EPBC Act means that the proposal must still ensure that significant impacts are not caused on OPMs. Hence, they are included in this report.

[3] https://www.dcceew.gov.au/environment/biodiversity/threatened/communities
[4] https://www.dcceew.gov.au/environment/epbc/our-role/approved-lists#species
[5] https://www.dcceew.gov.au/environment/biodiversity/migratory-species

4.4 Biologically Important Areas (BIAs)

1. The Commonwealth can declare Biologically Important Areas (BIAs) over areas where a specific biologically important behaviour for marine species that are protected under the EPBC Act is assessed to occur, such as breeding, foraging, resting and migration. BIA's can be spatial (a defined geographical area) and/or temporal (e.g. a breeding or migration season).

2. BIAs do not have legal standing or regulatory bases in themselves, they are designed to 'flag' the importance of an area to a particular protected species, and should be taken into account when assessing potential impacts of any proposed development(s) (proposed actions) in that area.

3. BIAs can be taken into account when designing suitable and effective measures to prevent, mitigate, manage and monitor potential impacts on protected species, considering the biologically important behaviour of the species that the BIA relates to (breeding, foraging, resting, migration etc).

4. BIAs may also assist with identifying information gaps about the protected species and their biologically important behaviour(s), and prioritising future research.

5. BIAs can be located anywhere within the Australian marine environment including State, Commonwealth and adjacent waters. They can also be designated over terrestrial areas used for biologically important behaviours by marine species, for example land-based nesting habitats for marine turtles and seabirds.

6. Designated BIAs in the CG area relate to marine turtle species and the Snubfin Dolphin (*Orvaella heinsohni*), as summarized in section 7 and assessed in detail in sections 10.2 and 10.3.

5. METHODS USED TO ASSESS COMMONWEALTH PROTECTED MATTERS

1. The assessment in this report was undertaken following the procedures and criteria outlined in the DCCEEW document:

   Commonwealth of Australia 2013, Matters of National Environmental Significance, Significant Impact Guidelines 1.1, Environment Protection and Biodiversity Conservation Act 1999 (the Significant Impact Guidelines)[6].

2. This included the following step-wise procedure:

   a) identify if there are there any MNES at four scales, within BKA's proposed operational area (POA) and within a 10, 20 and 30 km buffer around the area, using the DCCEEW Protected Matters Search Tool (PMST[7]) (Figures 6 & 7 and Annex 1),

   b) assess if there is potential for impacts on MNES, considering the nature, scale and duration of BKA's proposed operational activities at their broadest scope,

   c) assess possible measures to prevent, reduce and mitigate impacts on MNES, and any residual impacts,

   d) assess whether any impacts on MNES are likely to be significant (as defined by the Significant Impact Guidelines); and

   e) include potential indirect and offsite impacts in the assessment.

3. Although the EPBC Act and the Guidelines only require assessment of potential significant impacts on MNES, for completeness this report also includes assessment of potential significant impacts on the OPMs and BIAs that were identified in the PMST search.

4. To facilitate a systematic approach to assessing potential impacts, all identified MNES were incorporated into 'assessment tables' or 'analysis matrices' (the tables in sections 9 and 10 below), giving consideration to:

   a) the nature of each MNES and their quality, value, vulnerability and sensitivity to impacts,

   b) the nature, scope, scale and duration of the proposed operation, as summarised in section 1 above, and whether the operation presents any mechanisms whereby significant impacts might be caused, and what these mechanisms are,

   c) proposed impact prevention, reduction and mitigation measures, and any remaining residual impacts.

5. The assessment of likely significant impact took a conservative approach based on the Precautionary Principle, and was based on the criteria and procedures outlined in the Significant Impact Guidelines.

6. The Guidelines state that generally, the assessment of significant impact should consider the scale, duration and intensity of the proposed action and its impacts, and this is reflected in the assessment.

7. The Guidelines state that for a significant impact to be assessed as 'likely', it is not necessary for it to have a greater than 50% chance of occurring; it is sufficient if there is a real or not remote chance or possibility of it occurring, and this is reflected in the assessment.

8. The Guidelines also provide detailed criteria that should be applied when assessing the potential for significant impact on each type of MNES. These are summarized in Table 1 and are included and assessed as relevant for each MNES in the assessment tables in sections 9 and 10.

9. The potential for indirect and offsite impacts was considered in the assessment.

10. The Significant Impact Guidelines also provide specific guidance on the assessment of marine activities, including examples of what types of marine activities are considered to present a risk of significant impacts to MNES and those that do not. Because the BKA proposal is a wholly marine activity, section 13 includes an assessment against the Guidelines' marine criteria.

[6] www.dcceew.gov.au/environment/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance
[7] www.dcceew.gov.au/environment/epbc/protected-matters-search-tool

TABLE 1: *Detailed criteria for assessing the potential for significant impact on each type of MNES.*

From www.dcceew.gov.au/environment/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance

MNES (as listed in the EPBC Act)	Significant Impact Criteria
1. World Heritage sites:	Not relevant to this proposed action – none in the area.
2. National Heritage places:	An action is likely to have a significant impact on a National Heritage place if there is a real chance or possibility that it will cause one or more of the National Heritage values to be: • lost, • degraded or damaged; or • notably altered, modified, obscured or diminished.
3. Wetlands of international importance:	An action is likely to have a significant impact on the ecological character of a wetland of international importance if there is a real chance or possibility that it will result in: • areas of the wetland being destroyed or substantially modified, • a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland, • the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected, • a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health; or • an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.
4. Listed threatened ecological communities:	Not relevant to this proposed action – none in the area.
5. Listed threatened species (with the following two sub-categories): – Critically Endangered & Endangered species:	An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will: • lead to a long-term decrease in the size of a population, • reduce the area of occupancy of the species, • fragment an existing population into two or more populations, • adversely affect habitat critical to the survival of a species, • disrupt the breeding cycle of a population, • modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, • result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat, • introduce disease that may cause the species to decline; or • interfere with the recovery of the species.
– Vulnerable species:	An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will: • lead to a long-term decrease in the size of an important population of a species, • reduce the area of occupancy of an important population, • fragment an existing important population into two or more populations, • adversely affect habitat critical to the survival of a species, • disrupt the breeding cycle of an important population • modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, • result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, • introduce disease that may cause the species to decline; or • interfere substantially with the recovery of the species.

MNES (as listed in the EPBC Act)	Significant Impact Criteria
6. Listed migratory species:	An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will: • 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, • result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or • seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.
7. Nuclear actions, including uranium mines:	Not relevant to this proposed action.
8. Commonwealth marine areas:	An action is likely to have a significant impact on a Commonwealth marine area if there is a real chance or possibility that the action will: • result in a known or potential pest species becoming established in the Commonwealth marine area, • modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity results, • have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution, • result in a substantial change in air quality or water quality (including temperature) which may adversely impact on biodiversity, ecological integrity; social amenity or human health, • result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected; or • have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of a historic shipwreck.
9. Great Barrier Reef Marine Park:	Not relevant to this proposed action.
10. Protection of water resources from coal seam gas and coal mining:	Not relevant to this proposed action.

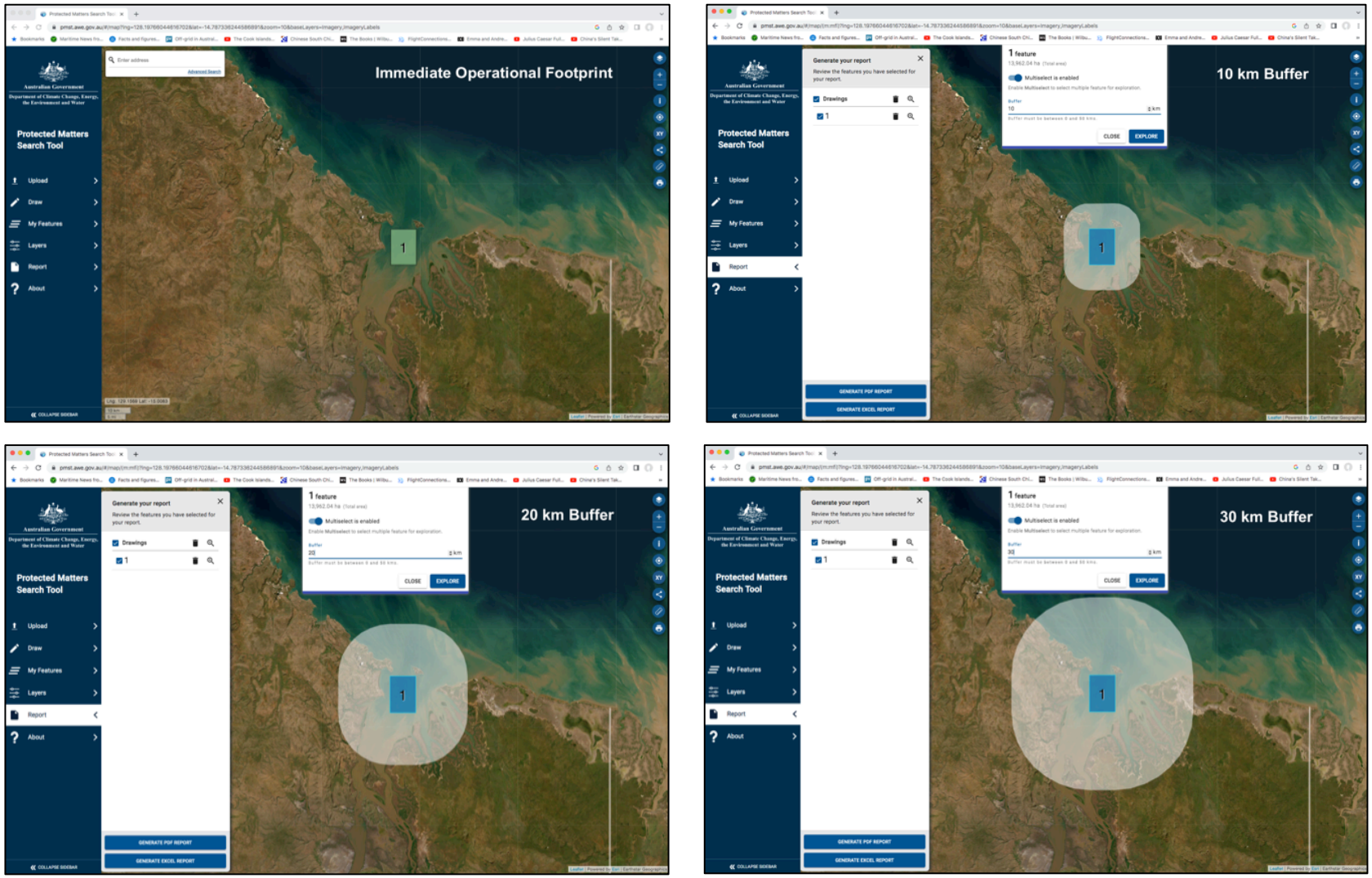
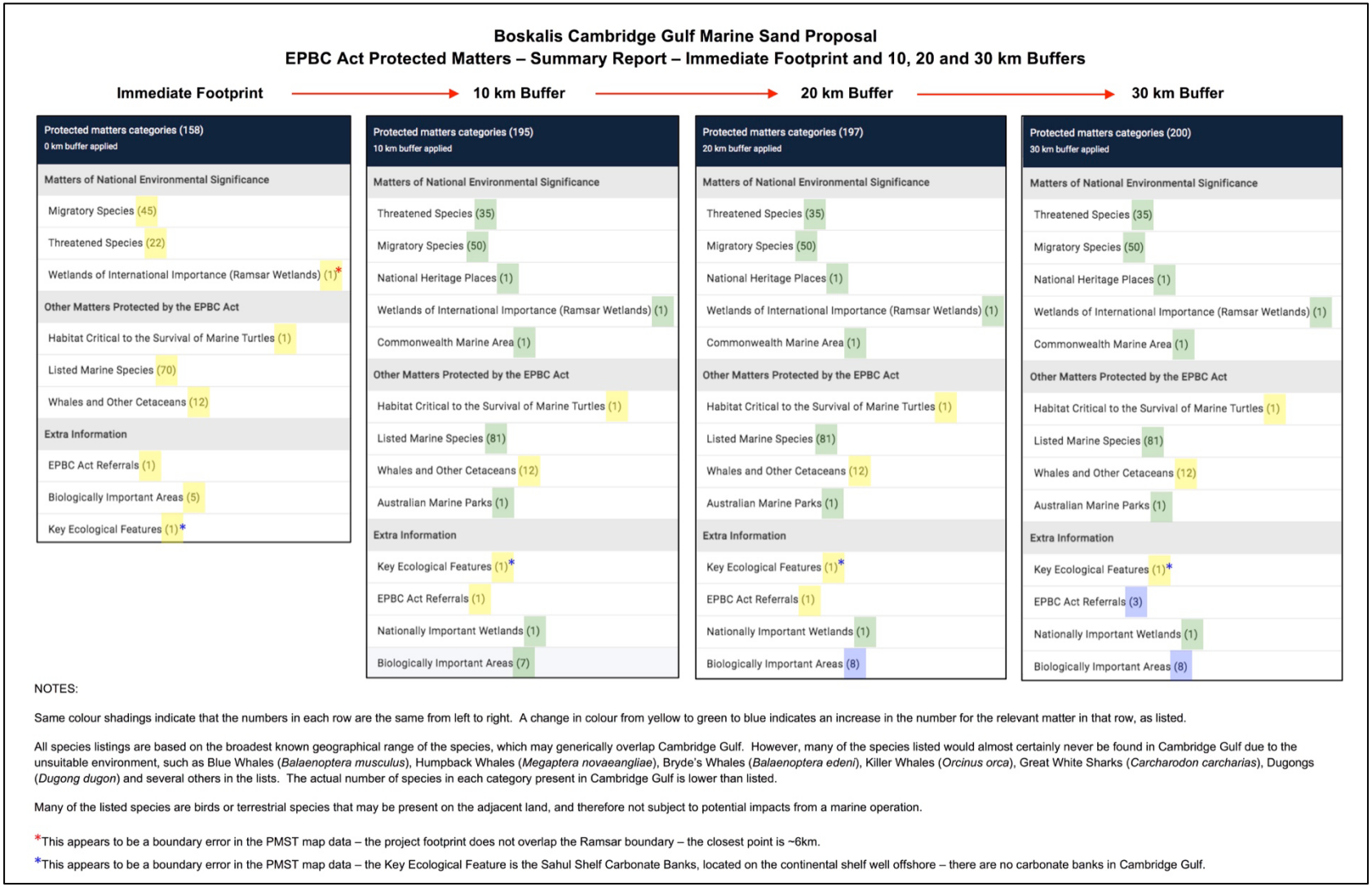


FIGURE 6: *The four search areas applied in the Commonwealth Protected Matters Search Tool (www.dcceew.gov.au/environment/epbc/protected-matters-search-tool).*



NOTES:

Same colour shadings indicate that the numbers in each row are the same from left to right. A change in colour from yellow to green to blue indicates an increase in the number for the relevant matter in that row, as listed.

All species listings are based on the broadest known geographical range of the species, which may generically overlap Cambridge Gulf. However, many of the species listed would almost certainly never be found in Cambridge Gulf due to the unsuitable environment, such as Blue Whales (*Balaenoptera musculus*), Humpback Whales (*Megaptera novaeangliae*), Bryde's Whales (*Balaenoptera edeni*), Killer Whales (*Orcinus orca*), Great White Sharks (*Carcharodon carcharias*), Dugongs (*Dugong dugon*) and several others in the lists. The actual number of species in each category present in Cambridge Gulf is lower than listed.

Many of the listed species are birds or terrestrial species that may be present on the adjacent land, and therefore not subject to potential impacts from a marine operation.

*This appears to be a boundary error in the PMST map data – the project footprint does not overlap the Ramsar boundary – the closest point is ~6km.

*This appears to be a boundary error in the PMST map data – the Key Ecological Feature is the Sahul Shelf Carbonate Banks, located on the continental shelf well offshore – there are no carbonate banks in Cambridge Gulf.

FIGURE 7: *Summary of the Protected Matters findings for the immediate footprint and the 10, 20 and 30 km buffers. Same colour shadings indicate that the numbers in each row are the same from left to right. A change in colour indicates an increase in the number for the relevant matter in that row. Note there is almost no difference between the buffers.*

6. PRESENCE & PROXIMITY OF MNES

1. Because, as shown on Figure 7, there is almost no difference in MNES between the 10, 20 and 30 km buffers, and because there are limited mechanisms whereby impacts might occur beyond the proposed operational area (POA), the findings are presented for the POA and the 10 km buffer. The findings for the 10 km buffer can be interpolated to the 20 and 30 km buffers, but with decreasing potential for impacts. The full PMST search results for the combined POA and 10 km buffer are presented in Annex 1.

6.1 Species Range Resolution in PMST results

1. It should be noted that biogeographical range data in the PMST is broadscale and subject to generalizations and errors due to lack of local range data for many species in many areas around Australia. It should be noted that many species listed as potentially present in the POA and/or the 10 km buffer, based on the PMST search, are not actually present in CG, due to the inhospitable environmental conditions and unsuitable habitat in CG.

2. For example (amongst others) the PMST identifies that Dugongs (*Dugong dugon*), Great White Sharks (*Carcharodon carcharias*), Whale Sharks (*Rhincodon typus*), Blue Whales (*Balaenoptera musculus*), Brydes Whales (*Balaenoptera brydei)*, Humpback Whales (*Megaptera novaeangilae*), Killer Whales (*Orcinus orca*) and other large species may be present in CG. However, the environmental conditions in CG relative to the requirements and preferences of these species make theiir presence extremely unlikely, and they have never been sighted there (see Section 9 of EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Setting & Existing Environment* and EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 14 - *Marine Mega-fauna Surveys Report)*.

3. Similarly, the PMST search lists multiple migratory wader birds and shorebird as known to occur in the POA despite the fact that these species feed along the shoreline and roost above the high tide line, and are therefore highly unlikely to be found in the open-water marine area of the POA in the middle of CG. The PMST even lists some wholly-terrestrial species including certain native rats and quolls as being found in the marine waters of the POA.

4. The number of MNES species in an area as indicated by the PMST search can therefore be significant over-estimates. The lack of species range resolution in PMST search results should be taken into account when considering what species are actually present and likely to be present. Reference should be made to local-scale surveys and data, as presented in Section 9 of EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Setting & Existing Environment* and EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 14 - *Marine Mega-fauna Surveys Report)*. This is addressed for each species where relevant in the assessments in section 10.

5. It should also be noted that there appear to be other scale errors in the PMST search – for example the PMST identifies one Wetland of International Importance (the Ord River Floodplain Ramsar Site) as being within the POA, when in fact there is no overlap – the closest distance is ~6 km, and there is therefore an overlap with the 10 km buffer only.

6. Finally, it should be noted that some species are repeated in the different lists, for example some marine turtle species appear in the Threatened Species, Migratory Species and Marine Species lists (there are multiple other examples). This means that the actual number of species identified by the PMST is less than the sum of the species in all list categories.

6.2 Non-relevant MNES

1. The PMST search finds that five of the ten MNES listed under the EPBC Act are not relevant to the BKA proposal, as follows:

    a) World Heritage sites (none in the area).
    b) Listed threatened ecological communities (none in the area).
    c) The Great Barrier Reef Marine Park (located over 1,7600 km away).
    d) Nuclear actions (not part of the proposed action).
    e) Coal seam gas and coal mining (not part of the proposed action).

6.3 MNES in the Proposed Operational Area

1. Table 2 shows the PMST search results in the POA, including MNES. The search finds that no area-based MNES overlap with the POA, and species from two categories of species-based MNES could potentially be present in the POA, as follows (noting the PMST range resolution inaccuracies described above, which means that most are not actually present):

    a) Listed Threatened Species - 22 such species are ‘potentially’ present in the POA.
    b) Listed Migratory Species - 45 such species are ‘potentially’ present in the POA.

2. The full details of each species are presented in section 10, including assessment of potential impacts of the proposed action in accordance with the Commonwealth significant impact criteria. Considering the point under section 6.1 on the lack of bio-geographic range resolution in PMST data, most of the species identified by the search are not actually found in the POA or CG generally, as addressed for each species in section 10.

6.4 MNES in the 10 km Buffer

1. Table 3 shows the PMST search results for the 10 km buffer, including MNES.

2. The search finds that the 10 km buffer around the outer boundary of the POA slightly overlaps with three area-based NMES, as follows:

    a) National Heritage Place - there is a slight overlap of the 10 km buffer with the eastern boundary of the West Kimberley National Heritage Place on the west coast of CG.

    b) Wetland of International Significance - there is a slight overlap of the 10 km buffer with the Ord River Floodplain Ramsar Site to the east of CG.

    c) Commonwealth Marine Area - there is a slight overlap of the 10 km buffer with the commencement of Commonwealth waters including the Joseph Bonaparte Gulf Marine Park located offshore from CG.

3. These are discussed in section 9.1 to 9.3 respectively, including assessment of potential impacts of the proposed action in accordance with the Commonwealth significant impact criteria.

4. The search also finds that species from two categories of species-based MNES could potentially be present in the 10 km buffer, as follows (noting the PMST range resolution inaccuracies described above, which means that most are not actually present):

    a) Listed Threatened Species - an additional 13 such species (in addition to those listed for the POA) are ‘potentially’ present in the 10 km buffer.

    b) Listed Migratory Species - an additional 5 such species (in addition to those listed for the POA) are ‘potentially’ present in the 10 km buffer.

5. The full details of each of these species are presented in section 10, including assessment of potential impacts of the proposed action in accordance with the Commonwealth significant impact criteria. Considering the point under section 6.1 on the lack of bio-geographic range resolution in PMST data, most of the species identified by the search are not actually found in the 10 km buffer, as addressed for each species in section 10.

7. PRESENCE & PROXIMITY OF OPMS & BIAS

Other Protected Matters (OPMs)

1. Table 2 shows the search results for the POA, including OPMs. These are (noting the PMST range resolution inaccuracies described above, which means that most are not actually present):

    a) Listed Marine Species - 70 such species are 'potentially' present in the POA.

    b) Whale & Other Cetacean Species - 12 such species are 'potentially' present in the POA (these are included in and are not in addition to the 70 Listed Marine Species).

    c) Habitat critical to marine turtles - the Flatback Turtle inter-nesting buffer BIA listed below.

2. Table 3 shows the search results for the 10 km buffer, including OPMs. These are:

    a) Listed Marine Species – an additional 11 such species (in addition to those listed for the POA) are 'potentially' present in the 10 km buffer.

    b) Whale & Other Cetacean Species – the same 12 such species listed for the POA are 'potentially' present in the 10 km buffer.

    c) Australian Marine Park - there is a slight overlap of the 10 km buffer with the commencement of the Commonwealth Joseph Bonaparte Gulf Marine Park located offshore from CG.

    d) Habitat critical to marine turtles - the Flatback Turtle inter-nesting buffer BIA listed below.

3. Similar to the search results for MNES, considering the point under section 6.1 on the lack of bio-geographic range resolution in PMST data, most of the OPM species identified by the search are not actually found in CG, the 10 km buffer or in the broader area, as addressed for each species in section 10.

Biologically Important Areas (BIAs)

1. Table 2 shows the search results for the proposed operational area, including BIAs. These are:

    a) Snubfin Dolphin (*Oracella heinshoni*) – the POA is within breeding, calving, foraging and resting BIA for this species (Figure 8).

    b) Flatback Turtle (*Natator depressus*) – the POA is within the inter-nesting buffer BIA for this species that covers a 60 km radius around Cape Domett (Figures 9A and 9B) (see discussion of this BIA in section 10.2.2. Extreme environmental conditions in CG, including extremely strong tidal currents, make it highly unlikely that Flatback Turtles would actually use this area for inter-nesting resting).

2. Table 3 shows the search results for the 10 km buffer, including BIAs. These are, in addition to the two BIAs listed for the POA above:

    a) Green Turtle *(Chelonia mydas)* - the 10 km buffer slightly overlaps with a foraging BIA for this species (Figure 10).

    b) Olive Ridley Turtle *(Lepidochelys olivacea)* - the 10 km buffer slightly overlaps with a foraging BIA for this species (Figure 11).

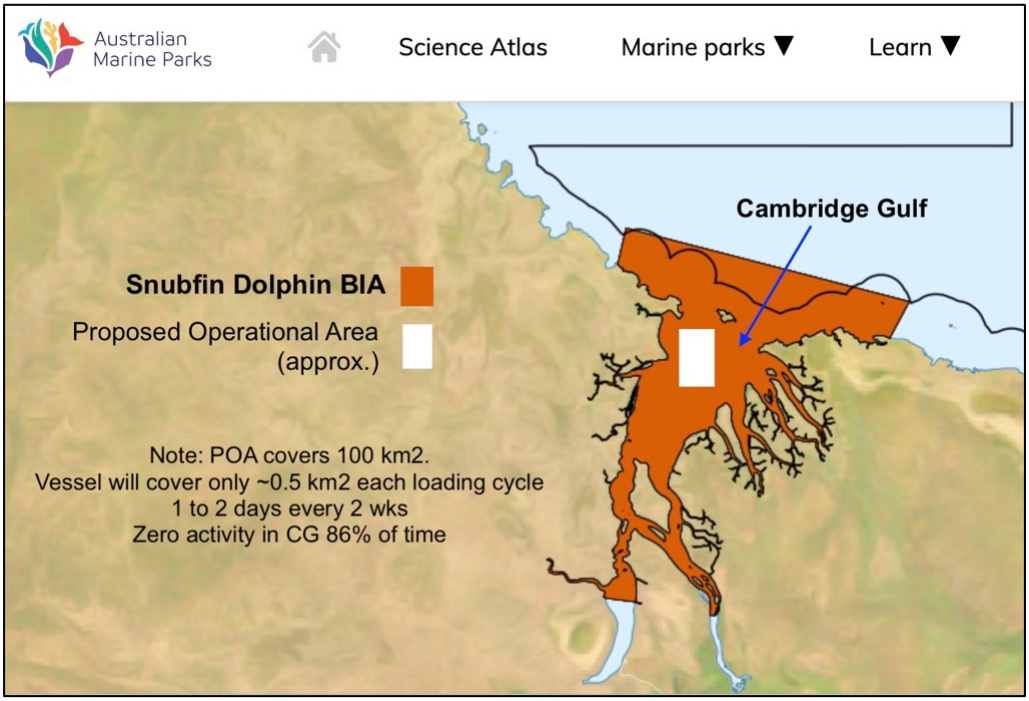


FIGURE 8: *Snubfin Dolphin (Oracella heinshoni) breeding, calving, foraging and resting BIA.*

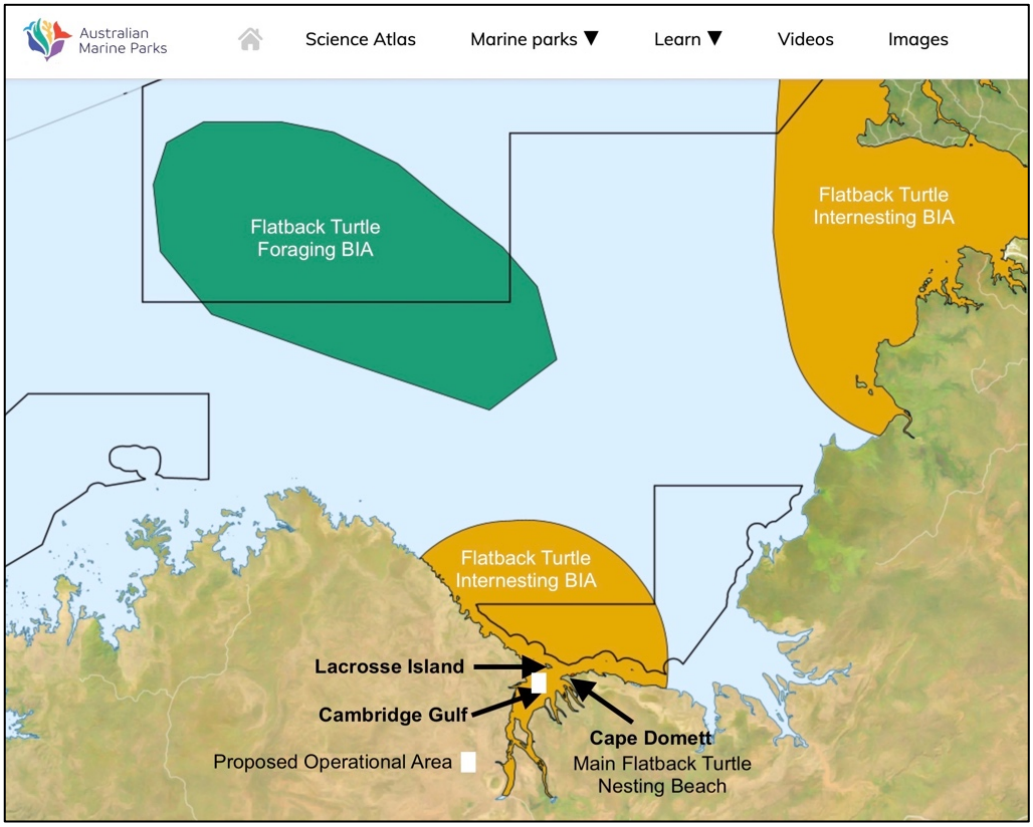


FIGURE 9A: *Flatback Turtle (Natator depressus) inter-nesting buffer BIA within 60 km radius around Cape Domett.*

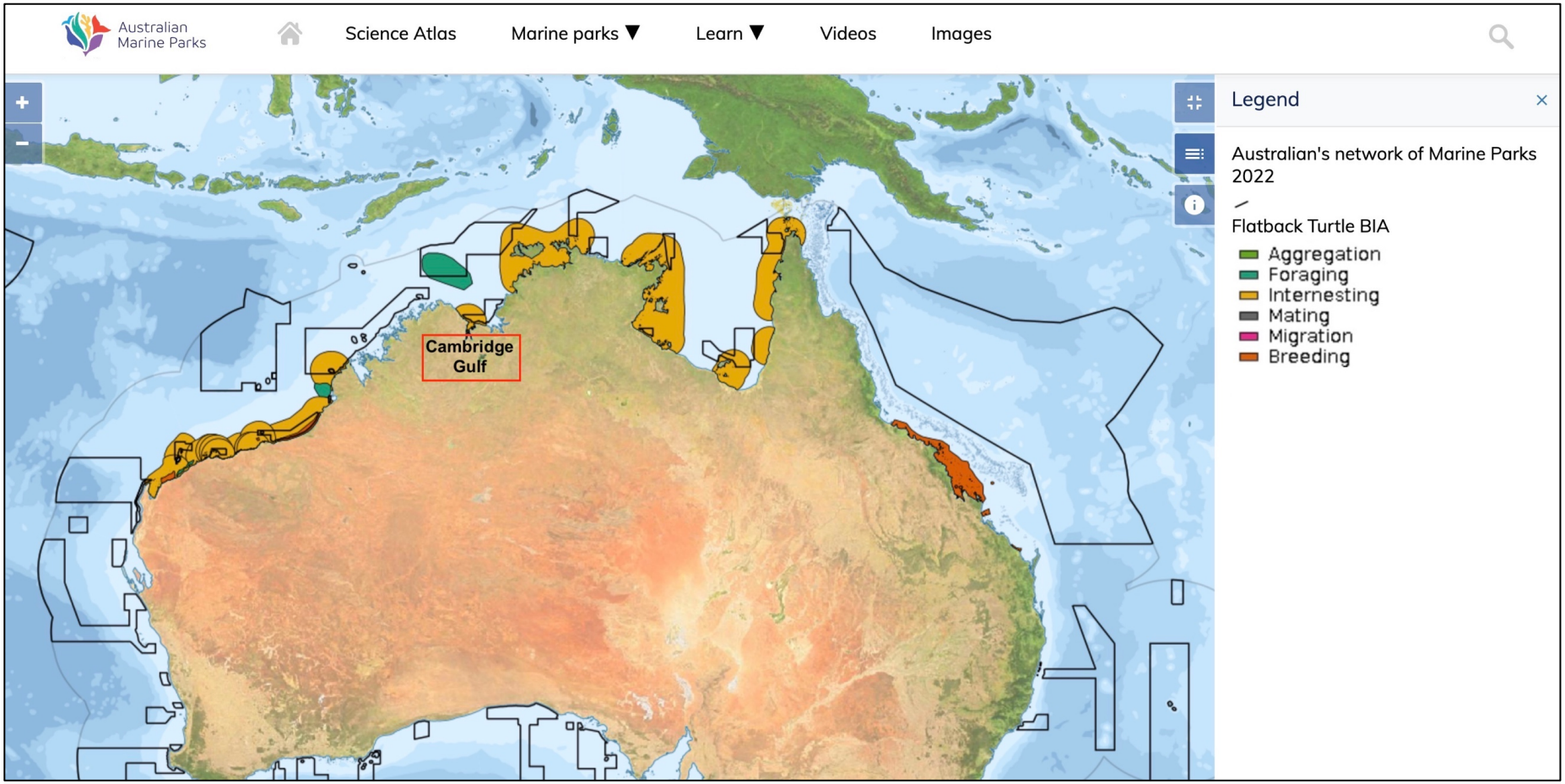


FIGURE 9B: *The Cambridge Gulf Flatback Turtle BIA in context with other Flatback Turtle BIAs nationally.*

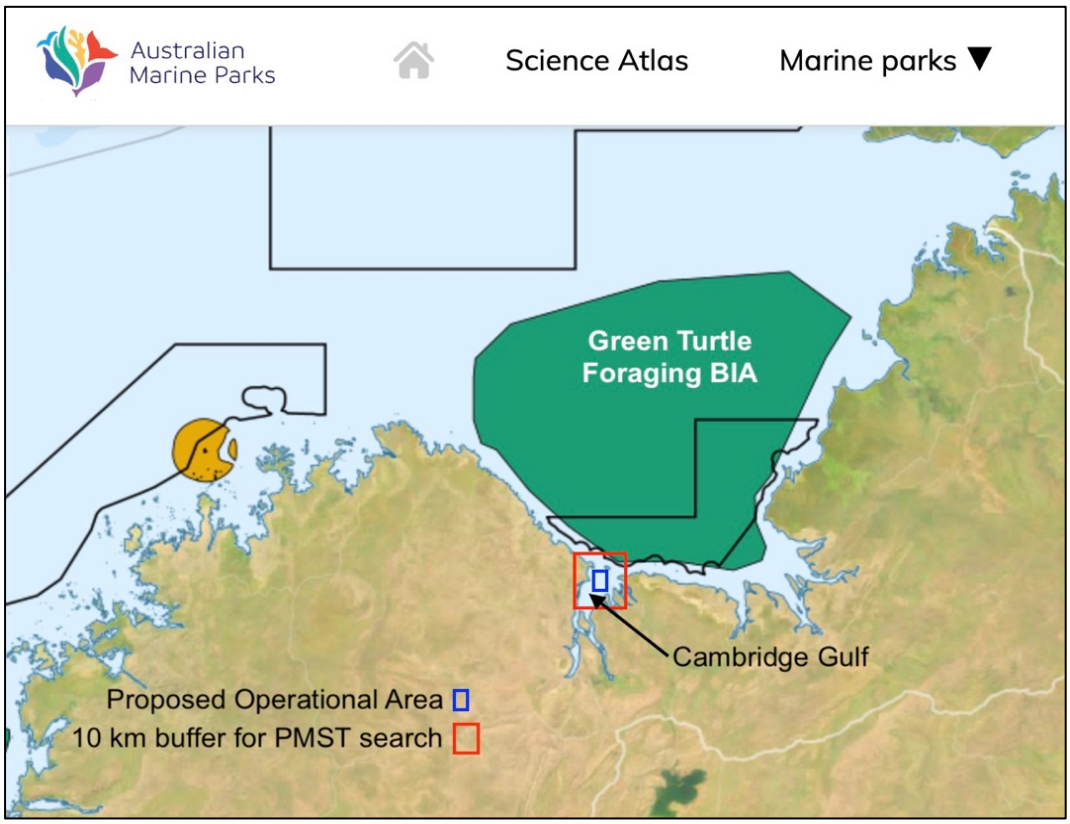


FIGURE 10: *Green Turtle (Chelonia mydas) foraging BIA offshore from CG.*

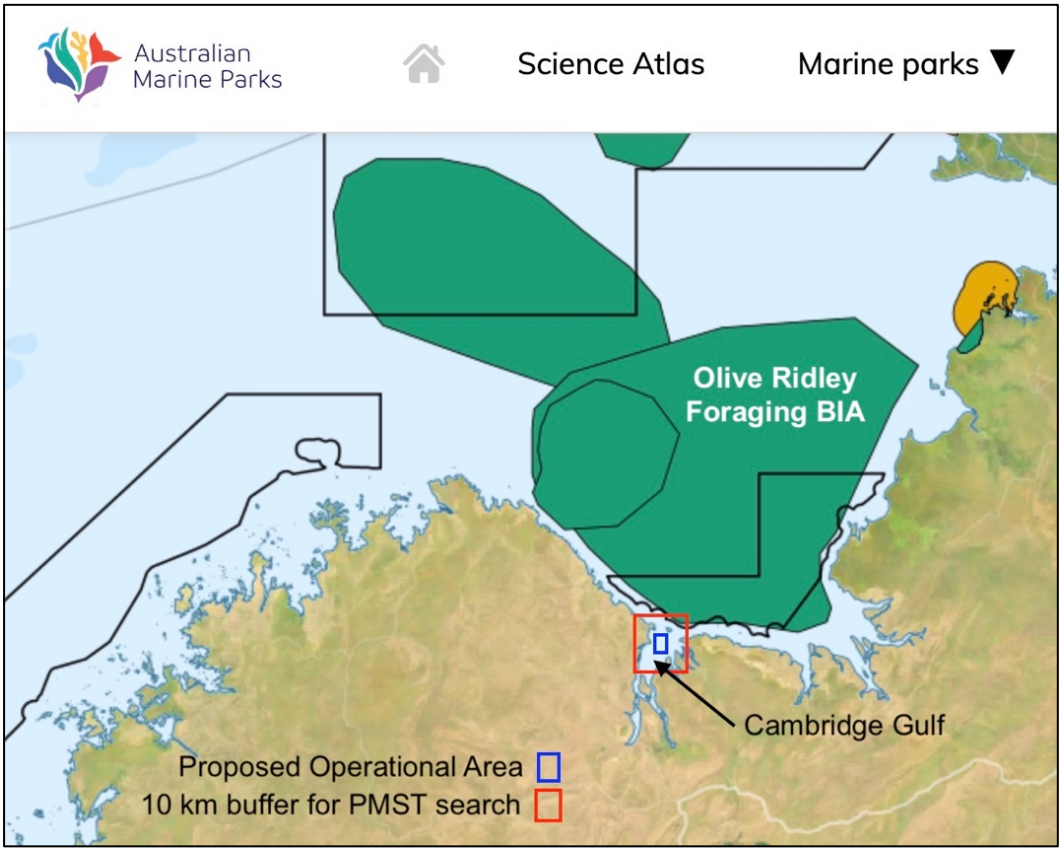


FIGURE 11: *Olive Ridley Turtle (Lepidochelys olivacea) foraging BIA offshore from CG.*

TABLE 2: *MNES, OPMs and BIAs that are present or potentially present within the proposed operational area (POA).*

MNES	Number	Description / Notes
1. World Heritage:	**None**	• N/a
2. National Heritage:	**None**	• N/a
3. Wetlands of International Importance:	**1** identified by PMST Actually **None**	• The PMST identifies the Ord River Floodplain Ramsar Site as being within the POA footprint. This is an error in PMST. • No overlap – the closest distance is ~6 km (Figures 2 & 15).
4. Commonwealth Marine Areas:	**None**	• N/a
5. Threatened Ecological Communities:	**None**	• N/a
6. Listed Threatened Species:	**22**	• Refer section 10 for species details. • Some of these are only 'potentially present' based on their broad geographical ranges, but in fact are not actually present in CG.
7. Listed Migratory Species:	**45**	• Refer section 10 for species details. • Some of these are only 'potentially present' based on their broad geographical ranges, but in fact are not actually present in CG.
OPMs		
8. Commonwealth Lands or Heritage:	**None**	• N/a
9. Listed Marine Species:	**70**	• Refer section 10 for species details. • Some of these are only 'potentially present' based on their broad geographical ranges, but in fact are not actually present in CG.
10. Whale & Other Cetacean Species:	**12**	• Refer section 10 for species details. • Some of these are only 'potentially present' based on their broad geographical ranges, but in fact are not actually present in CG.
11. Critical Habitats:	**None**	• N/a
12. Commonwealth Reserves - Terrestrial:	**None**	• N/a
13. Australian Marine Parks:	**None**	• N/a
14. Habitat Critical to the Survival of Marine Turtles:	**1** identified by PMST Actually **None**	• The PMST identifies nesting habitat for Flatback Turtles (*Natator depressus*) within the POA footprint. • This is an error as turtles nest on beaches, not in the sea itself. • The closest distance to nesting habitat (Lacrosse Is.) is ~6 km.
BIAs		
15. Snubfin Dolphin (*Oracella heinshoni*)	**1**	• The POA footprint is within breeding, calving, foraging and resting BIA for this species (Figure 8).
16. Flatback Turtle (*Natator depressus*)	**1**	• The POA footprint is within the overall inter-nesting buffer BIA for this species, which covers a 60 km radius around the Cape Domett nesting beach (Figure 9).

TABLE 3: *MNES, OPMs and BIAs that are present or potentially present within the 10 km buffer.*

MNES	Number	Description / Notes
1. World Heritage:	**None**	• N/a
2. National Heritage:	**1**	• The closest distance between the eastern coastal boundary of the West Kimberley National Heritage Place and the proposed operational area is ~2 km as shown on Figures 2 & 13. • The 10 km buffer therefore overlaps the eastern coastal boundary of the West Kimberly National Heritage Place.
3. Wetlands of International Importance:	**1**	• The closest distance between the Ord River Floodplain Ramsar Site and the proposed operational area is ~6 km as shown on Figures 2 & 15. • The 10 km buffer therefore overlaps part of the Ramsar Site.
4. Commonwealth Marine Areas:	**1**	• The closest distance between Commonwealth waters and the proposed operational footprint is 9.5 km as shown on Figures 2, 5 & 6. • The 10 km buffer therefore slightly overlaps Commonwealth waters.
5. Listed Threatened Ecological Communities:	**None**	• N/a
6. Listed Threatened Species:	**35**	• Refer section 10 for species details. • Some of these are only 'potentially present' based on their broad geographical ranges, but in fact are not actually present in CG.
7. Listed Migratory Species:	**50**	• Refer section 10 for species details. • Some of these are only 'potentially present' based on their broad geographical ranges, but in fact are not actually present in CG.
OPMs		
8. Commonwealth Lands or Heritage:	**None**	• N/a
9. Listed Marine Species:	**81**	• Refer section 10 for species details. • Some of these are only 'potentially present' based on their broad geographical ranges, but in fact are not actually present in CG.
10. Whale & Other Cetacean Species:	**12**	• Refer section 10 for species details. • Some of these are only 'potentially present' based on their broad geographical ranges, but in fact are not actually present in CG.
11. Critical Habitats:	**None**	• N/a
12. Commonwealth Reserves - Terrestrial:	**None**	• N/a
13. Australian Marine Parks:	**1**	• The closest distance between the Joseph Bonaparte Gulf Marine Park and the proposed operational footprint is 9.5 km as shown on Figures 2 & 5. • The 10 km buffer therefore slightly overlaps the Marine Park.
14. Habitat Critical to the Survival of Marine Turtles:	**1**	• The 10 km buffer overlaps the less significant turtle nesting beaches on Lacrosse Island, Barnett Point and Cape Dussejour, which are respectively 6 km, 6 km and 7 km from the closest boundary of the proposed operational area. • The 10 km buffer does not overlap the main turtle nesting beach at Cape Domett, which is 12 km from the closest boundary of the proposed operational area.
BIAs		
15. Snubfin Dolphin (*Oracella heinshoni*):	**1**	• The 10 km buffer is within is within breeding, calving, foraging and resting BIA for this species (Figure 8).
16. Flatback Turtle *(Natator depressus):*	**1**	• The 10 km buffer is within the overall inter-nesting buffer BIA for this species, which covers a 60 km radius around the Cape Domett nesting beach (Figure 9).
17. Green Turtles *(Chelonia mydas):*	**1**	• The 10 km buffer very slightly overlaps a foraging BIA for this species (Figure 10).
18. Olive Ridley Turtles *(Lepidochelys olivacea):*	**1**	• The 10 km buffer very slightly overlaps a foraging BIA for this species (Figure 11).

8. SCALE, DURATION & INTENSITY OF THE PROPOSED OPERATION

1. As outlined in section 5 above the EPBC Act Significant Impact Guidelines state that the assessment of significant impact should consider the scale, duration and intensity of the proposed action and its impacts. The parameters of each of these factors for the BKA marine sand proposal are therefore outlined below.

8.1 Spatial Scale (Area of Operations)

1. Table 4 summarizes some key data relating to the spatial scale (area) of the proposed action.

2. The total area of the proposed operational area (POA) as shown on Figures 12A is 100 km^2. This equates to 5.3% of the main body of CG from Lacrosse Island to Adolphus Island, which has an area of approximately 1,900 km^2, including the intertidal flats on both sides of the CG (Figure 13A). Further, this equates to 2.8 % of the total marine area of CG from Lacrosse Island upstream past Wyndham and the upper tidal reaches of East Arm, which is approximately 3,700 km^2 (Figure 12B).

3. The area of sand within the POA that is the subject of the proposed operation is ~75 km^2, which equates to 3.9% of marine area of the main body of CG, and 2.1% of the total marine area of CG.

4. It should be noted that operations will not occur over the entire POA at any one time. The SPV will have one sand uptake drag-head. The width of the drag-head will be approximately 6 m, so the scale of direct physical contact with the seabed will be a width of 6 m.

5. During each cycle when the SPV will be present in CG loading sand (for a period of one- to two-days only, see section 8.2), the sand-uptake drag-head will have physical contact with the seabed over an area of approximately 0.5 km^2, until the SPV is fully loaded, and then departs to deliver the sand to market in Asia. This means that the SPV drag head will physically contact only 0.5 % of the POA (100 km^2) during each period of operational presence in CG.

6. The sand capacity of the SPV will be between 75K m^3 to 125K m^3 (subject to final design) and this volume of sand will be loaded during each 1 to 2-day loading cycle in CG.

7. Studies to date indicate that there is a minimum of 300 million m^3 of suitable sand in the POA, and a much larger volume in CG overall (see EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 1 - *Sand Assessment*). To meet market demand BKA would be seeking to export up to 70 million m^3, representing a maximum of 23% of the minimum 300 million m^3 sand resource in the POA, and a much smaller % of the total sand resource in the CG overall.

8. The operation is proposed over an initial period of approximately 15 years, and during this period an average of <1 m of sand would be removed over the total area of the POA.

9. The SPV may occasionally navigate outside the POA for turning purposes at the end of each sand uptake run. However, the drag-head will be lifted and there will be no sand uptake during any such navigation outside the tenement. The SPV will be equipped with real time track monitoring.

10. To avoid passing the main turtle nesting beach on the seaward side of Cape Domett, it is proposed that the SPV will enter and leave CG via West Entrance, with a navigational footprint that is no different than the cargo vessels that already transit CG when entering and exiting the upstream port of Wyndham (Figure 12A).

11. As outlined in section 1 the operation does not require the construction of any marine, coastal or land-based facilities or infrastructure, which eliminates the scope for impacts from such activities and restricts the scale of the operation to the on-water aspects only.

12. Overall, considering the points above, the spatial scale of the proposed action at any one time is relatively small (only 0.5 km^2), This compares to many other coastal and marine development projects in WA, such as on the Pilbara coast, which can cover many square kilometres.

8.2 Temporal Scale (Duration of Operations)

1. Table 4 summarizes some key data relating to the temporal scale (duration) of the proposed action. As outlined in section 1 the initial operational life of the proposed action will be approximately 15 years. It should be noted that operations would not occur constantly in CG during the 15-year project life.

2. As outlined in section 1, there would only be sand-loading activity in CG for one- to two-days (24 to 48 hours) every two weeks, which equates to a maximum of only 52 days in any year, or only 14% of the time.

3. Between each sand-loading cycle there will be a two-week period (10 to 14 days) when there is no operational activity in CG at all. This means that there will be zero operational activity for 86% of the time during the 15-year project lifespan.

4. The lack of a permanent or continuous operational presence significantly reduces the scope for impacts, including compared to many other marine development projects in WA such as in the Pilbara region, which can have a major permanent presence and operate continuously, 24 hours per day seven days per week, for decades.

8.3 Intensity

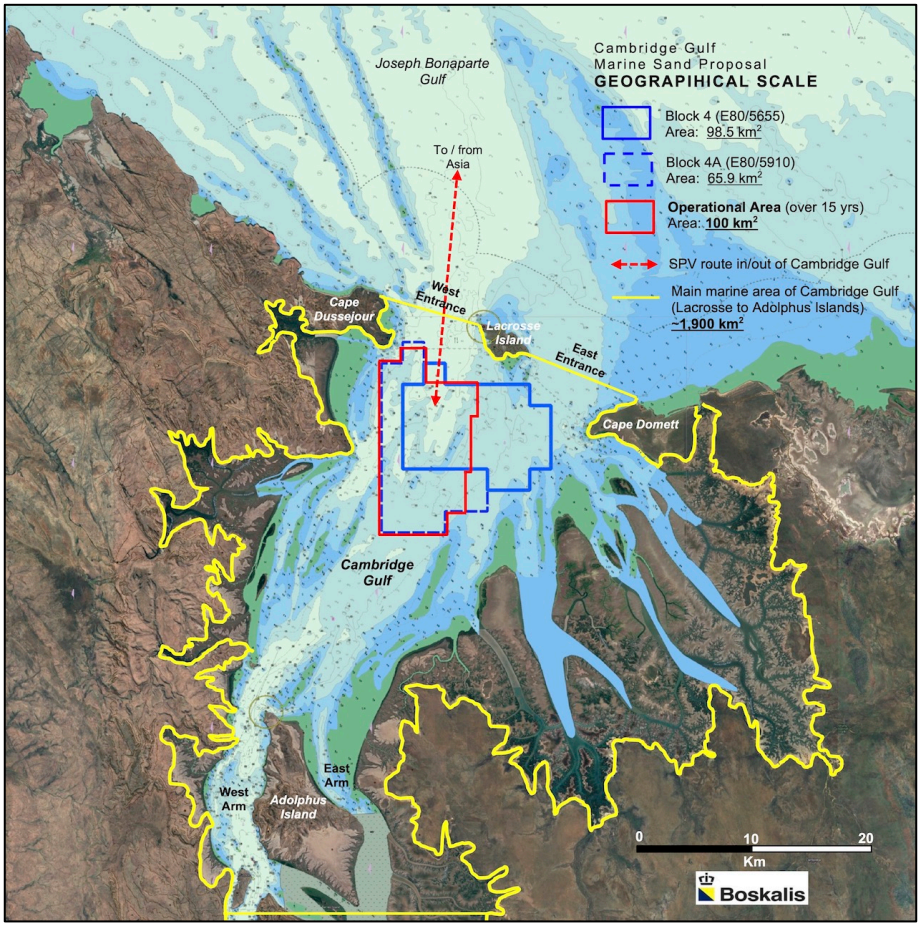
1. The EPBC Act Significant Impact Guidelines state that 'intensity' of impacts should be taken into account when assessing whether or not the impacts are significant – however the Guidelines do not define what is meant by intensity.

2. In environmental practice it is generally accepted that intensity relates to 'severity' of impacts, and includes factors such as whether the impacts are permanent and irreversible (severe) or temporary and reversible (less severe), whether species or ecological communities are killed outright (severe) or if the impacts are sub-lethal (less severe) etc.

3. Types of impacts need to be identified before their intensity or severity can be assessed - *this is assessed for each MNES in sections 9 and 10 below, noting that no significant, severe, irreversible impacts on MNES are identified.*

TABLE 4: *Key data relating to the spatial scale and temporal duration of the proposal*

1. Cambridge Gulf total marine area (Lacrosse Is. to upper reaches of West & East Arms):	3,700 km^2
2. Cambridge Gulf main marine area (Lacrosse Is. to Adolphus Is.):	1,900 km^2
3. Proposed operational area (POA) (over approx. 15 years):	100 km^2 (5.3% of item 1) (2.8% of item 2)
4. Area of sand within the POA:	75 km^2 (3.9% of item 1) (2.1% of item 2)
5. SPV length overall:	Up to 350 m
6. SPV draft:	Up to 20 m
7. SPV sand capacity:	Up to 125K m^3
8. SPV drag-head width:	6 m
9. Area of drag-head in contact with seabed during one loading cycle:	0.5 km^2 (0.5% of item 3)
10. Estimated sand volume in POA:	Minimum of 300M m^3
11. Sand volume to be exported (over 15 years):	Up to ~ 70M m^3 (23% of item 10)
12. Average depth of sand removal across operational area over 15 yrs:	< 1 m below current seabed
13. Operational life of the proposal:	Up to 15 years.
14: SPV sand-loading cycle in Cambridge Gulf:	1 to 2 days (24 to 48 hours) every 2 weeks
15. Voyage to / from Asian sand delivery port	10 to 14 days each cycle
16. No. of days / year SPV present in CG:	Up to 52 days (14% of time in a year)
17. Zero operational activity in CG:	86% of time each year / over project lifespan.



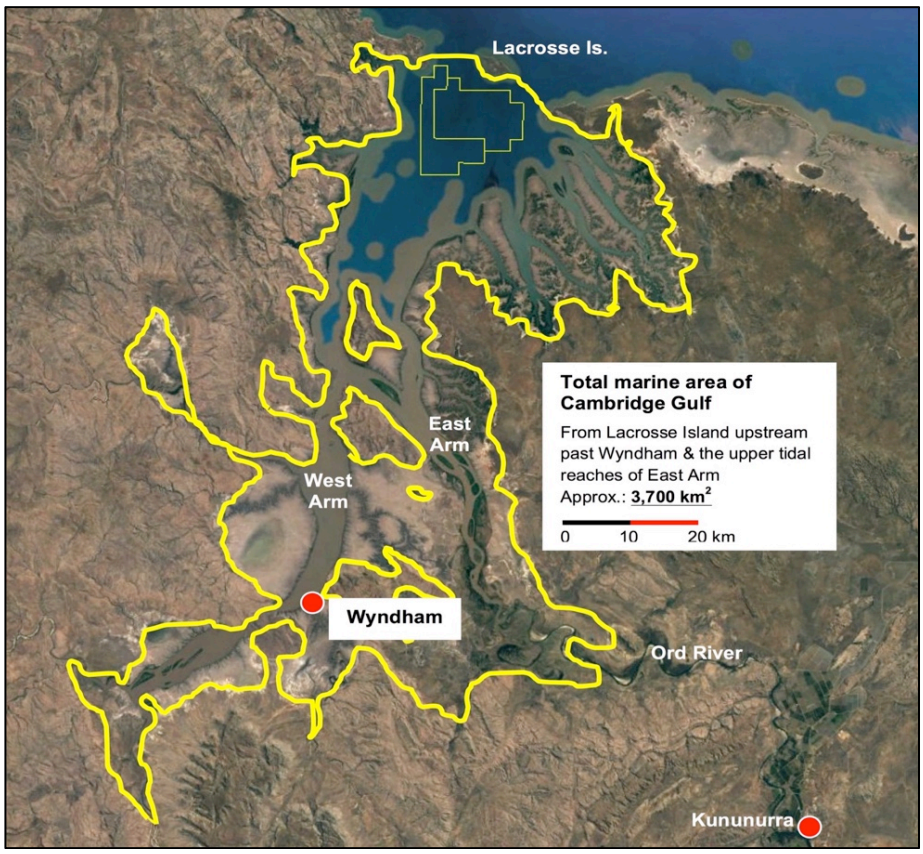


FIGURE 12A & B: *Geographical scale of the POA relative to marine areas of CG.*

9. POTENTIAL IMPACTS ON AREA-BASED MNES

9.1 Area-Based MNES in the general vicinity of the Proposed Action

1. As outlined in section 6 there are no area-based MNES that overlap with the POA, while the 10 km buffer around the outer boundary of the POA overlaps slightly with three area-based MNES as follows:

    a) National Heritage Place - the eastern boundary of the West Kimberley National Heritage Place is located on the west coast of CG. The shortest distance between the western boundary of the POA and the west coast of CG, which constitutes the eastern boundary of the West Kimberley National Heritage Place, is 2 km at Cape Dussejour (Figures 2, 4 & 15).

    b) Wetland of International Significance - the Ord River Floodplain Ramsar Site is located on the eastern side of CG, including the complex system of mangrove-lined tidal inlets known as the 'False Mouths of the Ord'. The Ramsar site is protected as the State-designated Ord River Nature Reserve. The shortest distance between the eastern boundary of the POA and the western boundary of the Ramsar site is 6 km (Figures 2, 5 & 13).

    c) Commonwealth Marine Area - there is a slight overlap (500 m) of the 10 km buffer with the commencement of Commonwealth waters including the Joseph Bonaparte Gulf Marine Park located offshore from CG. The shortest distance between the northern boundary of the POA and the southern (inshore) boundary of the Joseph Bonaparte Gulf Marine Park is 9.5 km (Figures 2, 5 & 15).

2. Potential impacts of the proposed action on these three area-based MNES that slightly overlap with the 10 km buffer are summarised in section 9.2 for West Kimberly National Heritage Place, section 9.3 for the Ord River Floodplain Ramsar Site and section 9.4 for the Commonwealth Marine Area. These include tables for each area-based MNES which present:

    - a brief description of the MNES,
    - its proximity to the POA,
    - the relevant EPBC Act significant impact criteria,
    - an assessment of potential impacts against the criteria; and
    - an overall finding of the potential impacts.

3. The assessments of potential impacts on the area-based MNES are based on the scientific and technical assessments contained in the following supporting reports, as cited where relevant. These reports can be referred to for the scientific and technical bases for the findings presented in in the sections 9.2 to 9.4.

    - EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Setting & Existing Environment.*
    - EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments.*
    - EPBC Referral Report No. 5 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Initial Report.*
    - EPBC Referral Report No. 8 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Full Modelling Report*.

9.2 Potential Impacts on the West Kimberley National Heritage Place

1. The West Kimberly National Heritage Place (NHP) and the location of the proposed action are shown on Figure 15. The NHP covers an extremely large area of 420,000 km^2 extending from Broome in the west to the west coast of CG in the east, where the proposed action is located as shown on Figure 14. The closest distance between the proposed operational area (POA) and the west coast of Cambridge Gulf, which forms the eastern boundary of the NHP, is ~1.5 km. This coastline comprises numerous small inlets with narrow bands of fringing mangroves backed by intertidal mudflats and salt-flats, with some outcrops of rocky shore (Figure 14).

2. The NHP was inscribed on the National Heritage List in 2011 in recognition of the area's geological, evolutionary, biological, ecological and Aboriginal and European cultural heritage values. Most of the listed National Heritage values of the NHP are located in the North Kimberley, Central Kimberley and South-west Kimberley sub-regions of the NHP. These areas have dedicated sections in the Australian Heritage Commission (AHC) Final Assessment Report for the NHP (AHC undated). The East Kimberley sub-region, which borders CG, is only occasionally and briefly mentioned in the AHC Report, mainly in passing in relation to cattle ranching history. The AHC Report does not identify any significant National Heritage values of the NHP on the west coast of CG.

3. Potential impacts of the proposed action on the NHP were assessed against the Commonwealth significant impact criteria for National Heritage places (Commonwealth of Australia 2013), which state:

    > *An action is likely to have a significant impact on a National Heritage place if there is a real chance or possibility that it will cause one or more of the National Heritage values to be lost, degraded or damaged; notably altered, modified, obscured or diminished.*

4. Because there do not appear to be any significant National Heritage values present in the part of the NHP that forms the west coast of CG closest to the proposed action, as per the AHC Report (AHC undated), there are no mechanisms whereby the proposed action, which is wholly-marine and which does not overlap the NHP, could cause direct impacts that would result in National Heritage values being lost, degraded, damaged or notably altered, modified, obscured or diminished.

5. As outlined above, the west coast of CG which forms part of the NHP comprises numerous small inlets with narrow bands of fringing mangroves backed by intertidal mudflats and salt-flats with some outcrops of rocky shore (Figures 14). Such environments are extremely common along the entire coast of northern Australia and they are not identified in the AHC Report as constituting National Heritage values of the NHP. Never-the-less, the potential for the proposed action to cause indirect impacts on these environments, and especially on mangroves areas, including through potential changes to hydrodynamics, sediment transport and coastal processes, has been thoroughly assessed, including thoroughly calibrated and validated 3D numeral modelling, in:

   - EPBC Referral Report No. 5 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Initial Report.*
   - EPBC Referral Report No. 8 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Full Modelling Report.*

6. The assessments in those reports show that predicted changes to hydrodynamics, sediment transport and coastal processes from the proposed action will be negligible and will not result in indirect impacts on mangrove areas, which are also naturally highly dynamic in CG. This is also discussed in section 9.3 in relation the Ord River Floodplain Ramsar Site, where the main ecological community also comprises mangroves back by intertidal mudflats and salt-flats.

7. Table 5 presents the summary assessment of whether the proposed action is likely to cause significant impacts on the NHP, in accordance with the EPBC Act Significant Impact Criteria, and finds no significant impact against the criteria. There do not appear to be any significant National Heritage values present in the part of the NHP that forms the west coast of CG that could potentially be impacted, as per the AHC Report (AHC undated). There is no scope for direct impacts as the proposed action does not overlap with the NHP. There are also no mechanisms whereby the proposed action could cause indirect impacts that would result in the loss, degradation, damage, notable alteration, modification or obscuring of any of the area's listed National Heritage values.

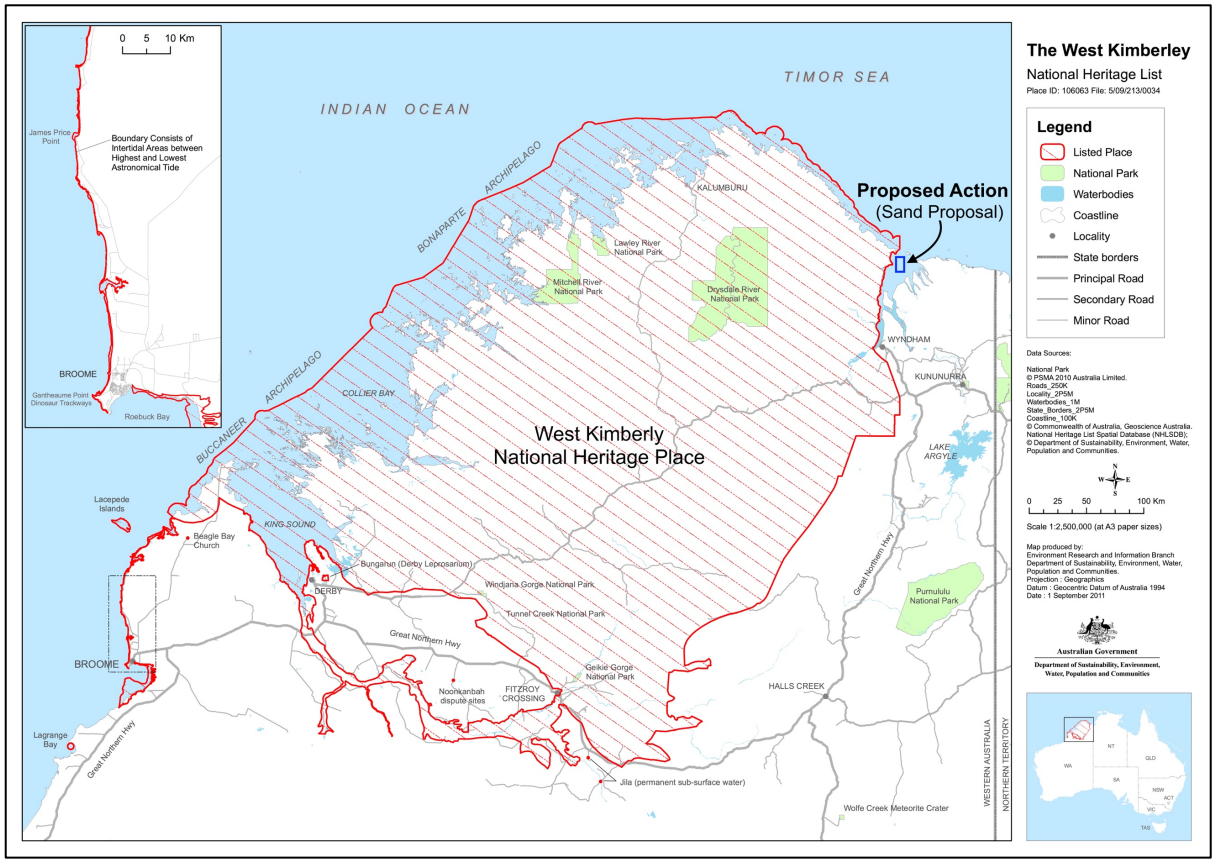


FIGURE 13: *The West Kimberley National Heritage Place & the location of the proposed action.*

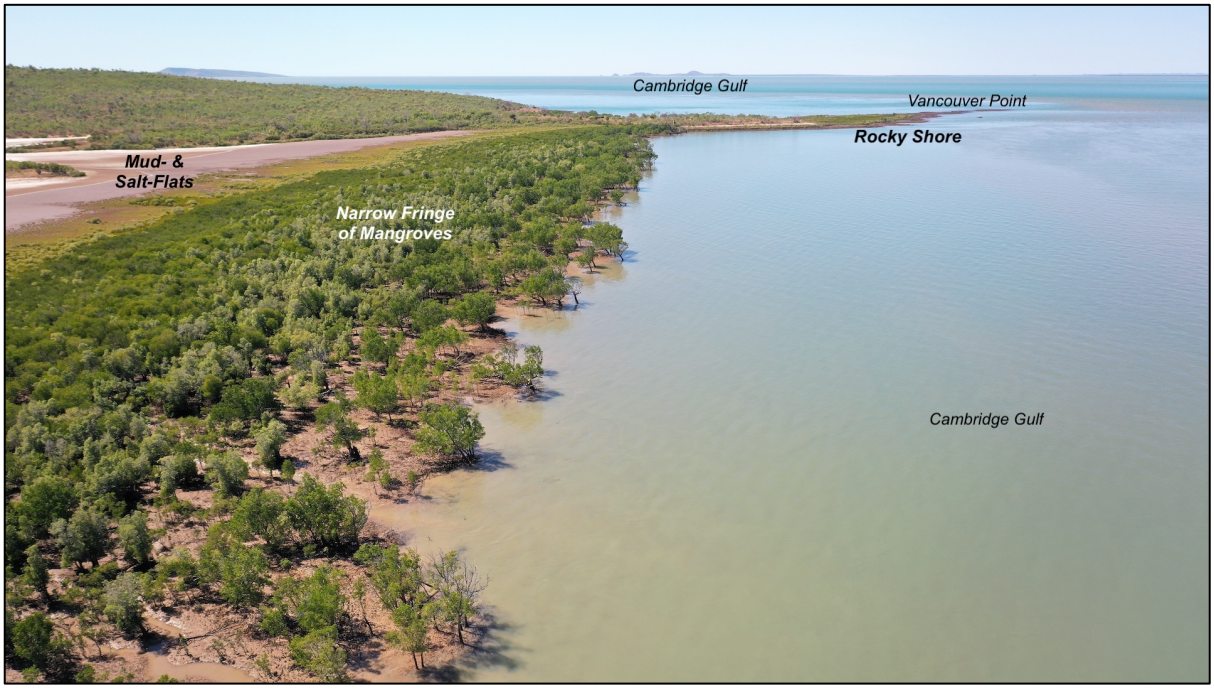


FIGURE 14: *Typical environments on the west coast of CG which forms the eastern boundary of the West Kimberley National Heritage Place. From left to right (landward to seaward): Mud- and salt-flats, narrow fringe of mangroves and rocky shore. This location is around Vancouver Point which is 2.5 km west of the western boundary of the POA.*

TABLE 5: *Assessment of potential for significant impacts on the West Kimberley National Heritage Place*

Brief Description	Proximity	Significant Impact Criteria	Assessment	Finding
• Refer Figures 13 & 14. • The West Kimberley National Heritage Place (NHP) covers an extremely large area of 420,000 km^2 extending from Broome in the west to the west coast of Cambridge Gulf in the east. • It was inscribed on the National Heritage List in 2011 in recognition of the area's geological, evolutionary, biological, ecological and Aboriginal and European cultural heritage values. • The eastern boundary includes the coastline (assumed to be HAT) along the west coast of Cambridge Gulf. • This coastline has rocky cliffs and rocky shores and numerous small inlets with narrow bands of fringing mangroves backed by intertidal mudflats and salt-flats.	• The POA does not overlap. • 10 km buffer overlaps. • The closest distance between the POA and the eastern boundary of the NHP is ~1.5 km.	An action is likely to have a significant impact on a NHP if there is a real chance or possibility that it will cause one or more of the National Heritage values to be: • lost, • degraded or damaged; or • notably altered, modified, obscured or diminished.	• Most of the listed values of the NHP are located in the North Kimberley, Central Kimberley and South-west Kimberley sub-regions of the NHP. These areas have dedicated sections in the Australian Heritage Commission (AHC) Final Assessment Report for the NHP. • The East Kimberley sub-region, where Cambridge Gulf is located, is only occasionally and briefly mentioned in the AHC Report, mainly in passing in relation to cattle ranching history. • The AHC Report does not identify any significant National Heritage values of the NHP on the west coast of CG. • There is no overlap between the POA and the NHP and therefore no scope for direct impacts. • There is no mechanism whereby the proposed action, which is wholly-marine, could cause indirect impacts that would result in the loss, degradation, damage, notable alteration, modification or obscuring of any of the National Heritage values.	**No significant impact.**

9.3 Potential Impacts on the Ord River Floodplain Ramsar Site

1. The Ord River Floodplain was designated as a Ramsar Site (Wetland of International Importance) in 1990, under the *Convention on Wetlands of International Importance* signed at Ramsar, Iran in 1971. As shown on Figures 15 to 17 the Ramsar Site covers the complex system of estuarine inlets located on the east side of CG, just inshore from Cape Domett, and to the east of the proposed action, known as the 'False Mouth of the Ord'. The Ramsar Site also extends southwards to cover the Lower Ord River and freshwater wetlands at Parry Lagoons. The site is protected as the State-designated *Ord River and Parry Lagoons Nature Reserve*.

2. The estuarine inlets of the False Mouth of the Ord are lined with relatively narrow bands of fringing mangroves backed by intertidal mud- and salt-flats, as shown on Figures 16 and 17. The intertidal flats in the Ramsar Site can be inundated by freshwater and brackish water during major wet season runoff events (Figure 18).

3. The closest distance between the proposed operational area (POA) and the boundary of the Ramsar Site is ~6 km as shown on Figure 15. The POA therefore does not overlap the Ramsar site, while there is some overlap of the 10 km buffer around the outer boundary of the POA and the north-western parts of the Ramsar site.

4. The site represents the best example of wetlands associated with the floodplain and estuary of a tropical river system in the Kimberley region of WA. Of the 19 species of mangrove found in WA, 15 have been recorded within the Ramsar Site, and the area is a nursery, feeding and/or breeding ground for a number of species protected under the EPBC Act. These include migratory birds and waterbirds, including the Australian Painted Snipe *(Rostratula australis)* and Little Curlew *(Numenius minutes*), and the site regularly supports 1% of the population of Plumed Whistling Duck *(Dendrocygna eytoni)* (Hale 2008).

5. The site also provides habitat typically used by Freshwater Sawfish (*Pristis microdon)* and Green Sawfish *(Pristis zijsron)* although no published records of their presence could be found. The endangered Northern River Shark *(Glyphis garricki)* has been found in upstream areas of the Ramsar site, in the Lower Ord River, about 30 km upstream from the POA (Kyne et al 2020 & 2021). Saltwater Crocodiles *(Crocodylus porosus)* are found throughout the area with highest numbers in the Lower Ord River (WMI 2012) (Kay 2004).

6. Potential impacts of the proposed action on the Ramsar site were assessed against the Commonwealth significant impact criteria for Wetlands of International Importance (Commonwealth of Australia 2013), which state:

   An action is likely to have a significant impact on the ecological character of a wetland of international importance if there is a real chance or possibility that it will result in:

   - *areas of the wetland being destroyed or substantially modified,*
   - *a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland,*
   - *the habitat or lifecycle of native species, including invertebrate fauna and fish species, which are dependent upon the wetland being seriously affected,*
   - *a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health; or*
   - *an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.*

7. Each of these five criteria is considered in turn in sub-sections 9.3.1 to 9.3.5, and a summary is presented in section 9.3.6.

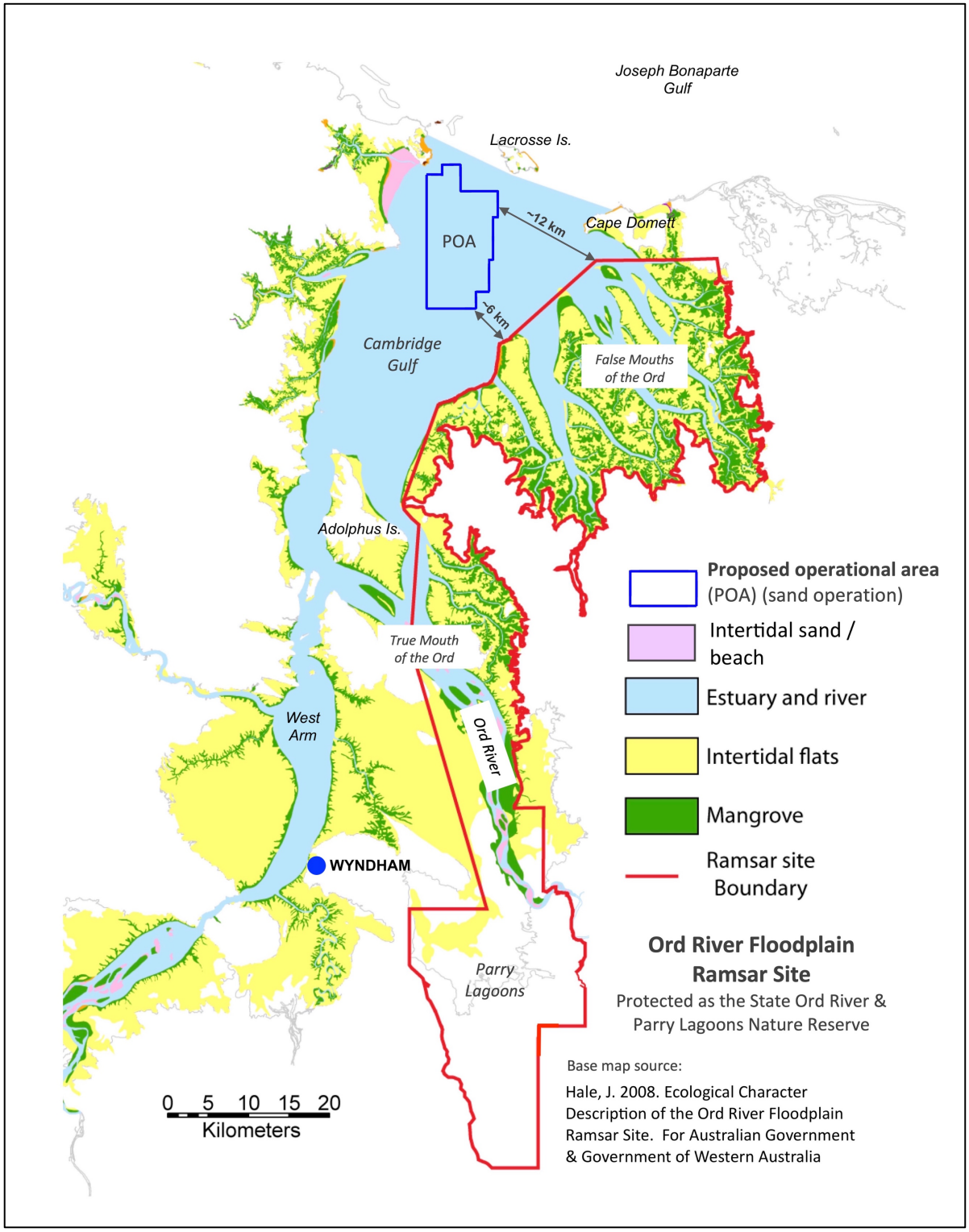


FIGURE 15: *The location of the proposed action (blue box) in relation to the Ord River Floodplain Ramsar Site (red boundary). The main ecological community in the Ramsar site comprises a relatively narrow band of mangroves along coastal fringe (green shading) backed by intertidal mud- and sand-flats (yellow shading). The area of the Ramsar site that is closest to the proposed action is the network of tidal inlets known as the 'False Mouths of the Ord' on the eastern side of CG (adapted from Hale 2008).*

FIGURE 16: *One of the many tidal inlets that make up the 'False Mouths of the Ord River' on the eastern side of CG. The narrow band of mangroves backed by mud- and salt-flats is typical of the coastline of this part of the Ramsar site and of the coastline around CG overall (image: BKA).*

FIGURE 17: *The intertidal flats in the Ord River Floodplain Ramsar Site can be inundated by freshwater and brackish water during major wet season runoff events. The normally whitish salt-flats appear brown due to an overlay of sediment-laden flood waters, which contribute alluvial sediments to the system. This is one of the tidal inlets that comprise the False Mouths of the Ord, on the eastern aside of CG (source: NW Regional Hub).*

9.3.1 Potential destruction or modification of the wetland

1. There is no overlap between proposed action and the Ramsar site so there is no scope for direct impacts that could destroy or substantially modify the wetland.

2. The potential for the proposed action to cause indirect impacts on the Ramsar site and especially on mangroves areas, including through potential changes to hydrodynamics, sediment transport and coastal processes, has been thoroughly assessed, including thoroughly calibrated and validated 3D numeral modelling, in:

   - EPBC Referral Report No. 5 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Initial Report.*
   - EPBC Referral Report No. 8 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Full Modelling Report.*

3. The assessments in those reports show that predicted changes to hydrodynamics, sediment transport and coastal processes from the proposed action are negligible and will not result in indirect impacts on the Ramsar site, which is also a naturally highly dynamic environment.

4. There does not appear to be significant sediment connection between the POA and the Ramsar site – there appears to be net outflow of sediment from CG, while the POA is located 'downstream' of the wetland, and most sediment input to CG appears to be on the western side of CG, while the wetland is located on the eastern side (Wolanski et al 2001 & 2004) (see EPBC Referral Reports No. 5 and No. 8). The Ramsar site appears to receive most sediment from its own catchment during wet season flood events (Figure 17). The wetland is formed by and naturally adapted to extreme inter-annual variations in wet season flooding and sedimentation and extreme natural forces such as cyclones (Hale 2008) (Wolanski et al 2001).

5. As outlined above the most significant ecological community in the Ramsar site is the mangroves that line the coast. Mangroves are dependent on and are influenced by coastal processes as they grow on intertidal sediments, and changes to sediment supply, both from landward and seaward sources, can in turn cause changes in mangrove communities.

6. Anthony et al (2020) provides a comprehensive review of the links between sediment dynamics and mangroves, and Figure 18 shows the main processes described by Anthony et al (2007) that are also fully applicable in CG. Most sediments in mangrove communities come from landward catchment sources, although seaward sources form long-shore drift and local deposition can also contribute, as shown on Figure 18. It is the latter sediment source that is relevant to this assessment, as the proposed action does not include any facilities or activities in the catchment, and only involves the proposed sourcing of sand from within the centre of CG, which is seaward of all mangroves in CG.

7. As outlined in Anthony et al (2007) potential impacts on mangroves from changes in sediment supply are caused by three main mechanisms:

   a) increased volume and/or rate of sediment supply,
   b) decreased volume and/or rate of sediment supply; and/or
   c) changes in the composition of supplied sediment.

8. Increased sediment supply can cause sedimentation and potentially smother mangrove seedlings and aerial roots, and cause changes to the elevation, morphology and tidal inundation profile of the substrate, changing its suitability for mangroves. These factors can cause changes in the local distribution of mangroves, including recession from the coastline as the substrate elevation, morphology and tidal inundation profile become unsuitable, and also expansion of mangroves as suitable substrate can be expanded by changes to elevation, morphology and tidal inundation profile.

9. Decreased sediment supply can reduce sedimentation, reduce substrate elevation and change the substrate morphology and tidal inundation profile. As with increased sediment supply, these factors can have both negative and positive impacts on mangroves, as the changed conditions could be either less or more suitable for mangroves.

10. Both increased and decreased sediment supply can also cause changes in the species composition and zonation of the mangrove community, as some species of mangrove trees have different substrate elevation, morphology and tidal inundation preferences. This is exemplified by species zonation bands often seen from seaward to landward in many mangrove communities, including in CG (Cresswell & Semenuk 2011).

11. Changes in the composition of supplied sediment are less significant for mangroves, as many species of mangrove trees can grow in a wide range of sediment types and sizes, from fine muds to coarse sands. However, changes in the composition of supplied sediment can cause changes in the species composition and zonation of the mangrove community, as some species have sediment-type preferences. The actual changes that might occur in any particular area will depend on site-specific conditions and the species of mangroves present in the area.

12. While mangroves are influenced by sediment dynamics and coastal processes, they in turn have a very significant influence on sediment dynamics and coastal processes. Their complex root systems act as sediment traps and wave-energy dissipaters, and their seaward vegetative canopies can dissipate the effects of winds on the coast. Through these factors

mangroves can assist the process of coastal stabilization and accretion, and one of the most significant ecosystem services provided by mangroves is coastal protection and erosion prevention (Lymburner et al 2020) (Alongi, 2008).

13. When assessing the potential impacts of possible changes in coastal processes on mangroves, it is important to note that mangrove communities are not static but are highly dynamic in nature, being on the land/ocean interface. Their extent, state and dynamics are influenced not only by sediment dynamics but also by freshwater and tidal inundation, salinity differences and exposure to high winds and waves (Lymburner et al 2020) (Alongi, 2008). As outlined above the mangrove areas in CG and especially on the eastern coastline and in the Ramsar site appear to be highly dynamic, with numerous areas of significant natural erosion and undercutting of mangroves (Figure 19). These natural erosion areas mainly face to the north-west and may therefore be impacted by north westerly winds and waves and less sheltered from cyclone impacts.

14. Previous studies have assessed historical changes in the extent of mangrove communities in CG. Studies by Jennings (1975) and Thom et al. (1975) report a net gain of mangroves in CG over 20 years from 1955 to 1975, based on comparisons of aerial photographs. A more recent comparison of satellite imagery taken 24 years apart (1996-2020) demonstrated an estimated net reduction in mangrove area in CG of 9,077 ha, as shown on Figure 20 (Bunting et al., 2022). This scale of loss (especially by cyclones) is not unprecedented. Paling et al. (2008) reported on the loss of 5,700 ha of mangroves from Exmouth (WA) following a single cyclone in 1999 (TC Vance), followed by significant recovery.

15. Construction of the Ord River Dam also has affected mangrove distribution in the Lower Ord River upstream from CG. Studies by Semeniuk (2000) and Wolanski et al. (2001 and 2004) estimated a major accumulation of sediment of about 20 million m^3 in the estuarine sections of the Lower Ord River over a 30-year period after the Ord River Dam was completed in 1971. This sedimentation caused a 50% decrease in cross-sectional areas of the estuary over the same period, which resulted in an increase in the extent of mangroves in the Ord River estuary.

16. Considering the points above, in order to assess potential impacts of the proposal on mangroves through possible changes in coastal processes, it is necessary to assess whether the proposal will cause any measurable changes in sediment supply to mangrove areas, and whether any such changes are significant in terms of causing serious or permanent/irreversible impacts on mangroves, within the context of their natural dynamics. As outlined above these factors were assessed in detail in EPBC Referral Reports No. 5 and No. 8, which found that the proposed action is unlikely to change hydrodynamics or sediment transport to any degree that would in turn affect the mangrove communities of CG. The mangrove areas receive most of their sediments from terrestrial sources as shown on Figure 18, and not from the POA which is located seaward of all mangrove areas.

17. *Overall, it is assessed that it is unlikely that the proposed action will cause significant, irreversible or even moderate or minor impacts on the habitats of the Ramsar site, including mangrove areas, through changes to coastal processes.*

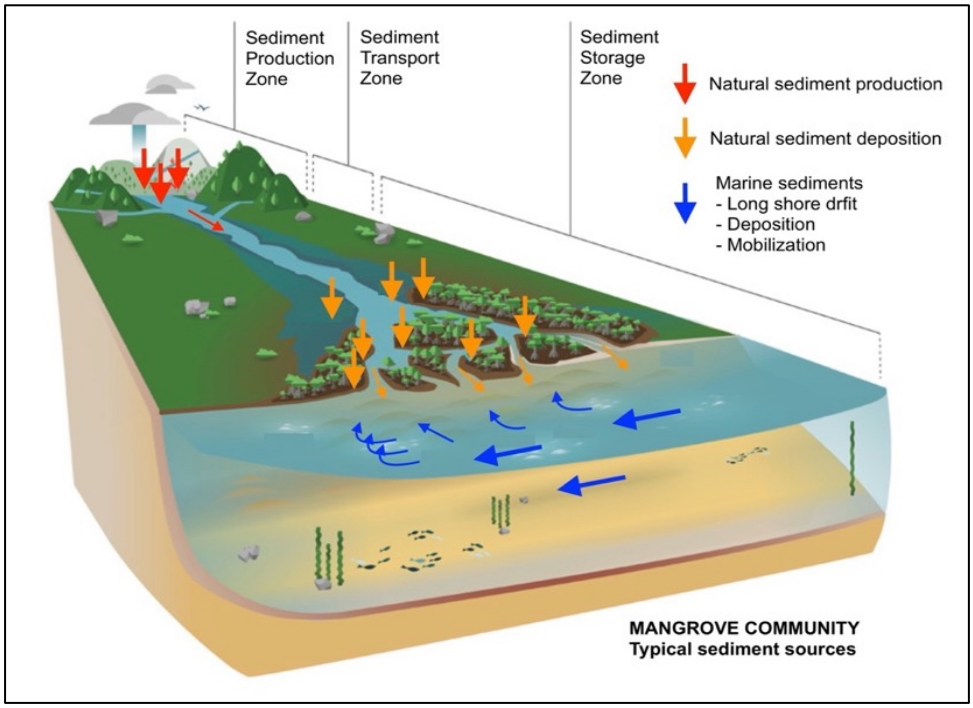


FIGURE 18*: Most sediments in mangrove communities come from landward catchment sources. Although seaward sources form long-shore drift and local deposition can also contribute, the former is the main sediment source in CG (from Anthony et al 2020).*

FIGURE 19*: Examples of natural dynamics of mangroves in CG under the influence of sediment dynamics, waves and wind, including cyclones Assessment of potential impacts of proposals should consider the context of natural dynamics (mages: Raaymakers July 2023 & Feb 2024) (see EPBC Referral Report No. 2 for full details including locations).*

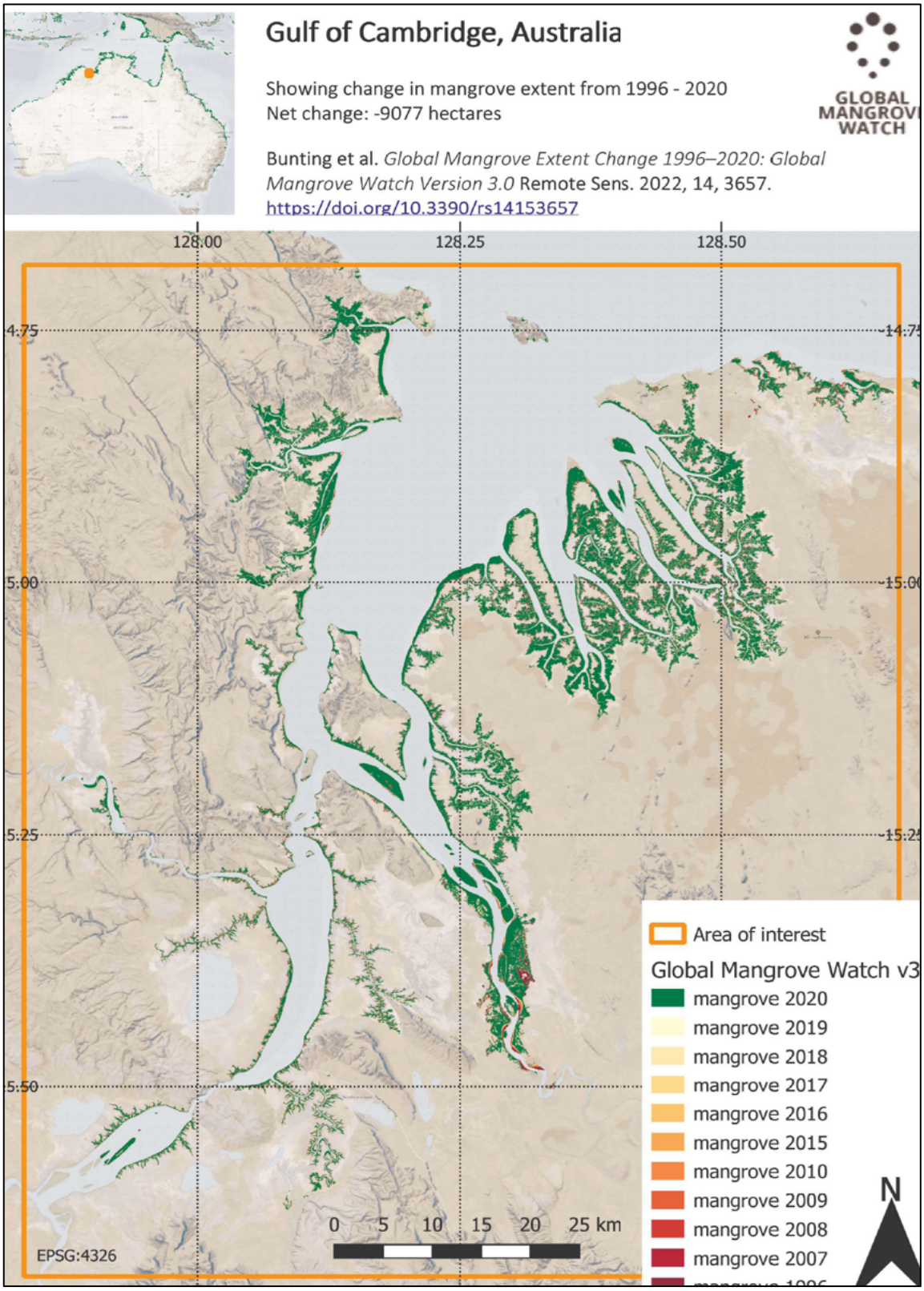


FIGURE 20. *Mangrove extent in 2020 (green) and net change since 1996 indicating an estimated net reduction in mangrove area of 9,077 ha in CG (source: http://www.globalmangrovewatch.org/).*

9.3.2 Potential changes to hydrological regime

1. The hydrological regime of the wetland is driven by the dry-season/wet-season tropical monsoonal cycle, including acute rainfall events associated with tropical cyclones and low-pressure systems (Hale 2008) (Wolanski et al 2001 & 2004). There are no mechanisms whereby the proposed action could change the climate-level factors of the tropical monsoonal cycle.

2. The proposed action is located offshore from and downstream of the wetland, and does not involve any facilities, activities or operations within or upstream of the wetland that could alter the hydrological regime.

3. As outlined in section 9.3.1, the potential for the proposed action to cause potential changes to hydrodynamics, sediment transport and coastal processes, which could in turn potentially affect the hydrological regime of the wetland, has been thoroughly assessed, and finds that predicted changes are negligible (EPBC Referral Reports No. 5 and No. 8).

9.3.3 Potential impacts on the habitat or lifecycle of native species

1. Because there is no scope for direct or indirect impacts on the wetland itself, as outlined above, the habitat of native species within the wetland will not be impacted. However, there are a number of species that 'may' inhabit the wetland that spend part of their lifecycle in the wetland and migrate to coastal or offshore waters through CG for other parts of their lifecycle, and therefore could potentially occasionally pass through the POA, including, *inter alia:*

    a) Protected species such as River Sharks *(Glyphis spp)* and Saltwater Crocodiles *(Crocodylus porosus),* and potentially Sawfish *(Pristis spp)* (although no published records of their presence found).

    b) Species of importance to fisheries such as Barramundi *(Lates calcarifer)*, Mud Crabs *(Scylla spp)* and banana prawns (*Peneaus indicus* and *P. merguiensis*).

2. Because there is no mechanism whereby the proposed operation could cause direct impacts on the wetland, there is similarly no mechanism whereby the proposed action could cause impacts on the lifecycle of these species during the period of their lifecycles spent in the wetland.

3. There is some potential for impacts from the proposed action when these species might occasionally move through the POA, including potential vessel strikes by the Sand Production Vessel (SPV) for those species that swim at or near the sea surface such as crocodiles, physical impact from the sand-uptake drag-head for those species that swim at or near the seabed (epibenthic species) such as Sawfish, and potential effects of underwater noise generated by the SPV.

4. Detailed descriptions of the presence of these species in the CG area are presented in Section 9 (Marine Fauna) of EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Setting & Existing Environment* and supported by:

    - EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 13 - *Marine eDNA Report*.
    - EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 14 - *Marine Mega-fauna Surveys Report*.

5. Potential impacts of the proposed action on marine fauna are assessed in detail in Section 10 (Marine Fauna) of EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments*. The assessment includes application of the impact mitigation hierarchy and best practice impact prevention and mitigation measures as summarized in Table 6, for marine species that may inhabit the wetland and occasionally migrate through CG including the POA as part of their lifecycle.

6. As presented in Table 6 the probability of vessel strikes on species that swim at or near the sea surface is very low due to the:

    a) Low presence of these species in the POA, as per site surveys (see EPBC Referral Report No. 2 - Annex 13 & Annex 14).

    b) Low presence of the SPV in CG (zero presence 86% of time during project lifespan).

    c) Low operational speed of the SPV (~2 knots) when operating in the POA.

    d) Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4).

7. As presented in Table 6 the probability of entrainment of epibenthic species in the SPV's drag-head is very low due to the:

    a) Low presence of these species in the POA, as per site surveys (see EPBC Referral Report No. 2 - Annex 13 & Annex 14).

    b) Low presence of the SPV in CG (zero presence 86% of time during project lifespan).

c) Low operational speed of the SPV (~2 knots) when operating in the POA.

d) Fitting the drag-head with marine-fauna deterrent / deflector chains, using a design that was proven most effective during comparative tests in relation to the Chevron Barrow Island project in WA.

8. As presented in Table 6 the probability of significant impacts of underwater noise from the SPV on these species is very low due to the:

a) Low presence of these species in the POA, as per site surveys (see EPBC Referral Report No. 2 - Annex 13 & Annex 14).

b) Low presence of the SPV in CG (zero presence 86% of time during project lifespan).

c) Low operational speed of the SPV (~2 knots) when operating in the POA.

d) Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4).

e) Separation of the sound generation profiles of the SPV and the sound repertoires of relevant species.

f) Naturally very high suspended sediment concentrations in CG, which reduces sound propagation (WODA 2015).

a) Naturally high sound levels from high tidal range resulting in strong tidal currents which can mask other sound sources (Marely et al 2017).

b) The SPV will be a 'newbuild' vessel and will incorporate relevant best practice noise reduction measures from the design-phase, as per the *IMO 2023 Underwater Noise Guidelines* (IMO 2023). As the design parameters for the SPV mature (it is still in conceptual phase), modelling of likely noise emissions will be undertaken in accordance with the IMO Guidelines, and used to inform optimum design and incorporation of noise reduction measures.

9. Further assessments for each relevant species are included in the Listed Species tables in section 10 below.

10. Overall, it is assessed that the likelihood of the proposed action seriously affecting the habitat or lifecycle of native species, including invertebrate fauna and fish species, which are dependent upon the wetland, as defined by the Commonwealth significant impact criteria for Ramsar wetlands, is negligible.

11. Never-the-less, should the proposed action proceed, BKA will seek to implement a comprehensive environmental and biodiversity research and monitoring program, in consultation and cooperation with relevant stakeholders as described in section 17 of EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments*. This would further assist protection and conservation of these species both in CG and in other areas.

TABLE 6: *Mitigation hierarchy & assessment of residual impacts for marine species that may inhabit the wetland and occasionally migrate through the POA as part of their lifecycle*

Marine Fauna	Potential Impact of the proposed action	Impact Avoidance / Prevention	Impact Minimization / Mitigation	Rehabilitation & Offsets	Residual Impacts
Saltwater Crocodile *(Crocodylus porosus):*	Potential vessel strike by the SPV (this species swims at or near the sea surface):	The probability of vessel strikes is very low due to the: – Low presence of this species in the POA, as per site surveys (see EPBC Referral Report No. 2 - Annex 14). – Low presence of the SPV in CG (zero presence 86% of time during project lifespan).	Low operational speed of the SPV (~2 knots). Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4).	None required.	As with any vessel operating at sea there is always a possibility of an interaction with marine mega-fauna (MMF). The measures listed in the columns to left make the likelihood very low.
Sawfish (3 x *Pristis spp* and *Anoxypristis cuspidata):*	Potential entrainment in the SPV's drag-head (these are epibenthic species).	Low presence of these species in the POA (preferred habitat is well upstream) and very low likelihood of being present on the seabed in the area, due to extreme environmental conditions. Low presence of the SPV in CG (zero presence 86% of time during project lifespan). The drag-head will be fitted with marine-fauna deterrent / deflector chains.	Low operational speed of the SPV (~2 knots). Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4).	None required. Never-the-less, should the proposed action proceed, BKA will seek to implement a comprehensive environmental and biodiversity research and monitoring program, in consultation and cooperation with relevant stakeholders as described in section 17 of EPBC Referral Report No. 4. This would further assist protection and conservation of these species both in CG and in other areas.	As with any vessel operating at sea there is always a possibility of an interaction with MMF. The measures listed in the columns to left make the likelihood very low.
River Sharks *(Glyphis spp):*	Potential entrainment in the SPV's drag-head (these are epibenthic species).	Low presence of these species in the POA (preferred habitat is well upstream) and very low likelihood of being present on the seabed in the area, due to extreme environmental conditions. Low presence of the SPV in CG (zero presence 86% of time during project lifespan). The drag-head will be fitted with marine-fauna deterrent / deflector chains ('turtle ticklers').	Low operational speed of the SPV (~2 knots). Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4).	None required. Never-the-less, should the proposed action proceed, BKA will seek to implement a comprehensive environmental and biodiversity research and monitoring program, as per row above.	As with any vessel operating at sea there is always a possibility of an interaction with MMF. The measures listed in the columns to left make the likelihood very low.

Marine Fauna	Potential Impact of the proposed action	Impact Avoidance / Prevention	Impact Minimization / Mitigation	Rehabilitation & Offsets	Residual Impacts
Boney fishes:	No impacts are predicted as the key fish species of CG prefer costal and upstream habitats, the POA is not suitable as fish habitat due to the extreme environmental conditions, and is not targeted by commercial or recreational fishers.	Impacts will be avoided / prevented as per left column.	Impact minimization / mitigation is not required as impacts will be avoided / prevented.	None required. Never-the-less, if the proposed action proceeds, BKA will look to support research and monitoring of the biology, ecology and behaviour of fish species in the CG area, in close coordination with relevant stakeholders including DPIRD Fisheries and commercial and recreational fishers, to provide scientific data to support improved management of these species.	None.
Mud Crabs (*Scylla spp*):	No impacts are predicted as the proposal will not impact on mud-crab habitats areas (mangroves along the coast and io the inlets, rivers and creeks) either directly or indirectly. Females migrating out of CG to spawn and juveniles migrating back into CG to grow are unlikely to pass through the POA due to the extreme environmental conditions, and likely migrate along the coastal belt out and in of CG.	Impacts will be avoided / prevented as per left column.	Impact minimization / mitigation is not required as impacts will be avoided / prevented.	None required. Never-the-less, if the proposed action proceeds, BKA will look to support research and monitoring of the biology, ecology and behaviour of mud crab species in the CG area, in close coordination with relevant stakeholders including DPIRD Fisheries and commercial and recreational fishers, to provide scientific data to support improved management of these species.	None.
Red Legged Banana Prawns (*Penaeus indicus*) **White Banana Prawns** (*P. merguiensis*)	No impacts are predicted directly on the fishing effort itself as the prawn-trawling grounds are ~100km offshore. No impacts are predicted on juvenile prawn nursery areas in CG (mangroves along the coast and up the inlets, rivers and creeks) as the proposed action will not affect these areas either directly or indirectly. Young adults migrating out of CG to spawn and larvae / juveniles migrating back into CG to grow are unlikely to pass through the POA due to the extreme	Impacts will be avoided / prevented as per left column.	Impact minimization / mitigation is not required as impacts will be avoided / prevented.	None required. Never-the-less, if the proposed action proceeds, BKA will look to support research and monitoring of the biology, ecology and behaviour of pawn species in the CG area, in close coordination with relevant stakeholders including DPIRD Fisheries and commercial and recreational fishers, to provide scientific data to support improved management of these species.	None.

Marine Fauna	Potential Impact of the proposed action	Impact Avoidance / Prevention	Impact Minimization / Mitigation	Rehabilitation & Offsets	Residual Impacts
	environmental conditions, and likely migrate along the coastal belt out and in of CG.				
All species above	Potential underwater noise impacts from the SPV:	Low presence of these species in the POA. Low presence of the SPV in CG (zero presence 86% of time during project lifespan). Separation of the sound generation profiles of the SPV and the sound repertoires of relevant species. Naturally very high suspended sediment concentrations in CG which reduces sound propagation (WODA 2015). Naturally high sound levels from high tidal range which can mask other sound sources (Marely et al 2017).	The SPV will be a 'newbuild' vessel and will incorporate relevant best practice noise reduction measures from the design-phase, as per the IMO 2023 Underwater Noise Guidelines (IMO 2023). As the design parameters for the SPV mature (it is still in conceptual phase), modelling of likely noise emissions will be undertaken in accordance with the IMO Guidelines, and used to inform optimum design and incorporation of noise reduction measures. Low operational speed of the SPV (~2 knots). Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4).	None required. Never-the-less, should the proposed action proceed, BKA will seek to implement a comprehensive environmental and biodiversity research and monitoring program, in consultation and cooperation with relevant stakeholders as described in section 17 of EPBC Referral Report No. 4. This would further assist protection and conservation of these species both in CG and in other areas.	None.

9.3.4 Potential changes to water quality

1. Description of the existing water quality in CG including data from BKA's comprehensive field sampling program is presented in Section 8 - Marine Environmental Quality (MEQ) of EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Setting & Existing Environment*. Overall, the MEQ in CG including the Ramsar wetland can be summarized as:

    a) free of chemical contaminants and pollutants, with no significant sources of potential contamination along the immediate coastline or in the broader catchment,

    b) normal sea temperature, salinity and pH, with expected variation between the dry- and wet-seasons,

    c) relatively low chlorophyll-*a* concentrations, in both the dry- and wet-seasons,

    d) extremely high suspended solids concentrations (SSC) and turbidity levels (the Traditional Owners refer to CG as 'Brown Water Country') (Figures 21 & 22); and

    e) very low (zero or near zero) benthic light levels throughout the year, due to extremely high SSC and a permanent suspended sediment layer at the seabed caused by strong tidal currents with each ~six-hourly change of the tide (Figure 23).

2. Potential impacts of the proposed action on water quality are assessed in detail in Section 9 - MEQ of EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments*. The assessment includes application of the impact mitigation hierarchy and best practice impact prevention and mitigation measures as summarized in Table 7, and assesses the following potential impacts on water quality:

    a) potential mobilisation of any existing (pre-project) contaminants that might be present in the sand that might be disturbed and released when it is dredged by the SPV,

    b) potential alteration of the suspended sediment and turbidity values in CG; and

    c) potential marine pollution from the SPV.

3. As presented in Table 7 the likelihood of the proposed action causing any change to water quality in the Ramsar wetland, let alone a substantial and measurable change which may adversely impact on biodiversity, ecological integrity, social amenity or human health, as per the Commonwealth significant impact criteria, is negligible for the following reasons:

    a) No direct impacts: There is no overlap between the POA and the Ramsar wetland so there is no scope for direct impacts on water quality in the wetland.

    b) Clean sand: The sand in the POA that will be sourced by the proposed action has been tested for potential contamination in accordance with the Commonwealth *National Assessment Guidelines for Dredging 2009* (NAGD 2009), and found to be free of all listed contaminants, as reported in Annex 11 - *Sediment Contamination Assessment* of EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Setting & Existing Environment*. There is therefore no potential for mobilisation of any existing (pre-project) contaminants that might be present in the sand when it is dredged by the SPV.

    c) Suspended sediment and turbidity from the SPV: The generation of sediment plumes from the operation of the SPV in the POA, including application of 3D hydrodynamic and sediment transport modelling in accordance with the WA EPA *Technical Guidance on Environmental Impact Assessment of Marine Dredging Proposals* (EPA 2021), is assessed in detail in EPBC Referral Report No. 8 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Full Modelling Report*. The assessment finds that the proposed action is unlikely to significantly alter the natural suspended sediment and turbidity levels in CG or in the Ramsar wetland, which are naturally extremely high and dynamic. A number of mitigating factors also apply to this issue, as follows:

        - The SPV will only operate in CG for one to two days very two weeks, or 52 days per year. There will be zero operational activity in CG for 86% of the time during the project's lifespan.

        - The constant movement and reworking of the seabed sediments in CG by strong tidal currents cause the sands to be well-sorted with the finer fractions of silt (which cause turbidity), being separated out and mostly kept in suspension (hence the high natural turbidity levels in CG).

        - The operation will only target the well-sorted sand, which does not contain the fine silts that generate most turbidity (the market requires the sand to meet a minimum grain size, so there is no productive value in taking fine material).

- There will be no dumping of sediments in CG, as would normally be carried out for a conventional port dredging operation, and which can be a significant source of sediments plumes. In this case the sand will be exported to the destination market port, eliminating dumping as a source of sediment plumes in CG.

- While not really necessary given the above factors, as an additional precaution the SPV will be fitted with best practice turbidity reduction measures, including a 'green valve' at the overflow water intake and discharge of overflow water at the keel rather than at the gunwale (refer Annex 3 of EPBC Referral Report No. 4).

d) Potential marine pollution from the SPV: Potential marine pollution from the SPV will be prevented and mitigated by the following factors:

- Compliance with maritime laws: The SPV will comply with all relevant requirements of the *International Convention for the Prevention of Pollution form Ships* (MARPOL) and the implementing Australian law - the Commonwealth *Protection of the Sea (Prevention of Pollution from Ships) Act* and related Marine Orders (administered by the Australian Maritime Safety Authority - AMSA).

- No waste streams from the SPV into CG: There will be no waste streams from the operation of the SPV into CG, including:

  - Bilge water: The SPV will not discharge bilge water when in Australian waters, and will comply with MARPOL Annex I requirements for oily-water separators and discharge standards when bilge water is discharged outside of Australian waters.

  - Sewage: The SPV will not discharge sewage when in Australian waters (it will be kept on-board in holding tanks), and will comply with MARPOL Annex IV requirements for on-board sewage treatment systems and discharge standards when sewage is discharged outside of Australian waters.

  - Garbage: The SPV will not discharge garbage when in Australian waters or place any garbage ashore in the Port of Wyndham or any other Australian port. All garbage will be kept on-board and managed in accordance with MARPOL Annex V and the vessels' IMO-compliant Garbage Management Plan, and discharged to approved port waste reception facilities at the sand destination port (Singapore).

- No refuelling in Australian waters: The SPV will not undertake any bunkering (refuelling) in Australian waters – eliminating the risk of spills from this potential source (which global statistics indicate is the highest frequency cause of spills).

- Prevention of accidents potentially resulting in oil spill: The risk of the SPV grounding or colliding with another vessel in CG is extremely low due to very low shipping traffic in CG (average of 1.3 ships per week for the last three financial years (CGL 2024), and the very low presence of the SPV in CG (one to two days every two weeks). The low risk will be reduced further through strict compliance with navigational safety and traffic separation requirements of the International Maritime Organization (IMO), AMSA and the Kimberley Ports Authority (KPA) (with whom BKA is consulting closely) (see also Annex 2 to EPBC Referral Report No. 4).

- Prevention of oil spill should an accident occur: The risk of a grounding or collision actually resulting in release of pollution will be avoided and minimized in that the SPV will be designed, built and operated in full compliance with MARPOL Annex I, including relevant protection of fuel tanks to prevent puncturing and loss of fuel (see also Annex 2 to EPBC Referral Report No. 4).

- Alternative, less polluting future fuel options: As part of BKA's fleet decarbonisation program, the SPV will be designed for dual-fuel use, allowing adoption of alternative fuels such as methanol as they become viable in the future. Methanol is a semi-volatile, low viscosity compound that is highly miscible with water, and as such disperses rapidly if spilled into the marine environment. Since it is infinitely water soluble, it does not accumulate in sediments.

- Shipboard Oil Pollution Emergency Plan: The SPV will have an IMO- and AMSA-compliant Shipboard Oil Pollution Emergency Plan (SOPEP) and equipment for responding in the highly unlikely event of a spill, with a program of regular training and exercises, in cooperation with relevant agencies.

FIGURE 21: *Suspended sediment concentrations and turbidity levels are naturally very high in CG, as shown in the wake of a vessel used by BKA for environmental survey work.*

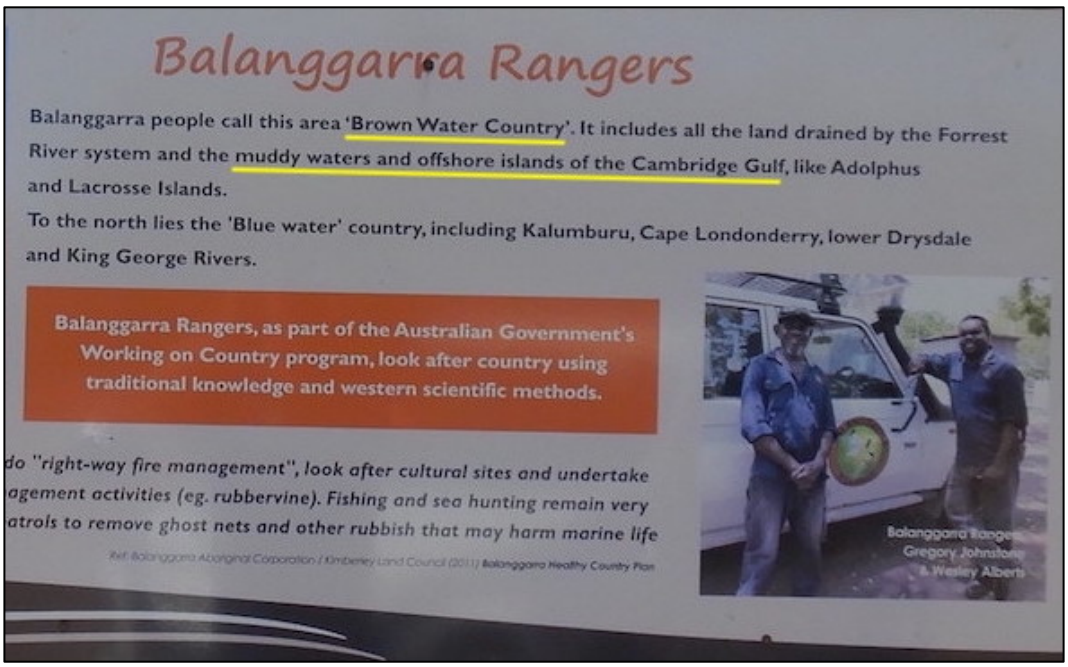


FIGURE 22: *An interpretive sign by the Balanggarra Indigenous Rangers at the Port of Wyndham public jetty, with reference to the area as 'Brown Water Country' and the 'muddy waters' of Cambridge Gulf.*

FIGURE 23: *Screen shots from three examples of the drop camera videos undertaken at 134 sites across CG and King Shoals in March 2023 and July-August 2023. These show the completely blacked-out aphotic zone near the seabed caused by a constantly suspended sediment layer for several meters above the seabed. 100% of the videos show exactly the same result. This inhibits the development of benthic communities in CG. All of the 134 videos are available from BKA.*

TABLE 7: *Mitigation hierarchy & assessment of residual impacts for water quality in the Ramsar site*

Potential Impact on Water Quality	**Impact Avoidance / Prevention**	**Impact Minimization / Mitigation**	**Rehabilitation & Offsets**	**Residual Impacts**
Potential mobilisation of any existing (pre-project) contaminants that might be present in the sand that might be disturbed and released when it is dredged by the SPV:	– The sand in the POA that will be sourced by the proposed action has been tested for potential contamination in accordance with the Commonwealth *National Assessment Guidelines for Dredging 2009* (NAGD 2009), and found to be free of all listed contaminants, as reported in Annex 11 of EPBC Referral Report No. 2. – There is therefore no potential for mobilisation of any existing (pre-project) contaminants that might be present in the sand when it is dredged by the SPV.	– None required.	– None required.	– None.
Potential alteration of the suspended sediment and turbidity values in CG:	– The generation of sediment plumes from the operation of the SPV in the POA, including application of 3D hydrodynamic and sediment transport modelling, is assessed in detail in EPBC Referral Report No. 8 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Full Modelling Report*. – The assessment finds that the proposed action is unlikely to significantly alter the natural suspended sediment and turbidity levels in CG or in the Ramsar wetland, which are naturally extremely high and dynamic. – The SPV will only operate in CG for one to two days very two weeks, or 52 days per year. There will be zero operational activity in CG for 86% of the time during the project's lifespan. – The constant movement and reworking of the seabed sediments in CG by strong tidal currents cause the sands to be well-	– While not really necessary given the impact avoidance / prevention factors, as an additional precaution the SPV will be fitted with best practice turbidity reduction measures, including a 'green valve' at the overflow water intake and discharge of overflow water at the keel rather than at the gunwale (refer Annex 3 of EPBC Referral Report No. 4).	– None required.	– None.

Potential Impact on Water Quality	**Impact Avoidance / Prevention**	**Impact Minimization / Mitigation**	**Rehabilitation & Offsets**	**Residual Impacts**
	sorted with the finer fractions of silt (which cause turbidity), being separated out and mostly kept in suspension (hence the high natural turbidity levels in CG). – The operation will only target the well-sorted sand, which does not contain the fine silts that generate most turbidity (the market requires the sand to meet a minimum grain size, so there is no productive value in taking fine material). – There will be no dumping of sediments in CG, as would normally be carried out for a conventional port dredging operation, and which can be a significant source of sediments plumes. In this case the sand will be exported to the destination market port, eliminating dumping as a source of sediment plumes in CG.			
Potential marine pollution from the SPV:	– Compliance with maritime laws: The SPV will comply with all relevant requirements of the *International Convention for the Prevention of Pollution form Ships* (MARPOL) and the implementing Australian law - the Commonwealth *Protection of the Sea (Prevention of Pollution from Ships) Act* and related Marine Orders (administered by AMSA). – No waste streams from the SPV into CG: There will be no waste streams from the operation of the SPV into CG, including: – Bilge water: The SPV will not discharge bilge water when in Australian waters, and will comply with MARPOL Annex I requirements for oily-water separators and discharge standards when bilge water is	– Shipboard Oil Pollution Emergency Plan: The SPV will have an IMO- and AMSA-compliant Shipboard Oil Pollution Emergency Plan (SOPEP) and equipment for responding in the highly unlikely event of a spill, with a program of regular training and exercises, in cooperation with relevant agencies.	– In the highly unlikely event of an accidental oil spill occurring from the SPV and causing impacts on the coastal environment, BKA would implement an appropriate rehabilitation program, in consultation with relevant agencies and stakeholders	– None.

Potential Impact on Water Quality	Impact Avoidance / Prevention	Impact Minimization / Mitigation	Rehabilitation & Offsets	Residual Impacts
	discharged outside of Australian waters. – Sewage: The SPV will not discharge sewage when in Australian waters (it will be kept on-board in holding tanks), and will comply with MARPOL Annex IV requirements for on-board sewage treatment systems and discharge standards when sewage is discharged outside of Australian waters. – Garbage: The SPV will not discharge garbage when in Australian waters or place any garbage ashore in the Port of Wyndham or any other Australian port. All garbage will be kept on-board and managed in accordance with MARPOL Annex V and the vessels' IMO-compliant Garbage Management Plan, and discharged to approved port waste reception facilities at the sand destination port (Singapore). – No refuelling in Australian waters: The SPV will not undertake any bunkering (refuelling) in Australian waters – eliminating the risk of spills from this potential source (which global statistics indicate is the highest frequency cause of spills). – Prevention of accidents potentially resulting in oil spill: The risk of the SPV grounding or colliding with another vessel in CG is extremely low due to very low shipping traffic in CG (average of 1.3 ships per week for the last three financial years (CGL 2024), and the very low presence of the SPV in CG (one to two days every two weeks). The low risk will be reduced further through strict compliance with navigational safety and			

Potential Impact on Water Quality	Impact Avoidance / Prevention	Impact Minimization / Mitigation	Rehabilitation & Offsets	Residual Impacts
	traffic separation requirements of the International Maritime Organization (IMO), AMSA and the Kimberley Ports Authority (KPA) (with whom BKA is consulting closely) (see also Annex 2 to EPBC Referral Report No. 4). – Prevention of oil spill should an accident occur: The risk of a grounding or collision actually resulting in release of pollution will be avoided and minimized in that the SPV will be designed, built and operated in full compliance with MARPOL Annex I, including relevant protection of fuel tanks to prevent puncturing and loss of fuel (see also Annex 2 to EPBC Referral Report No. 4). – Alternative, less polluting future fuel options: As part of BKA's fleet decarbonisation program, the SPV will be designed for dual-fuel use, allowing adoption of alternative fuels such as methanol as they become viable in the future. Methanol is a semi-volatile, low viscosity compound that is highly miscible with water, and as such disperses rapidly if spilled into the marine environment. Since it is infinitely water soluble, it does not accumulate in sediments.			

9.3.5 Potential invasive species

1. On each arrival in CG the SPV could potentially introduce marine pest species via ballast water or biofouling. Although there is no overlap between the POA and the Ramsar site, any marine pest species introduced anywhere in CG could potentially spread to the Ramsar site as the marine waters are a continuous medium, and could potentially be harmful to the ecological character of the wetland.

2. The potential introduction of marine pests will be avoided and minimized as follows:

    a) The SPV will carry ballast water on each voyage from SE Asia to CG to load sand – this ballast water will be treated as per point B) below and generally it will be discharged before the SPV enters CG to load sand, preventing the risk of ballast-mediated marine pest introductions within CG. Ballast water will not be discharged in or even near the Ramsar site.

    b) The SPV will be equipped with an IMO-compliant ballast water treatment system consistent with the IMO *International Convention for the Control & Management of Ships' Ballast Water & Sediments* (BWM Convention), and as required by the Commonwealth ballast water regulations under the Commonwealth *Biosecurity Act* and relevant amendments. The DCCEEW Significant Impact Guidelines include an Appendix on *Information for specific industry sectors*, which includes some specific significant impact criteria relating to marine activities. These state that:

        – *"Ballast water operations from vessels in Australian waters, undertaken in accordance with an approved Australian Government arrangement for the management of ballast water, would not normally be expected to have a significant impact on the Commonwealth marine environment."*

        Treating ballast water before discharge in accordance with the IMO BWM Convention and the ballast water regulations under the Commonwealth *Biosecurity Act* and relevant amendments constitutes an approved Australian Government arrangement for the management of ballast water.

    c) The SPV will implement a biofouling management plan with stringent biofouling prevention, management, mitigation and monitoring measures, consistent with the IMO biofouling guidelines (IMO 2023) and as required by the Commonwealth biofouling regulations under the Commonwealth *Biosecurity Act* and relevant amendments.

3. Biofouling management measures will include, *inter alia*:

    a) Maintenance of a high-grade, IMO-compliant anti-fouling system on the SPV's wet hull.
    b) Regular in-water inspections and when necessary, cleaning in Singapore – with a priority focus on niche areas.
    c) Periodic dry docking, out-of-water hull cleaning and repainting / refresh of the anti-fouling system.
    d) Required reporting to Australian authorities including before each arrival in Australian waters, as per the Commonwealth ballast water and biofouling requirements.

4. As the SPV will operate in CG which is within State Internal Waters, it will also comply with relevant requirements of the WA *Biosecurity and Agriculture Management Act* and undertake reporting under the WA Department of Primary Industries & Regional Development (DPIRD) (Fisheries) Vessel Check program (https://vessel-check.com/).

5. Although the risk of marine pest introduction is low through implementation of the avoidance and prevention measures outlined above, potential impacts will be further minimized and mitigated through development and implementation of an Introduced Marine Pests - Monitoring, Detection & Response Plan (IMP-MRP), in consultation with relevant stakeholders.

6. The risk of introduced marine pests will be further minimized by the extreme environmental conditions in CG, which are not conducive to colonization by marine species, as evidenced by the general lack of benthic biota in CG.

7. The measures outlined above are presented further in Table 8 in accordance with the Mitigation Hierarchy. Overall, given the above factors and measures, it is assessed that there is a low likelihood of marine pest species being introduced to CG and to the Ramsar site by the SPV and causing significant impacts.

TABLE 8: *Mitigation hierarchy & assessment of residual impacts for potential introduction of invasive species to the Ramsar site*

Potential Vector	**Impact Avoidance / Prevention**	**Impact Minimization / Mitigation**	**Rehabilitation & Offsets**	**Residual Impacts**
Ballast water discharges from the SPV	Ballast water will not be discharged in or even near the Ramsar site. Generally, the SPV will discharge ballast water before entering CG to load sand. Discharged ballast water will be treated by an IMO-compliant ballast water treatment system consistent with the IMO BWM Convention, as required by the Commonwealth ballast water regulations under the Commonwealth *Biosecurity Act* and relevant amendments.	The risk of introduced marine pests will be further minimized by the extreme environmental conditions in CG, which are not conducive to colonization by marine species, as evidenced by the general lack of benthic biota in CG. Although the risk of marine pest introduction is low through implementation of the avoidance and prevention measures outlined in the column to the left, potential impacts will be further minimized and mitigated through development and implementation of an Introduced Marine Pests - Monitoring, Detection & Response Plan (IMP-MDRP), in consultation with relevant stakeholders.	Rehabilitation - In the highly unlikely event of marine pest introduction occurring from the SPV and causing impacts, BKA would implement an appropriate rehabilitation program, in consultation with relevant stakeholders. Offsets - are not required as impacts will be avoided, prevented, minimized, mitigation, and if necessary, rehabilitated. Never-the-less, if the proposed action proceeds, BKA will seek to implement a comprehensive environmental and biodiversity research and monitoring program, in consultation and cooperation with relevant stakeholders. This would further assist environmental protection and biodiversity conservation in the area.	In the highly unlikely event of a marine pest introduction occurring from the SPV any residual impacts that might occur would be temporary and addressed through an appropriate rehabilitation program, in consultation with relevant stakeholders.

Biofouling on the SPV hull	– The SPV will implement a biofouling management plan with stringent biofouling prevention, management, mitigation and monitoring measures, consistent with the IMO biofouling guidelines (IMO 2023) and as required by the Commonwealth biofouling regulations under the *Biosecurity Act*.
	
	– Biofouling management measures will include:
	
	  – Maintenance of a high-grade, IMO-compliant anti-fouling system on the SPV.
	
	  – Regular in-water inspections and when necessary, cleaning in Singapore – with a priority focus on niche areas.
		As per ballast water above.	As per ballast water above.	As per ballast water above.

Potential Vector	**Impact Avoidance / Prevention**	**Impact Minimization / Mitigation**	**Rehabilitation & Offsets**	**Residual Impacts**
	– Periodic dry docking, out-of-water hull cleaning and refresh of anti-fouling system. – Required reporting to Australian authorities including before each arrival in Australian waters, as per the Commonwealth ballast water and biofouling requirements. – As the SPV will operate in CG which is within State Internal Waters, it will also comply with relevant requirements of the WA *Biosecurity and Agriculture Management Act* and undertake reporting under the WA DPIRD (Fisheries) Vessel Check program.			

9.3.6 Summary of potential impacts on the Ramsar wetland

1. Table 9 presents the assessment of whether the proposed action is likely to cause significant impacts against each of the Commonwealth Significant Impact Criteria for Ramsar wetlands, including application of best practice impact avoidance (prevention) and minimization (mitigation) measures, and finds no significant impact against each criterion.

2. There is no scope for direct impacts from the proposed action as the proposed action does not overlap with the Ramsar wetland.

3. The potential for indirect impacts on the wetland from uptake of sand from within CG, including potential changes in coastal processes, is assessed in:

   - EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments*,
   - EPBC Referral Report No. 5 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Initial Report*; and
   - EPBC Referral Report No. 8 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Full Modelling Report*.

4. These assessments find no significant indirect impacts on the Ramsar wetland.

TABLE 9: *Assessment of potential for significant impacts on Wetlands of International Importance - the Ord River Floodplain Ramsar Site*

Brief Description	Proximity	Significant Impact Criteria	Assessment	Finding
• Refer Figures 15 to 17. • The Ord River Floodplain was designated as a Ramsar Site (Wetland of International Importance) in 1990. • The Ramsar Site covers the complex system of estuarine inlets located on the east side of CG, just inshore from Cape Domett, lined with relatively narrow bands of fringing mangroves backed by intertidal flats, known as the 'False Mouth of the Ord River'. • It also extends southwards to cover the Lower Ord River itself and freshwater wetlands at Parry Lagoons. • The site represents the best example of wetlands associated with the floodplain and estuary of a tropical river system in the Kimberley region of WA. • Of the 19 species of mangrove found in WA, 15 have been recorded within the Ramsar Site. • The Ramsar Site is a nursery, feeding and/or breeding ground for migratory birds and waterbirds. • The site supports a number of species protected under the EPBC Act, including Freshwater Sawfish (*Pristis microdon) and* Green Sawfish *(Pristis zijsron)* (although no records of their presence found), endangered Northern River Shark *(Glyphis garricki)*, Saltwater Crocodile *(Crocodylus porosus)* and the Australian Painted Snipe *(Rostratula australis)*. • The site regularly supports 1% of the population of Plumed Whistling Duck *(Dendrocygna eytoni)* and Little Curlew *(Numenius minutes)*. • The Ramsar Site is protected as the WA State Ord River Nature Reserve.	• The proposed operational area does not overlap. • The 10 km buffer overlaps. • The closest distance between the proposed operational area and the boundary of the Ramsar Site is ~6 km as shown on Figure 15.	An action is likely to have a significant impact on the ecological character of a wetland of international importance if there is a real chance or possibility that it will result in:		

		• areas of the wetland being destroyed or substantially modified,	• There is no overlap between the proposed action and the Ramsar Site and therefore no scope for direct impacts that could destroy or substantially modify an area of the wetland.
			• The potential for indirect impacts on the wetland from uptake of sand from within CG, including potential changes in sediment dynamics and coastal processes, is assessed in:
			  • EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments*,
			  • EPBC Referral Report No. 5 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Initial Report* and
			  • EPBC Referral Report No. 8 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Full Modelling Report*.
			• The assessment indicates that there appears to be very little potential for sand sourcing to change coastal processes to any extent that could destroy or substantially modify an area of the wetland. This is because:
			  • the proposed sand-sourcing will not change hydrodynamics, which drive sediment dynamics, in CG to any meaningful degree over the 15-year time frame,
			  • there does not appear to be significant sediment connection between the proposed operational area and the wetland – there appears to be net outflow of sediment from CG, the proposed operational area is located 'downstream' of the wetland, and most input to CG appears to be on the western side of CG (Wolanski et al 2001 & 2004), while the wetland is located on the eastern side. The wetland appears to receive most sediment from its own catchment during wet season flood events; and
			  • the wetland is formed by and naturally adapted to extreme inter-annual variations in wet season flooding and sedimentation (Wolanski et al 2001 & 2004) (Hale 2008) and extreme natural destructive forces such as cyclones (Figure 19).
				No significant impact

Brief Description	Proximity	Significant Impact Criteria	Assessment	Finding
		• a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland,	• The hydrological regime of the wetland is driven by the dry-season/wet-season tropical monsoonal cycle, including acute rainfall events associated with tropical cyclones and low-pressure systems (Hale 2008) (Wolanski et al 2001 & 2004). There are no mechanisms whereby the proposed action could change the climate-level factors of the tropical monsoonal cycle. • The proposed action is located offshore from and downstream of the wetland, and does not involve any facilities, activities or operations within or upstream of the wetland that could alter the hydrological regime. • As outlined in section 9.3.1, the potential for the proposed action to cause potential changes to hydrodynamics, sediment transport and coastal processes, which could in turn potentially affect the hydrological regime of the wetland, has been thoroughly assessed, and finds that predicted changes are negligible (EPBC Referral Reports No. 5 and No. 8).	**No significant impact**

		• the habitat or lifecycle of native species, including invertebrate fauna and fish species, which are dependent upon the wetland being seriously affected,	• Because there is no scope for direct or indirect impacts on the wetland itself, as outlined above, the habitat of native species within the wetland will not be impacted.
			• However, there are a number of species that 'may' inhabit the wetland that spend part of their lifecycle in the wetland and migrate to coastal or offshore waters through CG for other parts of their lifecycle, and therefore could potentially occasionally pass through the POA, including, *inter alia:*
			  • Protected species such as River Sharks *(Glyphis spp)* and Saltwater Crocodiles *(Crocodylus porosus),* and potentially Sawfish *(Pristis spp)* (although no published records of their presence found).
			  • Species of importance to fisheries such as Barramundi *(Lates calcarifer)*, Mud Crabs *(Scylla spp)* and banana prawns (*Peneaus indicus* and *P. merguiensis*).
			• Because there is no mechanism whereby the proposed operation could cause direct impacts on the wetland, there is similarly no mechanism whereby the proposed action could cause impacts on the lifecycle of these species during the period of their lifecycles spent in the wetland.
			• There is some potential for impacts from the proposed action when these species might occasionally move through the POA, including:
				No significant impact

Brief Description	Proximity	Significant Impact Criteria	Assessment	Finding
			• potential vessel strikes by the SPV for those species that swim at or near the sea surface such as crocodiles, • physical impact from the sand-uptake drag-head for those species that swim at or near the seabed (epibenthic species) such as Sawfish; and • potential effects of underwater noise generated by the SPV. • As presented in Table 6 the probability of vessel strikes on species that swim at or near the sea surface is very low due to the: • Low presence of these species in the POA, as per site surveys (see EPBC Referral Report No. 2 - Annex 13 & Annex 14). • Low presence of the SPV in CG (zero presence 86% of time during project lifespan). • Low operational speed of the SPV (~2 knots) when operating in the POA. • Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4). • As presented in Table 6 the probability of entrainment of epibenthic species in the SPV's drag-head is very low due to the: • Low presence of these species in the POA, as per site surveys (see EPBC Referral Report No. 2 - Annex 13 & Annex 14). • Low presence of the SPV in CG (zero presence 86% of time during project lifespan). • Low operational speed of the SPV (~2 knots) when operating in the POA. • Fitting the drag-head with marine-fauna deterrent / deflector chains, using a design that was proven most effective during comparative tests in relation to the Chevron Barrow Island project in WA. • As presented in Table 6 the probability of significant impacts of underwater noise from the SPV on these species is very low due to the: • Low presence of these species in the POA, as per site surveys (see EPBC Referral Report No. 2 - Annex 13 & Annex 14). • Low presence of the SPV in CG (zero presence 86% of time during project lifespan). • Low operational speed of the SPV (~2 knots) when operating in the POA. • Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in	

Brief Description	Proximity	Significant Impact Criteria	Assessment	Finding
			accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4). • Separation of the sound generation profiles of the SPV and the sound repertoires of relevant species • Naturally very high suspended sediment concentrations in CG, which reduces sound propagation (WODA 2015). • Naturally high sound levels from high tidal range resulting in strong tidal currents which can mask other sound sources (Marely et al 2017). • The SPV will be a 'newbuild' vessel and will incorporate relevant best practice noise reduction measures from the design-phase, as per the *IMO 2023 Underwater Noise Guidelines* (IMO 2023). As the design parameters for the SPV mature (it is still in conceptual phase), modelling of likely noise emissions will be undertaken in accordance with the IMO Guidelines, and used to inform optimum design and incorporation of noise reduction measures. • Given all of these factors, it is assessed that there is almost no potential for the proposed action to seriously affect species that are dependent on the wetland.	
		• a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health; or	• The SPV will not cause any routine operational discharges of any forms of pollutants. • All garbage and other wastes will be retained on-board the SPV for appropriate disposal at the sand delivery port. • The SPV will not undertake any bunkering (fuelling) operations in CG - eliminating the risk of potential spills from this potential source (which global statistics indicate is the highest frequency cause of spills). • The SPV will be designed, built and operated in full compliance with all relevant latest requirements of the International Maritime Organization (IMO) and the Australian Maritime Safety Authority (AMSA), including COLREGs, SOLAS, STCW, AFS Convention, BWM Convention and MARPOL, including relevant protection of fuel tanks to prevent puncturing and fuel spills. • As part of BKA's fleet decarbonisation program, the SPV will be designed for duel-fuel use, allowing adoption of alternative fuels such as methanol as they become viable in future. • In the highly unlikely event of a spill of fuel from the SPV, it would likely disperse very quickly under the influence of the strong tidal currents, high sea-surface and air temperatures and strong solar UV radiation.	**No significant impact**

Brief Description	Proximity	Significant Impact Criteria	Assessment	Finding
			• The SPV will have an IMO- and AMSA-compliant Shipboard Oil Pollution Emergency Plan (SOPEP) and equipment for responding in the highly unlikely event of a spill. • Given all of these factors, it is assessed that there is almost no potential for the proposed action to cause substantial and measurable change in the water quality of the wetland, to adversely impact on biodiversity, ecological integrity, social amenity or human health.	
		• an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.	• The SPV will comply in full with the IMO BWM Convention and IMO Biofouling Guidelines, and with the Australian Biosecurity Act & Regulations, will be fitted with IMO-compliant ballast water treatment systems, and adhere to a stringent biofouling management regime and dry-space biosecurity regime. • The DCCEEW Significant Impact Guidelines explicitly state that implementation of these measures would be expected to prevent significant impact.	**No significant impact**

9.4 Potential Impacts on the Commonwealth Marine Area

1. As outlined in section 3, and shown on Figures 24 and 25, to seaward of CG is the State North Kimberly Marine Park, which extends from the Territorial Sea Baseline, which demarcates the entrance to CG, seaward to the 3 nm State limit Seaward of the 3 nm State limit are Commonwealth waters (the Commonwealth Marine Area), including the the Commonwealth Joseph Bonaparte Gulf Marine Park (JBGMP), which extends to seaward beyond the 12 nm Australian Territorial Sea offshore from CG. The Commonwealth Marine Area extends seaward beyond the outer boundary of the JBGMP as part of the Australian Exclusive Economic Zone (EEZ) up to the maritime border with Indonesia and East Timor (Figure 26).

2. The closest distance between the proposed operational area (POA) and the shoreward boundary of the Commonwealth Marine Area / JBGMP is 9.5 km as shown on Figures 24 and 25. The 10 km buffer around the outer boundary of the POA therefore slightly overlaps the Commonwealth Marine Area / JBGMP by 500 m.

3. As shown on Figures 24 and 25 the JBGMP Zone immediately offshore from CG is a Multiple Use Zone which is the least restrictive zone, and vessel transits are permitted. The SPV will transit through the Commonwealth Marine Park when arriving at and departing from CG, as marked on Figure 43.

4. Potential impacts of the proposed action on the Commonwealth Marine Area / JBGMP were assessed against the Commonwealth significant impact criteria for the Commonwealth Marine Area (Commonwealth of Australia 2013), which state:

   An action is likely to have a significant impact on a Commonwealth marine area if there is a real chance or possibility that the action will:

   - *result in a known or potential pest species becoming established in the Commonwealth marine area,*
   - *modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity results,*
   - *have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution,*
   - *result in a substantial change in air quality or water quality (including temperature) which may adversely impact on biodiversity, ecological integrity; social amenity or human health,*
   - *result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected; or*
   - *have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of a historic shipwreck.*

5. Each of these six criteria is considered in turn in Table 10, and finds no significant impact against each criterion. There is no scope for direct impacts from the sand-sourcing operation itself, as the POA does not overlap with the Commonwealth Marine Area.

6. As outlined above the SPV will transit through the Commonwealth Marine Area / JBGMP when arriving at and departing from CG, as marked on Figure 25. This is the same route used by the commercial vessels that routinely enter and depart CG to service the Port of Wyndham. Shipping transit is a routine activity through the Marine Park, and the SPV will comply with all relevant maritime laws and regulations when transiting the Marine Park.

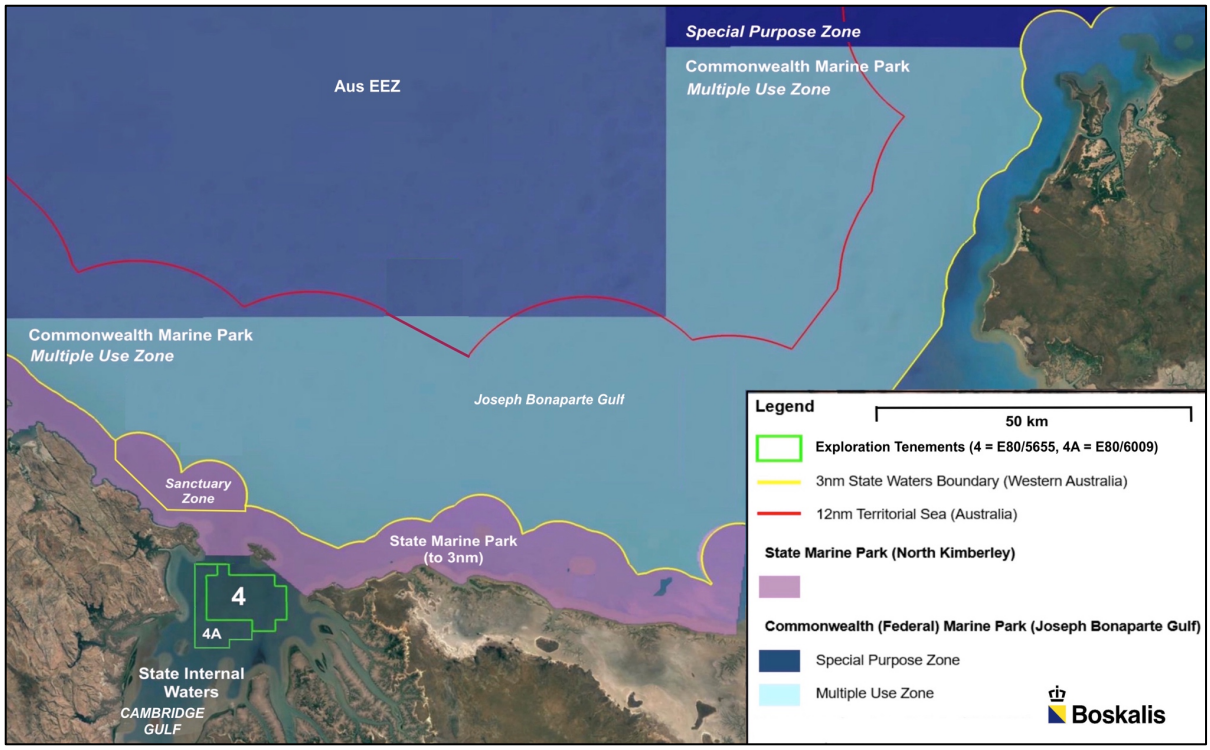


FIGURE 24: *Marine jurisdictions in and around CG.*

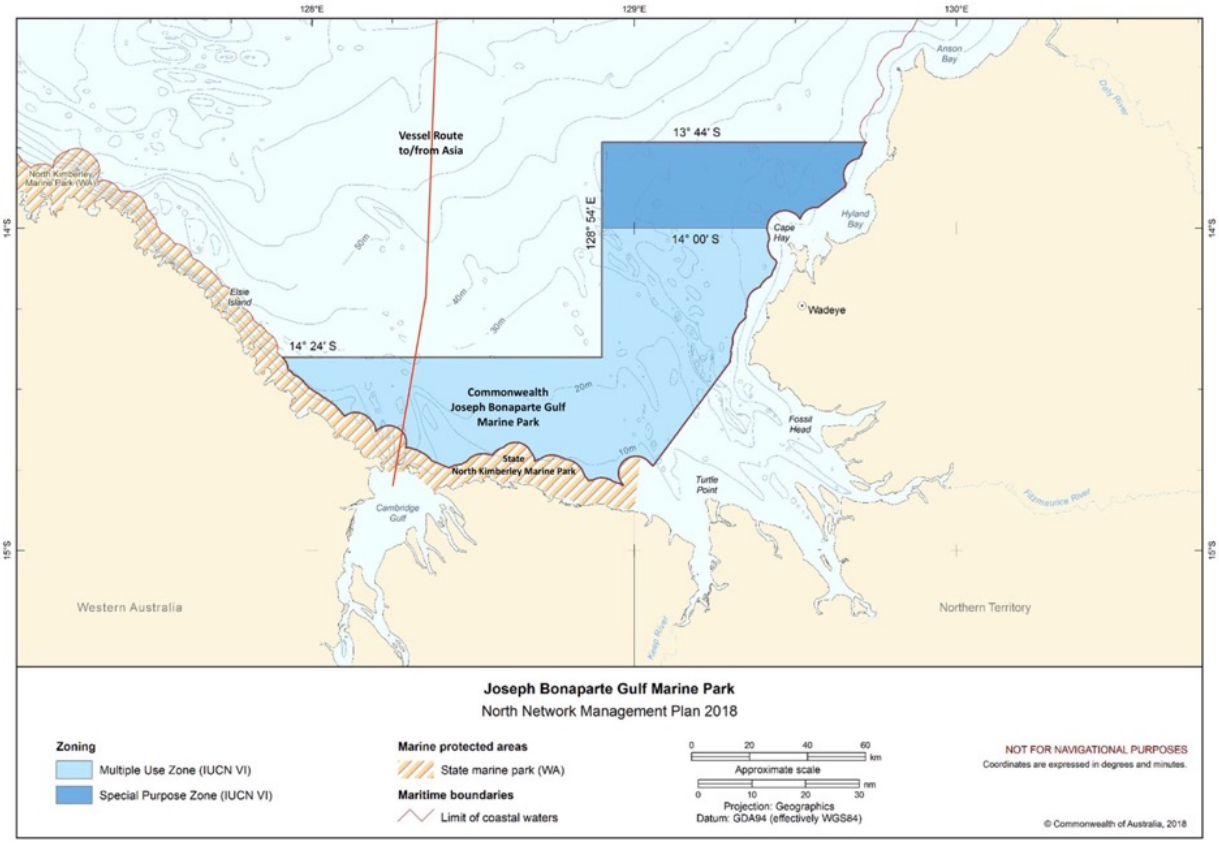


FIGURE 25: *The Commonwealth Joseph Bonaparte Gulf Marine Park (source: North Network Management Plan 2018).*

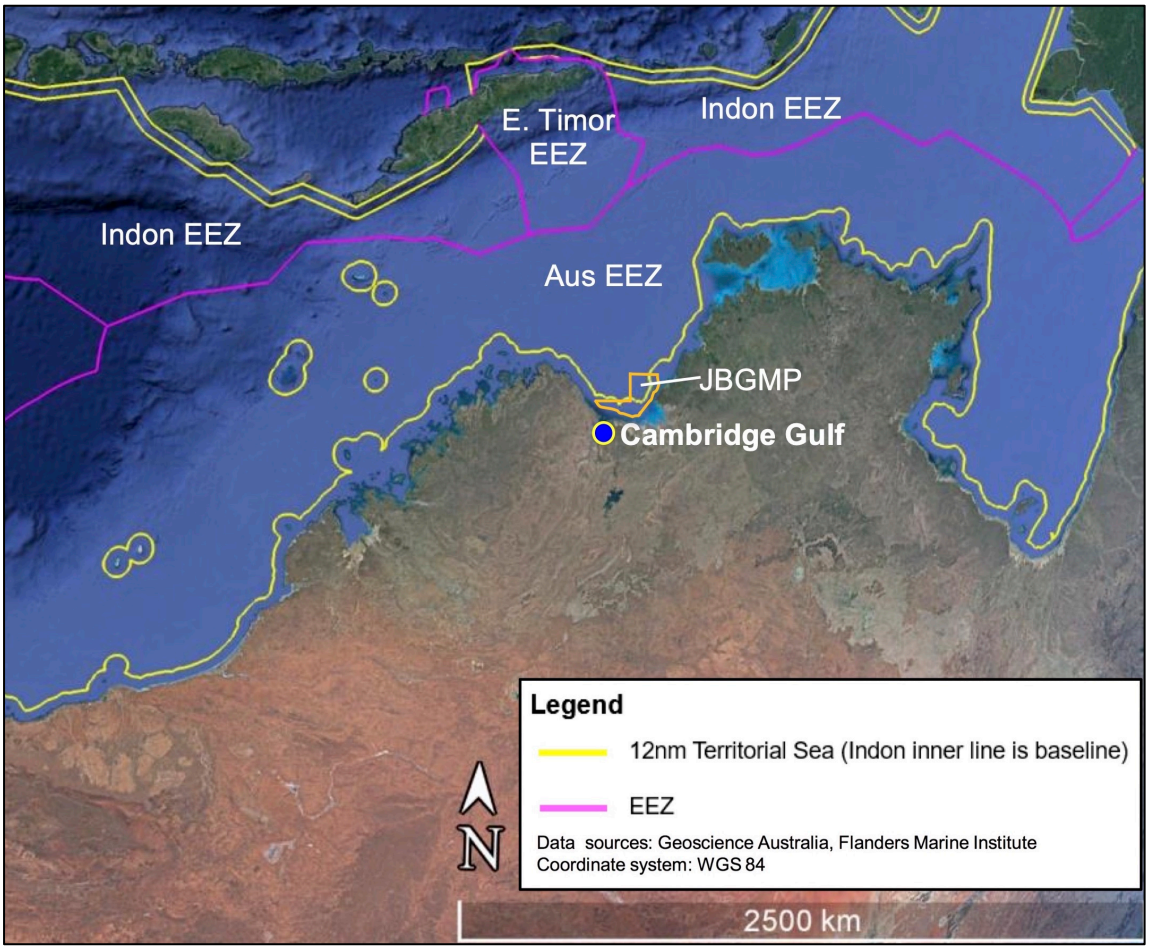


FIGURE 26: *The Commonwealth Marine Area offshore from CG includes the 12 nm Territorial Sea (yellow line) and the EEZ (purple line), which extends north to the maritime borders with Indonesia and East Timor. The Commonwealth Joseph Bonaparte Gulf Marine Park (JBGMP) (orange line) commences at the 3 nm State coastal waters limit and extends seaward beyond the 12 nm Territorial Sea into the EEZ by up to approx. 20 nm.*

TABLE 10: *Assessment of potential for significant impacts on the Commonwealth Marine Area*

Brief Description	**Proximity**	**Significant Impact Criteria**	**Assessment**	**Finding**
• *Refer Figures 24 to 26.* • *Jurisdictionally, CG is located wholly within the State Internal Waters of WA (landward of the Territorial Sea Baseline).* • *To seaward is the State North Kimberly Marine Park, which extends from the Territorial Sea Baseline seaward to the 3 nm State limit.* • *Beyond 3 nm are the Commonwealth Waters of the Joseph Bonaparte Gulf Marine Park, which straddles the Australian 12 nm Territorial Sea and EEZ.* • *The Australian EEZ extends north to the maritime borders with Indonesia and East Timor.*	• The proposed operational area does not overlap. • The 10 km buffer overlaps slightly (by ~500 m). • The closest distance between the proposed operational area and Commonwealth waters and is 9.5 km. • The SPV will transit through the Commonwealth Marine Park when arriving at and departing from CG, as marked on Figure 25. This is the same route used by the commercial vessels that routinely enter and depart CG to service the Port of Wyndham.	An action is likely to have a significant impact on a Commonwealth Marine Area if there is a real chance or possibility that the action will:		
		• result in a known or potential pest species becoming established in the Commonwealth marine area,	• The SPV will comply in full with the IMO BWM Convention and IMO Biofouling Guidelines, and with the Australian Biosecurity Act & Regulations, will be fitted with IMO-compliant ballast water treatment systems, and adhere to a stringent biofouling management regime. • The DCCEEW Significant Impact Guidelines explicitly state that implementation of these measures would be expected to prevent significant impact.	**No significant impact**
		• modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity results,	• There is no overlap between the proposed operational area and the Commonwealth Marine Area and therefore no scope for direct impacts that could modify, destroy, fragment, isolate or disturb an important or substantial area of habitat in the Commonwealth Marine Area. • The SPV will pass through the Commonwealth Marine Area when transiting to and from CG, according to normal navigational procedures as per any other vessel that regularly transits the area. • The SPV will operate in full compliance with all relevant requirements of IMO and AMSA, including COLREGs, SOLAS, STCW, MARPOL, AFS Convention, BWM Convention and others. • The DCCEEW Significant Impact Guidelines explicitly state that routine ship transits where appropriate precautions have been taken would not normally be expected to have a significant impact on NMES.	**No significant impact**
		• have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution,	• There is no overlap between the proposed operational area and the Commonwealth Marine Area and therefore no scope for substantial adverse effect on a population of a marine species or cetacean in the Commonwealth Marine Area. • As above the SPV will pass through the Commonwealth Marine Area when transiting to and from CG, according to normal navigational procedures as per any other vessel that regularly transits the area. • The SPV will operate in full compliance with all relevant requirements of IMO and AMSA, including COLREGs, SOLAS, STCW, MARPOL, AFS Convention, BWM Convention and others. • The DCCEEW Significant Impact Guidelines explicitly state that routine ship transits where appropriate precautions have been taken would not normally be expected to have a significant impact on NMES.	**No significant impact**
		• result in a substantial change in air quality or water quality (including temperature) which may adversely impact on biodiversity, ecological	• The SPV will pass through the Commonwealth Marine Area when transiting to and from CG and air emissions will be in full compliance with MARPOL Annex VI and the implementing AMSA regulation (Marine Order 97). • All garbage and other wastes will be retained on-board the SPV for appropriate disposal at the sand delivery port.	**No significant impact**

Brief Description	Proximity	Significant Impact Criteria	Assessment	Finding
		integrity; social amenity or human health,	• The SPV will not undertake any bunkering (fuelling) operations in the Commonwealth Marine Area – eliminating the risk of potential spills from this potential source (which global statistics indicate is the highest frequency cause of spills). • The SPV will be designed, built and operated in full compliance with all relevant latest requirements of the International Maritime Organization (IMO) and the Australian Maritime Safety Authority (AMSA), including COLREGs, SOLAS, STCW, AFS Convention, BWM Convention and MARPOL, including relevant protection of fuel tanks to prevent puncturing and fuel spills. • As part of BKA's fleet decarbonisation program, the SPV will be designed for duel-fuel use, allowing adoption of alternative fuels such as methanol as they become viable in future. • The SPV will have an IMO- and AMSA-compliant Shipboard Oil Pollution Emergency Plan (SOPEP) and equipment for responding in the highly unlikely event of a spill. • Given all of these factors, it is assessed that there is almost no potential for the proposed action to cause a substantial change in air quality or water quality, which may adversely impact on biodiversity, ecological integrity; social amenity or human health,	
		• result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected; or	• The SPV will pass through the Commonwealth Marine Area when transiting to and from CG according to normal navigational procedures as per any other vessel that regularly transits the area. • The SPV will not discharge any persistent organic chemicals, heavy metals, or other potentially harmful chemicals into the Commonwealth Marine Area.	**No significant impact**
		• have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of a historic shipwreck.	• Any historic shipwrecks that are located in Commonwealth Waters would not be impacted by the SPV, as it will simply pass through when transiting to and from CG according to normal navigational procedures as per any other vessel that regularly transits the area, and will not interact with the seabed in the Commonwealth marine area.	**No significant impact**

10. POTENTIAL IMPACTS ON SPECIES-BASED MNES

10.1 Assessment Structure

1. Review of the PMST search results for species-based MNES (Annex 1) shows that, due to the low resolution of biogeographical range data that supports the PMST, as outlined in section 6.1, many of the species listed as being present or potentially present in the POA or in the 10 km buffer, are actually highly unlikely to be in those areas. Large whale species, large shark species, wholly-pelagic offshore species, shore-based bird-species, fully land-based bird species and even some small terrestrial mammals are listed as being in CG – when local scale data and/or knowledge of habitat preferences versus environmental conditions in CG indicate that this is highly unlikely or even impossible.

2. Never-the-less, all species-based MNES listed from the PMST search are included in the assessment.

3. Two MNES species stand out in the PMST search as being of particular importance in the CG area:

    a) Flatback Turtles (*Natator depressus*): There is a major nesting site for Flatback Turtles (*Natator depressus*) at Cape Domett Seaward Beach just outside CG, and lesser nesting sites in the area. As outlined in section 7 an inter-nesting 'buffer' BIA is designated within a 60 km radius around Cape Domett and Lacrosse Island, which encompasses CG including the POA.

    b) Australian Snubfin Dolphin (*Orcaella heinsohni)*: There is a small population of this species in CG and the area is designated as a breeding, calving, feeding and resting BIA for Snubfins.

4. Given the importance of these two species, separate, specific assessments are presented in section 10.2 for Flatback Turtles and in 10.3 for Snubfin Dolphins.

5. All other MNES species from the PMST search are addressed in the assessment tables in sections 10.4 for threatened species and 10.5 for migratory species. The assessment tables list each species, provide notes on their presence/proximity based on the PMST listing, and assess likely impacts of the proposed sand-sourcing operation, against the relevant EPBC Act significant impact criteria. The tables are arranged as follows:

    Section 10.4 Threatened species:

    - Table 17 - Listed Threatened Species – critically endangered and endangered birds.
    - Table 18 - Listed Threatened Species – vulnerable birds.
    - Table 19 - Listed Threatened Species – critically endangered and endangered mammals.
    - Table 20 - Listed Threatened Species – vulnerable mammals.
    - Table 21 - Listed Threatened Species – critically endangered and endangered reptiles.
    - Table 22 - Listed Threatened Species – vulnerable reptiles.
    - Table 23 - Listed Threatened Species – critically endangered and endangered sharks.
    - Table 24 - Listed Threatened Species – vulnerable sharks.

    Section 10.5 Migratory species:

    - Table 25 - Listed Migratory Species – migratory marine birds.
    - Table 26 - Listed Migratory Species – migratory marine species.
    - Table 27 - Listed Migratory Species – migratory terrestrial species.
    - Table 28 - Listed Migratory Species – migratory wetland species.

6. It should also be noted that some species are repeated in the different lists, for example marine turtles appear in both the Threatened Species and Migratory Species lists (there are multiple other examples). This is highlighted for relevant species in the tables.

10.2 Specific Assessment for Flatback Turtles

10.2.1 Flatback conservation status & nesting in the CG area

1. Flatback Turtles (*Natator depressus)* are listed as both a threatened species (currently classified as 'vulnerable') and a migratory species under the EPBC Act, hence their status as MNES. They are also afforded general protection under the EPBC Act as 'marine' species. They are also protected by the WA *Biodiversity Conservation Act* under which they are also classified as 'vulnerable'.

2. As outlined in section 7 an inter-nesting 'buffer' BIA for Flatback Turtles is designated within a 60 km radius around Cape Domett and Lacrosse Island, linked to the significant Flatback Turtle nesting site at the Cape Domett Seaward Beach. This radius covers much of the main body of CG including BKA's proposed operational area, as per Figure 9 in section 7.

3. There is a globally significant nesting site for Flatback Turtles at Cape Domett Seaward Beach, outside and to the east of the eastern entrance to CG. The beach is 1.9 km long, faces north towards the offshore waters of Joseph Bonaparte Gulf and is separated from CG by Cape Domett itself. The nearest point of the POA is 12 km. Initial surveys at the Cape Domett Seaward Beach by Whiting et al (2008) estimated that the Flatback nesting population is one of the largest known, with an estimated yearly population in the order of several thousand turtles (estimated ~3,250). Peak nesting for Flatbacks at the Cape Domett is in the winter dry-season August-September each year, which differs from the west coast of WA where peak nesting season is in summer.

4. Since 2012 the WA Department of Biodiversity Conservation & Attractions (DBCA) has been undertaking annual monitoring of turtle nesting at the Cape Domett Seaward Beach, in cooperation with the Traditional Owners (TOs) of the area. Ten years of this data from 2013 to 2022 inclusive was analysed by BKA under a data-sharing agreement with DBCA. The report is included in the referral submission as EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 12 - *Cape Domett Turtle Data Report*. Amongst other findings, the annual DBCA monitoring indicates that Flatback Turtle nesting numbers at Cape Domett Seaward Beach may not have changed significantly since the surveys by Whiting et al (2008).

5. Aerial drone surveys were commissioned by BKA in late July 2023 to assess all supra-tidal sand areas in the CG region for signs of turtle nesting. In addition to Cape Domett, Flatback nesting was also observed at the locations listed in Table 8, which includes track and nest counts from the drone video at each site, and shown on Figure 27. Full details of these surveys are presented in section 9 (Marine Fauna) of EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Setting & Existing Environment*.

6. It should be noted that the counts are based on a single drone flight over each area – and are therefore one-off counts. Never-the-less, the data provides a relative indication of which sites are more significant than others in terms of numbers, at least on the days in late July 2023 when the drone was flown. Clearly, Cape Domett Seaward Beach is the most significant nesting site in terms of numbers.

7. It is clear from the studies by Whiting et al (2008), the DBCA data for Cape Domett 2013 - 2022 (EPBC Referral Report No. 2 - Annex 12) and the surveys by BKA in 2023, that Cape Domett is extremely significant and that other sites near CG are somewhat significant as Flatback Turtle nesting sites. BKA has therefore put significant effort into assessing potential impacts of the proposed marine sand-sourcing operation on the nesting sites and marine turtles generally.

8. Section 10 (Marine Fauna) of EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments* includes a detailed assessment of potential impacts of the proposed action on Flatback Turtles. This is not repeated in detail here for reasons of economy, but some of the main points are summarized in sections 10.2.2 to 10.2.4 below.

TABLE 11: *Aerial drone surveys Cambridge Gulf July 2023* (see Figure 27 for locations)

Flatback Nesting Site	Beach Length (km)	No. Nests	No. Track Sets	Likely Species*
1. Cape Domett Seaward Beach:	1.9	190	449	Flatback
1A. Cape Domett Small Beach:	0.4	7	7	"
2. Turtle Beach West (W of Cape Dussejour):	3	28	34	"
3. Turtle Bay (Lacrosse Island):	0.3	6	6	"
4. Barnett Point:	2.9	13	82	"

*Based on track characteristics.

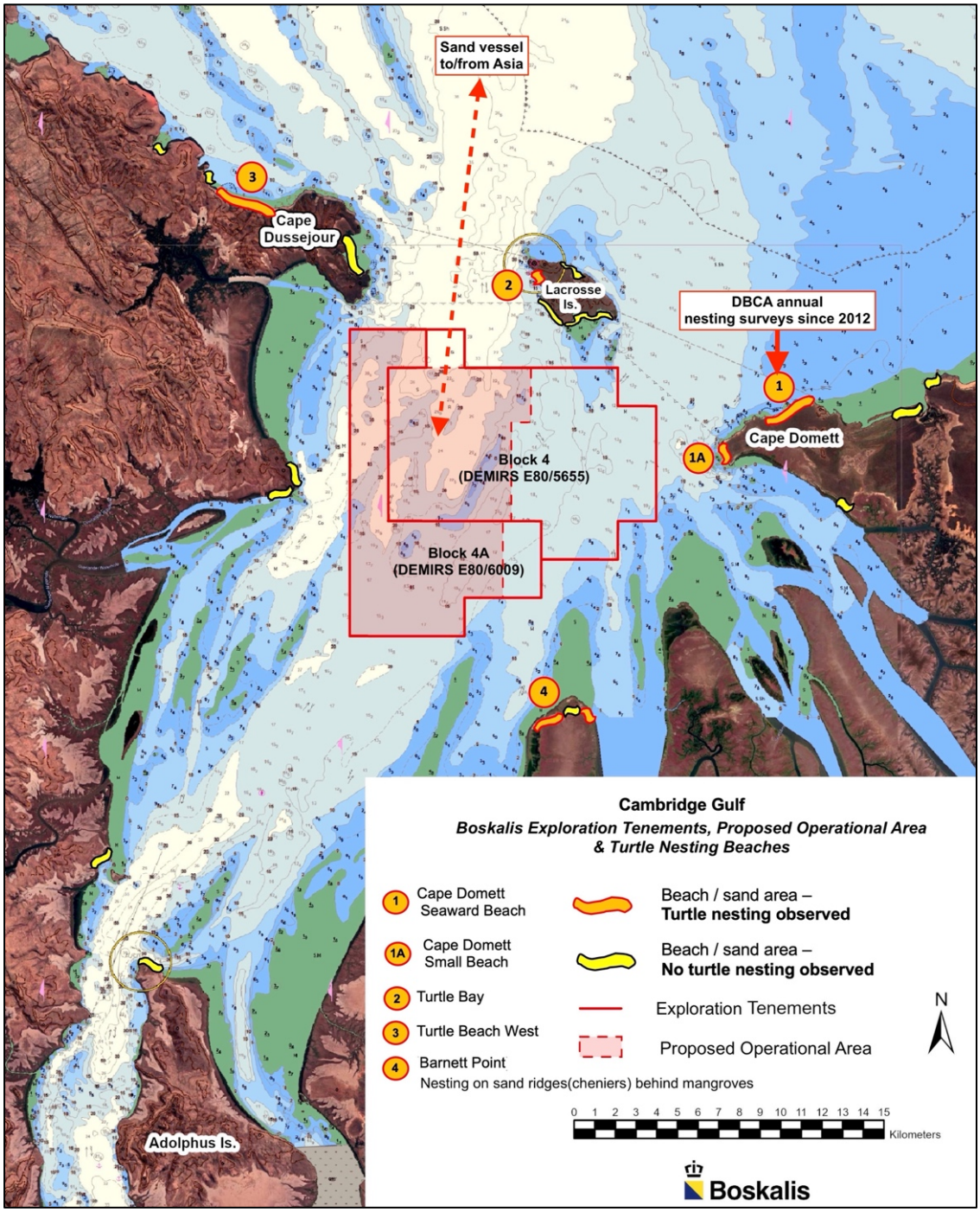


FIGURE 27: *Supra-tidal sand areas surveyed by aerial drone in late July 2023 (BKA 2024b).*

10.2.2 The inter-nesting buffer BIA

1. Inter-nesting BIAs are areas where marine turtles 'rest' between nocturnal nesting events, often being inactive and resting on the seabed to conserve energy for the next nesting event (Hays et al 1999). Studies on the Pilbara Coast of WA indicate that the inter-nesting area for Flatback Turtles in that region can range from 3.4 to 60 km from the nesting beach (Whittock et al 2014), with an average inter-nesting interval of around 13 days (Thums et al 2019). It is understood that the 60 km radius for the inter-nesting buffer around the Cape Domett nesting beach is derived from the range of up to 60 km assessed by Whittock et al (2014) for the Pilbara, without considering site conditions and turtle behaviour in the Cape Domett area.

2. The 60 km inter-nesting buffer is likely to be appropriate for the areas to seaward and extending offshore from Cape Domett, Lacrosse Island, Cape Dussijour and CG in general. However, it is assessed that the area within CG itself is highly unlikely

to be significantly used as inter-nesting habitat, due to the hostile environmental conditions, the known inter-nesting behaviour of Flatbacks and their preference for offshore areas for inter-nesting.

3. As outlined in EPBC Referral Reports No. 2, No. 5 and No. 8, the environmental conditions within CG and especially in the POA are extremely dynamic, with tidal currents up to 4 knots (>2 m/s), constantly moving seabed sediments and no light at the seabed. These conditions make the area highly unsuitable for marine turtles to use as an inter-nesting resting area – they would have to expend significant energy just to remain there, and would be buffeted around on the seabed in totally dark conditions.

4. The main nesting beaches in the CG area are located on the seaward coast and face out to sea. After each nesting event Flatbacks would most likely head straight offshore to the inner waters of Joseph Bonaparte Gulf for their inter-nesting rest, before coming back to the beach again. Flatbacks are known for heading quickly offshore between nesting efforts (McIntyre pers comms. 2024).

5. There is also no feeding habitat for Flatbacks (or other turtle species) within CG. Flatbacks are carnivorous, feeding mostly on soft-bodied prey such as sea cucumbers, soft corals and jellyfish (DCCEEW), which are not found inside CG due the extreme benthic conditions (see Referral Report No. 2 - section 6 on Benthic Communities & Habitats).

6. In addition to arial drone surveys of the nesting sites outlined above, BKA commissioned dedicated on-water marine mega-fauna (MMF) surveys in CG over nine-days in February 2024 and eight-days in July 2023, covering over 800 km of transects for each survey. The full results of these survey are presented in EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 14 - *Marine Mega-fauna Surveys Report*. These surveys included observing for marine turtles at sea throughout CG, with the following findings (see also Figures 28 and 29 in section 10.3 - which show the survey tracks and sightings):

    a) February 2024:

        - Two unidentified turtle sightings in CG, one inside the POA, and no other sightings.

    b) Late July 2023 (near peak nesting period):

        - Five Flatback Turtle sightings (three near Cape Domett where the main nesting beach is, one near Adolphus Island and one on west side of CG).
        - Seven unidentified turtle sightings (one near Cape Domett, one near Adolphus Island, one on west side of CG, one on east side of CG, two near Lacrosse Island and one within the POA).

7. Only one turtle was observed in the POA on each survey, both unidentified species. It should be noted that different sightings could be the same individual(s), so the actual number of turtles may be less than the number of sightings. These are very low numbers of on-water sightings considering the very large area covered, especially in late July 2023 near the peak nesting season, when hundreds of tracks and nests were observed on the nesting beaches.

8. These low on-water sighting numbers tend to indicate that the area within CG may not be significant as an inter-nesting, resting or foraging area by Flatback Turtles, despite the 60 km radius of the inter-nesting BIA extending inshore over CG. It would be useful to assess this further with satellite tagging of Flatbacks that nest at Cape Domett, to track their inter-nesting movements. This data could be used refine the inter-nesting BIA boundaries based on local-scale data.

9. Never-the-less, despite the above indications, given the large numbers of Flatback Turtles that congregate in the general area around CG each nesting season, there will always be a possibility that individuals could be present within CG, including within the POA. It is therefore necessary to assess the potential for interactions between the Sand Production Vessel (SPV) and marine turtles and any resulting in impacts. These are addressed in summary in Table 12 below and in detail in section 10 (Marine Fauna) of EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments*.

10.2.3 Application of impact mitigation hierarchy

1. In accordance with WA EPA guidelines BKA has applied the impact mitigation hierarchy as follows, in order of priority:

    - avoid impacts,
    - minimize impacts,
    - offset impacts; and
    - rehabilitate impacts.

2. Table 12 presents the mitigation hierarchy applied to the assessment of potential impacts from the proposed action on Flatback Turtles. The potential impacts are identified as potential changes to beach morphology, potential impacts of vessel lighting, potential vessel strikes, potential entrainment on the SPV's drag-head and potential impacts from underwater noise from the SPV. Table 12 shows that for all potential impact types, the residual impacts after application of the hierarchy are nil to negligible.

TABLE 12: *Mitigation hierarchy & assessment of residual impacts for Flatback Turtles.*

Potential Impact	**Impact Avoidance / Prevention**	**Impact Minimization / Mitigation**	**Rehabilitation & Offsets**	**Residual Impacts**
Potential changes to nesting beach morphology from potential changes in coastal processes:	Assessed in detail in: – EPBC Referral Report No. 5 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Initial Report.* – EPBC Referral Report No. 8 - Boskalis Cambridge Gulf - *Metocean & Sed Dynamics Full Modelling Report.* The proposed action will not cause changes to beach morphology.	Impact minimization / mitigation is not required as impacts will be avoided / prevented.	Rehabilitation or offsets are not required as impacts will be avoided / prevented.	Nil.
Potential impacts of vessel lighting:	The SPV will be permanently fitted with turtle safe lighting in accordance with the *National Light Pollution Guidelines for Wildlife* (Commonwealth of Australia, 2020). The SPV lighting in the POA will not be visible to nesting and hatching turtles due to distance, aspect and screening by geographical features.	As an added precaution the SPV will enter and depart CG via West Entrance (west of Lacrosse Island), which is 16 km away from the most important nesting beach at Cape Domett, screened from the seaward nesting beach west of Cape Dussejour, and 22 km from the nesting site at Barnett Point.	None required. Never-the-less, should the proposed action proceed, BKA will seek to implement a comprehensive environmental and biodiversity research and monitoring program, in consultation and cooperation with relevant stakeholders. This would further assist protection and conservation of this species both in CG and in other areas.	Nil.
Potential vessel strike by the SPV:	Low presence of these species in the POA Low presence of the SPV in CG (zero presence 86% of time during project lifespan).	Low operational speed of the SPV (~2 knots). Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4).	None required. Never-the-less, should the proposed action proceed, BKA will seek to implement a comprehensive environmental and biodiversity research and monitoring program, as per row above.	Negligible. As with any vessel operating at sea there is always a possibility of an interaction with marine fauna. The measures listed in the columns to left make the likelihood very low.
Potential entrainment in the SPV's drag-head (if turtle is on seabed):	Low presence of these species in the POA and very low likelihood of being present on the seabed in that area, due to strong currents / extreme environmental conditions. Low presence of the SPV in CG (zero presence 86% of time during project lifespan). The drag-head will be fitted with marine-fauna deterrent / deflector chains ('turtle ticklers').	Low operational speed of the SPV (~2 knots). Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4).	None required. Never-the-less, should the proposed action proceed, BKA will seek to implement a comprehensive environmental and biodiversity research and monitoring program, as per row above.	Negligible. As with any vessel operating at sea there is always a possibility of an interaction with marine fauna. The measures listed in the columns to left make the likelihood very low.
Potential underwater noise impacts from the SPV:	Low presence of this species in the POA. Low presence of the SPV in CG (zero	The SPV will be a 'newbuild' vessel and will incorporate relevant best practice noise reduction measures from the design-phase, as per the IMO 2023 Underwater Noise Guidelines (IMO	None required. Never-the-less, should the proposed action proceed, BKA will seek to implement a	Nil.

Potential Impact	Impact Avoidance / Prevention	Impact Minimization / Mitigation	Rehabilitation & Offsets	Residual Impacts
	presence 85% of time during project lifespan). Naturally very high suspended sediment concentrations in CG which reduces sound propagation (WODA 2015). Naturally high sound levels from high tidal range which can mask other sound sources (Marely et al 2017).	2023). As the design parameters for the SPV mature (it is still in conceptual phase), modelling of likely noise emissions will be undertaken in accordance with the IMO Guidelines, and used to inform optimum design and incorporation of noise reduction measures. Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4).	comprehensive environmental and biodiversity research and monitoring program, as per row above.	

10.2.4 Assessment against EPBC Act significant impact criteria

1. Because this report is intended to support the assessment of potential significant impacts on Commonwealth MNES, it is necessary to assess the potential for the proposed action to cause significant impacts on Flatback Turtles in accordance with the EPBC Act significant impact criteria.

2. Because Flatbacks fall under two MNES categories – threatened (vulnerable) species and migratory species, it is necessary consider the significant impact criteria for both. These assessments are presented in Tables 10 and 11 respectively. The tables show that for all criteria the proposed action will not cause significant impacts as defined by the EPBC Act guidelines.

TABLE 13: *Assessment of potential impacts on Flatback Turtles according to vulnerable species significant impact criteria.*

Threatened (vulnerable) species significant impact criteria	Proposed sand-sourcing Operation Impact Assessment	Outcome
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
– *lead to a long-term decrease in the size of an important population of a species,*	There are no mechanisms whereby the proposed action could cause impacts of a scope and scale that would cause long term decrease in the population of nesting Flatbacks in the CG area. The impact avoidance and minimization measures outlined in Table 12 result in nil to negligible impacts. Recovery of the population would be supported should the proposed action proceed, as outlined in the last row below.	No significant impact
– *reduce the area of occupancy of an important population,*	The main areas of occupation are the nesting beaches and the waters off the beaches, neither of which will be reduced by the proposed action.	No significant impact
– *fragment an existing important population into two or more populations,*	There are no mechanisms whereby the proposed action could fragment the population of nesting Flatbacks in the CG area.	No significant impact
– *adversely affect habitat critical to the survival of a species,*	The critical habitats are the nesting beaches and the waters off the beaches, neither of which will be adversely affected by the proposed action.	No significant impact
– *disrupt the breeding cycle of an important population,*	The SPV will be permanently fitted with turtle safe lighting in accordance with the *National Light Pollution Guidelines for Wildlife* (Commonwealth of Australia, 2020). In any case SPV lighting in the POA will not be visible to nesting and hatching turtles due to the distances between the turtle nesting sites and the POA, their geographical aspect and screening by geographical features. As an added precaution the SPV will enter and depart CG via West Entrance (west of Lacrosse Island), which is 16 km away from the most important nesting beach at Cape Domett and screened from it by Lacrosse Island, also screened from the seaward nesting beach west of Cape Dussejour, and 22 km from the nesting site at Barnett Point.	No significant impact

Threatened (vulnerable) species significant impact criteria	**Proposed sand-sourcing Operation Impact Assessment**	**Outcome**
– *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,*	EPBC Referral Reports No. 5 and No. 8 assessed potential changes to sediment transport and coastal processes from the proposed action, including potential changes to the morphology of the nesting beaches, and finds no changes to beach morphology either during or at the end of the 15-year project timeframe.	No significant impact
– *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat,*	Potential invasive species introductions will be addressed by the SPV complying with the IMO BWM Convention and IMO Biofouling Guidelines, and with the Australian Biosecurity Act & Regulations, being fitted with IMO-compliant ballast water treatment systems, and adhering to a stringent biofouling management regime in compliance with the Biosecurity Act. The DCCEEW Significant Impact Guidelines explicitly state that implementation of these measures would be expected to prevent significant impact.	No significant impact
– *introduce disease that may cause the species to decline; or*	As per invasive species. Also, the POA is geographically distant and separated from the nesting sites (e.g. 12 km to Cape Domett) and there will be zero shore-based facilities or activities that could be potential vectors for diseases.	No significant impact
– *interfere substantially with the recovery of the species.*	Recovery of the species would be supported should the proposed action proceed, as BKA will seek to implement and support a comprehensive environmental and biodiversity research and monitoring program, in consultation and cooperation with relevant stakeholders. This would further assist protection and conservation of this species both in CG and in other areas. BKA is already cooperating with DBCA with a data-sharing agreement, undertaking analysis of Cape Domett turtle nesting data for DBCA and sharing all survey and study results with DBCA.	No significant impact

TABLE 14: *Assessment of potential impacts on Flatback Turtles according to migratory species significant impact criteria.*

Migratory species significant impact criteria	**Proposed Sand-sourcing Operation Impact Assessment**	**Outcome**
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:		
– *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,*	The important habitats are the nesting beaches and the waters off the beaches, neither of which will be substantially modified, destroyed or isolated by the proposed action. EPBC Referral Reports No. 5 and No. 8 assessed potential changes to sediment transport and coastal processes from the proposed action, including potential changes to the morphology of the nesting beaches, and finds no changes to beach morphology either during or at the end of the 15-year project timeframe.	No significant impact
– *result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or*	Potential invasive species introductions will be addressed by the SPV complying with the IMO BWM Convention and Biofouling Guidelines, and with the Australian Biosecurity Act & Regulations, being fitted with IMO-compliant ballast water treatment systems, and adhering to a stringent biofouling management regime. The DCCEEW Significant Impact Guidelines explicitly state that implementation of these measures would be expected to prevent significant impact.	No significant impact
– *seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.*	The SPV will be permanently fitted with turtle safe lighting in accordance with the *National Light Pollution Guidelines for Wildlife* (Commonwealth of Australia, 2020). In any case SPV lighting in the POA will not be visible to nesting and hatching turtles due to the distances between the turtle nesting sites and the POA, their geographical aspect and screening by geographical features. As an added precaution the SPV will enter and depart CG via West Entrance (west of Lacrosse Island), which is 16 km away from the most important nesting beach at Cape Domett and screened from it by Lacrosse Island, also screened from the seaward nesting beach west of Cape Dussejour, and 22 km from the nesting site at Barnett Point.	No significant impact

10.3 Specific Assessment for Snubfin Dolphins

10.3.1 Snubfin Dolphin conservation status

1. Australian Snubfin Dolphins *(Orcaella heinsohni)* are classified as MNES through their listing as a migratory species under the EPBC Act. However, very little is known about the migration patterns of this species (DCCEEW 2024). Movements may only be in local areas (e.g. short seasonal inshore-offshore migrations) The definition of migratory species under the EPBC Act is derived from the international *Convention on Migratory Species* (CMS), and comprises species where:

   > *'the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries'*.

2. The Australian Snubfin Dolphin was described as a separate, Australian-specific species in 2005. While they may be found in southern Indonesia and Papua New Guinea, they generally do not leave coastal waters and it is likely that populations are distinct and do not *cyclically and predictably cross one or more national jurisdictional boundaries*.

3. Brown et al (2014) found that even within WA coastal waters the populations of Snubfins associated with different geographical areas are genetically distinct. This species may therefore not actually meet the EPBC definition of 'migratory, which gives them MNES status.

4. The species is not currently listed as threatened under the EPBC Act. However, it is currently being assessed by DCCEEW for possible threatened status, with findings due in October 2024 (not available at the time of this report). If it is listed as threatened this would also give the species MNES status.

5. Australian Snubfin Dolphins are also afforded general protection under the EPBC Act as both 'cetaceans' and marine' species. They are also protected by the WA *Biodiversity Conservation Act* under which they are also classified as 'migratory' and 'rare in need of monitoring' (noting the point above that they do not actually meet the CMS definition of migratory).

10.3.2 BIA & population in CG area

1. As outlined in section 7 the Commonwealth has designated a breeding, calving, feeding and resting BIA for Australian Snubfin Dolphins (*Orcaella heinsohni)* in the CG area, which overlaps the POA, as per Figure 8 in section 7.

2. The presence of a small population of Snubfins in the CG area was reported by Brown et al (2016, 2017), who conducted dedicated dolphin surveys in CG as well as other sites along the Kimberly coast west to Roebuck Bay (Broome). They found that the number of Snubfins in CG was much lower than at the other sites surveyed, and for previous surveys in the Dampier Archipelago. They made 34 sightings over nine days, with repeat sightings possibly being the same individuals. They identified six as distinct individuals. This compared to 140 identified individual Snubfin Dolphins in Roebuck Bay. The significantly lower number of Snubfins in CG could relate to the extreme environmental conditions and food limiting factors in CG compared to other sites (see EPBC Referral Report No. 2 - section 9 on Marine Fauna).

3. Brown et al (2016, 2017) made no sightings in the POA itself - they were mostly observed offshore outside of CG, on the western side of CG near Cape Dussejour and a group of four to five south of Adolphus Island.

4. As outlined in section 10.2.2, BKA commissioned dedicated on-water MMF surveys in CG over nine-days in February 2024 and eight-days in July 2023, covering over 800 km of transects for each survey (Figure 28). The full results of these survey are presented in EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 14 - *Marine Mega-fauna Surveys Report*. These surveys included observing for Snubfins throughout CG and in the POA, with the following findings (in all sightings the dolphins were swimming purposefully and directionally) (Figure 29):

   - Feb 2024 (wet season): Four sightings, two of which were in the POA.
   - July 2023 (dry-season): 11 sightings, two of which were in the POA and one was adjacent.

5. The number of sightings cannot be directly compared to the surveys by Brown et al (2016, 2017), as in addition to CG, they also surveyed a larger area out into Joseph Bonaparte Gulf and 50 kms westward along the coast to the Berkley River and up that river, with most of their sightings being offshore and not in CG.

6. Overall, for all surveys, most of the sightings that occurred within CG were in the southern part of the gulf towards and around Adolphus Island, which is 20 km south of the closest (southern) boundary of the POA. During consultations with the local commercial fisherman who has over 20-years of experience working in CG, he confirmed that Snubfins are mostly seen near and around Adolphus Island (Douglas pers comms 2024). This may be where their preferred food source is located - small fish, crustaceans and cephalopods (Marsh et al 1989). Douglas (pers. comms 2024) also advised that there is a marked reduction in sightings of Snubfin Dolphins in CG in the wet season, as per the BKA survey results (11 in dry-season versus four in wet-season, with similar survey effort), as they seem to move to other areas, possibly offshore away from the wet season freshwater and terrestrial sediment inputs.

10. The number and proportion of sightings for all surveys within the POA were very small (zero for Brown et al, two plus one adjacent for BKA 2023 and two for BKA 2024), and noting that repeat sightings could be the same individual(s), especially over subsequent days. Never-the-less, Snubfin Dolphins were sighted in POA, indicating that they do transit through this area. It is therefore necessary to assess the potential for interactions between the Sand Production Vessel (SPV) and Snubfin Dolphins and any resulting impacts. These are addressed in summary in Table 15 below and in detail in section 10 (Marine Fauna) of EPBC Referral Report No. 4 - Boskalis Cambridge Gulf - *Impact Assessments*.

10.3.3 Application of impact mitigation hierarchy

1. In accordance with WA EPA guidelines BKA has applied the impact mitigation hierarchy as follows, in order of priority:

   - avoid impacts,
   - minimize impacts,
   - offset impacts; and
   - rehabilitate impacts.

2. Table 15 presents the mitigation hierarchy applied to the assessment of potential impacts from the proposed sand-sourcing operation on Snubfin Dolphins. The potential impacts are identified as potential vessel strike and potential underwater noise impacts from the SPV. Table 15 shows that the residual impacts after application of the hierarchy are nil to negligible.

TABLE 15: *Mitigation hierarchy & assessment of residual impacts for Snubfin Dolphins* (*Orcaella heinshoni*).

Potential Impact of the proposal	**Impact Avoidance / Prevention**	**Impact Minimization / Mitigation**	**Rehabilitation & Offsets**	**Residual Impacts**
Potential vessel strike by the SPV:	Low presence of these species in the POA. Naturally shy and elusive behaviour of these species, which unlike other dolphin species avoid vessels. Low presence of the SPV in CG (zero presence 86% of time during project lifespan).	Low operational speed of the SPV (~2knots). Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4).	None required. Never-the-less, should the proposed action proceed, BKA will seek to implement a comprehensive environmental and biodiversity research and monitoring program, in consultation and cooperation with relevant stakeholders. This would further assist protection and conservation of these species both in CG and in other areas.	Negligible. As with any vessel operating at sea there is always a possibility of an interaction with marine fauna. The measures listed in the columns to left make the likelihood very low.
Potential underwater noise impacts from the SPV:	Low presence of these species in the POA. Naturally shy and elusive behaviour of these species, which unlike other dolphin species avoid vessels. Low presence of the SPV in CG (zero presence 85% of time during project lifespan). Separation of the sound generation profiles of the SPV and the sound repertoires of the dolphin species. Naturally very high suspended sediment concentrations in CG which reduces sound propagation (WODA 2015). Naturally high sound levels from high tidal range which can mask other sound sources (Marely et al 2017).	The SPV will be a 'newbuild' vessel and will incorporate relevant best practice noise reduction measures from the design-phase, as per the IMO 2023 Underwater Noise Guidelines (IMO 2023). As the design parameters for the SPV mature (it is still in conceptual phase), modelling of likely noise emissions will be undertaken in accordance with the IMO Guidelines, and used to inform optimum design and incorporation of noise reduction measures. Implementation of best-practice Marine Mega-fauna (MMF) observation and avoidance systems and procedures, in accordance with relevant guidelines (see also Annex 4 of EPBC Referral Report No. 4).	None required. Never-the-less, should the proposed action proceed, BKA will seek to support research and monitoring of the acoustic characteristics of the two dolphin species and of the CG environment, in close coordination with relevant stakeholders, including DBCA and the local TO ranger groups. This will provide scientific data to support improved protection, conservation and management of these species, both in CG and in other areas.	Nil

10.3.4 Assessment against EPBC Act significant impact criteria

1. Because this report is intended to support the assessment of potential significant impacts on Commonwealth MNES, it is necessary to assess the potential for the proposed sand-sourcing operation to cause significant impacts on Snubfin Dolphins in accordance with the EPBC Act significant impact criteria.

2. Snubfin Dolphins are classified as MNES because they are listed as a 'migratory' species, although as outlined above it is questionable whether or not they meet the trans-national definition of migratory under the Convention on Migratory Species. Never-the-less, Table 16 assesses potential impacts of the proposed sand-sourcing operation in accordance with the EPBC Act significant impact criteria for migratory species.

3. Table 16 shows that for all criteria the proposed action will not cause significant impacts as defined by the EPBC Act guidelines.

TABLE 16: *Assessment of potential impacts on Snubfin Dolphins according to migratory species significant impact criteria.*

Migratory species significant impact criteria	**Proposed Sand-sourcing Operation Impact Assessment**	**Outcome**
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:		
– *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,*	The important habitat are the waters of CG and offshore from CG in Joseph Bonaparte Gulf, which will not be substantially modified, destroyed or isolated by the proposed operation.	No significant impact
– *result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or*	Potential invasive species introductions will be addressed by the SPV complying in full with the IMO BWM Convention and IMO Biofouling Guidelines, and with the Australian Biosecurity Act & Regulations, being fitted with IMO-compliant ballast water treatment systems, and adhering to a stringent biofouling management regime. The DCCEEW Significant Impact Guidelines explicitly state that implementation of these measures would be expected to prevent significant impact.	No significant impact
– *seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.*	It is highly unlikely that the proposed action would seriously disrupt the lifecycle of an ecologically significant proportion of the population of Snubfin Dolphins in the CG area, given: – the restricted scope and scale of the proposed operation as outlined in section 8, including zero operational presence in CG for 86% of the time, small areal coverage of only 0.5 km^2 during each 1 to 2-day sand loading cycle, and two-week gaps between cycles, – the large scope and scale of the species' lifecycle habitats in the area (1,000s of km^2), – the very low number of sightings in CG and even lower number of sightings in the POA; and – application of the mitigation hierarchy outlined in Table 15 in section 10.3.3 above. Knowledge and understanding of the lifecycle and population dynamics of Snubfin Dolphins in both the CG area and other areas will be improved if the proposed action proceeds, as BKA will seek to implement a comprehensive environmental and biodiversity research and monitoring program, in consultation and cooperation with relevant stakeholders. This would further assist protection and conservation of these species both in CG and in other areas.	No significant impact

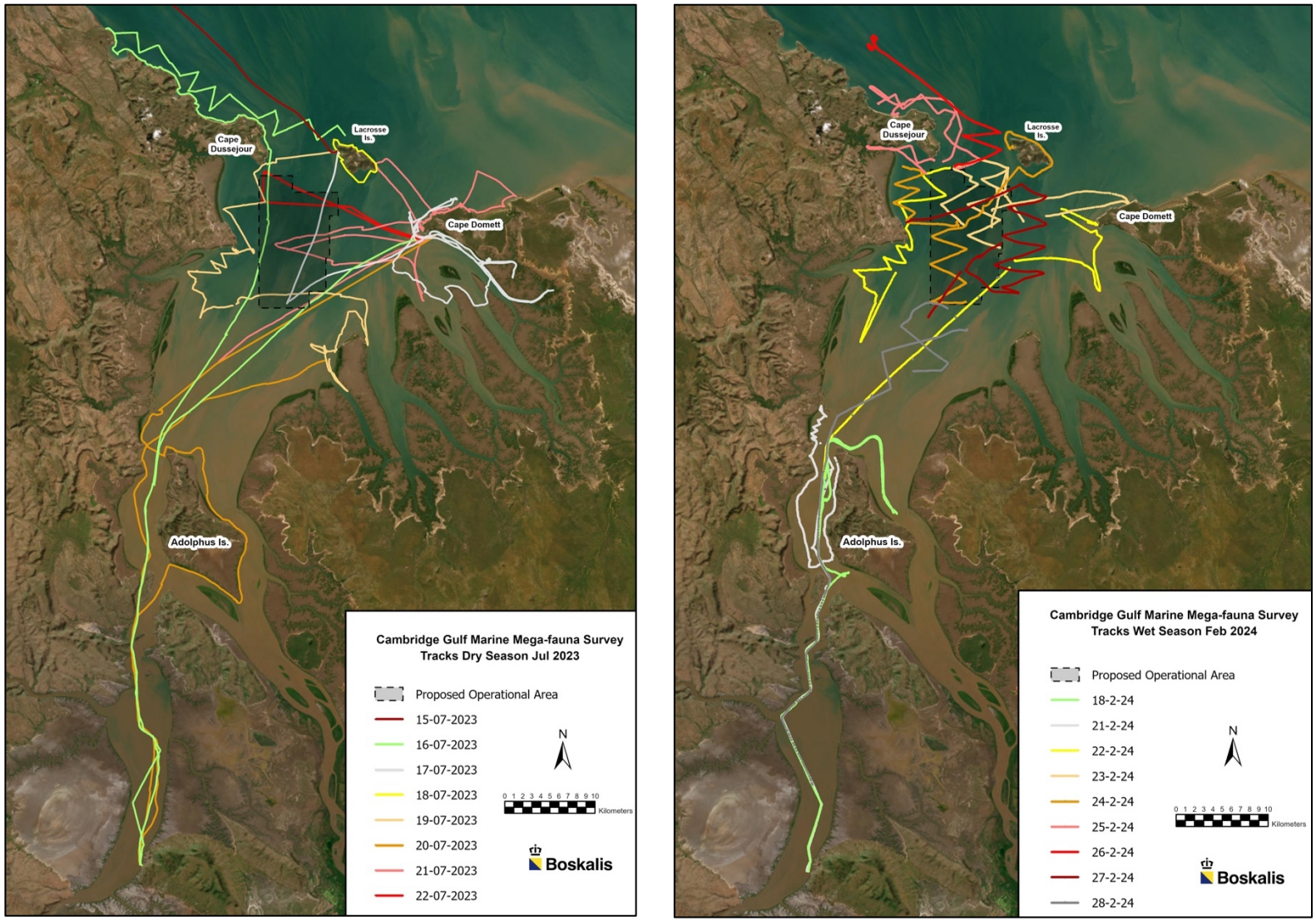


FIGURE 28: *Left: Dry-season MMF survey tracks. Right: Wet-season MMF survey tracks* (EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 14 - *Marine Mega-fauna Surveys Report*).

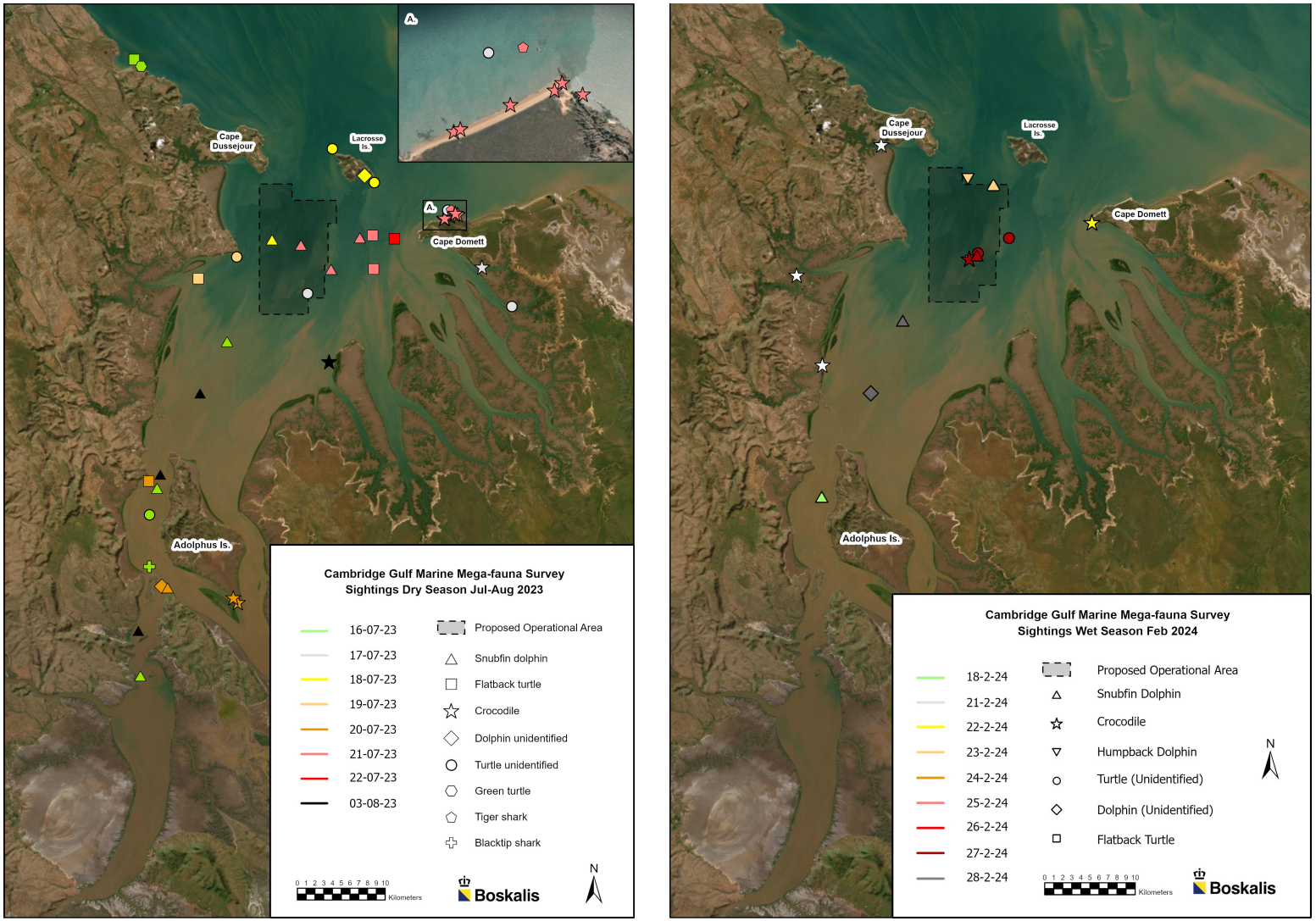


FIGURE 29: *Left: Dry-season MMF sightings. Right: Wet-season MMF sightings* (EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 14 - *Marine Mega-fauna Surveys Report*).

10.4 Threatened Species Assessment Tables

From PMST search as presented in Annex 1.

TABLE 17: *Assessment of potential for significant impacts on Listed Threatened Species – CRITICALLY ENDANGERED & ENDANGERED* ***BIRDS***

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Calidris canutus Red Knot Endangered  *Image credit: C Holmer*	• The PMST search states that the species or its habitat may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in PMST. • The Red Knot is a migratory wader / shorebird that feeds along the shoreline and roosts on sandy beaches. It is therefore highly unlikely that it would be found in the open-water marine area of the POA.	An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will: • lead to a long-term decrease in the size of a population, • reduce the area of occupancy of the species, • fragment an existing population into two or more populations, • adversely affect habitat critical to the survival of a species, • disrupt the breeding cycle of a population, • modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, • result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat, • introduce disease that may cause the species to decline; or • interfere with the recovery of the species.	Given that it is highly unlikely that the Red Knot would be found in the open-water marine area of the POA, there is almost no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error - not actually found in the POA (shore bird)
Calidris ferruginea Curlew Sandpiper Critically Endangered  *Image credit: eBird*	• The PMST search states that the species or its habitat is known to occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The Curlow Sandpiper is a migratory wader / shorebird that feeds along the shoreline and roosts above the high tide line. It is therefore highly unlikely that it would be found in the open-water marine area of the POA.	"	Given that it is highly unlikely that the Curlow Sandpiper would be found in the open-water marine area of the POA, there is almost no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error - not actually found in the POA (shore bird)

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Erythrotriorchis radiatus Red Goshawk Endangered  *Image credit: eBird*	• The PMST search states that the species or its habitat is likely to occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The Red Goshawk is a bird of prey that inhabits savannah woodland. It may be present in the coastal areas of CG but it is not a sea hawk and is unlikely to be found in the open-water marine area of the POA, except perhaps the occasional bird flying over the area from one side of CG to the other.		Given that it is highly unlikely that the Red Goshawk would be found in the open-water marine area of the POA, there is almost no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error – unlikely to be found in the POA (not a marine bird)
Erythrura gouldiae Gouldian Finch Endangered  *Image credit: N Hobgood*	• The PMST search states that the species or its habitat is likely to occur in the 10 km buffer area only. • The Gouldian Finch is a very small land-based seed-eating bird that nests in tree hollows – so it would only be present on land areas around CG.	"	Although it could possibly be found on coastal land in the 10 km buffer, given that it is highly unlikely that the Gouldian Finch would be found in the open-water marine area of the POA, there is almost no potential for any of the significant impacts listed in the criteria.	**No significant impact**
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew Critically Endangered  *Image credit: JJ Harrison*	• The PMST search states that the species or its habitat is known to occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The Eastern Curlow is a large migratory wader that feeds along the shoreline and roosts above the high tide line. It is therefore highly unlikely that it would be found in the open-water marine area of the POA.	"	Given that it is highly unlikely that the Eastern Curlew would be found in the open-water marine area of the POA, there is almost no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error - not actually found in the POA (shore bird)

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Rostratula australis Australian Painted Snipe Endangered  *Image credit: eBird*	• The PMST search states that the species or its habitat is likely to occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The Australian Painted Snipe is a stout shorebird that feeds along the shoreline and nests on the ground. It is therefore highly unlikely that it would be found in the open-water marine area of the POA.	"	Given that it is highly unlikely that the Australian Painted Snipe would be found in the open-water marine area of the POA, there is almost no potential for any of the significant impacts listed in the criteria. Figure 30 below shows the critical ecosystem components and processes that contribute to the survival of the Painted Snipe (from Hale 2008) and how the proposed sand-sourcing operation relates to each, indicating no potential for significant impacts on any of the components and processes. A similar model applies to all of the listed bird species that have similar coastal, wetland and terrestrial habitats.	**No significant impact** PMST resolution error - not actually found in the POA (shore bird)

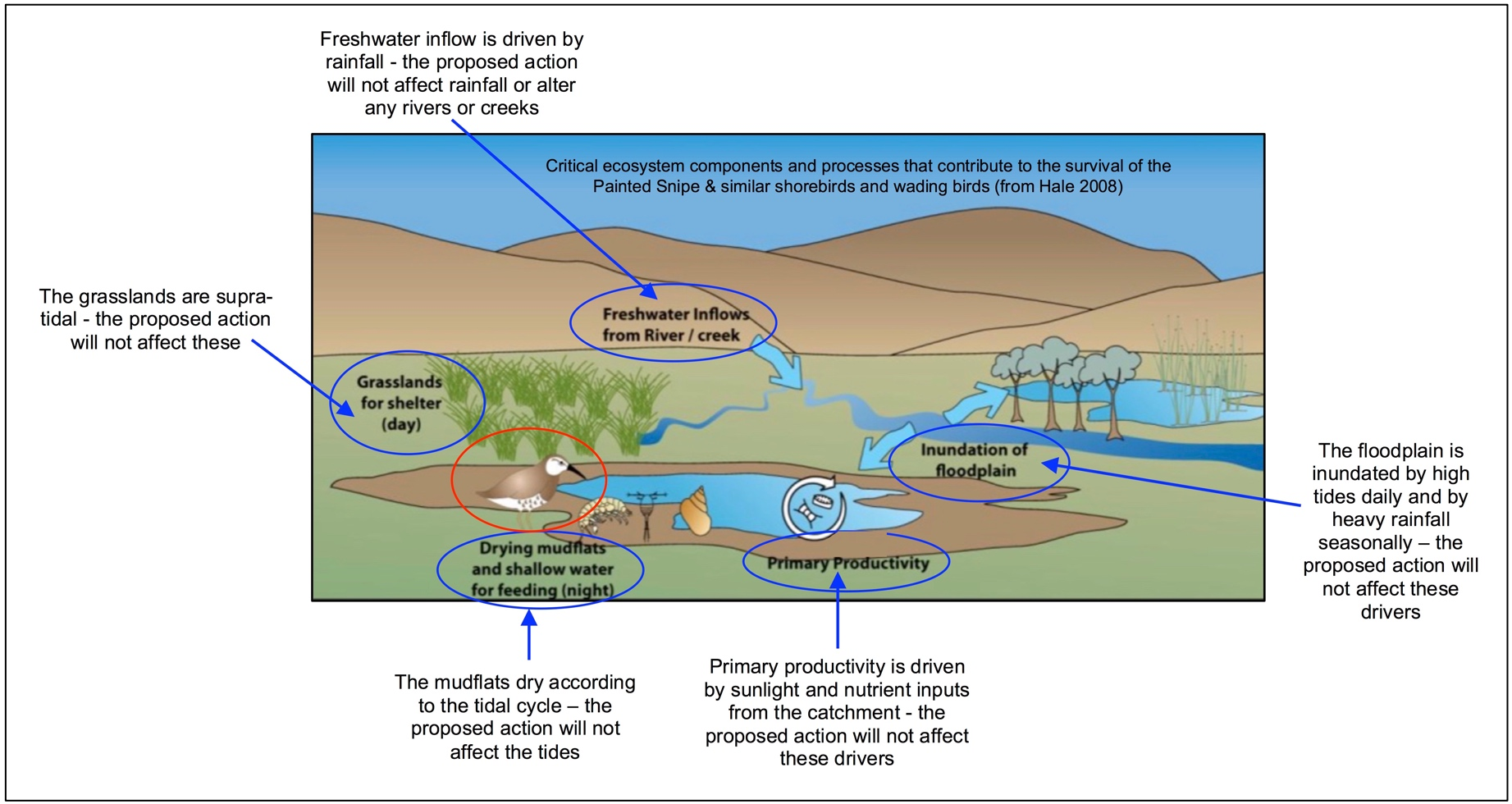


FIGURE 30: *The critical ecosystem components and processes that contribute to the survival of the Painted Snipe (from Hale 2008) and how the proposed sand-sourcing operation relates to each, indicating no potential for significant impacts on any of the components and processes. A similar model applies to all of the listed bird species that have similar coastal, wetland and terrestrial habitats.*

TABLE 18: *Assessment of potential for significant impacts on Listed Threatened Species – VULNERABLE **BIRDS***

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover Vulnerable  *Image credit: eBird*	• The PMST search states that the species or its habitat is likely to occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The Greater Sand Plover is a small migratory shorebird that feeds along the shoreline and roosts on sand-spits, sand-banks, beaches and occasionally on rocky points. • It is therefore highly unlikely that it would be found in the open-water marine area of the POA.	An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will: • lead to a long-term decrease in the size of an important population of a species, • reduce the area of occupancy of an important population, • fragment an existing important population into two or more populations, • adversely affect habitat critical to the survival of a species, • disrupt the breeding cycle of an important population, • modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, • result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, • introduce disease that may cause the species to decline; or • interfere substantially with the recovery of the species.	Given the wholly marine nature of the proposed action, and that it is highly unlikely that the Greater Sand Plover would be found in the open-water marine area of the POA, there is almost no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error - not actually found in the POA (shore bird)
Falco hypoleucos Grey Falcon Vulnerable  *Image credit: Barraimaging*	• The PMST search states that the species or its habitat is likely to occur in the 10 km buffer area only. • The Grey Falcon is a very rare Australian endemic, usually confined to the arid inland. It inhabits Triodia grassland, Acacia shrubland and lightly timbered arid woodland. It may be present in the coastal areas of CG but it is not a seabird and is unlikely to be found in the open-water marine area of the POA, except perhaps the occasional bird flying over the area from one side of CG to the other.	"	Although it could possibly be found on coastal land in the 10 km buffer, given the wholly marine nature of the proposed action, and that it is highly unlikely that the Grey Falcon would be found in the open-water marine area of the POA, there is almost no potential for any of the significant impacts listed in the criteria.	**No significant impact**

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Falcunculus frontatus whitei Crested Shrike-tit (Northern) Vulnerable  *Image credit: eBird*	• The PMST search states that the species or its habitat is likely to occur in the 10 km buffer area only. • The Crested Shrike-tit is an Australian endemic which inhabits open Eucalypt woodlands and feeds mainly on insects, spiders, seeds and, sometimes, particularly during the breeding season, young birds. • It may be present in the coastal areas of CG but it is not a seabird and is unlikely to be found in the open-water marine area of the POA.	"	Although it could possibly be found on coastal land in the 10 km buffer, given the wholly marine nature of the proposed action, and that it is highly unlikely that the Crested Shrike-tit would be found in the open-water marine area of the POA, there is almost no potential for any of the significant impacts listed in the criteria.	**No significant impact**
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit Vulnerable  *Image credit: eBird*	• The PMST search states that the species or its habitat may occur in the 10 km buffer area only. • The Bar-tailed Godwit is a large, highly migratory wader that feeds along the shoreline and roosts above the high tide line. It is therefore highly unlikely that it would be found in the open-water marine area of the POA.	"	Although it may be found on coastal land in the 10 km buffer, given the wholly marine nature of the proposed action, and that it is highly unlikely that the Bar-tailed Godwit would be found in the open-water marine area of the POA, there is almost no potential for any of the significant impacts listed in the criteria.	**No significant impact**
Tyto novaehollandiae kimberli Masked Owl (northern) Vulnerable  *Image credit: eBird*	• The PMST search states that the species or its habitat may occur in the 10 km buffer area only. • The Masked Owl is a bird of prey that inhabits savannah woodland. It may be present in the coastal areas of CG but it is not a seabird and is unlikely to be found in the open-water marine area of the POA.	"	Although it may be found on coastal land in the 10 km buffer, given the wholly-marine nature of the proposed action, and that it is highly unlikely that the Masked Owl would be found in the open-water marine area of the POA, there is almost no potential for any of the significant impacts listed in the criteria.	**No significant impact**

TABLE 19: *Assessment of potential for significant impacts on Listed Threatened Species – CRITICALLY ENDANGERED & ENDANGERED* ***MAMMALS***

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Balaenoptera musculus Blue Whale Endangered  *Image credit: earth.com*	• The PMST search states that the species or its habitat may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The potential presence of this species relates to the estimated overall bio-geographical range of the species, which could extend over the general area of CG. However, it does not automatically mean that this species is actually or is likely to be present. • The environmental conditions in CG, including shallow water depth (mean 112m LAT), relative to the requirements and preferences of this species make it extremely unlikely that they would enter the CG. • Whales are also generally absent from the adjacent offshore waters of Joseph Bonaparte Gulf, due to their relative shallowness (15 to 75 m LAT) (Galaiduk et al. 2018). • Satellite tagging studies and BIA maps shows that Blue Whales undertake annual migrations along the west coast of WA and north past East Timor to the Banda Sea, and not east to Joseph Bonaparte Gulf and Cambridge Gulf (Figure 31).	An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will: • lead to a long-term decrease in the size of a population, • reduce the area of occupancy of the species, • fragment an existing population into two or more populations, • adversely affect habitat critical to the survival of a species, • disrupt the breeding cycle of a population, • modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, • result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat, • introduce disease that may cause the species to decline; or • interfere with the recovery of the species.	Given that it is highly unlikely that Blue Whales would be found in the POA, or even in CG or JBG generally, and given the nature of the proposed action, there is no potential for any of the significant impacts listed in the criteria. In any case the SPV will have marine mega-fauna observation and avoidance measures (see also Annex 4 of EPBC Referral Report No. 4).	**No significant impact** PMST resolution error - not actually found in the POA or CG overall (migration routes are ~1,000 km to the west, water depth too shallow and environmental conditions are not suitable in CG).
Dasyurus hallucatus Northern Quoll Endangered  *Image credit: ABC*	• The PMST search states that the species or its habitat is likely to occur in the 10 km buffer area only. • The Northern Quoll is a terrestrial species that inhabits rocky areas, eucalypt woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. • It may be present in the coastal areas of CG but it would not be found in the open-water marine area of the proposed operational area.	"	Although it may be found on coastal land in the 10 km buffer, given the wholly marine nature of the proposed action, and that the Northern Quoll would not be found in the open-water marine area of the POA, there is no potential for any of the significant impacts listed in the criteria.	**No significant impact**

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Mesembriomys gouldii gouldii Black-footed Tree-rat Endangered  *Image credit: AWRC*	• The PMST search states that the species or its habitat may occur in the 10 km buffer area only. • The Black-footed Tree-rat is a terrestrial species that inhabits lowland open forests and woodlands, particularly those dominated by *Eucalyptus miniata* and/or *E. tetrodonta* with well-developed shrubby understoreys. The subspecies is nocturnal and forages in trees and on the ground. • It may be present in the coastal areas of CG but it would not be found in the open-water marine area of the POA.	“	Although it may be found on coastal land in the 10 km buffer, given the wholly marine nature of the proposed action, and that the Black-footed Tree-rat would not be found in the open-water marine area of the POA, there is no potential for any of the significant impacts listed in the criteria.	**No significant impact**
Petrogale concinna monastria Nabarlek Endangered  *Image credit: ZooChat*	• The PMST search states that the species or its habitat is likely to occur in the 10 km buffer area only. • The Nabarlek is a small marsupial macropod (related to wallabies and kangaroos) that is shy and nocturnal and restricted to granite and sandstone rocky cliffs, hills and gorges. Its diet is grasses, sedges and ferns found in and around their scrub-covered refuges. • It may be present in the coastal areas of CG but it would not be found in the open-water marine area of the POA.	“	Although it may be found on coastal land in the 10 km buffer, given the wholly marine nature of the proposed action, and that the Nabarlek would not be found in the open-water marine area of the POA, there is no potential for any of the significant impacts listed in the criteria.	**No significant impact**

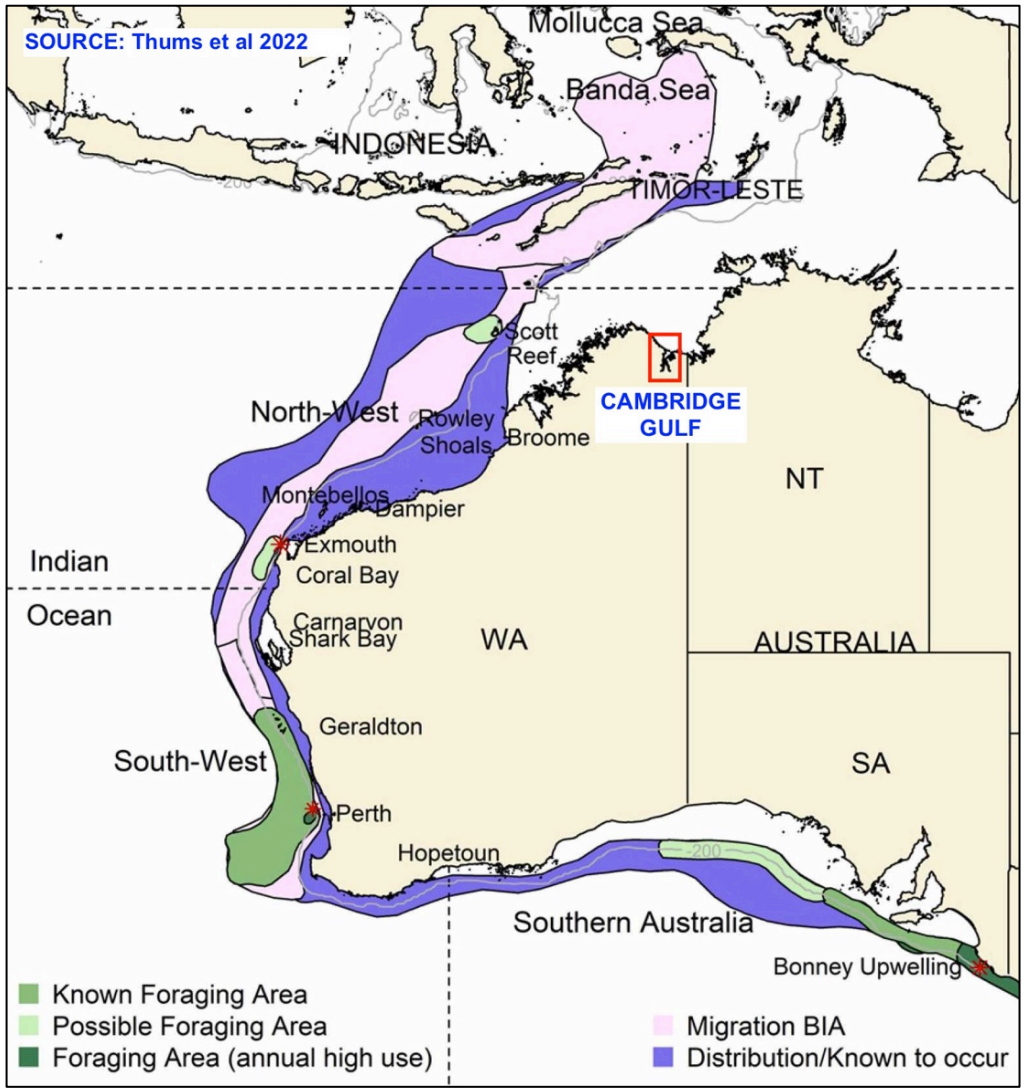


FIGURE 31: *Satellite tagging studies show that Blue Whales undertake annual migrations along the west coast of WA north past Timor Leste to the Banda Sea, and not east to Joseph Bonaparte Gulf and Cambridge Gulf (Thums et al 2022).*

TABLE 20: *Assessment of potential for significant impacts on Listed Threatened Species – VULNERABLE **MAMMALS***

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Macroderma gigas Ghost Bat Vulnerable  *Image credit: D MacKenzie*	• The PMST search states that the species or its habitat is likely to occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST – the Ghost Bat is not a marine species. • The Ghost Bat is the only Australian bat that preys on large vertebrates – birds, reptiles and other mammals – which it detects using acute sight and hearing, combined with echolocation, while waiting in ambush at a perch. It roosts in caves, old mine tunnels and in deep cracks in rocks. It does not normally fly over the sea. • It may be present in the coastal areas of CG but it would not be found in the open-water marine area of the POA.	An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will: • lead to a long-term decrease in the size of an important population of a species, • reduce the area of occupancy of an important population, • fragment an existing important population into two or more populations, • adversely affect habitat critical to the survival of a species, • disrupt the breeding cycle of an important population, • modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, • result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, • introduce disease that may cause the species to decline; or • interfere substantially with the recovery of the species.	Given the wholly marine nature of the proposed action, and that the Ghost Bat would not be found in the open-water marine area of the POA, there is no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error - not actually found in the POA (land-based bat)
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat Vulnerable  *Image credit: Aus Museum*	• The PMST search states that the species or its habitat is likely to occur in the 10 km buffer area only. • The Bare-rumped Sheathtail Bat is an insectivorous bat that occurs primarily in tropical eucalypt woodland and possibly rainforest, in the coastal lowlands of north-eastern Queensland and the Top End of the Northern Territory. It 'may' occur in tropical WA. • It could potentially be present in the coastal areas of CG but it would not be found in the open-water marine area of the POA.	"	Although it may be found on coastal land in the 10 km buffer, given the wholly marine nature of the proposed action, and that the Bare-rumped Sheath-tailed Bat would not be found in the open-water marine area of the POA, there is no potential for any of the significant impacts listed in the criteria.	**No significant impact**

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Trichosurus vulpecula arnhemensis Northern Brushtail Possum Vulnerable  *Image credit: Open source*	• The PMST search states that the species or its habitat may occur in the 10 km buffer area only. • The Northern Brushtail Possum is a nocturnal semi-arboreal marsupial. It occurs mainly in tall eucalypt open forests with large hollow-bearing trees, particularly where the understorey includes some shrubs that bear fleshy fruits, which they feed on. • It could potentially be present in the coastal areas of CG but it would not be found in the open-water marine area of the POA.	"	Although it may be found on coastal land in the 10 km buffer, given the wholly marine nature of the proposed action, and that the Northern Brushtail Possum would not be found in the open-water marine area of the POA, there is no potential for any of the significant impacts listed in the criteria.	**No significant impact**
Xeromys myoides Water Mouse / False Water Rat Vulnerable  *Image credit: iNaturalist*	• The PMST search states that the species or its habitat is likely to occur in the 10 km buffer area only. • The Water Mouse is a small native rodent recorded from coastal saltmarsh including samphire shrublands, saline reed-beds and saline grasslands, mangroves and coastal freshwater wetlands. • It is almost certainly present in the wetland habitats along the coastal areas of CG, but would not be found in the open-water marine area of the POA.	"	Although it may be found on coastal land in the 10 km buffer, given the wholly marine nature of the proposed action, and that the Water Mouse would not be found in the open-water marine area of the POA, there is no potential for any of the significant impacts listed in the criteria.	**No significant impact**

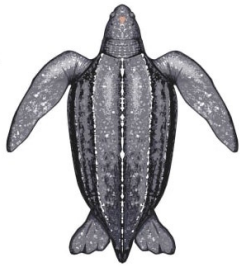
TABLE 21: *Assessment of potential for significant impacts on Listed Threatened Species – CRITICALLY ENDANGERED & ENDANGERED* ***REPTILES***

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**

Aipysurus apraefrontalis Short-nosed Seasnake
 	
Critically Endangered
 	
 
Image credit: V Udyawar
	• The PMST search states that the species or its habitat may occur in the 10 km buffer area.
	
	• The general geographical range of this species includes the CG area and it could thus potentially be present.
	
	• While CG is within the general geographic range of many of the seasnake species that are found in northern Australian waters, no published records of sightings in CG were identified through literature search. A local commercial fisherman with over 20-years of experience in CG advised that seasnakes are not seen in CG (Douglas pers. comms. 2024).
	
	• Seasnakes were not observed during BKA's three environmental survey campaigns in CG, either in the systematic MMF surveys or incidental observations. Several seasnakes were observed on the sea surface in Joseph Bonaparte Gulf offshore from CG (see EPBC Referral Report No. 2)
	
	• The environmental conditions and general lack of food sources discussed in Referral Report No. 2 may be the reason why seasnakes are not seen in CG.
		An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
		• lead to a long-term decrease in the size of a population,
		• reduce the area of occupancy of the species,
		• fragment an existing population into two or more populations,
		• adversely affect habitat critical to the survival of a species,
		• disrupt the breeding cycle of a population,
		• modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,
		• result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat,
		• introduce disease that may cause the species to decline; or
		• interfere with the recovery of the species.
			• There is potential for interaction between the SPV and any seasnakes that might be present in the POA during the short 24 to 48-hour periods when the SPV will be present every 2 weeks.
			
			• Potential for collision is very low due to:
			  • The low likelihood of seasnakes actually being present, based on surveys to date.
			  • The short duration (24-48 hours) of each cycle of presence of the SPV – with 10 to 14-day gaps between cycles.
			  • SPV will operate at very low speed (~2 knots).
			  • SPV will have marine mega-fauna observation and avoidance measures.
			  • SPV will have marine mega-fauna deterrence /exclusion device on the sand uptake drag head.
			
			• The potential for noise disturbance is low as seasnakes are amongst the least noise sensitive marine species (Chapius et al 2019), the SPV will only be present for short periods each cycle with gaps in between, it will operate at very low speeds (2 knots) and will be a new-build vessel with noise reduction measures as per IMO Guidelines (IMO 2023).
			
			• Overall, even in the highly unlikely event of an interaction between the SPV and the occasional seasnake, significant impacts as outlined in the Significant Impact Criteria would not be caused.
				No significant impact

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Aipysurus foliosquama Leaf-scaled Seasnake Critically Endangered  *Image credit: Aus Geographic*	• As per Short-nosed Seasnake above.	"	• As per Short-nosed Seasnake above.	**No significant impact**

Caretta caretta Loggerhead Turtle
 	
Endangered
 	
 
 	
	• The PMST search states that the species or its habitat is likely to occur in the POA.
	
	• The global geographical range of this species includes the CG area and thus it could potentially occur, although it does not seem 'likely'.
	
	• The main rookeries (nesting sites) for Loggerheads are in the southern Great Barrier Reef and along the WA coast from Shark Bay to North West Cape (1,600 km from Cambridge Gulf) (DCCEEW).
	
	• Loggerhead Turtles are carnivorous, feeding primarily on benthic invertebrates. Given the lack of benthic invertebrates in CG (due to aphotic conditions and high current velocities near the seabed) (see EPBC Referral Report No. 2) it seems unlikely that Loggerheads would be found in the Gulf – it is not suitable feeding habitat.
	
	• No previous records of Loggerheads in CG were identified by literature search. Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe any Loggerheads. The main turtle species observed were Flatbacks *(Natator depressus),* associated with nearby nesting beaches, and one Green *(Chelonoa mydas).*
		"	• The most significant marine turtle species in the CG area is the Flatback Turtle (*Natator depressus*), and a separate, specific assessment for that species is presented in section 10.2.
			
			• There is potential for interaction between the SPV and any Loggerhead Turtles that 'might' be present in the POA during the short 24 to 48-hour periods when the SPV will be present every 2 weeks.
			
			• Potential interactions include physical collision and low-level noise disturbance.
			
			• The potential for physical collision is very low due to:
			  • The low likelihood of Loggerheads actually being present, based on the lack of suitable habitat and food sources and lack of observations of Loggerheads in CG to date.
			  • The short duration (24-48 hours) of each cycle of presence of the SPV – with 10 to 14-day gaps between cycles.
			  • SPC will operate at very low speed (~2 knots).
			  • SPV will have marine mega-fauna observation and avoidance measures.
				No significant impact
				
				PMST resolution error – no records of this species inside CG to date and habitat conditions in CG are not suitable for this species.

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
			• SPV will have marine mega-fauna deterrence /exclusion device on the sand uptake drag head. • SPV will be fitted with turtle safe lighting (although this is not relevant to Loggerheads as they do not nest in the area). • The potential for noise disturbance is low as the SPV will only be present for short periods each cycle with gaps in between, it will operate at very low speeds (2 knots) and will be a new-build vessel with relevant noise reduction measures as per IMO Guidelines (IMO 2023). • Overall, even in the highly unlikely event of an interaction between the SPV and the occasional Loggerhead Turtle that 'might' enter CG, significant impacts as outlined in the Significant Impact Criteria would not be caused.	
Dermochelys coriacea Leatherback Turtle Endangered  **Leatherback** *Dermochelys coriacea*	• The PMST search states that the species or its habitat is likely to occur in the POA. • The global geographical range includes the CG area and it could thus it could potentially occur, although it does not seem 'likely'. • No large rookeries for Leatherbacks have been recorded in Australia and the nearest rookeries are in Indonesia. In Australia they are commonly reported feeding in coastal waters from southern Queensland to central New South Wales, in Tasmania, Victoria and eastern South Australia and in south-western Western Australia (DCCEEW). • Leatherback Turtles are carnivorous, feeding primarily in the open ocean on jellyfish and other soft-bodied invertebrates. Given the very high turbidity and lack of benthic invertebrates in CG (due to aphotic conditions and high current velocities near the seabed) (see EPBC Referral Report No. 2) it is not suitable for Leatherbacks.	"	• As per Loggerhead Turtles above. •	**No significant impact** PMST resolution error – no records of this species inside CG to date and habitat conditions in CG are not suitable for this species.

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
	• No previous records of Leatherbacks in CG were identified by literature search. Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe any Leatherbacks. The main turtle species observed were Flatbacks *(Natator depressus),* associated with nearby nesting beaches, and one Green *(Chelonoa mydas).*			
Lepidochelys olivacea Olive Ridley Turtle Endangered  	• The PMST search states that foraging, feeding or related behavior of this species is known to occur in the POA. The PMST does not provide a reference for the basis of 'known to occur'. • The global geographical range of this species includes CG area and thus could potentially occur. • No large rookeries (nesting sites) for Olive Ridleys have been recorded in Australia and the nearest (small) rookeries are in northwest Arnhem Land in the NT (1,000 km by sea from CG) (DCCEEW). • Olive Ridleys are carnivorous, feeding mostly on shellfish and small crabs. Given lack of benthic invertebrates in CG (due to aphotic conditions and high current velocities near the seabed) (see EPBC Referral Report No. 2) it seems unlikely that Olive Ridleys would be found in CG. • As outlined in section 7 the Commonwealth has designated a foraging BIA for this species in waters offshore from CG, in JBG, which provides much more suitable foraging habitat than inside CG. • No previous records of Olive Ridley's in CG were identified by literature search. Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe any Olive Ridley's. The main turtle species observed were Flatbacks *(Natator depressus),* associated with nearby nesting beaches, and one Green *(Chelonoa mydas).*	"	• As per Loggerhead Turtles above.	**No significant impact** PMST resolution error – no records of this species inside CG to date and habitat conditions in CG are not suitable for this species.

TABLE 22: *Assessment of potential for significant impacts on Listed Threatened Species – VULNERABLE* ***REPTILES***

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria**	**Assessment**	**Finding**
Acanthophis hawkei Plains Death Adder Vulnerable  *Image credit: Venomland*	• The PMST search states that the species or its habitat may occur in the 10 km buffer area. • It could potentially be present in the coastal areas of CG but it would not be found in the open-water area of the POA.	An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will: • lead to a long-term decrease in the size of an important population of a species, • reduce the area of occupancy of an important population, • fragment an existing important population into two or more populations, • adversely affect habitat critical to the survival of a species, • disrupt the breeding cycle of an important population, • modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, • result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, • introduce disease that may cause the species to decline; or • interfere substantially with the recovery of the species.	• Although it may be found on coastal land in the 10 km buffer, given the wholly marine nature of the proposed action, and that the Plains Death Adder would not be found in the POA, there is no potential for any of the significant impacts listed in the criteria.	**No significant impact**
Chelonia mydas Green Turtle Vulnerable  	• The PMST search states that foraging, feeding or related behavior of this species is known to occur in the POA. • The PMST does not provide a reference for the basis of 'known to occur'. • The global geographical range of this species includes the CG area and it could thus potentially occur. • 12 years (2012 to 2022) of monitoring nesting Flatback Turtles at Cape Domett seaward beach outside of CG by DBCA observed less than four Greens in any year nesting on the Cape Domett beach (not inside the POA), amongst hundreds of Flatbacks nesting on that beach. • In WA the major rookeries are in the North West Shelf region from the Ningaloo coast to the Lacepede Islands	"	• The most significant marine turtle species in the CG area is the Flatback Turtle (*Natator depressus*), and a separate, specific assessment for that species is presented in section 10.2. • There is potential for interaction between the SPV and any Green Turtles that 'might' be present in the POA during the short 24 to 48-hour periods when the SPV will be present every 2 weeks. • Potential interactions include physical collision and low-level noise disturbance.	**No significant impact** PMST resolution error – no records of this species inside CG to date and habitat conditions in CG are not suitable for this species.

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria**	**Assessment**	**Finding**

	(900 km by sea west of Cambridge Gulf) (DCCEEW). Nesting in the Cambridge Gulf area is incidental.
	
	• Adult green turtles feed mostly on seagrasses and algae, which are not present in CG.
	
	• As outlined in section 7 the Commonwealth has designated a foraging BIA for this species in waters offshore from CG, in Joseph Bonaparte Gulf, which provides much more suitable foraging habitat than inside CG.
	
	• Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 observed a single Green Turtle in waters outside of CG.
			• The potential for physical collision is very low due to:
			  • The low likelihood of Green Turtles actually being present, based on the lack of suitable habitat and food sources and lack of observations of Greens in CG to date.
			  • The short duration (24-48 hours) of each cycle of presence of the SPV – with 10 to 14-day gaps between cycles.
			  • SPC will operate at very low speed (~2 knots).
			  • SPV will have marine mega-fauna observation and avoidance measures. (see also Annex 4 of EPBC Referral Report No. 4).
			  • SPV will have marine mega-fauna deterrence /exclusion device on the sand uptake drag head.
			  • SPV will be fitted with turtle safe lighting (although this is not relevant to Greens as they do not nest in the area).
			
			• The potential for noise disturbance is low as the SPV will only be present for short periods each cycle with gaps in between, it will operate at very low speeds (2 knots) and will be a new-build vessel with relevant noise reduction measures as per IMO Guidelines (IMO 2023).
			
			• Overall, even in the highly unlikely event of an interaction between the SPV and the occasional Green Turtle that 'might' enter CG, significant impacts as outlined in the Significant Impact Criteria would not be caused.	

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria**	**Assessment**	**Finding**
Eretmochelys imbricate Hawksbill Turtle Vulnerable  	• The PMST search states that the species or its habitat is likely to occur in the POA. • The general geographical range of this species includes the CG area and it could thus potentially be present. • However, the key nesting and inter-nesting areas for Hawksbill Turtles in WA are the Dampier Archipelago, the Ningaloo and Jurabi Coasts and Thevenard, Barrow, Lowendal and Montebello Islands (the closest being over 1,500 km by sea from CG) (DCCEEW). • Hawksbill Turtles spend their first five to ten years drifting on ocean currents). During this pelagic (ocean-going) phase, they are often found in association with rafts of *Sargassum* weed. Once Hawksbill Turtles reach 30 to 40 cm curved carapace length, they settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat. They primarily feed on sponges and algae (DCCEEW). • Given the lack of sponges and algae in CG (due to aphotic conditions and high current velocities near the seabed) it seems unlikely that Hawksbills would be found in CG – it is not suitable feeding habitat. • Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe any Hawksbills in CG.	“	• As per Loggerhead & Green Turtles Turtles above.	**No significant impact** PMST resolution error – no records of this species inside CG to date and habitat conditions in CG are not suitable for this species.
Natator depressus Flatback Turtle Vulnerable	• The PMST search states that foraging, feeding or related behavior of this species is known to occur in the POA. • The PMST does not provide a reference for the basis of ‘known to occur’. • The Flatback Turtle is carnivorous, feeding mostly on soft-bodied prey such as sea cucumbers, soft corals and jellyfish (DCCEEW). It therefore seems unlikely that they would feed inside CG, as suggested by the PMST search, due to lack of food resources, as outlined for the other turtle species above. • There is a globally significant nesting beach for Flatback	“	• **Given the significance of this marine turtle species in the CG area, a separate, specific assessment of potential impacts from the proposed sand-sourcing operation is presented in section 10.2.** • It finds ‘no significant impact’ in relation to the significant impact criteria.	**No significant impact**

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria**	**Assessment**	**Finding**


Flatback
Natator depressus
	Turtles on the seaward side of Cape Domett on the eastern side of Cambridge Gulf (12 km from the nearest point of the POA). Thousands of nests per year are estimated. Peak nesting is in Aug-Sept (Whiting et al 2008).
	
	• There is lower intensity of Flatback nesting on a seaward beach west of Cape Dussejour, at Turtle Bay on Lacrosse Island, and on sand areas behind mangroves at East Bank Point inside Cambridge Gulf.
	
	• Turtle surveys commissioned by BKA in July 2023 (using both boat- and aerial-drone based surveys) observed the following (see EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 14 - *Marine Mega-fauna Surveys Report*):
	  • Cape Domett: 456 track pairs / 197 nests.
	  • West of Cape Dussejour: 34 track pairs / 28 nests.
	  • Turtle Bay on Lacrosse Is.: 6 track pairs / 6 nests.
	  • Barnett Point: 82 track pairs / 13 nests.
	
	• WA-DBCA has been undertaking annual nest monitoring at Cape Domett since 2012 and the data from these surveys has been analysed by BKA under agreement with DBCA. The resulting report is EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - Annex 12 - *Cape Domett Turtle Data Report.*
	
	• As outlined in section 7 the Commonwealth has designated an inter-nesting buffer BIA for this species within a 60 km radius around Cape Domett. This covers CG and the POA. The applicability of the BIA is discussed in section 10.2.2.			

TABLE 23: *Assessment of potential for significant impacts on Listed Threatened Species – CRITICALLY ENDANGERED & ENDANGERED* ***SHARKS***

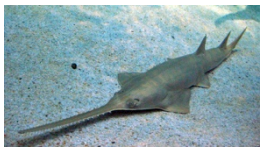
Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria**	**Assessment**	**Finding**

Glyphis garricki
Northern River Shark
 	
Endangered
 
Image credit: Sam Lyne
	• The PMST search states that the species or its habitat is known to occur in the POA, however supporting data is for upstream inlets and the Ord River – not in the POA itself (another example of the geo-resolution issues with PMST).
	
	• Kyne et al (2020 & 2021) report this species in the Lower Ord River and upstream in the Durack and Pentecost Rivers which discharge into CG. Population numbers throughout its range in northern Australia are estimated at between 2,500 and 10,000 adults. Close-Kin Mark-Recapture studies by Bravington et al (2019) indicate its range to be more widespread across northern Australia than initially documented, and recommend a down-listing from 'endangered' to 'vulnerable'.
	
	• Marine eDNA sampling commissioned by Boskalis in 2024 did not detect DNA evidence of river sharks in the POA, at any sites in CG outside the POA or in upstream areas on both the west and east side of CG (see EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Annex 14 - Marine eDNA Report)*.
	
	• Throughout its range the Northern River Shark inhabits large rivers, estuaries, and coastal bays, all of which are characterized by high turbidity, silty or muddy bottoms and large tides. The most sensitive birthing and juvenile growth phases occur in fresher upstream areas, however the sharks migrate to more saline marine waters as they mature to adulthood. Northern River Sharks may therefore pass through the POA during such movements.
	
	• Any Northern River Sharks in CG may therefore pass through the POA during such movements.
		An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
		• lead to a long-term decrease in the size of a population,
		• reduce the area of occupancy of the species,
		• fragment an existing population into two or more populations,
		• adversely affect habitat critical to the survival of a species,
		• disrupt the breeding cycle of a population,
		• modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,
		• result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat,
		• introduce disease that may cause the species to decline; or
		• interfere with the recovery of the species.
			• There is potential for interaction between the SPV and any Northern River Shark that might be present in the POA during the short 24 to 48-hour periods when the SPV will be present every 2 weeks.
			
			• Potential for physical impact is very low due to:
			  • The low likelihood of Northern River Shark actually being present in the POA.
			  • The short duration (24-48 hours) of each cycle of presence – with 10 to 14 -day gaps between cycles.
			  • SPV will operate at very low speed (~2 knots).
			  • SPV will have marine mega-fauna observation and avoidance measures (see also Annex 4 of EPBC Referral Report No. 4).
			  • SPV will have marine mega-fauna deterrence/exclusion device on the sand uptake drag head.
			
			• Overall, even in the highly unlikely event of an interaction between the SPV and an individual Northern River Shark, significant impacts as outlined in the Significant Impact Criteria would not be caused.
			
			• BKA is prepared to support long-term research and monitoring of River Sharks in the CG area should the proposed action proceed. thereby contributing to the protection and conservation of this species in in the CG area and elsewhere.
				No significant impact
				
				PMST resolution error – no records of this species inside POA to date – records are from rivers well upstream of the POA – (Kyne et al 2020 & 2021)

TABLE 24: *Assessment of potential for significant impacts on Listed Threatened Species – VULNERABLE* ***SHARKS***

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Carcharodon carcharias Great White Shark Vulnerable  *Image credit: Wikipedia*	• The PMST search states that the species or its habitat may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The potential presence of this species relates to its estimated overall bio-geographical range, which has very occasionally been found in tropical waters. However, it does not automatically mean that this species is actually or is likely to be present. • Great White Sharks are mainly found in colder temperate waters and the environmental and food conditions in CG relative to the requirements and preferences of this species make it extremely unlikely that they would enter CG.	An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will: • lead to a long-term decrease in the size of an important population of a species, • reduce the area of occupancy of an important population, • fragment an existing important population into two or more populations, • adversely affect habitat critical to the survival of a species, • disrupt the breeding cycle of an important population, • modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, • result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, • introduce disease that may cause the species to decline; or • interfere substantially with the recovery of the species.	• Given that it is highly unlikely that Great White Sharks would be found in the POA, or even in CG generally, and given the nature of the proposed operation, there is no potential for any of the significant impacts listed in the criteria. • The SPV will have marine mega-fauna observation and avoidance measures (see also Annex 4 of EPBC Referral Report No. 4).	**No significant impact** PMST resolution error – no records of this species inside POA or CG overall to date and habitat conditions in the POA and CG overall are not suitable .

Pristis clavata Dwarf Sawfish
 	
Vulnerable
 	
 
Image credit: R Kuiter
	• The PMST search states that the species or its habitat is known to occur in the POA, however there is no supporting data in the project area itself (another example of the geo-resolution issues with PMST).
	
	• Literature search did not find any record of this species in CG and the eDNA sampling commissioned by BKA in 2024 did not detect DNA evidence of this species at any sites in CG itself or in upstream areas on both the west and east side of CG (see EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Annex 14 - Marine eDNA Report*).
	
	• The Dwarf Sawfish usually inhabits shallow (2–3 m) coastal waters and upstream estuarine habitats (DCCEEW), not deeper open waters such as the proposed operational area
		"	• Given the unlikely presence of Dwarf Sawfish in the POA and the short 24 to 48-hour periods when the SPV will be present every 2 weeks there is a low likelihood of interaction with the SPV.
			
			• Additionally:
			  • SPV will operate at very low speed (~2 knots).
			  • SPV will have marine mega-fauna observation and avoidance measures.
			  • SPV will have marine mega-fauna deterrence/exclusion device on the sand uptake drag head.
				No significant impact
				
				PMST resolution error – no records of this species inside POA to date and habitat conditions in the POA are not suitable for this species.

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
	(>20m deep LAT) with strong tidal currents and permanent aphotic zone near the seabed. • Dwarf Sawfish may move into shallow coastal waters after the wet season, and during the wet season enter estuarine and more-fresh waters to breed (Peverell 2005). • Stevens et al (2008) reported that Dwarf Sawfish appear to move only small distances and occupy restricted areas.		• Overall, even in the highly unlikely event of an interaction between the SPV and an individual Sawfish, significant impacts as outlined in the Significant Impact Criteria would not be caused. • BKA is prepared to support long-term research and monitoring of Sawfish in the CG area should the proposed action proceed. thereby contributing to the protection and conservation of this species in in the CG area and elsewhere.	
Pristis pristis Freshwater Sawfish Vulnerable  *Image credit: Fishes of Aus*	• The PMST search states that the species or its habitat is likely to occur in the POA. • In northern Australia, this species appears to be confined to freshwater drainages and the upper reaches of estuaries, occasionally being found as far as 400 km upstream from the sea (Thorburn et al. 2007; Whitty et al. 2008). In the CG area it probably only occurs in the Durack; Lower Ord and Pentecost Rivers (DCCEEW). • Literature search did not find any record of this species in CG and the eDNA sampling commissioned by BKA in 2024 did not detect DNA evidence of this species at any sites in CG itself or in upstream areas on both the west and east side of CG (see EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Annex 14 - Marine eDNA Report*).	"	• As per Dwarf Sawfish above.	**No significant impact** PMST resolution error – no records of this species inside POA to date and habitat conditions in the POA are not suitable for this species.
Pristis zijsron Green Sawfish Vulnerable  *Image credit: R Pion*	• The PMST search states that the species or its habitat is known to occur in the POA, however there is no supporting data in the project area itself (another example of the geo-resolution issues with PMST). • The Green Sawfish is the most marine of the Sawfish species. They mainly inhabit coastal marine waters and while individuals have been recorded in estuaries the species does not penetrate into freshwater. There are records of Green Sawfish hundreds of kilometres offshore in relatively deep water (Stevens et al., 2005). • They could therefore potentially be present in the POA, however they generally feed on shoaling fish such as mullet, baitfish and prawns, in shallow waters, stunning them with by sideswipes of the saw, and molluscs and small crustaceans can be swept out of seabed sediments	"	• As per Dwarf Sawfish above.	**No significant impact** PMST resolution error – no records of this species inside POA to date and habitat conditions in the POA are not suitable for this species.

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
	by the saw (Allen 1982; Cliff & Wilson 1994) (Poganoski et al. 2002). • Such foods resources are not present in the POA, due to water depth (~20m LAT), aphotic conditions and high current velocities near the seabed, so any Green Sawfish in the area would likely only be passing through. • Literature search did not find any record of this species in CG and the eDNA sampling commissioned by BKA in 2024 did not detect DNA evidence of this species at any sites in CG itself or in upstream areas on both the west and east side of CG (see EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Annex 14 - Marine eDNA Report*).			
Rhincodon typus Whale Shark Vulnerable  *Image credit: Pacific Aquarium*	• The PMST search states that the species or its habitat may occur in the POA. • The global geographical range of this species includes the CG area and it could thus potentially be present. • However, Whale Sharks are plankton filter feeders and generally inhabit coastal and open-ocean marine waters, and would be very unlikely to be found in the highly turbid and low-productivity inshore waters of CG, which does not match their environmental and foods requirements. There are no recorded sightings in the area.	"	• Given that it is highly unlikely that Whale Sharks would be found in the POA, or even in CG generally, and given the nature of the proposed operation, there is no potential for any of the significant impacts listed in the criteria. • The SPV will have marine mega-fauna observation and avoidance measures, and this large, surface-dwelling, slow-moving species would be easily spotted and avoided.	**No significant impact** PMST resolution error – no records of this species inside POA or CG overall to date and habitat conditions in the POA and CG overall are not suitable

10.5 Migratory Species Assessment Tables

From PMST search as presented in Annex 1.

TABLE 25: *Assessment of potential for significant impacts on Listed Migratory Species – MIGRATORY* ***MARINE BIRDS***

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Anous stolidus Common Noddy Not listed as threatened  *Image credit: Qld Govt.*	• The PMST search states that the species or its habitat may occur in the POA. • The Common Noddy is a migratory seabird that feeds on fish, squid and other marine animals, and roosts and nests on islands and coastal areas. It is widespread throughout tropical and subtropical seas, islands and coasts globally. • There are no major populations known in the CG area but its broad range means that it could potentially be present. • Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe this species in CG.	An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will: • 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, • result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or • seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	• There are no mechanisms whereby the proposed action would cause any of the significant impacts listed in the criteria.	**No significant impact**
Apus pacificus Fork-tailed Swift Not listed as threatened  *Image credit: eBird*	• The PMST search states that the species or its habitat is likely to occur in the POA. • The Fork-tailed Swift is a highly migratory bird that breeds in Siberia in the northern summer August-Sept, and feeds in Australia from October to April. • Although listed in PMST as a 'marine bird' they are mainly insectivorous and therefore spend most of their time over land. They are widespread in WA including scattered along the coast in the CG region (DCCEEW). • Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe this species in CG.	"	• There are no mechanisms whereby the proposed action would cause any of the significant impacts listed in the criteria.	**No significant impact**

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Calonectris leucomelas Streaked Shearwater Not listed as threatened  *Image credit: eBird*	• The PMST search states that the species or its habitat may occur in the POA. • This is a pelagic seabird that hunts for fish over the open sea. It breeds in north Asia in the northern summer and migrates to southern waters including off Australia in the northern winter / southern summer. • The very broad geographical range means that it could potentially be present in CG, although being pelagic it is more likely to be found offshore. • Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe this species in CG.	"	• There are no mechanisms whereby the proposed action would cause any of the significant impacts listed in the criteria.	**No significant impact**
Fregata ariel Lesser Frigatebird Not listed as threatened  *Image credit: eBird*	• The PMST search states that the species or its habitat may occur in the POA. • The Lesser Frigatebird is common in tropical seas globally, and is the most common and widespread frigatebird in Australian seas, which breeds mainly on offshore islands (Lindsey, 1986). • The very broad geographical range means that it could potentially be seen in CG, although there are no records. • Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe this species in CG.	"	• There are no mechanisms whereby the proposed action would cause any of the significant impacts listed in the criteria.	**No significant impact**
Fregata minor Great Frigatebird Not listed as threatened  *Image credit: eBird*	• The PMST search states that the species or its habitat may occur in the POA. • Similar to *F. ariel* but much less common in Australian coastal waters – a more offshore/oceanic species. • Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe this species in CG.	"	• There are no mechanisms whereby the proposed action would cause any of the significant impacts listed in the criteria.	**No significant impact**

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Phaethon lepturus White-tailed Tropicbird Not listed as threatened  *Image credit: eBird*	• The PMST search states that the species or its habitat may occur in the POA. • The White-tailed Tropicbird is common in tropical seas globally, which breeds on tropical islands and disperses widely across the oceans when not breeding. It feeds on fish and squid, caught by surface plunging. • The very broad geographical range of this species means that it could potentially be present in CG, although there are no formal records of this. • Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe this species in CG.	"	• There are no mechanisms whereby the proposed action would cause any of the significant impacts listed in the criteria.	**No significant impact**
Sternula albifrons Little Tern Not listed as threatened  *Image credit: eBird*	• The PMST search states that the species or its habitat may occur in the 10 km buffer area. • The species is widespread both globally and also in Australia, with breeding sites widely distributed from north-western Western Australia, around the northern and eastern Australian coasts to south-eastern Australia. • They inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits, and also on exposed ocean beaches (DCCEEW). • They feed mainly on small fish by plunging in shallow water of channels and estuaries and also eat crustaceans, insects, annelids and molluscs along the shoreline (DCCEEW). • Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 observed small numbers of this species in CG.	"	• There are no mechanisms whereby the proposed operation would cause any of the significant impacts listed on the criteria.	**No significant impact**

TABLE 26: *Assessment of potential for significant impacts on Listed Migratory Species – MIGRATORY* ***MARINE SPECIES***

NOTE: Some species that are Migratory Marine Species are also Critically Endangered, Endangered or Vulnerable species and are therefore listed in the tables above as relevant. Assessment of these is not repeated here – they are listed at the end of Table 26 with a reference to the relevant MNES table above where they are assessed.

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**

Anoxypristis cuspidata
Narrow Sawfish
 	
Not listed as threatened
 	
 
Image credit: M Dando
	• The PMST search states that the species or its habitat is likely to occur in the POA (although conditions in the area would seem to make this unlikely).
	
	• The Narrow Sawfish is found across a broad swathe of the Indo-Pacific. Like most Sawfish it prefers soft bottom-substrate. It can tolerate low salinity levels and is found in inshore waters, including bays and estuaries.
	
	• Like most Sawfish, they undergo an ontogenetic shift in habitat, with smaller juveniles usually found in upstream areas while larger adults are usually found in deeper waters offshore.
	
	• Narrow Sawfish that might therefore occasionally pass through the operational area as part of this inter-habitat movement.
	
	• Like most Sawfish, the Narrow Sawfish feeds on small fish, squid and invertebrates on and near the seabed. It uses its rostrum in a side-to-side thrashing action to stir up the sediment and uncover prey. It can also use its rostrum among schools of fish to incapacitate fish.
	
	• Given the very strong currents, aphotic conditions, dynamic seabed and lack of benthic biota in the POA, they are unlikely to remain and feed there. Feeding areas are likely to be upstream in estuarine inlets for the juveniles and offshore for larger adults.
	
	• Literature search did not find any record of this species in CG. The eDNA sampling commissioned by BKA in 2024 did detected very low traces of DNA evidence of this species at one site located 8 km upstream in the Lyne River on the west side of CG (see EPBC Referral Report No. 2 - Boskalis Cambridge Gulf - *Annex 14 - Marine eDNA Report*).
		An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:
		• 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,
		• result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
		• seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.
			• The proposed operation will not substantially modify, destroy or isolate an area of important habitat for this species.
			• Potential invasive species introductions will be addressed by the SPV complying in full with the IMO BWM Convention and IMO Biofouling Guidelines, and with the Australian Biosecurity Act & Regulations, being fitted with IMO-compliant ballast water treatment systems, and adhering to a stringent biofouling management regime.
			• The DCCEEW Significant Impact Guidelines explicitly state that implementation of these measures would be expected to prevent significant impact.
			• The proposed action will not seriously disrupt the lifecycle of this species.
			
			• Given the low-likelihood of Narrow Sawfish occurring in the POA and the short 24 to 48-hour periods when the SPV will be present every 2 weeks there is a low likelihood of interaction with the SPV.
			
			• Additionally:
			  • SPV will operate at very low speed (~2 knots).
			  • SPV will have marine mega-fauna observation and avoidance measures.
			  • SPV will have marine mega-fauna deterrence/exclusion device on the sand uptake drag head.
				No significant impact
				
				PMST resolution error – no records of this species inside POA to date and habitat conditions in the POA are not suitable for this species.

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
			• Overall, even in the highly unlikely event of an interaction between the SPV and an individual Sawfish, significant impacts as outlined in the Significant Impact Criteria would not be caused. BKA is prepared to support long-term research and monitoring of Sawfish in the CG area should the proposed action proceed. thereby contributing to the protection and conservation of this species in in the CG area and elsewhere.	
Balaenoptera edeni Bryde's Whale Not listed as threatened  *Image credit: Wikipedia*	• The PMST search states that the species or its habitat may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The potential presence of this species relates to the estimated overall bio-geographical range of the species, which could extend over the general area of CG. However, it does not automatically mean that this species is actually or is likely to be present. • The environmental conditions in CG relative to the requirements and preferences of this species make it extremely unlikely that they would enter the Gulf. • In coastal areas they are resident in waters containing suitable prey stocks of pelagic shoaling fishes, out to the 200 m depth isobar, often exploiting 'boils' of fish herded by other predator species (Best 1977) (Kato 2002). Such food resources are not present in CG. • Whales are also generally absent from the adjacent offshore waters of Joseph Bonaparte Gulf, due to their relative shallowness (15 to 75 m LAT) (Galaiduk et al. 2018).	"	• Given that it is highly unlikely that Brydes Whales would be found in the POA, or even in CG generally, and given the nature of the proposed action, there is no potential for any of the significant impacts listed in the criteria. • The SPV will have marine mega-fauna observation and avoidance measures.	**No significant impact** PMST resolution error – no records of this species inside POA or CG overall to date and habitat conditions in the POA and CG overall are not suitable

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Carcharhinus longimanus Oceanic Whitetip Shark Not listed as threatened  *Image credit: sail-world.com*	• The PMST search states that the species or its habitat may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The potential presence of this species relates to the estimated overall bio-geographical range of the species, which could extend over the general area of CG. However, it does not automatically mean that this species is actually or is likely to be present. • The environmental conditions in CG relative to the requirements and preferences of this species make it extremely unlikely that they would enter the Gulf. • As its names suggests, the Oceanic Whitetip is a pelagic species that prefers offshore, deep-ocean areas. It is only found close to land around oceanic islands and areas with narrow continental shelves dropping quickly to very deep water (which do not exist in CG or even in Joseph Bonaparte Gulf – the shallow continental shelve extends way offshore towards Indonesia).	“	• Given the offshore pelagic nature of this species and the environmental conditions in CG there is almost no chance that it would be found in the Gulf.	**No significant impact** PMST resolution error – no records of this species inside POA or CG overall to date and habitat conditions in the POA and CG overall are not suitable
Crocodylus porosus Salt-water Crocodile Not listed as threatened  *Image credit: BKA*	• The PMST search states that the species or its habitat is likely to occur in the POA. • There are significant numbers of crocodiles present throughout CG, however they mainly inhabit shoreline areas and up the mangrove-lined inlets, with most being found well upstream in the Ord River (Kay 2004). • The occasional crocodile might transit through the POA – located in open water in the centre of the Gulf – for example if moving from one side of the Gulf to the other – but this is likely to be a very low frequency occurrence. Generally, there is a very low probability of crocodiles being present in the open-water marine area of the POA - it is not their preferred habitat.	“	• Given that it is highly unlikely that Salt-water Crocodiles would be found in the operational footprint, and given the nature of the proposed action, there is no potential for any of the significant impacts listed in the criteria. • The SPV will have marine mega-fauna observation and avoidance measures (see also Annex 4 of EPBC Referral Report No. 4).	**No significant impact**

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Dugong dugon Dugong Not listed as threatened  *Image credit: F Kennedy*	• The PMST search states that the species or its habitat may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The potential presence of this species relates to the estimated overall bio-geographical range of the species, which could extend over the general area of CG. However, it does not automatically mean that this species is actually or is likely to be present. • The environmental conditions in CG relative to the requirements and preferences of this species make it extremely unlikely that they would enter the Gulf. • Most importantly, Dugong feed on certain species of seagrass. No seagrass meadows are not found in CG, due to the high current velocities and high turbidity levels (BKA 2024b) (McMahon et al 2017) (Walker et al 1996). • Environmental surveys in CG to date have never observed Dugong (BKA 2024b, Brown et al 2016, 2017) and commercial fishermen with decades of experience in the area report that Dugong are never seen in CG (Douglas pers. comms. 2023).	“	• Given the absence of this species in CG there is almost no chance that any of the significant impacts listed could occur. • The SPV will have marine mega-fauna observation and avoidance measures (see also Annex 4 of EPBC Referral Report No. 4).	**No significant impact** PMST resolution error – no records of this species inside POA or CG overall to date and habitat conditions in the POA and CG overall are not suitable for this species – No seagrass food.
Megaptera novaeangliae Humpback Whale Not listed as threatened  *Image credit: WWF*	• The PMST search states that the species or its habitat may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The environmental conditions in CG relative to the requirements and preferences of this species make it extremely unlikely that they would enter the Gulf. • Humpback Whales undertake annual migrations along the west coast of WA north to core calving grounds off the West Kimberly coast, but not east to Joseph Bonaparte Gulf and CG (Figure 32).	“	• Given that it is highly unlikely that Humpback Whales would be found in the POA, or even in CG generally, and given the nature of the proposed action, there is no potential for any of the significant impacts listed in the criteria. • The SPV will have marine mega-fauna observation and avoidance measures (see also Annex 4 of EPBC Referral Report No. 4).	**No significant impact** PMST resolution error – no records of this species inside POA or CG overall to date and habitat conditions in the POA and CG overall are not suitable.

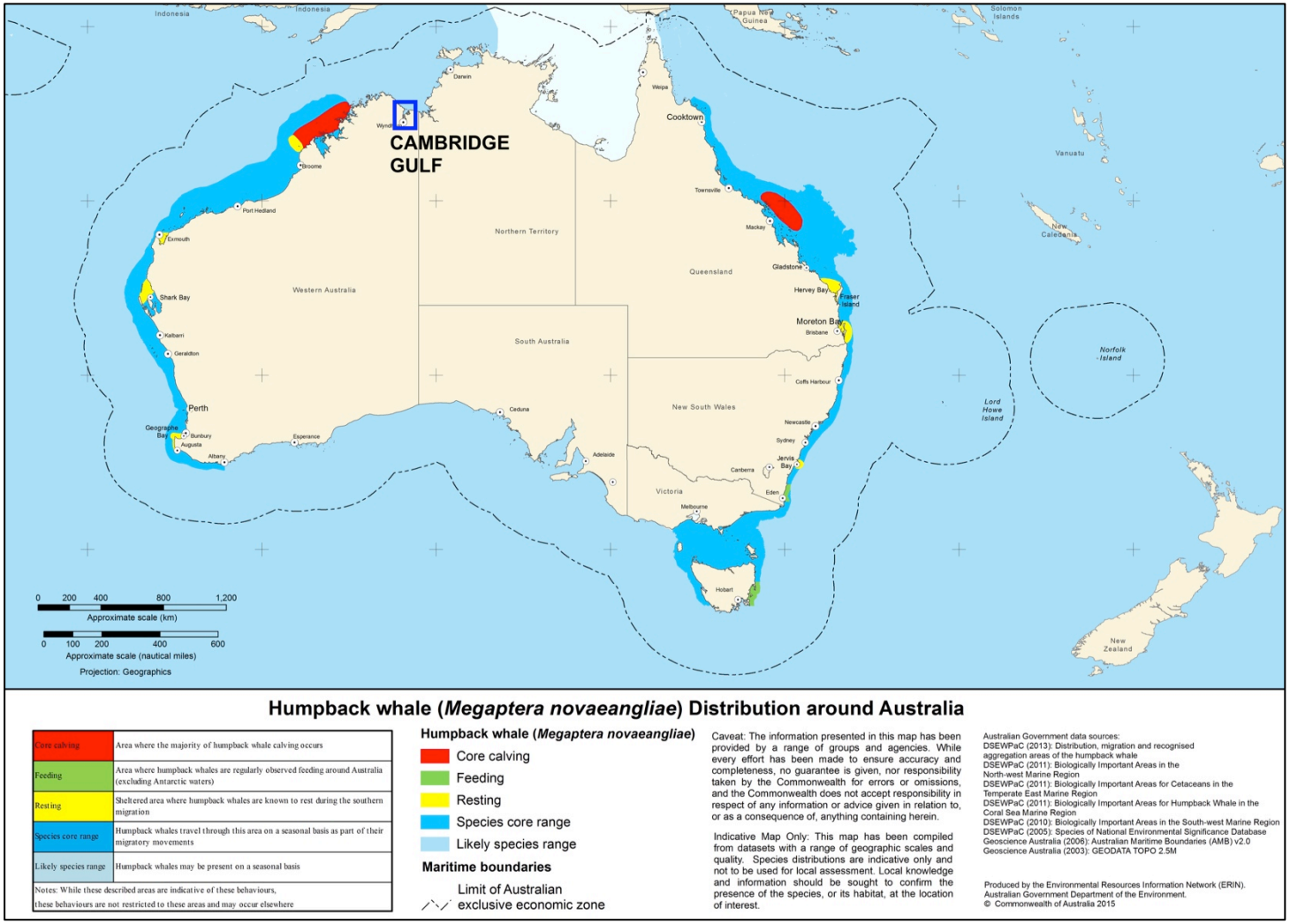
Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Mobula alfredi Reef Manta Ray Not listed as threatened  *Image credit: Aus Museum*	• The PMST search states that the species or its habitat may occur in the POA. • The potential presence of this species relates to the estimated overall bio-geographical range of the species, which could extend over the general area of CG. However, it does not automatically mean that this species is actually or is likely to be present. • The environmental conditions in CG relative to the requirements and preferences of this species make it extremely unlikely that they would enter CG. • As its name suggests, the Reef Manta is often found in coral reef areas, although it is widely distributed in tropical marine waters. They are pelagic and feed by filtering seawater for zooplankton. They have fairly small territorial ranges centred on local upwelling sites where plankton concentrations occur. The strong tidal currents and high turbidity of CG are not aligned with their preferred habitat. • Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe this species in CG.	“	• Given that it is highly unlikely that Reef Mantas would be found in the proposed operational area, or even in CG generally, and given the nature of the proposed action, there is no potential for any of the significant impacts listed in the criteria. • The SPV will have marine mega-fauna observation and avoidance measures (see also Annex 4 of EPBC Referral Report No. 4).	**No significant impact** PMST resolution error – no records of this species inside POA or CG overall to date and habitat conditions in the POA and CG overall are not suitable
Mobula birostris Giant Manta Ray Not listed as threatened  *Image credit: G Stevens*	• The PMST search states that the species or its habitat may occur in the POA. • As per *M. alfredi* except more oceanic and thus even less likely to be found in the highly turbid waters of CG. • Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe this species in CG.	“	• As per *M. alfredi*	**No significant impact** PMST resolution error – no records of this species inside POA or CG overall to date and habitat conditions in the POA and CG overall are not suitable

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Orcaella heinsohni Australian Snubfin Dolphin Not listed as threatened Currently being assessed by DCCEEW for possible 'threatened' status – findings due Oct 2024.  *Image credit: I Beasley*	• NOTE: Although listed as a 'migratory species' – there is very little known about the migration patterns of this species – and movements may only be in local areas (e.g. short offshore-inshore movements) (DCCEEW). • The PMST search states that breeding of this species is known to occur within in the POA. • A small population of Australian Snubfin Dolphins *(Orvaella heinsohni)* is present in CG (EPBC Referral Report No. 2 – Annex 14) (Brown et al 2017, 2016). • As outlined in section 7 the Commonwealth has designated a breeding, calving, feeding and resting BIA for this species over CG.	"	• **Given the significance of this species in the CG area, a separate, specific assessment of potential impacts from the proposed sand-sourcing operation is presented in section 10.3.** • It finds 'no significant impact' in relation to the significant impact criteria.	**No significant impact**
Orcinus orca Killer Whale Not listed as threatened  *Image credit: mindenpictures.com*	• The PMST search states that the species or its habitat may occur in the POA. • The potential presence of this species relates to its estimated overall bio-geographical range, which could extend over the general area of CG. However, it does not automatically mean that this species is actually or is likely to be present. • The environmental conditions in CG relative to the requirements and preferences of this species make it extremely unlikely that they would enter the Gulf. • Killer Whales are pelagic species than can also be found in coastal waters. They prey upon a very wide range of species from small fish to the largest whales. The main Killer Whale populations in WA are centred on the seasonal presence of Humpback Whales from the West Kimberly southwards, and around Bremmer Bay in the very south of WA (Kampf 2021).	"	• Given that it is highly unlikely that Orcas would be found in the POA, or even in CG generally, and given the nature of the proposed action, there is no potential for any of the significant impacts listed in the criteria. • The SPV will have marine mega-fauna observation and avoidance measures (see also Annex 4 of EPBC Referral Report No. 4).	**No significant impact** PMST resolution error – no records of this species inside POA or CG overall to date and habitat conditions in the POA and CG overall are not suitable

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Sousa sahulensis Australian Humpback Dolphin Not listed as threatened  *Image credit: A Brown*	• NOTE: Although listed as a 'migratory species' – there is very little known about the migration patterns of this species They do not appear to undergo large-scale seasonal migrations, although seasonal shifts in abundance have been observed (Parra & Cagnazzi 2016). • The PMST search states that the species or its habitat is known to occur in the POA. • A small population of Australian Humpback Dolphins *(Sousa sahulensis)* has been observed in Cambridge Gulf, and their presence may be seasonal (Brown et al 2017, 2016).	"	• **Refer the assessment for Snubfin Dolphins in section 10.3, the same factors and measures apply.** • It finds 'no significant impact' in relation to the significant impact criteria.	**No significant impact**
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin Not listed as threatened  *Image credit: KML*	• The PMST search states that the species or its habitat is likely to occur in the POA. • The potential presence of this species relates to its estimated overall bio-geographical range, which could extend over the general area of CG. However, it does not automatically mean that this species is actually or is likely to be present. • The environmental conditions in CG relative to the requirements and preferences of this species make it extremely unlikely that they would enter the Gulf. • Surveys by Brown et al (2016. 2017) also did not observe any in CG. Environmental surveys in March 2023, July-Aug 2023 and Feb 2024 did not observe this species in CG.	"	• Given that it is highly unlikely that Bottlenose Dolphins would be found in the POA, or even in CG generally, and given the nature of the proposed action, there is no potential or any of the significant impacts listed in the criteria. • The SPV will have marine mega-fauna observation and avoidance measures (see also Annex 4 of EPBC Referral Report No. 4).	**No significant impact** PMST resolution error – no records of this species inside POA or CG overall to date and habitat conditions in the POA and CG overall are not suitable

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Migratory Marine Species that are also Critically Endangered, Endangered or Vulnerable species and are therefore listed in the Tables above as identified.				
Balaenoptera musculus Blue Whale Endangered	Refer Table 19 where this species is also listed.	An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will: • 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, • result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	Refer Table 19	**No significant impact**
Carcharodon carcharias Great White Shark Vulnerable	Refer Table 24 where this species is also listed.	"	Refer Table 24	**No significant impact**
MARINE TURTLES ***Caretta caretta*** Loggerhead Turtle Endangered ***Chelonia mydas*** Green Turtle Vulnerable ***Dermochelys coriacea*** Leatherback Turtle Endangered ***Eretmochelys imbricate*** Hawksbill Turtle Vulnerable ***Lepidochelys olivacea*** Olive Ridley Turtle Endangered	Refer Tables 21 and 22 where these species are also listed, as relevant.	"	Refer Tables 21 and 22	**No significant impact**

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Natator depressus Flatback Turtle Vulnerable				
SAWFISH (in addition to *A. cuspidate* at top of this table) ***Pristis clavata*** Dwarf Sawfish Vulnerable ***Pristis pristis*** Freshwater Sawfish Vulnerable ***Pristis zijsron*** Green Sawfish Vulnerable	Refer Table 24 where these species are also listed, as relevant.	"	Refer Table 24	**No significant impact**
Rhincodon typus Whale Shark Vulnerable	Refer Table 24 where this species is also listed.	"	Refer Table 24	**No significant impact**



FIGUE 32: *Humpback Whales undertake annual migrations along the coast of WA north to core calving grounds off the West Kimberley coast, but not east to Joseph Bonaparte Gulf and Cambridge Gulf (DCCEEW).*

TABLE 27: *Assessment of potential for significant impacts on Listed Migratory Species – MIGRATORY* ***WETLAND SPECIES***

NOTE: Some species that are Migratory Wetland Species are also Critically Endangered, Endangered or Vulnerable species and are therefore listed in the tables above as relevant. Assessment of these is not repeated here – they are simply listed at the end of Table 27 with a reference to the relevant MNES table above where they are assessed.

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Acrocephalus orientalis Oriental Reed-Warbler Not listed as threatened  *Image credit: eBird*	• The PMST search states that the species or its habitat is may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • This species' preferred habitat is amongst reeds / grasses in wetland areas and it is highly unlikely that it would be found in the deep open-water marine area of the POA.	An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will: • 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, • result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or • seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	• Any individuals of this species near CG would be found in the wetland habitats around the shores and upstream and not in the open-water marine area of the central Gulf where the POA area is located. • There is therefore almost no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error - not actually found in the POA (shore bird)
Actitis hypoleucos Common Sandpiper Not listed as threatened  *Image credit: M Szczepanek*	• The PMST search states that the species or its habitat is may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • This species' preferred habitat is along shorelines and intertidal areas where in browses for prey in shallow water and it is highly unlikely that it would be found in the deep open-water marine area of the POA.	"	• Any individuals of this species near CG would be found around the shores and intertidal areas and not in the open-water marine area of the central Gulf where the POA is located. • There is therefore almost no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error - not actually found in the POA (shore bird)

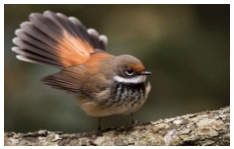
Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Calidris acuminate Sharp-tailed Sandpiper Not listed as threatened  *Image credit: Wikimedia*	• The PMST search states that the species or its habitat is may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • This species' preferred habitat is along shorelines and intertidal areas where in browses for prey in shallow water and it is highly unlikely that it would be found in the deep open-water marine area of the POA.	"	• Any individuals of this species near CG would be found around the shores and intertidal areas and not in the open-water marine area of the central Gulf where the POA is located. • There is therefore almost no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error - not actually found in the POA (shore bird)
Calidris melanotos Pectoral Sandpiper Not listed as threatened  *Image credit: A Trepte*	• The PMST search states that the species or its habitat is may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • This species' preferred habitat is along shorelines and intertidal areas where in browses for prey in shallow water and it is highly unlikely that it would be found in the deep open-water marine area of the POA.	"	• Any individuals of this species near CG would be found around the shores and intertidal areas and not in the open-water marine area of the central Gulf where the POA is located. • There is therefore almost no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error - not actually found in the POA (shore bird)
Charadrius veredus Oriental Plover Not listed as threatened  *Image credit: eBird*	• The PMST search states that the species or its habitat is may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The Oriental Plover is mostly found inland; in open grasslands in arid and semi-arid zones. It is less often found in estuarine or littoral environments, where it forages along shorelines and supra-tidal areas. It is highly unlikely that it would be found in the deep open-water marine area of the POA.	"	• Any individuals of this species near CG would be found around the shores and supra-tidal areas and not in the open-water marine area of the central Gulf where the POA is located. • There is therefore almost no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error - not actually found in the POA (land-based bird)

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Glareola maldivarum Oriental Pratincole Not listed as threatened  *Image credit: G Kinard*	• The PMST search states that the species or its habitat is may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • The Oriental Pratincole is mostly found inland in open grasslands often recently burnt, and around freshwater wetlands where they hunt insects (DCCEEW). It is less often found in estuarine or littoral environments. It is highly unlikely that it would be found in the deep open-water marine area of the POA.	"	• Any individuals of this species near CG would be found inland on open grassy areas and possibly around the wetlands inshore from the Gulf, and not in the open-water marine area of the central Gulf where the POA is located. • There is therefore almost no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error - not actually found in the POA (land-based bird)
Limnodromus semipalmatus Asian Dowitcher Not listed as threatened  *Image credit: eBird*	• The PMST search states that the species or its habitat is may occur in the 10 km buffer zone. • This species preferred habitat is along shorelines and intertidal areas where in browses for prey in shallow water. While they may be found in the 10 km buffer it is highly unlikely that it would be found in the deep open-water marine area of the proposed operational area.	"	• Any individuals of this species near CG would be found around the shores and intertidal areas and not in the open-water marine area of the central Gulf where the POA is located. • There is therefore almost no potential for any of the significant impacts listed in the criteria.	**No significant impact**
Pandion haliaetus Osprey Not listed as threatened  *Image credit: Birds of the World*	• The PMST search states that the species or its habitat is may occur in the 10 km buffer zone. • The Osprey is a Sea Eagle that is definitely present in the CG area, including being observed during BKA's environmental surveys in CG. • It roosts and nests in large, often-dead trees (for enhanced views) around the coast and hunting for fish over marine areas – including potentially over the proposed operational area.	"	• While individual Ospreys may occasionally hunt for fish over the POA, including at times when the SPV might be present, there are no mechanisms whereby the proposed action would cause any of the significant impacts listed in the criteria.	**No significant impact**

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Migratory Wetland Species that are also Critically Endangered, Endangered or Vulnerable species and are therefore listed in the Tables above as identified.				
Calidris canutus Red Knot Endangered	Refer Table 17 where these species is also listed.	"	Refer Table 17.	**No significant impact**
Calidris ferruginea Curlew Sandpiper Critically Endangered	Refer Table 17 where these species is also listed.	"	Refer Table 17.	**No significant impact**
Charadrius leschenaultia Greater Sand Plover Vulnerable	Refer Table 18 where these species is also listed.	"	Refer Table 18.	**No significant impact**
Limosa lapponica Bar-tailed Godwit Vulnerable	Refer Table 18 where these species is also listed.	"	Refer Table 18.	**No significant impact**
Numenius madagascariensis Eastern Curlew Critically Endangered	Refer Table 17 where these species is also listed.	"	Refer Table 17.	**No significant impact**

TABLE 28: *Assessment of potential for significant impacts on Listed Migratory Species – MIGRATORY* ***TERRESTRIAL SPECIES***

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Cecropis daurica Red-rumped Swallow Not listed as threatened  *Image credit: D Hastings*	• The PMST search states that the species or its habitat is may occur in the POA. • This seems to be an error caused by the lack of geographical resolution in the PMST. • This is a wholly terrestrial species that might be found in land areas around CG but it is highly unlikely that it would be found in the deep open-water marine area of the POA.	An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will: • 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, • result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	• Any individuals of this species near CG would be found in land areas and not in the open-water marine area of the central Gulf where the POA is located. • There is therefore almost no potential for any of the significant impacts listed in the criteria.	**No significant impact** PMST resolution error - not actually found in the POA (land-based bird)
Cuculus optatus Oriental Cuckoo Not listed as threatened  *Image credit: eBird*	"	"	"	**No significant impact** PMST resolution error - not actually found in the POA (land-based bird)
Hirundo rustica Barn Swallow Not listed as threatened  *Image credit: eBird*	"	"	"	**No significant impact** PMST resolution error - not actually found in the POA (land-based bird)

Species (Alphabetical order)	**PMST Occurrence / Proximity**	**Significant Impact Criteria** (From the DCCEEW Guidelines)	**Assessment**	**Finding**
Motacilla cinerea Grey Wagtail Not listed as threatened  *Image credit: C Crespo*	"	"	"	**No significant impact** PMST resolution error - not actually found in the POA (land-based bird)
Motacilla flava Yellow Wagtail Not listed as threatened  *Image credit: eBird*	"	"	"	**No significant impact** PMST resolution error - not actually found in the POA (land-based bird)
Rhipidura rufifrons Rufous Fantail Not listed as threatened  *Image credit: iNaturalist*	• The PMST search states that the species or its habitat is may occur in the 10 km buffer zone.	"	• Any individuals of this species near CG would be found in land areas and not in the open-water marine area of the central Gulf where the POA is located. • There is therefore almost no potential for any of the significant impacts listed in the criteria.	**No significant impact**

11. POTENTIAL IMPACTS ON OPMs

1. It should be noted that potential impacts on other matters protected under the EPBC Act (Other Protected Matters or OPMs) are NOT triggers for the EPBC Act assessment and approval process and do not have associated Significant Impact Criteria. However, they are still protected under the EPBC Act and assessing and avoiding potential impacts on OPMs needs to be taken into account in any proposed development.

2. The Protected Matters search for the 10 km buffer as presented in Annex 1 lists a number of marine bird, fish, mammal and reptile species as OPMs that may be present in the area. The majority of these are also MNES and are therefore already addressed in section 10 above as relevant to each species. Those that are not MNES include a few additional bird species, seasnake species and cetacean species, who's board geographic ranges generally include the CG area, but which are not likely to actually be present in CG for the same reason as presented for the MNES-species. Potential impacts of the proposed action on these species are the same as for the similar MNES species as assessed in section 10 – and all are assessed as 'No Significant Impact' according to the DCCEEW Significant Impact Criteria.

3. The Protected Matters search as presented in Annex 1 lists the Commonwealth Joseph Bonaparte Gulf Marine Park as being an OPM located within the 10 km buffer. The Joseph Bonaparte Gulf Marine Park is part of the Commonwealth Marine Area and is therefore also an MNES, and has been assessed in section 9 – showing 'No Significant Impact' from the proposed action according to the DCCEEW Significant Impact Criteria.

4. The Protected Matters search as presented in Annex 1 lists the area as being 'Habitat Critical to the Survival of Marine Turtles' during the months of August-September. This relates to the Flatback Turtle *(N. depressus)* nesting beach on the seaward side of Cape Domett, 12 km from the nearest point of the POA. Given the significance of Flatback Turtle in the CG area, a separate, specific assessment of potential impacts from the proposed sand-sourcing operation is presented in section 10.2. It finds 'no significant impact' in relation to the significant impact criteria.

12. POTENTIAL IMPACTS ON BIAs

1. As outlined in section 7 there are two BIAs that encompass CG, an inter-nesting buffer BIA for Flatback Turtles and a breeding, calving, feeding and resting BIA for Snubfin Dolphins.

2. Given the significance of both Flatback Turtles and Snubfin Dolphins in the CG area, separate, specific assessments of potential impacts on these two species, including the biologically important behaviours specified in the BIA designations, is presented in sections 10.2 and 10.3 respectively. They find 'no significant impact' in relation to the significant impact criteria for both species.

3. As outlined in section 7 there are also foraging BIAs for both Green and Olive Ridley Turtles in Joseph Bonaparte Gulf offshore from GC. There is no overlap with the proposed sand-sourcing operation and no mechanisms whereby the proposed operation might impact on foraging behavior by turtles in those areas.

13. SPECIFIC CRITERIA ON MARINE ACTIVITES

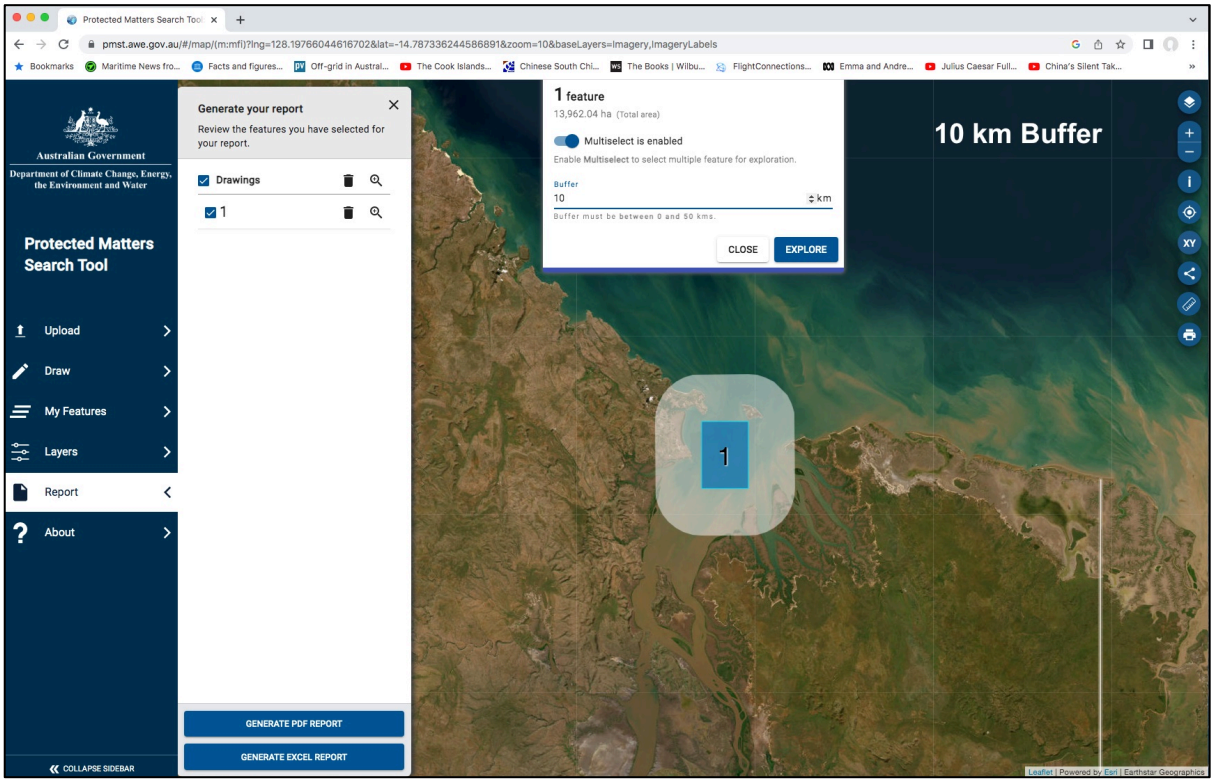
The DCCEEW Significant Impact Guidelines provide some specific criteria relating to marine activities. As the proposed sand-sourcing operation is a wholly marine activity it has been assessed against these criteria as shown in Table 26, with a finding of 'No Significant Impact' for each criterion.

TABLE 29*: Assessment of the proposed action against specific DCCEEW criteria relating to marine activities.*

Marine Criteria *(From the DCCEEW Guidelines)*	**Assessment**	**Finding**
1. *Otherwise lawful recreational fishing and recreational boating would not normally be expected to have a significant impact on NMES.*	Not relevant to the proposed action.	N/a
2. *Routine ship transits where appropriate precautions have been taken against translocating potential pest species would not normally be expected to have a significant impact on NMES.*	The occasional presence of the SPV in Cambridge Gulf (24-48 hrs every 2 weeks) will not be dissimilar to the cargo vessels that already routinely transit the Gulf when entering and exiting the upstream port of Wyndham. The SPV will comply in full with the IMO BWM Convention and IMO Biofouling Guidelines, and with the Australian Biosecurity Act & Regulations, will be fitted with IMO-compliant ballast water treatment systems, and adhere to a stringent biofouling management regime and dry-space biosecurity regime.	No significant impact
3. *Ballast water operations from vessels in Australian waters, undertaken in accordance with an approved Australian Government arrangement for the management of ballast water, would not normally be expected to have a significant impact on the Commonwealth marine environment.*	The SPV will comply in full with the IMO BWM Convention and IMO Biofouling Guidelines, and with the Australian Biosecurity Act & Regulations, will be fitted with IMO-compliant ballast water treatment systems, and adhere to a stringent biofouling management regime.	No significant impact
4. *Small-scale infrastructure projects such as new jetties within an existing port would not normally be expected to have a significant impact on NMES.*	The proposed action does not involve the construction of any infrastructure in Cambridge Gulf or anywhere else.	No significant impact
5. *Large-scale infrastructure projects such as a large pontoon, new aquaculture proposals, construction of a jetty, or a tourist facility (for example, a marina) in the Great Barrier Reef Marine Park may have a significant impact on the environment of the Great Barrier Reef Marine Park and should be referred to the minister.*	The proposed action does not involve the construction of large-scale infrastructure in the Great Barrier Reef Marine Park, in Cambridge Gulf or anywhere else.	No significant impact
6. *Expansion of an existing port which requires land reclamation or spoil disposal in a World Heritage property, a National Heritage place, in or adjacent to the Great Barrier Reef Marine Park, a Ramsar wetland or an area containing nationally listed threatened species or ecological communities, or which involves modifying an area of important habitat for a nationally listed migratory species, is likely to have a significant impact on NMES.*	The proposed action does not involve expansion of an existing port, land reclamation or spoil disposal in or adjacent to any of these areas, or any other area, and does not involve modifying an area of important habitat for a nationally listed migratory species.	No significant impact
7. *Construction of a new port in a Commonwealth marine area, in or adjacent to the Great Barrier Reef Marine Park, a World Heritage property, or a National Heritage place is likely to have a significant impact on NMES.*	The proposed action does not involve construction of a new port in or adjacent to any of these areas, or any other area.	No significant impact

Marine Criteria *(From the DCCEEW Guidelines)*	**Assessment**	**Finding**
8. Dredging of a new shipping channel through a World Heritage property, a National Heritage place, through or next to the Great Barrier Reef Marine Park, a Ramsar wetland, or an area containing nationally listed threatened species or ecological communities, or which involves modifying an area of important habitat for a nationally listed migratory species, is likely to have a significant impact on NMES.	The proposed action does not involve dredging of a new shipping channel through or adjacent to any of these areas.	No significant impact
9. Dredging to maintain existing navigational channels would not normally be expected to have a significant impact on the environment where the activity is undertaken as part of normal operations and the disposal of spoil does not have a significant impact.	While the proposed action does not involve dredging to maintain existing navigational channels, the operation is not dissimilar to routine maintenance dredging, except that it will have even less impact, as follows: • The SPV will only operate on site for 24 to 48 hours for each cycle, followed by either a 10 to 14-day break, compared to normal maintenance dredging where the dredge operates continuously 24/7 until the campaign is completed. • The SPV will target sand without fine silts, thus significantly minimizing turbidity generation, compared to normal maintenance dredging where all sediment types present in the channel are dredged including fine silts. • The SPV will not undertake any disposal of spoil – the sand will be exported to market. If the DCCEEW Guidelines consider that routine maintenance dredging is not expected to have significant impact, then given the above, the proposed action has even less impact.	No significant impact

ANNEX 1: PMST REPORT FOR POA & 10 KM BUFFER



Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 02-Nov-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	35
Listed Migratory Species:	50

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	81
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1
Habitat Critical to the Survival of Marine Turtles:	1

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	2
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	1
Biologically Important Areas:	7
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status	Buffer Status
Natural			
The West Kimberley	WA	Listed place	In buffer area only

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Ord river floodplain	Within Ramsar site	In feature area

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
Commonwealth Marine Areas (EPBC Act)	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris canutus			
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii			
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Erythrotriorchis radiatus			
Red Goshawk [942]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Erythrura gouldiae			
Gouldian Finch [413]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Falco hypoleucos			
Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Falcunculus frontatus whitei			
Crested Shrike-tit (northern), Northern Shrike-tit [26013]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Limosa lapponica baueri			
Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rostratula australis			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Tyto novaehollandiae kimberli			
Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area	In buffer area only
MAMMAL			
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
Dasyurus hallucatus			
Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Macroderma gigas			
Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Mesembriomys gouldii gouldii			
Black-footed Tree-rat (Kimberley and mainland Northern Territory), Djintamoonga, Manbul [87618]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Petrogale concinna monastria			
Nabarlek (Kimberley) [87607]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Saccolaimus saccolaimus nudicluniatus			
Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Trichosurus vulpecula arnhemensis			
Northern Brushtail Possum [83091]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Xeromys myoides			
Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
REPTILE			
Acanthophis hawkei			
Plains Death Adder [83821]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Aipysurus apraefrontalis			
Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Aipysurus foliosquama			
Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat may occur within area	In feature area
Caretta caretta			
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas			
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Eretmochelys imbricata			
Hawksbill Turtle [1766]	Vulnerable	Breeding likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Lepidochelys olivacea			
Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Natator depressus			
Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In feature area
SHARK			
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In feature area
Glyphis garricki			
Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat known to occur within area	In feature area
Pristis clavata			
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pristis pristis			
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pristis zijsron			
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Sphyrna lewini			
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus			
Common Noddy [825]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Calonectris leucomelas			
Streaked Shearwater [1077]		Species or species habitat may occur within area	In feature area
Fregata ariel			
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat may occur within area	In feature area
Fregata minor			
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area	In feature area
Phaethon lepturus			
White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
Sternula albifrons			
Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
Migratory Marine Species			
Anoxypristis cuspidata			
Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area	In feature area
Balaenoptera edeni			
Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
Carcharhinus longimanus			
Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Caretta caretta			
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas			
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Crocodylus porosus			
Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area	In feature area
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Dugong dugon			
Dugong [28]		Species or species habitat may occur within area	In feature area
Eretmochelys imbricata			
Hawksbill Turtle [1766]	Vulnerable	Breeding likely to occur within area	In feature area
Lepidochelys olivacea			
Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Megaptera novaeangliae			
Humpback Whale [38]		Species or species habitat may occur within area	In feature area
Mobula alfredi as Manta alfredi			
Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In feature area
Mobula birostris as Manta birostris			
Giant Manta Ray [90034]		Species or species habitat may occur within area	In feature area
Natator depressus			
Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In feature area
Orcaella heinsohni			
Australian Snubfin Dolphin [81322]		Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Orcinus orca			
Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Pristis clavata			
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pristis pristis			
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pristis zijsron			
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Sousa sahulensis as Sousa chinensis			
Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area	In feature area
Tursiops aduncus (Arafura/Timor Sea populations)			
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cecropis daurica			
Red-rumped Swallow [80610]		Species or species habitat may occur within area	In feature area
Cuculus optatus			
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundo rustica			
Barn Swallow [662]		Species or species habitat may occur within area	In feature area
Motacilla cinerea			
Grey Wagtail [642]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat likely to occur within area	In feature area
Rhipidura rufifrons			
Rufous Fantail [592]		Species or species habitat may occur within area	In buffer area only
Migratory Wetlands Species			
Acrocephalus orientalis			
Oriental Reed-Warbler [59570]		Species or species habitat may occur within area	In feature area
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris canutus			
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Charadrius leschenaultii			
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius veredus			
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area	In feature area
Glareola maldivarum			
Oriental Pratincole [840]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limnodromus semipalmatus			
Asian Dowitcher [843]		Species or species habitat may occur within area	In buffer area only
Limosa lapponica			
Bar-tailed Godwit [844]		Species or species habitat may occur within area	In buffer area only
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pandion haliaetus			
Osprey [952]		Species or species habitat likely to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Acrocephalus orientalis			
Oriental Reed-Warbler [59570]		Species or species habitat may occur within area overfly marine area	In feature area
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus			
Common Noddy [825]		Species or species habitat may occur within area	In feature area
Anseranas semipalmata			
Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In buffer area only
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In buffer area only
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris canutus			
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Calonectris leucomelas			
Streaked Shearwater [1077]		Species or species habitat may occur within area	In feature area
Cecropis daurica as Hirundo daurica			
Red-rumped Swallow [80610]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In buffer area only
Charadrius leschenaultii			
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius veredus			
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat may occur within area	In feature area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area	In feature area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area	In feature area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat may occur within area overfly marine area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In buffer area only
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pandion haliaetus			
Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Phaethon lepturus			
White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons			
Rufous Fantail [592]		Species or species habitat may occur within area overfly marine area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Sternula albifrons as Sterna albifrons			
Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
Fish			
Campichthys tricarinatus			
Three-keel Pipefish [66192]		Species or species habitat may occur within area	In feature area
Choeroichthys brachysoma			
Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area	In feature area
Choeroichthys suillus			
Pig-snouted Pipefish [66198]		Species or species habitat may occur within area	In feature area
Corythoichthys amplexus			
Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area	In feature area
Corythoichthys flavofasciatus			
Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area	In buffer area only
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area	In feature area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area	In feature area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area	In feature area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area	In feature area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area	In feature area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area	In feature area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In feature area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area	In feature area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area	In feature area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus spinosissimus			
Hedgehog Seahorse [66239]		Species or species habitat may occur within area	In feature area
Micrognathus micronotopterus			
Tidepool Pipefish [66255]		Species or species habitat may occur within area	In feature area
Solegnathus hardwickii			
Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area	In feature area
Solegnathus lettiensis			
Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In feature area
Solenostomus cyanopterus			
Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In feature area
Syngnathoides biaculeatus			
Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In feature area
Trachyrhamphus bicoarctatus			
Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In feature area
Trachyrhamphus longirostris			
Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area	In feature area
Mammal			
Dugong dugon			
Dugong [28]		Species or species habitat may occur within area	In feature area
Reptile			
Acalyptophis peronii			
Horned Seasnake [1114]		Species or species habitat may occur within area	In feature area
Aipysurus apraefrontalis			
Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area	In feature area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area	In feature area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat may occur within area	In feature area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area	In feature area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area	In feature area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Chitulia ornata as Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [87377]		Species or species habitat may occur within area	In feature area
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may occur within area	In feature area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Disteira kingii			
Spectacled Seasnake [1123]		Species or species habitat may occur within area	In feature area
Disteira major			
Olive-headed Seasnake [1124]		Species or species habitat may occur within area	In feature area
Emydocephalus annulatus			
Turtle-headed Seasnake [1125]		Species or species habitat may occur within area	In feature area
Enhydrina schistosa			
Beaked Seasnake [1126]		Species or species habitat may occur within area	In feature area
Eretmochelys imbricata			
Hawksbill Turtle [1766]	Vulnerable	Breeding likely to occur within area	In feature area
Hydrelaps darwiniensis			
Black-ringed Seasnake [1100]		Species or species habitat may occur within area	In feature area
Hydrophis elegans			
Elegant Seasnake [1104]		Species or species habitat may occur within area	In feature area
Hydrophis macdowelli as Hydrophis mcdowelli			
Small-headed Seasnake [75601]		Species or species habitat may occur within area	In feature area
Lapemis curtus as Lapemis hardwickii			
Spine-bellied Seasnake [83554]		Species or species habitat may occur within area	In feature area
Lepidochelys olivacea			
Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Natator depressus			
Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pelamis platurus			
Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area	In feature area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera edeni			
Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
Delphinus delphis			
Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
Grampus griseus			
Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae			
Humpback Whale [38]		Species or species habitat may occur within area	In feature area
Orcaella heinsohni			
Australian Snubfin Dolphin [81322]		Breeding known to occur within area	In feature area
Orcinus orca			
Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Sousa sahulensis			
Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area	In feature area
Stenella attenuata			
Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In feature area
Tursiops aduncus			
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Tursiops aduncus (Arafura/Timor Sea populations)			
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area	In feature area
Tursiops truncatus s. str.			
Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories	Buffer Status
Joseph Bonaparte Gulf	Multiple Use Zone (IUCN VI)	In buffer area only

Habitat Critical to the Survival of Marine Turtles

Scientific Name	Behaviour	Presence	Buffer Status
Aug - Sep			
Natator depressus			
Flatback Turtle [59257]	Nesting	Known to occur	In feature area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
North Kimberley	Marine Park	WA	In buffer area only
Ord River	Nature Reserve	WA	In buffer area only

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Ord Estuary System	WA	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
2D Seismic Survey in WA Permit Area TP/22 and Commonwealth Permit Area WA-280-P	2005/2100	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Biologically Important Areas

Scientific Name	Behaviour	Presence	Buffer Status
Dolphins			
Orcaella heinsohni			
Australian Snubfin Dolphin [81322]	Breeding	Known to occur	In feature area

Orcaella heinsohni Australian Snubfin Dolphin [81322]	Calving	Known to occur	In feature area
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Foraging (high density prey)	Known to occur	In feature area
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Resting	Known to occur	In feature area
Marine Turtles			
Chelonia mydas Green Turtle [1765]	Foraging	Known to occur	In buffer area only
Lepidochelys olivacea Olive Ridley Turtle [1767]	Foraging	Known to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur	In feature area

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