Browse Carbon Capture and Storage Project

Application Number: **02625** Commencement Date: **08/10/2024** Status: **Locked**

1. About the project

1.1 Project details

1.1.1 Project title *

Browse Carbon Capture and Storage Project

1.1.2 Project industry type *

Energy Generation and Supply (non-renewable)

1.1.3 Project industry sub-type

LNG/FLNG

1.1.4 Estimated start date *

01/01/2030

1.1.4 Estimated end date *

31/12/2065

1.2 Proposed Action details

1.2.1 Provide an overview of the proposed action, including all proposed activities. *

The purpose of the proposed Browse Carbon Capture and Storage ("CCS") Project is to develop the infrastructure to transport, inject and permanently sequester up to 270 mmscfd (~14,200 tonnes of Carbon Dioxide (CO_2) per day) into the Calliance Storage Formation at an expected annual average injection rate of 3 - 4 million tonnes per annum (mtpa). The CO_2 will originate from the proposed Browse to NWS Project

(EPBC 2018/8319), which is expected to produce approximately 80 million tonnes (this is the middle case of the range of expected outcomes) of reservoir CO2 over the life of that proposal. The Browse CCS Project will be designed to capture and permanently sequester, at a minimum, 85% of the CO2 removed from reservoir fluids ("reservoir CO2") by the Browse to NWS Project. On this basis, the Browse CCS Project is expected to enable a net reduction of greenhouse gas (GHG) emissions from the Browse to NWS Project by approximately 53 million tonnes (47%). It will also enable an additional 9 mt of CO2 that would otherwise be sent to onshore processing facilities, to be captured and sequestered.

Key subsea infrastructure enabling operation of the proposal includes a subsea CO2 flowline connected to the Browse FPSOs and the injection sites, as well as operation of between 2 and 6 gas injection wells. A total of up to 7 wells would be drilled as part of the proposal. The CO2 stream, once separated from reservoir hydrocarbons, will be dehydrated and compressed to enable injection at the well sites by equipment that will be located on board the Browse to NWS Project Floating, Production, Storage and Offtake (FPSOs) vessels .

The proposed Browse to NWS project initially included provisions to vent the CO2 to atmosphere, however, the Browse CCS Project is proposed to be utilised to avoid the need to vent these emissions by injecting them into an underground storage formation.

A detailed description of the Browse CCS Project is provided within **Att 1 Proposed Browse CCS Project Referral Supporting Information Document (Section 2, pg. 32).**

Scope and Battery Limits

The scope of the Browse CCS Project is limited to the following physical components:

- Drilling and completion activities of up to seven wells, of which between two and six would be operated as part of the CO2 injection system.
- Installation and commissioning of a subsea CO2 injection flowline up to 130km in length, to be installed along one of two possible routes.
- Installation and commissioning of supporting subsea infrastructure such as communication and control umbilicals and well control infrastructure (i.e. x-mas trees).
- Monitoring of the CO2 plume within the Calliance Storage Formation via periodic geophysical and/or seismic surveys.
- Operation and maintenance of the subsea infrastructure.
- Capture of the CO2 stream at the outlet of the Acid Gas Removal Unit, dehydration of the CO2 stream and injection into subsea infrastructure via use of an electrically driven export compressor. This equipment will be installed and operated from the two Floating, Production, Storage and Offtake vessels (FPSO), which form part of the Browse to NWS project infrastructure.
- Decommissioning and removal of all infrastructure installed as part of the Browse CCS Project.

The ‘battery limits’ the Browse CCS Project commences at the point at which the CO2 is separated from the Browse reservoir fluids via the Acid Gas Removal Unit (AGRU) on each of the two Browse FPSO. Operation of the AGRU and associated activities, as well as generation of electricity (and other incidental utilities) that will be used by the CCS Project are within the scope of the Browse to NWS Project.

The management and impact assessment associated with the risk of an unplanned release of concentrated CO2 stream to the Commonwealth Marine Environment is contained solely within the scope of the Browse CCS Project. Further details regarding the potential impacts, including changes to marine water composition, resulting from a highly unlikely release of CO2 from the storage formation are described in **Att 7 CO2 Release and Hydrocarbon Spill Modelling Report (Appendix C)**. A Protected Matters Search Tool was conducted for the environment that may be affected (EMBA) for the worst case, highly unlikely spill event that may occur as a result of the proposal (See **Att 8 Hydrocarbon Spill EMBA Protected Matters Search Tool Report (Appendix D)**).

All other activities required for the proposed Browse CCS Project (equipment on each FPSO including product extraction from reservoirs, separation of CO2 from other reservoir fluids, generation of electricity and operation of the overall system including utilities such as cooling water) are outside the scope of this referral. These activities are all included within the scope of the activities described as part of the previously referred proposed Browse to NWS Project.

Development Envelope

The spatial extent of physical infrastructure associated with the Browse CCS Project is shown in **Figure 1-1** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document (Section 1.3.3, pg. 23)**. The boundary of this project area aligns with the boundary of each GHG or pipeline graticular block boundaries that either infrastructure will be installed in, or which may be affected by, the movement of the CO2 plume within the geological formation.

A second Project Area boundary is shown in **Figure 1-2** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document (Section 1.3.3, pg. 24)**, to show the boundary of the area in which seismic surveys would be conducted as part of periodic surveys conducted to monitor the migration of the CO2 plume. The is no physical disturbance to the seabed associated with this activity.

The Browse CCS Project does not involve any activities in WA State Waters or within 3 nautical miles of Scott Reef above the mean high tide mark. There may be temporary and localised impact to State Waters due to noise from vessels installing or maintaining the CO2 flowline when it is in proximity to the State Waters boundary. Given the short term nature of these activities, there are no planned impacts from this activity that would have a significant effect on the environment within WA State waters and as such the proposed Browse CCS Project is not being referred under the WA *Environment Protection Act 1986*.

Disturbance footprint

Seabed disturbance is associated with the temporary or permanent installation, placement and decommissioning of facilities, infrastructure, and equipment, including:

- A subsea CO2 Injection Flowline of up to 130km in total length
- 7 injection wells (up to 6 wells will be operated, 7 will be drilled). All wells will be located along the final 10km of either the primary or alternative injection flowline route.
- MODU or support vessel anchors / moorings
- Subsea control infrastructure such as electrical and hydraulic cables (umbilicals)
- Associated subsea structures such as manifolds, in line tees (ILT) and end terminations (FLET)

Other activities that may cause seabed disturbance include seabed intervention & preparation and secondary stabilisation for the CO2 Injection Flowline or subsea infrastructure and temporary wet parking of project infrastructure during construction prior to installation at the final design location.

Seabed disturbance associated with the CCS infrastructure is estimated at approximately 2.5 km2 and will only occur in deep, offshore waters (>200m deep). All disturbance due to the presence of infrastructure on the seabed is completely reversible as infrastructure will be removed as part of project decommissioning.

Drilling and completion of injection wells will generate drill cuttings, require cementing of the casing, and require the use of a range of fluids, that may be discharged to the marine environment, typically at the seabed and at or near the sea surface depending on the hole section.

The modelling undertaken in relation to the development of the Browse resource indicates that sediment deposition from well drilling would potentially occur to a distance in the order of a couple of hundred metres from each well location (in the direction of the prevailing current). This assessment aligns with several studies which indicate that the spread of cuttings can be expected to be up to about 150 m from the discharge location. Drill cuttings and retained non-water based fluid (<6.9% oil on cuttings) released at or

below the surface after treatment on the drilling centre for the bottom-hole (reservoir) well sections are generally dispersed and settle within a seabed area confined to a maximum of 500 m distance of the discharge point.

1.2.2 Is the project action part of a staged development or related to other actions or proposals in the region?

Yes

1.2.3 Is the proposed action the first stage of a staged development (or a larger project)?

No

1.2.4 Related referral(s)

EPBC Number	Project Title
2018/8319	Browse to North West Shelf Development, Indian Ocean, WA

1.2.5 Provide information about the staged development (or relevant larger project).

The purpose of the Browse Carbon Capture and Storage (CCS) Project is to capture a compressed CO2 stream from onboard the two proposed FPSO's that form part of the proposed Browse to NWS Project (EPBC 2018/8319). The Browse CCS Project (this referral) will then capture and transport this CO2 to the injection sites, for permanent sequestration into the Calliance Storage Formation. Total Scope 1 GHG emissions from the proposed Browse to NWS Project are estimated at 112 MT, of which approximately 70 MT are from the venting of reservoir CO2. Reservoir CO2 is separated from the hydrocarbons when extracted from the reservoir, as part of the gas processing process. The proposed Browse CCS Project will be designed to permanently sequester at least 85% of the reservoir CO2 that would otherwise be vented from the proposed Browse to NWS Project. A detailed outline of all greenhouse gas emissions is provided in **Section 10 (pg. 264)** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

Energy (i.e. electricity) will be required to operate the equipment used to sequester the CO2, which will generate GHG emissions. The equipment involved in the capture and transport of this CO2 will generate approximately 2.5 MT CO2e. This results in a potential net benefit of the Browse CCS Project of 53 MT, equivalent to a 47% reduction in total Scope 1 emissions of the proposed Browse to NWS Project.

The CCS project also facilitates the opportunity to increase the amount of CO2 that is separated from the natural gas stream before being sent onshore, facilitating its permanent sequestration. A reduction in the gas export CO2 specification from 2.5 mol% to 1 mol% will make an additional 9 MT of reservoir CO2 available to be sequestered by the Browse CCS Project.

As described in the Final Environment Impact Statement (EIS) for the proposed Browse to NWS Project, CCS was one of many options considered by the Browse Joint Venture(BJV) to reduce Scope 1 GHG emissions. At the time of referral of the proposed Browse to NWS, the BJV determined that it was not technically or commercially feasible to incorporate CCS into the Browse to NWS Project from project Ready For Start Up (RFSU). Rather, at the time the Browse to NWS Project was referred, it was determined that generation of GHG offsets through approved and validated carbon farming methodologies was a

significantly lower risk and more cost-effective solution than geosequestration of reservoir CO2. It was noted in the EIS that while CCS for an offshore floating facility is technically challenging, with time, CCS technology would improve and engineering considerations for future CCS were incorporated into the FPSO design to accommodate retro-fit of CCS technology in the future.

Since publication of the draft EIS in 2019, the BJV has undertaken extensive studies into the technical, commercial and regulatory feasibility of CCS. Based on these studies and improvements in CCS technology, the BJV has now determined that it is possible to incorporate CCS from RFSU, rather than retrofitting facilities at a future date. The feasibility studies undertaken since publication of the Final EIS have further progressed work on managing technical, operational and safety risks and reducing uncertainty. Implementation of the Browse CCS Project is aligned to Woodside's Climate Strategy, which prioritises economically viable opportunities to avoid and reduce emissions over the use of offsets.

An overview of the relationship between the Browse to NWS Project and the Browse CCS Project is further described in **Section 1.4.1 (pg. 25)** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document**. A detailed overview of direct and indirect GHG emissions from implementation of the proposed Browse CCS Project are outlined in **Section 10 (pg. 264)** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

Background to the proposed Browse to NWS Project (EPBC 2018/8319)

The Browse to NWS Project was referred under the Environment Protection and Biodiversity Conservation Act in 2018. As discussed above, the scope of the Browse to NWS Project as referred does not include CCS and anticipates venting to atmosphere any reservoir CO2 separated from natural gas onboard the FPSO and not sent onshore.

During the public comment process on the Browse to NWS Project that was conducted from late 2019 to early 2020, a number of submissions raised the potential use of CCS as a mechanism to mitigate GHG emissions. In the Final EIS for the Browse to NWS Project published in 2022, it was noted that CCS for an offshore floating facility was considered technically challenging, but that with time, CCS technology would likely improve. As such, it was stated that the BJV would continue to assess the feasibility of CCS opportunities, but that CCS would not form part of the Browse to NWS Project action. In the consideration of public comments, it was also noted that should an opportunity be considered feasible in the future from a technical, commercial, and regulatory perspective and be able to be progressed by the BJV in relation to the Browse to NWS Project titles, this would be separately referred by Woodside as Operator for and on behalf of the BJV. The referral of the Browse CCS Project under the EPBC Act is in line with this statement.

Since the Final EIS and Response to Submissions for the Browse to NWS Project was published, the BJV has continued to evaluate opportunities to reduce CO2 emissions from the Browse to NWS Project. This evaluation includes work conducted by the BJV over the last 2-3 years to determine that the Calliance Storage Formation, located in proximity to the Browse to NWS Project, is a suitable storage location. This was formally validated in June 2024, when the Responsible Commonwealth Minister declared an identified GHG storage formation over the Calliance Storage Formation under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*.

Submission of this referral will facilitate full regulatory oversight and public transparency on the Browse CCS Project, including those impacts and risks that are new or different relative to the Browse to NWS Project and the relationship between the two separate but related proposals. Further, concurrent referral of the Browse to NWS Project and the Browse CCS Project enables a clear consideration of the individual and cumulative impact profile of both actions, even though they are being progressed via separate referrals.

This approach best balances the need for transparency and robust environmental impact assessment for all the activities to be progressed as part of the broader Browse Project, while avoiding duplication of assessment and delay. While the Browse to NWS Project and Browse CCS Project are linked, both actions are capable of independent description (as evidenced by the CCS Referral itself) and will be subject to separate regulatory approvals.

Within the referral supporting document, sufficient information has been included to allow for a thorough understanding of the relationship between the Browse CCS project relates to the proposed Browse to NWS Project, including an assessment of risks to MNES from the CCS Project considered in isolation (**Section 6 of Att 1 Proposed Browse CCS Project Referral Supporting Information Document**) and cumulatively (**Section 7 of Att 1 Proposed Browse CCS Project Referral Supporting Information Document**) with those related to the Browse to NWS Project. A comprehensive description of activities relating to the Browse CCS Project are included in **Section 2** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document** including a comprehensive overview of how these interact with the Browse to NWS Proposal.

Background to the proposed Browse to NWS Project

Upon referral of the Browse to NWS Project, it was determined by the Commonwealth Environment Minister's Delegate to be a controlled action, due to potentially significant impacts to the following Matters of National Environment Significant:

- National heritage values of a National Heritage place
- Listed threatened species and communities
- Listed migratory species
- Commonwealth marine area, the protected matter being the environment generally.

An estimate of GHG emissions was included with the Browse to NWS Project referral submission information. It was determined by the Minister's Delegate that the Scope 1 and 3 GHG emissions from the Browse to NWS Project were not a controlling provision, as they were not so significant as to be considered a direct or majority cause of any significant impact to any MNES. The Browse CCS Project is not being progressed to ensure any significant impacts to MNES are managed, but to generally ensure the Browse to NWS Project is best aligned with the BJV's participants strategies to minimise contribution to climate change.

Assessment of the Browse to NWS Project under the EPBC Act is not yet complete as, at the time of referral, the Commonwealth Minister is awaiting further information from the Western Australian Government. The specific information being requested is the final approval decision and any conditions that will be set for the North West Shelf Project Extension under the WA Environment Protection Act by the WA Environment Minister.

1.2.6 What Commonwealth or state legislation, planning frameworks or policy documents are relevant to the proposed action, and how are they relevant? *

Relevant legislation, frameworks or policy documents relevant to the proposal include:

***Environment Protection (Sea Dumping) Act* 1981**

The *Environment Protection (Sea Dumping) Act 1981 (Sea Dumping Act)* regulates the disposal of carbon dioxide (CO2) via carbon capture and sequestration at sea.

Under this Act, a Sea Dumping Permit (SDP) is required where a proponent seeks to dispose of CO2 via carbon capture and storage at sea within Australian waters. This includes any CO2 injected during the appraisal stage.

Granting of SDPs for this purpose requires the Environment Minister (or delegate) to be satisfied that the material meets the criteria set out in the London Protocol including the composition of a CO2 stream and any contaminants.

The Department of Climate Change Energy Environment and Water (DCCEEW) have provided guidance that a SDP will be necessary to ensure that CO2 streams are loaded, transported and sequestered at appropriate offshore sites result in no significant adverse impacts result to the marine environment or to

human health and safety. The SDP application must include a proposed duration of the permit. The proposed duration must be appropriate to undertake long-term monitoring.

A SDP will be in place prior to the commencement of any CO2 injection operations as part of the Browse CCS Project. The duration of the permit will be aligned to that defined in the long-term monitoring plan in the approved Calliance Storage Formation Site Plan (**Section 6, pg. 43 of Att 1 Proposed Browse CCS Project Referral Supporting Information Document**).

Offshore Petroleum and Greenhouse Gas Storage Act 2006 and relevant associated Regulations

The *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) provides a framework for all offshore petroleum exploration, production, recovery and GHG storage activities in Commonwealth waters. The OPGGS Act is supported by regulations and directions that cover safety, diving, integrity, petroleum resource management and environmental management. Several assessments are required under the OPGGS Act from NOPSEMA to construct, operate, and decommission a GHG storage facility.

Offshore Petroleum and Greenhouse Gas (Environment) Regulations 2023

The related *OPGGS (Environment) Regulations 2023* (OPGGS (E) Regulations) ensure that any petroleum or GHG storage activity is consistent with environmentally sustainable development (ESD) principles and is carried out in such a way that the environmental impacts and risks of the activity are reduced to As Low As Reasonably Practicable (ALARP) and are of an acceptable level (Government of Australia, 2014).

Under the OPGGS (E) Regulations, the titleholder of a petroleum or GHG storage activity must not carry out that activity unless an accepted Environment Plan (EP) is in force for the activity. The EP must describe the activity, the receiving environment, environmental aspects and assess potential environmental impacts. In addition, an EP must contain appropriate risk-based environmental performance outcomes and standards, and an implementation strategy. It must also provide criteria for determining whether the outcomes and standards are met.

In addition, under the OPGGS (E) Regulations, an Oil Pollution Emergency Plan (OPEP) is required as part of the EP's implementation strategy. The OPEP must be accepted by NOPSEMA before any drilling, construction, or production activities can commence within a retention lease.

Activities in Commonwealth waters requiring an accepted EP and OPEP for the proposed Browse CCS Project may include (but are not limited to): drilling and completions; installation and commissioning; operations and maintenance (including monitoring); and decommissioning. EPs for all relevant activities will be submitted to NOPSEMA for approval before activities commence.

Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2023

The related *OPGGS (Greenhouse Gas Injection and Storage) Regulations 2023* (OPGGS (GGIS) Regulations) ensure the fundamental suitability for CO2 storage sites via a Declaration of Identified GHG Storage Formation. The Application for Declaration of Identified GHG Storage Formation provides a mechanism for the transition from a GHG Assessment Permit to a GHG Holding Lease or GHG Injection Licence. This is an important step in establishing the technical viability of the GHG Storage Formation. The process is administered by NOPTA, with advice from other agencies as required, and the Declaration is made by the Responsible Commonwealth Minister.

A GHG Injection Licence is required where a titleholder seeks to inject or store (on a permanent basis or otherwise) a substance into the seabed or subsoil of an offshore area. A GHG Injection Licence Application will include a Site Plan. The Site Plan contains a Measurement, Monitoring and Verification (MMV) Program to ensure reservoir integrity (**Section 2.6, pg. 43** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document**), a site closure (decommissioning) plan, and other required information as described in the OPGGS (Resource Management and Administration Regulations) 2011 (see below).

The Browse CCS Project will comply with the Injection Licence and the Site Plan which will be in place prior to CO2 injection activities. This includes CO2 storage integrity monitoring requirements to demonstrate that the Calliance Storage Formation remains an effective and sound sealing mechanism.

Greenhouse Gas Storage (Resource Management and Administration Regulations) 2011

In accordance with these regulations, a Well Operations Management Plan (WOMP) is required for any well activity prior to commencement of the activity and the activity must be conducted in accordance with the WOMP in force.

The WOMP must provide a description of the control measures in place that ensure that risks to the integrity of the well will be reduced to as low as reasonably practicable (ALARP) throughout the life of the well, including periods when the well is suspended (i.e. not operational but not permanently abandoned), and that a description of the performance standards for those control measures are also described and appropriate. Additionally, a description of the planned performance outcomes and criteria against which performance is to be measured should also be included.

Further, the WOMP should include a description of the monitoring, audit and well integrity assurance processes that will be implemented to ensure the performance outcomes and performance standards are met throughout the life of the well, including periods when the well is suspended.

A WOMP will be submitted to NOPSEMA for approval before activities commence.

***National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule* 2015**

The safeguard mechanism (SGM) is a Commonwealth Government mechanism for reducing emissions at industrial facilities. It sets legislated limits—known as baselines—on the greenhouse gas emissions of these facilities. According to information published by the Clean Energy Regulator (regulator for the SGM), these baselines will decline, predictably and gradually, on a trajectory consistent with achieving Australia's emission reduction targets of 43% below 2005 levels by 2030 and net zero by 2050.

Greenhouse Gas emissions directly arising from the Browse CCS Project within the scope of this referral would be minimal, however, are likely to be within the scope of the FPSO facilities under SGM.

Other Commonwealth Legislation

The proposed Browse CCS Project is subject to further Commonwealth legislative requirements in addition to those described above. These include, but are not limited to the following:

- Australian Heritage Council Act 2003
- Australian Jobs Act 2013
- Biosecurity Act 2015
- Civil Aviation Act 1988
- Climate Change Act 2022
- Hazardous Waste (Regulation of Exports and Imports) Act 1989
- National Greenhouse and Energy Reporting Act 2007
- National Radioactive Waste Management Act 2012
- Navigation Act 2012
- Protection of the Sea (Prevention of Pollution from Ships) Act 1983
- Protection of the Sea (Harmful Anti-fouling Substances) Act 2006
- Submarine Cables and Pipelines Protection Act 1963
- Underwater Cultural Heritage Act 2018 (UCH Act).

Commonwealth Policy Framework

Australian Ballast Water Management Requirements 2017

On 1 July 2001, Australia introduced mandatory ballast water management requirements to reduce the risk of introducing harmful aquatic organisms into Australia's marine environment through ship's ballast water. These requirements are consistent with International Maritime Organisation (IMO) Guidelines for minimising the translocation of harmful aquatic species in ships' ballast water. Version 8 of the requirements was released in March 2020 and includes updates to reflect the *Biosecurity (Ballast Water and Sediment) Amendment (Ballast Water Management Methods) Determination 2019* and *the Biosecurity (Ballast Water Same Risk Area) Amendment (Great Barrier Reef and Northern Territory) Instrument* 2019.

National Biofouling Management Guidance for the Petroleum Production and Exploration Industry 2009

This guidance document aims to help operators in the petroleum production and exploration industry minimise the amount of biofouling accumulating on vessels, infrastructure and submersible equipment and thus minimise the risk of spreading marine pests around the Australian coastline.

State Legislation

The Development Envelope is restricted to Commonwealth Jurisdiction. Due to the presence of WA state managed fisheries within the Development Area that operate in Commonwealth waters, the proposed Browse CCS Project is subject to the *Fish Resources Management Act 1994* (it is noted that this Act is to be replaced by the *Aquatic Resources Management Act 2016*, however; there is no confirmed timeframe for this transition).

Other application legislation, including the EPBC Act, are described in **Att 1 Proposed Browse CCS Project Referral Supporting Information Document (Section 1.6, Pg 27).**

1.2.7 Describe any public consultation that has been, is being or will be undertaken regarding the project area, including with Indigenous stakeholders. Attach any completed consultation documentations, if relevant. *

Woodside takes community and stakeholder consultation seriously. We acknowledge there may be persons who hold rights or interests that may be impacted by our activities, and we seek to understand who those persons are, engage with them in an inclusive and respectful manner, and manage our activities in a way that will avoid or minimise risks and impacts to them. In many cases the stakeholder feedback we receive builds upon our established understanding of the areas and communities in which we operate as well as the potential impacts and risks of our activities and supports continuous improvement of our processes and activities. Woodside supports meaningful consultation, which includes inclusive engagement with First Nations communities. Woodside's aim is to ensure the activity is carried out in a manner that is consistent with the principles of Ecologically Sustainable Development (ESD). We want relevant persons whose functions, interests or activities may be affected by the proposed activity to have the opportunity to provide feedback on our proposed activity, in accordance with the intended outcome of consultation. Woodside engages in ongoing consultation throughout the life of our projects. We emphasise open and transparent communication and feedback on our activities.

Implementation of the proposed Browse CCS Project is aligned with much of the feedback received from stakeholders on the related project, the Proposed Browse to NWS Project.

Stakeholders include decision-making authorities, other relevant government agencies and authorities (Local, State and Commonwealth), local communities, first nations stakeholders, academics, research authorities and environmental NGOs. Multiple methods of engagement have been used, including via face-to-face meetings, community drop-in sessions, emails, letters and phone calls.

Consultation conducted, as outlined in this referral, has been informed by the Interim Engaging with First Nations People and Communities on Assessments and Approvals under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (interim guidance) which outlines the statutory obligations

that apply to, and the department's expectations of, proponents engaging with First Nations people and communities under the EPBC Act.

Stakeholder identification process

In 2024, stakeholders in the geographical area of interest were identified through historical stakeholder engagements and Woodside's ongoing activities. First Nations groups relevant to the operational area of the Browse CCS Project, as well as First Nations groups who had notified Woodside of their interest to be involved in discussions related to Browse Basin activities were also identified.

Over the period April – June 2024, identified stakeholders (**Table 11-1, pg. 267 of Att 1 Proposed Browse CCS Project Referral Supporting Information Document)** were provided information on the Browse CCS Project via email and postal notifications as a preliminary step intended to inform the submission of this referral. The notifications invited feedback and informed of the communication channels to do this. It was also noted there would be several further opportunities to provide feedback across phases of the proposed project. Written feedback was received by some stakeholders in response to these notifications and subsequently responded to (see **Table 11-3, pg. 274 of Att 1 Proposed Browse CCS Project Referral Supporting Information Document**).

In addition to email and postal notifications on Browse CCS Project, face-to-face meetings with some stakeholders took place. These meetings focused on community leaders, industry/business representative organisations, Indigenous organisations and Traditional Custodians, infrastructure operators and local government authorities.

During these meetings, stakeholders were provided with an overview of the Browse CCS Project and how it relates to the Browse to NWS Project development concept, and their broad views were sought. In line with Woodside's commitment to ongoing consultation throughout the life of the Browse CCS Project, stakeholders were also provided with information about the ongoing mechanisms for consultation that have been established.

These face-to-face engagements provided an opportunity for stakeholders to ask questions about CCS, the Browse CCS Project and the proposed Browse to NWS Project. Woodside was able to provide responses directly to stakeholders and understand any concerns.

Other Consultation

Table 11-2 (pg. 269) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document** provides a summary of stakeholder engagement undertaken since 2022 in relation to the proposed Browse to NWS Project. Woodside notes that further feedback may be received as part of our ongoing engagements.

1.3.1 Identity: Referring party

Privacy Notice:

Personal information means information or an opinion about an identified individual, or an individual who is reasonably identifiable.

By completing and submitting this form, you consent to the collection of all personal information contained in this form. If you are providing the personal information of other individuals in this form, please ensure you have their consent before doing so.

The Department of Climate Change, Energy, the Environment and Water (the department) collects your personal information (as defined by the Privacy Act 1988) through this platform for the purposes of enabling the department to consider your submission and contact you in relation to your submission. If you fail to provide some or all of the personal information requested on this platform (name and email address), the department will be unable to contact you to seek further information (if required) and subsequently may impact the consideration given to your submission.

Personal information may be disclosed to other Australian government agencies, persons or organisations where necessary for the above purposes, provided the disclosure is consistent with relevant laws, in particular the Privacy Act 1988 (Privacy Act). Your personal information will be used and stored in accordance with the Australian Privacy Principles.

See our Privacy Policy to learn more about accessing or correcting personal information or making a complaint.

Alternatively, email us at privacy@awe.gov.au.

☑ **Confirm that you have read and understand this Privacy Notice ***

1.3.1.1 Is Referring party an organisation or business? *

Yes

Referring party organisation details

ABN/ACN	63005482986
Organisation name	WOODSIDE ENERGY LTD.
Organisation address	11 Mount St, Perth WA, 6000

Referring party details

Name	Aaron McDonald
Job title	Environment Approvals Lead - Browse
Phone	0417 683 394
Email	aaron.mcdonald@woodside.com.au
Address	

1.3.2 Identity: Person proposing to take the action

1.3.2.1 Are the Person proposing to take the action details the same as the Referring party details? *

No

1.3.2.2 Is Person proposing to take the action an organisation or business? *

Yes

Person proposing to take the action organisation details

ABN/ACN	63005482986
Organisation name	WOODSIDE ENERGY LTD.
Organisation address	11 Mount St, Perth, WA 6000

Person proposing to take the action details

Name	Kimberly Walpot
Job title	Vice President, Browse
Phone	9348 4000
Email	kimberly.walpot@woodside.com
Address	11 Mount St, Perth, WA 6000

1.3.2.14 Are you proposing the action as part of a Joint Venture? *

Yes

Joint Venture Name	Business Address	ABN/ACN	Responsible Person	Email
BP Developments Australia Pty Ltd	Level 15, 240 St George's Tce Perth WA	54081102856		
Japan Australia LNG (MIMI Browse) Pty Ltd	152 St Georges Tce Perth	18006303180		

Joint Venture Name	Business Address	ABN/ACN	Responsible Person	Email
PetroChina International Investment (Australia) Pty Ltd	Level 32, 345 Queen Street Brisbane QLD 4000	47152953529		

1.3.2.15 Are you proposing the action as part of a Trust? *

No

1.3.2.17 Describe the Person proposing the action's history of responsible environmental management including details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against the Person proposing to take the action. *

Woodside is a global energy company, founded in Australia, with a spirit of innovation and determination. Our focus in operations remains on safety, reliability, efficiency and environmental performance, leveraging more than 35 years of operating experience. Our approach to environmental management is detailed in its Health,Safety & Environment Policy. Integrity, accountability and transparency drive our environmental, social and governance (ESG) aspirations and guide decision making at all levels of our business. We strive to operate responsibly across our business activities. Enduring and meaningful relationships with communities are fundamental to our social performance. We engage with our workforce regularly to communicate safety information and to understand current and emerging safety issues.

Regular communication channels include site based pre-start meetings, safety event bulletins, safety learning meetings, performance updates and reports. Our formal site based health, safety and environment (HSE) representatives meet at operated sites each month to discuss workplace HSE risks and raise priority issues with site management

Further detail is available on the Woodside website, accessible via the attached external link.

Historic Performance

Woodside Energy has not been subject of proceedings from environmental regulatory agencies, either past or present, under a Commonwealth or State law for the protection of the environment or the conservation and sustainable use of natural resource

Prior EPBC Referrals

The following provides a list of prior development referrals submitted by Woodside.

2023/09559- H2Perth hydrogen and ammonia project

2022/09365 – H2TAS

2022/09328 – Woodside Solar Facility

2018/8335 – NWS Project Extension

2018/8319 – Proposed Browse to NWS Development

2013/7079 – Browse FLNG Development

2011/5980 – Greater Western Flank Phase 1 Gas Development

2011/5936 – Julimar Brunello Gas Development Project

2008/4111 – Development of Browse Basin Gas Fields (Upstream)

2006/2968 – Pluto Gas Project Including Site B 2005/2258 – Pluto Gas Project

2007/3436 – North West Shelf Gas Venture Phase VI Expansion

2006/3191 – Woodside Project Facilities Increase

2005/2500 – North Rankin B gas compression facility

2005/2464 – Western Flank Gas Development

2004/1805 – Angel

In addition, the list below details the most recent EPBC Act referrals for exploration programs undertaken by Woodside as Operator:

2013/7081 – Babylon 3D Marine Seismic Survey

2012/6618 – Outer Canning exploration drilling program off NW coast of WA

2012/6493 – Rosebud 3D Marine Seismic Survey in WA-30-R and TR/5

2011/5959 –Tridacna 3D Ocean Bottom Cable Marine Seismic Survey

2010/5720 – Vincent M1 and Enfield M5 4D Marine Seismic Survey

2010/5420 – Koolama 2D Seismic Survey Dampier Basin

2010/5415 – Laverda 3D Marine Seismic Survey and Vincent M1 4D Marine Seismic Survey.

2009/5037 – Drill and Profile Exploration Well Somerset 1, License Area T34P

2008/4558 – Enfield M4 4D Marine Seismic Survey

2008/4430 – Torosa-5 Appraisal Well, WA-30-R

2000/13 - Woodside Geotechnical Investigation Sunrise Bank

1.3.2.18 If the person proposing to take the action is a corporation, provide details of the corporation's environmental policy and planning framework

Woodside has a corporate Health, Safety, Environment Management System (HSE MS). It aims to be recognised as an industry leader in HSE through managing activities in a sustainable manner, giving regard to Woodside's workforce, communities and the environment. Woodside is committed to managing activities to minimise adverse health, safety or environmental impacts, incorporating the 'right first time' approach to quality.

The principles of Woodsides HSE policy are found within the following documents:

Woodside **Health and Safety Policy** (refer to **Att 4 Woodside Health and Safety Policy**) recognises that at Woodside we believe that process and personal safety related incidents, and occupational illnesses are preventable. We strive to be an industry leader in health and safety and are committed to managing our activities to minimise adverse health and safety risk related impacts.

The Woodside **Environment and Biodiversity Policy** (refer to **Att 6 Woodside Environment and Biodiversity Policy**) recognises the intrinsic value of nature and the importance of conserving biodiversity and ecosystem services to support the sustainable development of our society. We are committed to doing our part. We understand and embrace our responsibility to undertake activities in an environmentally sustainable way.

Lastly, the **Woodside Quality Policy** (refer to **Att 5 Woodside Quality Policy**) recognises that outstanding quality performance is essential to sustainably meeting business and stakeholder objectives and obligations. We apply quality management principles to ensure that development and operational opportunities are realised to create value and that associated risks are controlled to protect value. Responsibility for the application of these Policies rests with Woodside employees, contractors and joint venturers engaged in the relevant activities under Woodside operational control. Woodside managers are also responsible for promotion of this Policy in non-operated joint ventures. This Policy will be reviewed regularly and updated as required.

1.3.3 Identity: Proposed designated proponent

1.3.3.1 Are the Proposed designated proponent details the same as the Person proposing to take the action? *

Yes

Proposed designated proponent organisation details

ABN/ACN	63005482986
Organisation name	WOODSIDE ENERGY LTD.
Organisation address	11 Mount St, Perth, WA 6000

Proposed designated proponent details

Name	Kimberly Walpot
Job title	Vice President, Browse
Phone	9348 4000
Email	kimberly.walpot@woodside.com
Address	11 Mount St, Perth, WA 6000

1.3.4 Identity: Summary of allocation

Confirmed Referring party's identity

The Referring party is the person preparing the information in this referral.

ABN/ACN	63005482986
Organisation name	WOODSIDE ENERGY LTD.
Organisation address	11 Mount St, Perth WA, 6000
Representative's name	Aaron McDonald
Representative's job title	Environment Approvals Lead - Browse
Phone	0417 683 394
Email	aaron.mcdonald@woodside.com.au
Address	

Confirmed Person proposing to take the action's identity

The Person proposing to take the action is the individual, business, government agency or trustee that will be responsible for the proposed action.

ABN/ACN	63005482986
Organisation name	WOODSIDE ENERGY LTD.
Organisation address	11 Mount St, Perth, WA 6000
Representative's name	Kimberly Walpot
Representative's job title	Vice President, Browse
Phone	9348 4000
Email	kimberly.walpot@woodside.com
Address	11 Mount St, Perth, WA 6000

Confirmed Proposed designated proponent's identity

The Person proposing to take the action is the individual or organisation proposed to be responsible for meeting the requirements of the EPBC Act during the assessment process, if the Minister decides that this project is a controlled action.

Same as Person proposing to take the action information.

1.4 Payment details: Payment exemption and fee waiver

1.4.1 Do you qualify for an exemption from fees under EPBC Regulation 5.23 (1) (a)? *

No

1.4.3 Have you applied for or been granted a waiver for full or partial fees under Regulation 5.21A? *

No

1.4.5 Are you going to apply for a waiver of full or partial fees under EPBC Regulation 5.21A?

No

1.4.7 Has the department issued you with a credit note? *

No

1.4.9 Would you like to add a purchase order number to your invoice? *

No

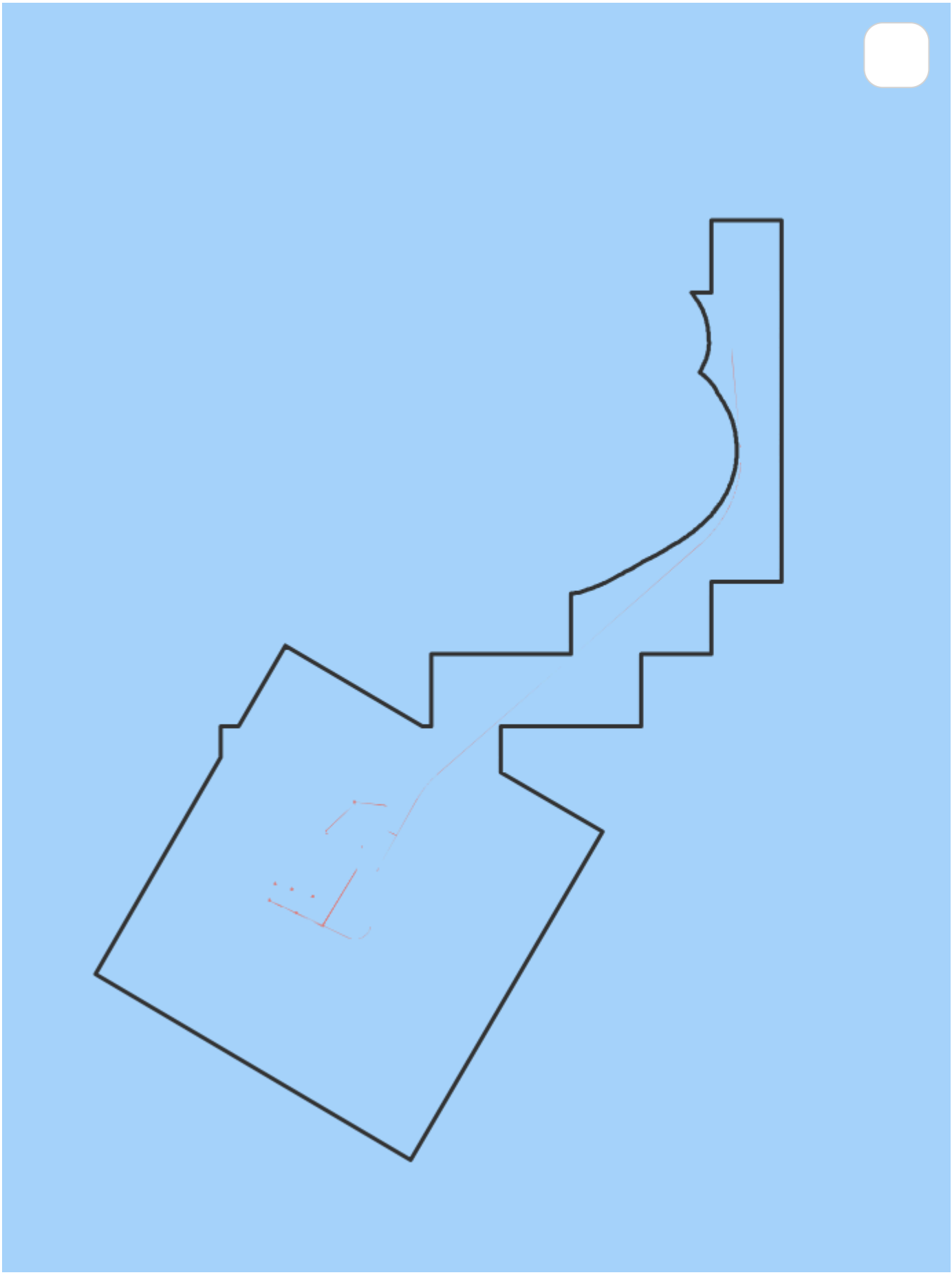
1.4 Payment details: Payment allocation

1.4.11 Who would you like to allocate as the entity responsible for payment? *

Person proposing to take the action

2. Location

2.1 Project footprint



Project Area- 316416.8 Ha Disturbance Footprint - 381.19 Ha

Maptaskr © 2024 -13.761791, 123.199595

Powered By Esri - Sources: Esri, TomTom, Garmin, F…

2.2 Footprint details

2.2.1 What is the address of the proposed action? *

Indian Ocean, Offshore Western Australia

2.2.2 Where is the primary jurisdiction of the proposed action? *

Commonwealth Marine

2.2.3 Is there a secondary jurisdiction for this proposed action? *

No

2.2.5 What is the tenure of the action area relevant to the project area? *

The *Offshore Petroleum and Greenhouse Gas Storage Act* 2006 (OPGGS Act) and associated regulations provides for petroleum exploration and recovery; and injection and storage of GHG substances in offshore areas, and sets out a basic framework of rights, duties, obligations, entitlements and responsibilities of governments and industry. All activities and infrastructure forming part of the Browse CCS Project will occur within the boundary of either greenhouse gas or petroleum titles granted to the Browse Joint Venture in accordance with the OPGGSA.

Greenhouse Gas Titles

The *Offshore Petroleum and Greenhouse Gas Storage Act 2006* establishes a title system for the assessment, injection and storage of greenhouse gas (GHG) substances in geologic formations in Commonwealth offshore areas. A GHG assessment permit authorises the permittee to explore in the permit area for potential GHG storage formations or injection sites.

Woodside Energy Ltd. (Woodside) was granted Greenhouse Gas Assessment Permit G-8-AP on 12 August 2022 following initial participation and nomination of the area on behalf the Browse Joint Venture, in the 2021 Greenhouse Gas offshore licensing round. A single Eligible Storage Formation was identified in the vicinity of the Calliance field consisting of an area of 33 graticular blocks within G-8-AP. G-8-AP is located 425 km north of Broome and 295 km from the Western Australia, Kimberley coast in water depths of 300 m to 1,000 m. The permit consists of 42 graticular blocks and overlaps the petroleum Retention Leases (WA-28-R, WA-29-R, WA-31-R and WA-32-R) containing the Calliance and Brecknock fields. The Storage Formation includes Calliance field as well as the surrounding Southern Aquifer and the Brecknock-Calliance Graben Aquifer to the north of the field.

Prior to any CO2 injection commencing, Woodside on behalf of the Browse Joint Venture will be required to obtain GHG injection licence. This licence authorises the licensee to carry out operations for the injection and permanent storage of GHG substances into a declared identified GHG storage formation in the licence

area. As per requirements of the *Offshore Petroleum and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2023*, a holder of a greenhouse gas injection licence must not inject GHGs into a storage formation unless they do so in accordance with an approved Site Plan.

The Browse CCS Project will comply with the Injection Licence and conditions of the Site Plan which will be in place prior to CO2 injection activities as required by the *Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act)* and supporting regulations, which will include CO2 storage integrity monitoring requirements to demonstrate that the Calliance Storage Formation constitutes an effective and sound sealing mechanism.

The Site Plan for the Calliance Storage Formation is not yet finalised but will describe the proposed Browse CCS Project concept for sequestration of CO2 over the life of the hydrocarbon project and will include a CO2 Measurement, Monitoring and Verification (MMV) Program.

The CCS flowline will be located in Commonwealth Waters, within petroleum Retention Leases currently granted to the Browse Joint venture participants.

3. Existing environment

3.1 Physical description

3.1.1 Describe the current condition of the project area's environment.

The proposed Browse CCS Project is located approximately 290 km north-west of mainland Australia and approximately 425 km north of Broome, Western Australia. The Project Area is located between 8km and 50km from mean low water mark of Scott Reef. A detailed overview of the existing environment of the Project Area is described in **Section 3** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document**

The Development Area is located within the North-west Marine Region (NWMR); one of the five marine regions established to delineate Australia's Commonwealth waters based primarily on ecosystem characteristics. The NWMR encompasses Commonwealth waters from the border of WA and the Northern Territory (NT) to Kalbarri. This region includes the NWS and Sahul Shelf, several ecologically significant coral reefs and is characterised by expanses of continental shelf and slope. The NWMR has been further sub-divided into eight provincial bioregions. The Project Area is within the Timor Province provincial bioregion.

Project Area Environment

The deep-water environment of the Project Area is primarily flat and smooth with a seabed gradient of approximately 1°, with water depths greater than 300 m.

The seabed sediment habitat within the Development Area is largely soft and unconsolidated. There are areas of exposed layers of eroded stiff clay and cemented silt which subsequently comprise more consolidated sediments at the Calliance and Brecknock reservoirs.

Submerged and Emergent Reefs

There are several submerged and emergent reefs and shoals within the NWMR which are the most notable features within the vicinity of the proposal. Those within or in the vicinity of the Project Area are described briefly below. The specific ecological values of these reefs and shoals as relevant to the Project Area are

described in further detail within **Section 3.3.3.2, pg. 71 of Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

3.1.2 Describe any existing or proposed uses for the project area.

This section summarises the available information relating to the socio-economic and cultural environment pertaining to and within the vicinity of the Project Area. Information on heritage and cultural values and existing uses of the Project Area, such as scientific research and tourism, and related stakeholders is also provided in this section. Due to the remote location of the Project Area from the WA coastline, socio-economic activities within the area are limited to commercial fishing, traditional Indonesian fishing, limited recreational fishing and tourism activities at Scott Reef; as well as oil and gas activities that occur in the wider North West Marine Region (NWMR).

Protected places of the wider NWMR that display heritage, social and cultural values, including recreational opportunities, amenity, cultural heritage, conservation, and scientific significance, are also described in this section. For further detail, Refer to **Section 3.5** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

Commonwealth Managed Fisheries

The diverse range of habitats and species within the NWMR has allowed for various fisheries to develop and operate throughout the region. Australian Fisheries Management Authority (AFMA) manages more than 20 fisheries on behalf of the Commonwealth Government and is bound by objectives under the Commonwealth *Fisheries Management Act 1991*.

State Managed Fisheries

WA State commercial fisheries are managed by the WA Department of Fisheries (WA DPIRD) under the WA *Fish Resources Management Act 1994* (FRMA), Fisheries Resources Management Regulations 1995, relevant gazetted notices and licence conditions, and applicable Fishery Management Plans.

Traditional Fisheries

Indonesian fishers have traditionally visited reefs in the NWMR to collect marine species that are economically significant. In 1974 the Australia-Indonesia Memorandum of Understanding regarding the Operations of Indonesian Traditional Fishermen in Areas of the Australian Fishing Zone and Continental Shelf – 1974 (MoU 74) was signed by the Governments of Australia and Indonesia; this allowed Indonesian fishers to continue to fish in designated areas using traditional methods only. These methods include reef gleaning, free-diving, hand lining and other non-mechanised methods.

Initially, traditional fishing was allowed within the 12 mile fishing zones that existed around the following reefs or islets in the region at that time: Ashmore Reef (Pulau Pasir), Cartier Island (Pulau Baru), Seringapatam Reef (Afringan), Scott Reef (Pulau Dato) and Browse Island (Berselan). In 1989 “Practical Guidelines” for implementing the MoU 74 were agreed, which resulted in the creation of the MoU Box that encloses the five areas formerly agreed. The MoU 74 and Practical Guidelines have remained in force since their adoption.

It is likely that Indonesian fishing vessels will occur within proximity of the proposal, but activity is likely to be transient as fishing is unlikely in the deep waters of the Project area.

Shipping

Shipping activity in and around the Development Area is sparse with the main commercial shipping routes located approximately 50 to 100 km west of the Development Area. The main shipping activity in the NWMR relates to transits to and from Broome, and transportation of goods between Australian and international ports. Major ports are adjacent to the Roebuck, Montebello and Dampier Commonwealth marine reserves.

In 2012, AMSA established a network of shipping fairways off the north-west coast of Australia. The shipping fairways, while not mandatory, aim to reduce the risk of collision between transiting vessels and offshore infrastructure. The fairways are intended to direct large vessels such as bulk carriers and LNG ships trading to the major ports into pre-defined routes to keep them clear of existing and planned offshore infrastructure.

Industry

The NWMR supports a number of industries including petroleum exploration and production, as well as minerals extraction.

There are seven sedimentary petroleum basins in the NWMR: the Northern and Southern Carnarvon basins, Perth, Browse, Roebuck, Offshore Canning and Bonaparte basins. Of these, the Northern Carnarvon, Browse and Bonaparte basins hold large quantities of gas and comprise most of Australia's reserves of natural gas. Several other petroleum activities in the Browse Basin are currently being conducted or proposed by other petroleum operators. The proposed Browse CCS Project contributes to the proposed Browse to NWS Project.

Tourism

Recreation and tourism activities in the NWMR occur predominantly in WA State waters (extending offshore 3 nm from the mainland), adjacent to coastal population centres (e.g. Broome), with a peak in activity during the winter months (dry season). These activities include recreational fishing, diving, snorkelling, wildlife watching and boating.

Only one to two recreational fishing charter operators run trips to Scott Reef. The location has the potential to provide significant opportunities for pelagic sport fishing; however, given the distance from Broome and closest landfall and associated costs, only a limited number of charter operators are prepared to take recreational fishers out to Scott Reef. Those companies that do visit Scott Reef tend to make the trip only four to five times per year, spending around five days at the reef each time. Fishing is mainly focused on the south, west and north extremities of Scott Reef, generally only going into the South Scott Reef lagoon for snorkelling and for layover at night.

Scientific Research

Surrounding the Development Area, scientific research is predominately undertaken at Scott Reef, Rowley Shoals and Ashmore Reef. A number of marine research and monitoring programs have been ongoing, particularly those conducted by Australian Institute of Marine Science and the Western Australian Museum. AIMS has been monitoring coral and fish communities at Scott Reef since 1993 with regular surveys of the reef over the last 25 years. Other organisations that have been involved in undertaking or funding research activities at Scott Reef include WA DoF, CSIRO and the Australian Research Council (ARC). The WA DPIRD also conducts regular monitoring and research programs in the region of the Development Area. These activities are designed to collect fishery independent stock assessment data for management of each relevant fishery. Research/monitoring may take place 'on-board' existing commercial vessels or independently using dedicated research vessels.

The wider NWMR contains a number of IUCN Category Ia (Sanctuary Zone) sites which are areas managed mainly for scientific research and environmental monitoring. This research has typically been undertaken by the organisations listed above.

3.1.3 Describe any outstanding natural features and/or any other important or unique values that applies to the project area.

Commonwealth Heritage Places are a collection of sites recognised for their Indigenous, historical and/or natural values, which are owned or controlled by the Australian Government. A number of these sites are owned or controlled by the Department of Defence, as well as Government agencies relating to maritime

safety, customs and communication.

The Protected Matters search identified the Scott Reef and Surrounds – Commonwealth Area as the only Commonwealth Heritage Place located within the vicinity of the Development Area, at approximately 12km from the Development Area.

Key Ecological Features (KEFs)

KEFs are elements of the Commonwealth Marine Area that are considered to be of regional importance for either a region's biodiversity or its ecosystem function and integrity. The Commonwealth Marine Area is a MNES under the EPBC Act.

The following criteria are used to identify KEFs in Australia:

- a species, group of species or community with a regionally important ecological role (e.g. a predator, prey that affects a large biomass or number of other marine species)
- a species, group of species or community that is nationally or regionally important for biodiversity
- an area or habitat that is nationally or regionally important for:
- enhanced or high biological productivity
- aggregations of marine life
- biodiversity or endemism
- a unique seafloor feature with ecological properties of regional significance.

Two KEF's overlap the Project Area, the Continental Slope Demersal Fish Communities and the Seringapatam Reef and Commonwealth waters in the Scott Reef Complex.

Scott Reef

Scott Reef is situated in both Commonwealth and State waters. It includes the Scott Reef Nature Reserve and Scott Reef and its surrounds is identified as a key ecological feature. Due to the location of Scott Reef adjacent to the Project Area, several long-term ecological studies of the reef have been commissioned by the BJV to understand the long term trends and health of the region.

Scott Reef is an emergent reef comprising two coral continental shelf atolls approximately 5 km from the Project Area. It is one of the largest emergent reefs within the NWMR. The reef system comprises shallow to deep bathymetry shaped by the coral reef structure and a deep-water channel separates North and South Scott Reef. There is a continual cycle of upwelling with the cooler, nutrient-enriched waters from the channel thermocline. At high tide only a portion of reef system on the north-west edge of South Scott Reef, named Sandy Islet, is visible.

Scott Reef hosts the largest diversity of hard corals within WA, with fourteen distinct benthic habitat types described and mapped. Uniquely, South Scott Reef hosts extensive deep lagoonal coral habitats (30 – 70 m). The scleractinian corals (light dependent), which are found to a maximum depth of 75 m are the keystone species of the coral communities within the Scott Reef system which are considered to be of high conservation and ecological value. Sponges, crustaceans, molluscs and echinoderms are also abundant at Scott Reef, and it supports five species of seagrass and 121 species of algae in low abundance.

Seringapatam Reef

Seringapatam Reef is a continental shelf atoll located more than 15 km north of the Project Area which forms part of a KEF with Scott Reef; Seringapatam Reef and Commonwealth waters in the Scott Reef Complex, due to the diverse aggregations of marine life that they support. Seringapatam Reef features similar marine habitats and species to those found at Scott Reef and is an emergent coral reef, but unlike Scott Reef has no permanent island or islet. The reef is characterised by a combination of physical environmental conditions including clear, warm waters typical of oceanic environments and a large tidal range that provides a high physical energy input to these remote reef marine ecosystems. The reef is an

area of high primary productivity and high species richness with regards to both benthic and pelagic marine life. Seringapatam Reef is known to historically provide habitat for sea snakes and a diverse assemblage of fish.

Australian Marine Parks

A network of marine parks has been designated around Australia as part of a National Representative System of Marine Protected Areas (NRSMPA). There are six marine park networks geographically aligned with the Marine Regions of Australia. The objective of the network is to ensure sustainable use and enjoyment of the natural resources within the parks, whilst maintaining the protection and conservation of their biodiversity and natural, cultural, socio-economic and heritage values.

There are no Australian marine parks within the Project Area. The Kimberley Marine Park (IUCN Category IV) is the closest to the Project Area, being approximately 25 km away.

State Marine Parks and Reserves

State Marine Parks in WA waters are managed by the Department of Biodiversity, Conservation and Attractions (DBCA). There are no State Marine Parks within the Project Area. The Rowley Shoals Marine Park is the closest to the Project Area, being more than 350 km away.

The Scott Reef Nature Reserve is approximately 5 km from the Project Area which was designated in 1993 and encompasses South Scott Reef (including Sandy Islet) down to the low mean water mark. This Nature Reserve protects the physical and ecological features of Scott Reef, including important nesting habitat (designated as a Biologically Important Area (BIA) and Habitat Critical for Survival of a Species) for the green turtle.

3.1.4 Describe the gradient (or depth range if action is to be taken in a marine area) relevant to the project area.

Bathymetry of the Project Area is shown in **Figure 3-1 (pg. 53)** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document**. Project infrastructure will be installed at depths ranging from 300m - 650m, increasing southerly along the flowline route, towards the injection locations which average >500m water depth.

Regional Overview

The NWMR is characterised by expanses of continental shelf and slope, with complex areas of bathymetry such as plateaus, terraces and major canyons that facilitate upwelling of nutrients and sediment transport. The continental shelf in the northern most part of the region (north of Cape Leveque) is described as a ‘rimmed ramp’, as the waters over the outer margins of the shelf are shallower than the middle portions. This ‘ramp’ is a unique feature of the Australian continental margin in this region, with the rim at its outer edge being the site of several coral reefs including Ashmore, Cartier, Scott and Seringapatam Reefs. More than 40% of the NWMR is less than 200 m deep. The shallow shelf is contrasted by features such as the Cuvier and Argo abyssal plains which reach depths in excess of five kilometres.

This variation in bathymetry and interactions with oceanographic processes provides a diversity of habitat to marine fauna and flora within the NWMR. Several bathymetric features within the NWMR are classified as Key Ecological Features (KEFs) by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) due to their importance in supporting biodiversity and/or ecosystem function within the region.

Project Area

The deep-water environment of the Project Area is primarily flat and smooth with a seabed gradient of approximately 1°, with water depths greater than 300 m.

The seabed sediment habitat within the Project Area is largely soft and unconsolidated. There are areas of exposed layers of eroded stiff clay and cemented silt which subsequently comprise more consolidated sediments at the Calliance and Brecknock reservoirs. ‘Mega ripples’ or ‘sand waves’ are featured to the north-north-west of the Brecknock reservoir seabed area at water depths of more than 650 m. These sand waves are orientated in a north-east to south-west direction with a crest-to-crest distance between 10 and 30 m. These features are no higher than 1 m from crest to trough.

3.2 Flora and fauna

3.2.1 Describe the flora and fauna within the affected area and attach any investigations of surveys if applicable.

Flora and fauna and ecological communities within the region and overlapped by the Project Area are described below. Due to size limitations, additional detail including all relevant species and communities are outlined in **Section 3.3** (pg. 49) and **Section 3.4** (pg. 72) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.** This includes a PMST that has been obtained for the Project Area (**Att 2 Project Area Protected Matters Search Tool Report Appendix A).**

Ecological Communities

The NWMR has a large area of continental shelf and continental slope, with a range of bathymetric features such as canyons, plateaus, terraces, ridges, reefs, banks and shoals. The marine environment in this region is typified by tropical marine ecosystems with diverse habitats of coral reef, soft sediments, canyons and limestone pavement. The NWMR boasts high species diversity and is home to significant populations of internationally threatened species.

This section discusses the ecology, biodiversity and biogeography of the Project Area in the context of the wider NWMR. The key species and habitats which form the ecological communities’ representative of the broader NWMR and Project Area are discussed in the following sections. Individual EPBC Act listed Threatened and Migratory species are discussed separately in **Section 3.4** (pg. 72) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document**.

Threatened Ecological Communities

Threatened Ecological Communities (TECs) are ecological communities where the natural composition and function of the ecological community have been significantly depleted across its full range, such that they are threatened due to a risk of extinction. Three categories exist for listing TECs under the EPBC Act: critically endangered, endangered and vulnerable. There are no TECs listed within the Project Area. The closest TEC to the Project Area is the Monsoon vine thickets on the coastal sand dunes of Dampier Peninsula, which is more than >290 km from the Project Area.

Plankton, Benthic Communities and Infaunal assemblages.

Please refer to **Section 3.3.2** (pg. 61)of the **Att 1 Proposed Browse CCS Project Referral Supporting Information Document** for further details of these communities.

EPBC Listed and Threatened Migratory Fauna

A PMST report generated for the Project Area including a 20 km buffer (**Att 2 Project Area Protected Matters Search Tool Report Appendix A**) identified 25 listed Threatened species, 41 listed Migratory species and 74 listed Marine species. All MNES considered Known to occur, Likely to occur or that May occur within the Project Area are described in **Section 3.4** (pg. 72) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

An assessment / justification for this classification and an overview of the species' use of habitats within the Project Area is provided. This included a screening of species not expected to occur within the project area, documented in **Att 3 Species Presence Assessment (Appendix B)**. A summary of key species groups that may or are likely to occur in the Project Area are outlined below.

Seabirds and Migratory Shorebirds

An overview of seabirds and migratory shorebirds within the NWMR (as relevant to the Project Area) is provided in the sections below, followed by species specific profiles of those seabird and migratory shorebird species which are classified as Known to occur, Likely to occur or May occur within the Project Area.

Seabirds

Regional Overview

Seabirds within the NWMR consist of tropical and sub-tropical breeding species and non-breeding migratory species. A number of offshore islands within the NWMR support breeding colonies of seabirds. Surveys around Ashmore Reef, Seringapatam Reef, Scott Reef (about 200 km, more than 15 km and 5 km from the Project Area, respectively) and the wider Browse Basin region identified 26 species of seabird, including the brown booby, Abbott's booby, streaked shearwater and lesser frigatebird. Specifically, Ashmore Reef is considered to support some of the most important seabird breeding colonies in the NWS. Browse Island (about 160 km east of the Project Area) supports a large breeding colony of crested terns, with some evidence of breeding by eastern reef egrets. The Lacepede Islands (approximately 300 km south-east of Scott Reef) are also an important breeding site for seabirds including the lesser frigatebird, brown booby, bridled tern, roseate tern and common noddy.

Scott Reef

Scott Reef is the only emergent land mass within the vicinity of the Project Area which may serve to provide nesting and/or roosting for seabirds, albeit in small numbers in comparison to other breeding and roosting sites in the region. Seabirds utilising Scott Reef are predominately associated with Sandy Islet (a part of South Scott Reef) and occur in small numbers in comparison to other breeding and roosting sites in the region.

Project Area

Within the Project Area there are no emergent land masses which seabirds could utilise for critical life cycle habits such as nesting or breeding. Sandy Islet, located over 20 km from the Project Area, can provide temporary roosting habitat. The offshore ocean habitat of the Project Area may be utilised by some seabird species for foraging, in particular those seabird species

Migratory Shorebirds

Regional Overview

The annual life cycle of Australia's migratory shorebirds has four approximate phases: breeding (May to August) in the northern hemisphere, southward migration (August to November), non-breeding (December to February) in the southern hemisphere, and northward migration (March to May). Potential flight paths used by migratory shorebirds during their northward and southward migrations. The Project Area does not lie within the East Asian Australasian Flyway (EAAF).

Within the NWMR, Ashmore Reef (about 200 km north of the Project Area) is recognised as an internationally important site for five species of migratory shorebird; the ruddy turnstone, grey plover, greater sand plover, sanderling and grey-tailed tattler. The sand flats of Ashmore Reef and neighbouring Cartier Island are recognised as particularly important for feeding migratory shorebirds during non-breeding periods. These sandflats are also an important staging point during the migration between the northern hemisphere and Australia.

On the WA mainland, Roebuck Bay and Eighty Mile Beach have been identified as two of the most important areas in the EAAF for migratory shorebirds, with counts of 336,000 individuals on Eighty Mile Beach and 170,900 individuals in Roebuck Bay, representing over 30 species. These sites are used more heavily during the southward migration (i.e., the breeding period from May to August) and many birds remain throughout the non-breeding period (December to February). Roebuck Bay and Eighty Mile Beach are listed as RAMSAR sites because they are internationally important migration stopover and feeding areas for migratory shorebirds.

Project Area

As there are no emergent land masses within the Project Area, migratory shorebirds are at most expected to pass through the Project Area as they migrate / transit between key habitats (outside of the Project Area). Exceptions may include low numbers of those few species which are known to occur at Scott Reef (5 km from the Project Area).

Marine Mammals

A range of whales and dolphins utilise the waters within the Project Area. Refer to **Section 3.4.4** (pg. 82)of the **Att 1 Proposed Browse CCS Project Referral Supporting Information Document** for a summary of Marine mammals potentially occurring within the Project Area.

Marine Reptiles - Marine Turtles

Six species of marine turtle occur within Australian waters: the loggerhead turtle, green turtle, leatherback turtle, hawksbill turtle, olive ridley turtle and flatback turtle. All six marine turtle species are known to occur within the NWMR and are protected under the EPBC Act. Four may occur within the project area.

Marine turtles require both marine and terrestrial habitats to complete their life history stages. These animals are highly migratory and exhibit strong fidelity to their nesting and breeding locations. The NWMR supports a number of marine turtle nesting rookeries on both coastal beaches and offshore island habitats.

Within the NWMR, the Pilbara and Kimberley coastline and coastal islands present important nesting, inter-nesting and foraging habitat for these marine turtle species. Subsequently, there are a number of areas classified as BIAs and//or Habitat Critical to the Survival of a species for marine turtle species in the Pilbara and Kimberley regions.

Project Area

There are no emergent land masses within the Project Area which would support nesting activities for marine turtles**.** However, the green turtle is known to nest near to the Project Area at Sandy Islet, part of Scott Reef**.** Additional information to the species profile table is provided below for the green turtle due to the abundance of this species at Scott Reef, the importance of this emergent land mass to the life cycle of the species and the likelihood of occurrence of this species within the Project Area.

Four marine turtle species known to occur within WA waters have the potential to occur within the Project Area, however; foraging, nesting or inter-nesting areas, BIAs or areas identified as habitat critical to the survival of a species have not been identified within the Project Area.

Sea Snakes

The water depths (approximately >300 m) and predominately bare sandy substrates of the Project Area are not considered to present important habitat for sea snakes. The suitable shallower reef habitats associated with Scott Reef are also approximately 5 km from the Project Area. Sea snakes are therefore not considered to be reliant on habitats within the Project Area and are not considered likely to occur.

3.2.2 Describe the vegetation (including the status of native vegetation and soil) within the project area.

Benthic Primary Producers

Background

Benthic Primary Producers (BPPs) are predominately marine plants (e.g., seagrasses and macroalgae), but also include invertebrates such as scleractinian (reef-building) corals, which acquire a significant proportion of their energy from symbiotic microalgae that live in the coral animal (polyps). Benthic Primary Producer Habitat (BPPH) is defined as “the functional ecological communities that inhabit the seabed within which BPPs are prominent components and areas of seabed that can support these communities”. BPPH plays a major role in marine ecosystem functioning, including acting as a substrate and providing shelter and food for animals, as well as contributing to physical stability of the seabed. The BPPs relevant to the proposed Browse CCS Project are described below.

Seagrass

Regional Overview

In the NWMR, seagrass habitats are generally found in shallow water environments near the mainland and offshore reefs and shoals.

Project Area

Seagrasses were not recorded in the Project Area by previous benthic habitat surveys in the area as water depths within the Project Area are too deep to provide suitable conditions for seagrass growth (see **Section 3.3.2.4, pg. 66 of Att 1 Proposed Browse CCS Project Referral Supporting Information Document**).

Macroalgae

Regional Overview

A total of 351 species of marine benthic red algae and 171 species of marine benthic brown and green algae have been recorded in north-western Australia. Surveys in the Kimberley region by WA Museum (WAM) have identified 72 species of macroalgae in the southern Kimberley, and 90 species in the northern Kimberley, most of which are widespread tropical taxa.

Project Area

The growth of macroalgae in the deep waters of the Project Area is restricted due to light availability and lack of hard substrate to support attachment in the predominantly soft sediment habitats of the area. Previous benthic habitat surveys of the region found no macroalgal beds within the Project Area (see **Section 3.3.2.4, pg. 66 of Att 1 Proposed Browse CCS Project Referral Supporting Information Document**)..

Corals

Regional Overview

Coral reefs and communities of the NWMR include remote oceanic reefs systems (atolls) such as Scott Reef, Seringapatam etc, fringing reefs around offshore islands such as Browse Island and along coastlines such as the Kimberley Region and submerged shoals on the NWS such as Rankin Bank and Glomar Shoals.

Project Area

Within the deep waters of the Project Area, no deep water soft or hard corals were observed during environmental surveys of the region (see **Section 3.3.2.4, pg. 66 of Att 1 Proposed Browse CCS Project Referral Supporting Information Document**).

3.3 Heritage

3.3.1 Describe any Commonwealth heritage places overseas or other places recognised as having heritage values that apply to the project area.

The PMST search **(Att 2 Project Area Protected Matters Search Tool Report Appendix A)** identified the Scott Reef and Surrounds – Commonwealth Area as the only Commonwealth Heritage Place located within the vicinity of the Project Area, overlapping the Project Area.

Aboriginal Heritage Sites

No known sites of Aboriginal Heritage significance are located within or proximate to the Project Area according to the WA DPLH – Aboriginal Cultural Heritage Inquiry System (ACHIS) or Australasian Underwater Cultural Heritage Database. The existence of any unknown Aboriginal sites or artefacts of significance within the Project Area, or the wider NWMR, is considered highly unlikely due to the site's remote offshore location.

Indigenous Archaeological Heritage Assessment

Woodside understands that communal cultural connection may exist between Traditional Custodians and land and waters. It is understood from the onshore archaeological record that Aboriginal people have occupied the Australian continent for at least 65,000 years and in many places maintain a strong continuing connection that is said to extend back in Indigenous cosmology to the beginning of time.

It is understood that the sea level has risen significantly during the 65,000 years of Indigenous occupation of Australia, and areas that were once inhabited are now submerged on the continental shelf. Sea levels reached a minimum of -130 m at the Last Glacial Maximum ~20,000 years ago. Material preserved on the ancient landscape to -130 m has the potential to provide further information about the earliest periods of human occupation.

Recent archaeological discoveries demonstrate that the now submerged landscape was occupied and inhabited and can retain archaeological material from this time.

In recognition of this, Woodside considers the ancient landscape between the mainland and -130 m water depth as an area where potential Indigenous archaeological material may exist on the seabed, as this covers the full extent of this possible Indigenous occupation. Known Indigenous heritage places including archaeological sites within Commonwealth waters may be protected subject to declarations under the Aboriginal and Torres Strait Islander Heritage Protection Act 1984, Underwater Cultural Heritage Act 2018 or EPBC Act 1999. However, these Acts only extend protection to heritage places specified by declaration or otherwise included on a statutory list.

No archaeological sites within the Browse CCS Project area have been identified by Traditional Custodians in discussions and consultation with Woodside.

As noted in **Section 3.3.3.1** (pg. 69) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document** there is no overlap between the Browse CCS Project area and the ancient landscape. However there is potential for seabed disturbance from planned activities and therefore potential for impacts to archaeological material. Woodside will comply with the requirements of the *Underwater Cultural Heritage Act* 2018, and will apply the guidance provided in "Assessing and Managing Impacts to Underwater Cultural Heritage in Australian Waters – Guidelines on the application of the *Underwater Cultural Heritage Act* 2018".

World, National and Commonwealth Heritage Places

Commonwealth Heritage Places are a collection of sites recognised for their Indigenous, historical and/or natural values, which are owned or controlled by the Australian Government. A number of these sites are owned or controlled by the Department of Defence, as well as Government agencies relating to maritime safety, customs and communication.

3.3.2 Describe any Indigenous heritage values that apply to the project area.

Overview

In this section, the heritage value of places within the Browse CCS Project Area and the cultural features of the Browse CCS Project Area are described. In line with The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (Burra Charter) and associated practice notes, Woodside understands heritage value to refer to the cultural significance of a place to an individual or group. A cultural feature, by contrast, is understood to be comparable to the Burra Charter term “fabric” and refer to a place’s elements, fixtures, contents, and objects which have cultural values. Although these features are necessarily physical, the place they inhabit or comprise may have tangible or intangible dimensions.

Through consultation with identified stakeholders, and review of publicly available literature, Woodside recognises the deep spiritual and cultural connection to the environment that First Nations peoples hold.

Sea Country Values

‘Sea Country’ can be defined as the area of sea over which a First Nations group has interests, cultural value, connection and use. It has been noted that the “saltwater peoples” of the north-west are associated with discrete clan estates or tribal areas, often referred to in contemporary Aboriginal English as ‘saltwater country’ or ‘sea country’.

Cultural identity is understood to refer to the fact that “essence of being a 'Saltwater' person is ontological rather than merely technological. That is, it is about how people relate spiritually to the sea and engage with spiritual forces that created it, the marine flora and fauna and people”. In northern Australia Sea Country is ‘gaining recognition as a cultural landscape with customary law defining ownership and management rights and responsibilities.’ For example, Bardi and Jawi people say their identity and existence is intimately connected to the sea. This is partly a reflection of the process of native title moving beyond determinations, the influence of more than a decade of the Aboriginal ranger movement, legal challenges by Traditional Owner groups, and research carried out as part of two-way science activities that include Traditional Owner groups and researchers working in partnership.

In terms of seascape extent it has been suggested that “For those mainland groups whose exploitation of the sea was limited to littoral resources, it is likely that seascapes extended no more than c. 20–30 km out to sea, out to the horizon and the limit of human visibility. However, in some coastal places, clouds that can be seen well over 100 km out to sea are imbued with spiritual significance. For those groups with elaborate canoe technology, seascapes extend well over the horizon.” Additional details and references are included in Section 3.5.2.1 (pg. 113) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document**).

Woodside recognises the potential for marine ecosystems to include cultural features as well as environmental values. The link between environmental protection and cultural heritage protection is illustrated in the Australian Government’s Indigenous Protected Areas Program. The Indigenous Protected Areas program provides for “areas of land and sea managed by Indigenous groups as protected areas for biodiversity conservation…IPAs deliver environmental benefits…Managing IPAs also helps Indigenous communities protect the cultural values of their country for future generations…”. Sea Country also creates and produces life, acting as fertility zones for creatures that move, backwards and forwards between land

and sea, across species and nourishing physical, spiritual, intellectual and cultural ecologies across vast areas. As stated in the Australian Marine Parks North-West Management Plan 2018, “Traditional owners have managed and used sea country within the region for tens of thousands of years”..

Cultural features of coastal areas may include marine species that may travel many thousands of kilometres through areas with similar cultural values to multiple Indigenous language groups. Some species may travel as far as 5,000 km from Antarctica to the Kimberley region of Western Australia, passing Indigenous language groups along the entire west coast of Australia.

Sea country values are defined by Woodside using multiple lines of evidence including:

- desktop assessment of sea country values from publicly available sources
- consultation with First Nations groups and individuals.

Desktop Assessment of Sea Country Values

Traditional Owner Groups and First Nations Stakeholders identified in relation to the Browse CCS Project are presented in **Section 11.2 (pg. 267)** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document**. Cultural features and heritage values of these stakeholders with regards to Sea Country cultural features and heritage values were assessed using publicly available sources. Sea Country cultural features and heritage values are summarised in **Table 3-37** (pg. 114) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document** according to the First Nations groups (where identified or inferable) who hold these values.

Cultural values and heritage features of Scott Reef

Noting that Scott Reef and surrounds are a listed heritage place, Woodside undertook desktop research to identify Aboriginal cultural values associated with Scott Reef.

No specific cultural values associated with Scott Reef were identified. However, as noted in **Section 3.5.2.1** (pg. 113) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document**, there are cultural features and heritage values associated with Sea Country more broadly. Cultural values associated with specific reefs closer to the coast, and more broadly to reefs being part of Sea Country were found.

The research methodology involved searching for references to Scott Reef in the reasons for judgement in Native Title Determinations along parts of the Kimberley coast that often quote evidence given by Traditional Owners in relation to such matters. Healthy Country Plans published by Traditional Owners were also reviewed, along with Aboriginal Corporation websites and social media sites, and management plans prepared by regulatory authorities in consultation with Traditional Owners. A search of academic, state and national library, AIATSIS and museum databases was also undertaken.

Scott Reef’s lack of specific values may be due to its considerable distance from the Kimberley Coast, some 430 kilometres north of Broome. For example, for Mayala, Noomoonjoo (Caffarelli Island) is considered a long journey. Caffarelli Island is an outlying island in the chain of islands that comprise the Buccaneer Archipelago, and is approximately 30km from the mainland. Scott Reef is some 253km beyond Noomoonjoo, and does not have an adjoining chain of islands (see **Figure 3-11** (pg. 118) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document**). Scott Reef is also a considerable distance away from any Native Title Determination Areas.

Although Scott Reef, as a feature of the ocean, forms part of Sea Country, it is a long way from the mainland so is less likely to be a part of everyday culture and life as compared to reef systems and islands readily accessible and close to the coast. Woodside acknowledges the role of Scott Reef in, for example, the health of turtle populations and other migratory species and thus the broader value of Scott Reef to Sea Country generally.

3.4 Hydrology

3.4.1 Describe the hydrology characteristics that apply to the project area and attach any hydrological investigations or surveys if applicable. *

The Project Area only occurs in deep, oceanic environments.

4. Impacts and mitigation

4.1 Impact details

Potential Matters of National Environmental Significance (MNES) relevant to your proposed action area.

EPBC Act section	Controlling provision	Impacted	Reviewed
S12	World Heritage	No	Yes
S15B	National Heritage	No	Yes
S16	Ramsar Wetland	No	Yes
S18	Threatened Species and Ecological Communities	Yes	Yes
S20	Migratory Species	Yes	Yes
S21	Nuclear	No	Yes
S23	Commonwealth Marine Area	Yes	Yes

EPBC Act section	Controlling provision	Impacted	Reviewed
S24B	Great Barrier Reef	No	Yes
S24D	Water resource in relation to large coal mining development or coal seam gas	No	Yes
S26	Commonwealth Land	No	Yes
S27B	Commonwealth Heritage Places Overseas	No	Yes
S28	Commonwealth or Commonwealth Agency	No	Yes

4.1.1 World Heritage

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

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4.1.1.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.1.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The Project Area does not overlap with, or occur in proximity to, any World Heritage Areas.

4.1.2 National Heritage

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

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4.1.2.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.2.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The Project Area does not overlap with, or occur in proximity to, any National Heritage Listed Places.

4.1.3 Ramsar Wetland

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

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4.1.3.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.3.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The Project Area does not overlap with, or occur in proximity to, any Ramsar Wetlands.

4.1.4 Threatened Species and Ecological Communities

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Threatened species

Direct impact	Indirect impact	Species	Common name
No	No	Aipysurus apraefrontalis	Short-nosed Sea Snake, Short-nosed Seasnake
No	No	Aipysurus foliosquama	Leaf-scaled Sea Snake, Leaf-scaled Seasnake
No	No	Aipysurus fuscus	Dusky Sea Snake
Yes	No	Anous tenuirostris melanops	Australian Lesser Noddy
Yes	No	Balaenoptera borealis	Sei Whale
Yes	No	Balaenoptera musculus	Blue Whale
Yes	No	Balaenoptera physalus	Fin Whale
No	No	Calidris acuminata	Sharp-tailed Sandpiper
No	No	Calidris canutus	Red Knot, Knot
No	No	Calidris ferruginea	Curlew Sandpiper
Yes	No	Carcharodon carcharias	White Shark, Great White Shark
Yes	No	Caretta caretta	Loggerhead Turtle
Yes	No	Chelonia mydas	Green Turtle
No	No	Dermochelys coriacea	Leatherback Turtle, Leathery Turtle, Luth

Direct impact	Indirect impact	Species	Common name
Yes	No	Eretmochelys imbricata	Hawksbill Turtle
No	No	Glyphis garricki	Northern River Shark, New Guinea River Shark
No	No	Lepidochelys olivacea	Olive Ridley Turtle, Pacific Ridley Turtle
Yes	No	Natator depressus	Flatback Turtle
No	No	Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew
No	No	Papasula abbotti	Abbott's Booby
No	No	Phaethon lepturus fulvus	Christmas Island White-tailed Tropicbird, Golden Bosunbird
Yes	No	Phaethon rubricauda westralis	Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird
No	No	Pristis pristis	Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish
No	No	Pristis zijsron	Green Sawfish, Dindagubba, Narrowsnout Sawfish
Yes	No	Rhincodon typus	Whale Shark
Yes	No	Sphyrna lewini	Scalloped Hammerhead

Ecological communities

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4.1.4.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

Yes

4.1.4.2 Briefly describe why your action has a direct and/or indirect impact on these protected matters. *

An EPBC Act Protected Matters Search Tool (PMST) identified 25 listed threatened species that may occur within the project area (**Att 2 Project Area Protected Matters Search Tool Report Appendix A**). Some species were excluded from the Referral as they were considered not likely to occur in the project area based on the habitat or known distribution of the species (**Att 3 Species Presence Assessment Appendix B**).

No TECs are present within the project area or the Environment that May Be Affected (EMBA) associated with unplanned loss of containment of hydrocarbons or CO2 scenarios.

A description of the impacts is included in **Att 1 Proposed Browse CCS Project Referral Supporting Information Document** (referred to as 'Att 1' below due to word count limits).

Birds

Threatened bird species that have the potential to occur within the project area include:

- Australian lesser noddy (*Anous tenuirostris melanops*) – Vulnerable
- Red-tailed Tropicbird (*Phaethon rubricauda westralis*) - Endangered

Activities that may have direct or indirect impacts on the species listed above include:

- Light emissions from vessels (**Att 1, Section 5.3, pg. 139**). Light may result in changes to behaviour, with no lasting effect.
- Atmospheric noise from vessels, helicopters and MODUs (**Att 1, Section 5.4, pg. 144**). Noise may result in changes in behaviour, with no lasting effect.
- Routine MODU and vessel discharges (**Att 1, Section 5.7, pg. 166**). Discharges have the potential to result in fauna injury/mortality, with no lasting effect.
- Unplanned discharge of hazardous and non-hazardous waste (**Att 1, Section 5.11, pg. 189**). This is highly unlikely and a there is a very low risk to threatened bird species.
- Unplanned hydrocarbon release (**Att 1, Section 5.14, pg. 203**). There are potential impacts to threatened species including potential injury or mortality from exposure to hydrocarbons. This is highly unlikely to occur, with a moderate risk to threatened species.

Marine Mammals

Threatened marine mammal species that have the potential to occur within the project area include:

- sei whale (*Balaenoptera borealis*) – Migratory, Vulnerable
- blue whale (*Balaenoptera musculus*) – Migratory, Endangered
- fin whale (*Balaenoptera physalus*) – Migratory, Vulnerable

Activities that may have direct or indirect impacts on the species listed above include:

- Underwater noise emissions from construction and operations (**Att 1, Section 5.6, pg. 147**). Modelling indicated that fauna injury/mortality is predicted if individuals remain close to the source for a long period of time, which is considered highly unlikely. Slight temporary, behavioural impacts may occur to marine mammals from underwater noise emissions.
- Routine MODU and vessel discharges (**Att 1, Section 5.7, pg. 166**). These have the potential to result in fauna injury/mortality, with no lasting effect on marine mammals.
- Drilling and completions discharges to seabed and at surface (**Att 1, Section 5.8, pg. 171**). Discharges could result in injury/mortality to individuals, with no lasting effect predicted.
- Subsea control fluid discharges (low toxicity, water-based) during construction and maintenance activities (**Att 1, Section 5.9, pg. 180**). Discharges could result in injury/mortality to individuals, with no lasting effect predicted.
- Flowline preparation discharges at the seabed and include a mixture of seawater treated with preservation chemicals and dye (**Att 1, Section 5.10, pg. 183**). Discharges may result in fauna injury/mortality to individuals, with no lasting effect.
- Unplanned discharge of hazardous and non-hazardous waste (**Att 1, Section 5.11, pg. 189**). This is highly unlikely and a there is a very low risk to threatened marine mammals.
- Unplanned vessel interaction with marine fauna (**Att 1, Section 5.12, pg. 194**). Impacts on marine mammals are unlikely and there is a moderate risk to individuals but no risk to species or community function.
- Unplanned hydrocarbon release (**Att 1, Section 5.14, pg. 203**). Exposure to hydrocarbons has the potential to result in injury or mortality to fauna. This is highly unlikely to occur, with a moderate risk to threatened species.

- Unplanned CO2 loss of containment **(Att 1, Section 5.15, pg. 219**). The assessment identifies fauna injury or mortality as a potential impact. It is highly unlikely that a significant loss of containment event occurs. The risk to threatened species is low.

Marine Reptiles

Threatened marine reptile species that have the potential to occur within the project area include:

- Green turtle (*Chelonia mydas*) – Vulnerable, Migratory
- Loggerhead turtle (*Caretta caretta*) – Endangered, Migratory
- Hawksbill turtle (*Eretmochelys imbricata*) – Vulnerable, Migratory
- Flatback turtle *(Natator depressus*) – Vulnerable, Migratory

Activities that may have direct or indirect impacts on the species listed above include:

- Light emissions from vessels (**Att 1, Section 5.3, pg. 139**). Light may result in changes to fauna behaviour, with no lasting effect on turtles.
- Underwater noise emissions from construction and operations (**Att 1, Section 5.6, pg. 147**). Modelling indicated that fauna injury/mortality is predicted if individuals remain close to the source for a long period of time, which is considered highly unlikely. Slight temporary, behavioural impacts may occur to turtles from underwater noise emissions.
- Routine MODU and vessel discharges (**Att 1, Section 5.7, pg. 166**). Discharges have the potential to result in fauna injury/mortality, with no lasting effect on turtles.
- Drilling and completions discharges to seabed and at surface (**Att 1, Section 5.8, pg. 171**). Discharges could result in injury/mortality to individuals, with no lasting effect predicted.
- Subsea control fluid discharges (low toxicity, water-based) during construction and maintenance activities (**Att 1, Section 5.9, pg. 180**). Discharges could result in injury/mortality to individuals, with no lasting effect predicted.
- Flowline preparation discharges at the seabed and include a mixture of seawater treated with preservation chemicals and dye (**Att 1, Section 5.10, pg. 183**). Discharges may result in fauna injury/mortality to individuals, with no lasting effect.
- Unplanned discharge of hazardous and non-hazardous waste (**Att 1, Section 5.11, pg. 189**). This is highly unlikely and a there is a very low risk to threatened turtle species.
- Unplanned vessel interaction with marine fauna (**Att 1, Section 5.12, pg. 194**). The assessment highlighted that given the proposed mitigation measures, impacts on threatened turtles are highly unlikely and there is a low risk to these species.
- Unplanned hydrocarbon release (**Att 1, Section 5.14, pg. 203**). Exposure to hydrocarbons has the potential to result in injury or mortality to fauna. This is highly unlikely to occur, with a moderate risk to threatened species.
- Unplanned CO2 loss of containment (**Att 1, Section 5.15, pg. 219**). The assessment identifies fauna injury or mortality as a potential impact. It is highly unlikely that a significant loss of containment event occurs. The risk to threatened species is low.

Fish

Threatened fish species that have the potential to occur within the project area include:

- Whale shark (*Rhincodon typus*) – Migratory, Vulnerable
- White shark (*Carcharodon carcharias*) – Migratory, Vulnerable
- Scalloped Hammerhead (*Sphyrna lewini*) – Migratory, Threatened

Activities that may have direct or indirect impacts on the species listed above include:

- Light emissions from vessels (**Att 1, Section 5.3, pg. 139**). Light may result in changes to fauna behaviour, with no lasting effect on threatened fish species.
- Underwater noise emissions from construction and operations (**Att 1, Section 5.6, pg. 147**). Modelling indicated that fauna injury/mortality is predicted if individuals remain close to the source for

a long period of time, which is considered highly unlikely. Slight temporary, behavioural impacts may occur to fish from underwater noise emissions.

- Routine MODU and vessel discharges (**Att 1, Section 5.7, pg. 166**). Discharges have the potential to result in fauna injury/mortality, with no lasting effect on threatened fish species.
- Drilling and completions discharges to seabed and at surface (**Att 1, Section 5.8, pg. 171**). Discharges could result in injury/mortality to individuals, with no lasting effect predicted.
- Subsea control fluid discharges (low toxicity, water-based) during construction and maintenance activities (**Att 1, Section 5.9, pg. 180**). Discharges could result in injury/mortality to individuals, with no lasting effect predicted.
- Flowline preparation discharges at the seabed and include a mixture of seawater treated with preservation chemicals and dye (**Att 1, Section 5.10, pg. 183**). Discharges may result in fauna injury/mortality to individuals, with no lasting effect.
- Unplanned discharge of hazardous and non-hazardous waste (**Att 1, Section 5.11, pg. 189**). This is highly unlikely and a there is a very low risk to threatened fish species.
- Unplanned vessel interaction with marine fauna (**Att 1, Section 5.12, pg. 194**). The assessment highlighted that given the proposed mitigation measures, impacts on threatened fish species are highly unlikely and there is a low risk to these species.
- Unplanned hydrocarbon release (**Att 1, Section 5.14, pg. 203**). Exposure to hydrocarbons has the potential to result in injury or mortality to fauna. This is highly unlikely to occur, with a moderate risk to threatened species.
- Unplanned CO2 loss of containment (**Att 1, Section 5.15, pg. 219**). The assessment identifies fauna injury or mortality as a potential impact. It is highly unlikely that a significant loss of containment event occurs. The risk to threatened species is low.
- Unplanned introduction of invasive marine species (**Att 1, Section 5.13, pg. 198**). The assessment concluded that the likelihood of invasive marine species being introduced from the project is remote.

4.1.4.4 Do you consider this likely direct and/or indirect impact to be a Significant Impact? *

No

4.1.4.6 Describe why you do not consider this to be a Significant Impact. *

Section 6.3 of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document** presents a significant impact assessment of the Proposed Action in relation to threatened species. The purpose of this is to determine if a significant impact (as defined by the EPBC Act) is likely to occur to MNES. The assessment utilises the definitions and criteria provided in the MNES Significant Impact Guidelines. A summary of the findings in this document are outlined below.

Seabirds and Shorebirds

A significant impact assessment of the Proposed Action in relation to seabirds and shorebirds is presented in **Table 6-3** (pg. 238) (Vulnerable) and **Table 6-4** (pg. 239) (Endangered) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document**

Significant impacts to these species are not predicted as an important population of the species is not present in the Development Area and impacts on this species as a result of light, atmospheric noise and routine MODU and vessel discharges are expected to be negligible behavioural impacts which will not result in a decrease in the species population.

Further, the Proposed Action is being undertaken in a manner such that the anthropogenic threats to seabirds are minimised or, where possible, eliminated. As such, the Proposed Action is not inconsistent with the Wildlife Conservation Plan for Seabirds.

Marine Mammals

A significant impact assessment of the Proposed Action in relation to these species is presented in **Table 6-6** (pg. 241) (endangered species) and **Table 6-7** (pg. 241) (vulnerable species) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

The primary sources of potential impacts on pygmy blue whales are underwater noise and unplanned vessel interactions. Marine discharges from the vessels, drilling and completion activities and subsea infrastructure are expected to have no lasting effect on the species.

Impacts on pygmy blue whales as a result of underwater noise emissions are expected to be limited to temporary behavioural impacts (avoidance) to a small number of migrating pygmy blue whales within the migratory BIA. On the basis of the modelling results, the risk of a pygmy blue whale being exposed to temporary threshold shift or permanent threshold shift from continuous underwater noise sources associated with the proposed Browse CCS Project activities is highly unlikely.

Best practice management measures in accordance with a precautionary approach have been established within the proposed Browse to NWS Project Whale Management Plan, which all proposed Browse CCS Project activities generating underwater noise in excess of 120 dB re 1 µPa.m will be required to comply with. Successful implementation will ensure that, with a high degree of certainty, the anthropogenic noise from the proposed Browse CCS Project will be managed such that any blue whale will be able to continue to utilise the migratory BIA without injury, and no blue whale will be displaced from the possible foraging area.

The risk of injury to pygmy blue whale as a result of a vessel strike has been assessed as low.

As impacts to pygmy blue whales will be limited to temporary behavioural disturbance, impacts are not significant.

Table 6-6 (pg. 241) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document** also presents an assessment of the Proposed Action in consideration of the Conservation Management Plan for the Blue Whale (2015-2025) which concludes that the Proposed Action is not inconsistent with the plan.

Significant impacts to vulnerable marine mammals are not predicted as an important population of these species is not present in the Development Area. Similar to pygmy blue whales, underwater noise impacts these species will be limited to potential temporary behavioural impacts (avoidance) to a small number of individuals. The risk of injury to pygmy blue whale as a result of a vessel strike has been assessed as low.

Marine Turtles

A significant impact assessment of the Proposed Action in relation these species is presented in **Table 6-10** (pg. 247) (endangered species) and **Table 6-11** (pg. 247) (vulnerable species) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

The aspects that may impact marine turtles are light emissions, underwater noise emissions, and vessel discharges. These emissions have been assessed as having no lasting effect on turtles, with impacts limited to temporary behavioural impacts.

It is noted that while loggerhead, hawksbill and flatback turtles may occur transitionally within the Development Area this is expected to occur occasionally and in low numbers. There are no BIAs or habitat critical to the survival of these species overlapping the Development Area and the offshore open waters of the Development Area do not present important habitat for these species.

It is noted that a green turtle nesting and internesting BIAs and Habitat Critical to Survival of the green turtle (and designated 20 km internesting buffer) associated with Sandy Islet are present in the area but do not overlap the Development Area. This buffer is a radius on the known nesting location, and studies have shown that the green turtle remains within close proximity to Scott Reef during interesting. Sandy Islet is

approximately 29 km from the proposed infrastructure at its closest point. As such green turtles are not expected to utilise the deep-water habitats of the Development Area in significant numbers during the internesting period.

Underwater noise, including helicopter noise, is not expected to impact marine turtles significantly. Although helicopter noise can be perceived by turtles, the dynamic positioning compatibility transponders will be at depths>300m, and therefore, it is unlikely to impact marine turtles. Additionally, modelling undertaken for the proposed Browse to NWS Project indicates that noise emissions (above behavioural impact thresholds) from vertical seismic profiling, the MODU and the operating wells at Brecknock will not reach Scott Reef/Sandy Islet and, as such, will not impact the habitat critical to the survival or inter-nesting BIA of green turtles. Modelling of the proposed seismic survey activities also indicated that an injury to marine turtle is unlikely to occur, and given the planned mitigation, the small exposure area, the temporary nature of the activities and the likely avoidance behaviour of marine turtles, it is considered that impacts will be limited to temporary behavioural (avoidance) and would not result in any lasting effect.

The National Light Pollution Guidelines for Wildlife states that where there is an important habitat for listed species that are known to be affected by artificial light within 20 km of a light source, impacts should be considered in the assessment process. Given the distance of the MODU and flowline installation vessel to Sandy Islet turtle nesting habitat exceeds 20 km, impacts to nesting turtles or emergent hatchlings are not predicted to occur. It is noted that marine turtles do not use light cues to guide breeding behaviours and there is no evidence, published or anecdotal, that suggests internesting turtles are impacted by light from offshore vessels or installations.

Chemical discharges are a threat to green turtles within the Scott Reef and Brose Island Area. However, given that the discharges will disperse rapidly close to the discharge point and that any contact with the discharge with fish will be of extremely short duration, it is not considered credible that toxic effects on marine fauna will occur.

Given the above, significant impacts to threatened marine reptiles are not predicted and the Proposed Action is not inconsistent with the Recovery Plan for Marine Turtles in Australia.

Fish

A significant impact assessment of the Proposed Action in relation these species is presented in **Table 6-14** (pg. 252)of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

An important population or habitat critical to the survival of these species does not exist in the Development Area. Impact on these species as a result of light, underwater noise, routine MODU and marine discharges are expected to be minor or negligible. The risk of injury to whale sharks as a result of a vessel strike has been assessed as low.

The underwater noise modelling indicated that noise emissions from vertical seismic profiling, the MODU and the operating wells at Brecknock will not reach Scott Reff and, as such, will not impact sited attached fish. Temporary impairment to fish and Whale sharks is highly improbable to occur since it would be necessary for the fish to remain within a short distance of the source for a long period of time (12 hours from vertical seismic profiling, the MODU and operating wells or 24 hours of the seismic surveys activities).

Given this, significant impacts on threatened fish are not predicted.

4.1.4.7 Do you think your proposed action is a controlled action? *

Yes

4.1.4.8 Please elaborate why you think your proposed action is a controlled action. *

While significant impacts to threatened species and ecological communities are not predicted to occur as a result of the Proposed Action, the Development Area does overlap with the Development Area for the Browse to NWS Project, including the Browse Development Area. The proposed Browse to NWS Project is currently being assessed by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) (EPBC ref 2018 / 8319).

This overlap of Development Areas means that cumulative impacts need to be considered in the assessment of the Proposed Action, and as such, it should be considered a controlled action.

An assessment of the potential cumulative impacts to threatened fauna is presented in **Section 7** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

4.1.4.10 Please describe any avoidance or mitigation measures proposed for this action and attach any supporting documentation for these avoidance and mitigation measures. *

Avoidance and mitigation measures that will be implemented for the Proposed Action are outlined in **Section 5** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

4.1.4.11 Please describe any proposed offsets and attach any supporting documentation relevant to these measures. *

As detailed above, no significant residual impacts from the Proposed Action are expected on threatened species or ecological communities. As such no offsets are proposed.

4.1.5 Migratory Species

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Direct impact	Indirect impact	Species	Common name
No	No	Actitis hypoleucos	Common Sandpiper
Yes	No	Anous stolidus	Common Noddy
No	No	Anoxypristis cuspidata	Narrow Sawfish, Knifetooth Sawfish
Yes	No	Balaenoptera borealis	Sei Whale
Yes	No	Balaenoptera edeni	Bryde's Whale
Yes	No	Balaenoptera musculus	Blue Whale
Yes	No	Balaenoptera physalus	Fin Whale
No	No	Calidris acuminata	Sharp-tailed Sandpiper
No	No	Calidris canutus	Red Knot, Knot
No	No	Calidris ferruginea	Curlew Sandpiper
No	No	Calidris melanotos	Pectoral Sandpiper
Yes	No	Calonectris leucomelas	Streaked Shearwater
Yes	No	Carcharhinus longimanus	Oceanic Whitetip Shark
No	No	Carcharias taurus	Grey Nurse Shark
Yes	No	Carcharodon carcharias	White Shark, Great White Shark
No	No	Caretta caretta	Loggerhead Turtle
No	No	Cecropis daurica	Red-rumped Swallow
Yes	No	Chelonia mydas	Green Turtle
No	No	Dermochelys coriacea	Leatherback Turtle, Leathery Turtle, Luth
Yes	No	Eretmochelys imbricata	Hawksbill Turtle
Yes	No	Fregata ariel	Lesser Frigatebird, Least Frigatebird
No	No	Fregata minor	Great Frigatebird, Greater Frigatebird

Direct impact	Indirect impact	Species	Common name
No	No	Hirundo rustica	Barn Swallow
Yes	No	Isurus oxyrinchus	Shortfin Mako, Mako Shark
Yes	No	Isurus paucus	Longfin Mako
No	No	Lepidochelys olivacea	Olive Ridley Turtle, Pacific Ridley Turtle
Yes	No	Megaptera novaeangliae	Humpback Whale
No	No	Mobula alfredi	Reef Manta Ray, Coastal Manta Ray
No	No	Mobula birostris	Giant Manta Ray
No	No	Motacilla cinerea	Grey Wagtail
No	No	Motacilla flava	Yellow Wagtail
Yes	No	Natator depressus	Flatback Turtle
No	No	Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew
Yes	No	Orcinus orca	Killer Whale, Orca
No	No	Phaethon lepturus	White-tailed Tropicbird
Yes	No	Physeter macrocephalus	Sperm Whale
No	No	Pristis pristis	Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish
No	No	Pristis zijsron	Green Sawfish, Dindagubba, Narrowsnout Sawfish
Yes	No	Rhincodon typus	Whale Shark
Yes	No	Sternula albifrons	Little Tern
Yes	No	Tursiops aduncus (Arafura/Timor Sea populations)	Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)

4.1.5.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

Yes

4.1.5.2 Briefly describe why your action has a direct and/or indirect impact on these protected matters. *

An EPBC Act Protected Matters Search Tool (PMST) identified 41 listed migratory species that may occur within the project area (**Att 2 Project Area Protected Matters Search Tool Report Appendix A**). Some species were excluded from the Referral as they were considered not likely to occur in the project area based on the habitat or known distribution of the species (**Att 3 Species Presence Assessment Appendix B**).

A description of the impacts is included in **Att 1 Proposed Browse CCS Project Referral Supporting Information Document** (referred to as 'Att 1' below).

Birds

Migratory bird species that have the potential to occur within the project area include:

- Common noddy (*Anous stolidus*) – Migratory
- Streaked shearwater (*Calonectris leucomelas*) – Migratory
- Lesser frigatebird (*Fregata ariel*) – Migratory
- Little tern (*Sternula albifrons*) – Migratory
- Red-footed booby (*Sula sula*) – Migratory

Activities that may have direct impacts on the species listed above include:

- Light emissions from vessels (**Att 1, Section 5.3, pg. 139**). Light may result in changes to behaviour, with no lasting effect.
- Atmospheric noise from vessels, helicopters and MODUs (**Att 1, Section 5.4, pg. 144**). Noise may result in changes in behaviour, with no lasting effect.
- Routine MODU and vessel discharges (**Att 1, Section 5.7, pg. 166**). Discharges have the potential to result in fauna injury/mortality, with no lasting effect.
- Unplanned discharge of hazardous and non-hazardous waste (**Att 1, Section 5.11, pg. 189**). This is highly unlikely and a there is a very low risk to migratory bird species.
- Unplanned hydrocarbon release (**Att 1, Section 5.14, pg. 203**). There are potential impacts to threatened species including potential injury or mortality from exposure to hydrocarbons. This is highly unlikely to occur, with a moderate risk to migratory species.

Marine mammals

Migratory marine mammal species that have the potential to occur within the project area include:

- Sei whale (*Balaenoptera borealis*) – Migratory, Vulnerable
- Blue whale (*Balaenoptera musculus*) – Migratory, Endangered
- Fin whale (*Balaenoptera physalus*) – Migratory, Vulnerable
- Bryde's whale (*Balaenoptera edeni*) – Migratory
- Humpback whale (*Megaptera novaeangliae*) – Migratory
- Killer whale (*Orcinus orca*) – Migratory
- Sperm whale (*Physeter macrocephalus*) – Migratory
- Spotted bottlenose dolphin (Arafura / Timor Sea populations) (*Tursiops aduncus*) - Migratory

Activities that may have direct impacts on the species listed above include:

- Underwater noise emissions from construction and operations (**Att 1, Section 5.6, pg. 147**). Modelling indicated that fauna injury/mortality is predicted if individuals remain close to the source for a long period of time, which is considered highly unlikely. Slight temporary, behavioural impacts may occur to marine mammals from underwater noise emissions.
- Routine MODU and vessel discharges (**Att 1, Section 5.7, pg. 166**). Discharges have the potential to result in fauna injury/mortality, with no lasting effect on marine mammals.
- Drilling and completions discharges to seabed and at surface (**Att 1, Section 5.8, pg. 171**). Discharges could result in injury/mortality to individuals, with no lasting effect predicted.

- Subsea control fluid discharges (**Att 1, Section 5.9, pg. 180**). Discharges could result in injury/mortality to individuals, with no lasting effect predicted.
- Flowline preparation discharges at the seabed and include a mixture of seawater treated with preservation chemicals and dye (**Att 1, Section 5.10, p. 183**). Discharges may result in fauna injury/mortality to individuals, with no lasting effect.
- Unplanned discharge of hazardous and non-hazardous waste (**Att 1, Section 5.11, pg. 189**). This is highly unlikely and a there is a very low risk to marine mammals.
- Unplanned vessel interaction with marine fauna (**Att 1, Section 5.12, pg. 194**). Impacts on marine mammals are unlikely and there is a moderate risk to individuals but no risk to species or community function.
- Unplanned hydrocarbon release (**Att 1, Section 5.14, pg. 203**). There are potential impacts to threatened species including potential injury or mortality from exposure to hydrocarbons. This is highly unlikely to occur, with a moderate risk to migratory species.
- Unplanned CO2 loss of containment (**Att 1, Section 5.15, pg. 219**). The assessment identifies fauna injury or mortality as a potential impact. It is highly unlikely that a significant loss of containment event occurs. The risk to migratory species is low.

Marine reptiles

Migratory marine reptile species that have the potential to occur within the project area include:

- Green turtle (*Chelonia mydas*) – Vulnerable, Migratory
- Loggerhead turtle (*Caretta caretta*) – Endangered, Migratory
- Hawksbill turtle (*Eretmochelys imbricata*) – Vulnerable, Migratory
- Flatback turtle (*Natator depressus*) – Vulnerable, Migratory

Activities that may have direct impacts on the species listed above include:

- Light emissions from vessels (**Att 1, Section 5.3, pg. 139**). Light may result in changes to fauna behaviour, with no lasting effect on marine turtles.
- Underwater noise emissions from construction and operations (**Att 1, Section 5.6, pg. 147**). Modelling indicated that fauna injury/mortality is predicted if individuals remain close to the source for a long period of time, which is considered highly unlikely. Slight temporary, behavioural impacts may occur to turtles from underwater noise emissions.
- Routine MODU and vessel discharges (**Att 1, Section 5.7, pg. 166**). Discharges have the potential to result in fauna injury/mortality, with no lasting effect on turtles.
- Drilling and completions discharges to seabed and at surface (**Att 1, Section 5.8, pg. 171**). Discharges could result in fauna injury/mortality, with no lasting effect predicted.
- Subsea control fluid discharges (low toxicity, water-based) during construction and maintenance activities (**Att 1, Section 5.9, pg. 180**). Discharges could result in injury/mortality to individuals, with no lasting effect predicted.
- Flowline preparation discharges at the seabed and include a mixture of seawater treated with preservation chemicals and dye (**Att 1, Section 5.10, pg. 183**). Discharges may result in fauna injury/mortality to individuals, with no lasting effect.
- Unplanned discharge of hazardous and non-hazardous waste (**Att 1, Section 5.11, pg. 189**). This is highly unlikely and a there is a very low risk to turtles.
- Unplanned vessel interaction with marine fauna (**Att 1, Section 5.12, pg. 194**). The assessment highlighted that given the proposed mitigation measures, impacts on turtles are highly unlikely and there is a low risk to these species.
- Unplanned hydrocarbon release (**Att 1, Section 5.14, pg. 203**). Impacts include potential injury or mortality from exposure to hydrocarbons. This is highly unlikely to occur, with a moderate risk to migratory species.
- Unplanned CO2 loss of containment (**Att 1, Section 5.15, pg. 219**). The assessment identifies fauna injury or mortality as a potential impact. It is highly unlikely that a significant loss of containment

event occurs. The risk to migratory species is low.

Fish

Migratory fish species that have the potential to occur within the project area include:

- Shortfin mako (*Isurus oxyrinchus*) – Migratory
- Longfin mako (*Isurus paucus*) – Migratory
- Whale shark (*Rhincodon typus*) – Migratory, Vulnerable
- White shark (*Carcharodon carcharias*) – Migratory, Vulnerable
- Giant Manta Ray (*Mobula birostris*) – Migratory
- Oceanic whitetip shark (*Carcharhinus longimanus*) – Migratory
- Scalloped Hammerhead (*Sphyrna lewini*) – Migratory, Threatened

Activities that may have direct impacts on the species listed above include:

- Light emissions from vessels (**Att 1, Section 5.3, pg. 139**). Light may result in changes to fauna behaviour, with no lasting effect on migratory fish species.
- Underwater noise emissions from construction and operations (**Att 1, Section 5.6, pg. 147**). Modelling indicated that fauna injury/mortality is predicted if individuals remain close to the source for a long period of time, which is considered highly unlikely. Slight temporary, behavioural impacts may occur to fish from underwater noise emissions.
- Routine MODU and vessel discharges (**Att 1, Section 5.7, pg. 166**). Discharges have the potential to result in fauna injury/mortality, with no lasting effect on migratory fish.
- Drilling and completions discharges (**Att 1, Section 5.8, pg. 171**). Discharges could result in injury/mortality to individuals, with no lasting effect predicted.
- Subsea control fluid discharges during construction and maintenance activities (**Att 1, Section 5.9, pg. 180**). Discharges could result in injury/mortality to individuals, with no lasting effect predicted.
- Flowline preparation discharges at the seabed and include a mixture of seawater treated with preservation chemicals and dye (**Att 1, Section 5.10, pg. 183**). Discharges may result in fauna injury/mortality to individuals, with no lasting effect.
- Unplanned discharge of hazardous and non-hazardous waste (**Att 1, Section 5.11, pg. 189**). This is highly unlikely and a there is a very low risk to migratory fish species.
- Unplanned vessel interaction with marine fauna (**Att 1, Section 5.12, pg. 194**). Given the proposed mitigation measures, impacts on threatened fish species are highly unlikely and there is a low risk to these species.
- Unplanned hydrocarbon release (**Att 1, Section 5.14, pg. 203**). There are potential impacts to threatened species including potential injury or mortality from exposure to hydrocarbons. This is highly unlikely to occur, with a moderate risk to migratory species.
- Unplanned CO2 loss of containment (**Att 1, Section 5.15, pg. 219**). It is highly unlikely that a significant loss of containment event occurs. Potential impacts include fauna injury or mortality and the risk to migratory species is low.
- Unplanned introduction of invasive marine species (**Att 1, Section 5.13, pg. 198**). The likelihood of invasive marine species being introduced from the project is remote.

4.1.5.4 Do you consider this likely direct and/or indirect impact to be a Significant Impact? *

No

4.1.5.6 Describe why you do not consider this to be a Significant Impact. *

Section 6.3 of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document** presents a significant impact assessment of the Proposed Action in relation to migratory species. The purpose of this is to determine if a significant impact (as defined by the EPBC Act) is likely to occur to MNES. The assessment utilises the definitions and criteria provided in the MNES Significant Impact Guidelines.

Seabirds and Shorebirds

A significant impact assessment of the Proposed Action in relation to seabirds and shorebirds is presented in **Table 6-4** (pg. 239) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

Significant impacts to these species are not predicted as impacts on these species as a result of light, atmospheric noise and routine MODU and vessel discharges are expected to be negligible behavioural impacts which will not substantially modify important habitat for the species or disrupt the lifecycle of these species.

Further, the Proposed Action is being undertaken in a manner such that the anthropogenic threats to seabirds are minimised or, where possible, eliminated. As such, the Proposed Action is not inconsistent with the Wildlife Conservation Plan for Seabirds.

Marine Mammals

A significant impact assessment of the Proposed Action in relation to marine mammals is presented in **Table 6-8** (pg. 244) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

Potential impacts to migratory marine mammals are the same as described for threatened marine mammals above. These impacts will be limited to temporary behavioural disturbance. The risk of injury to marine mammals as a result of a vessel strike has been assessed as low.

Given this, the Proposed Action will not substantially modify important habitat for the species or disrupt the lifecycle of these species and significant impacts are not predicted.

Table 6-8 (pg. 244) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.** also presents an assessment of the Proposed Action in consideration of the Conservation Management Plan for the Blue Whale (2015-2025) which concludes that the Proposed Action is not inconsistent with the plan.

Marine Turtles

A significant impact assessment of the Proposed Action in relation to marine turtles is presented in **Table 6-12** (pg. 249) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

As these migratory species are also threatened species, an assessment of potential impacts is already presented above. These impacts will be limited to temporary behavioural disturbance. Given this, the Proposed Action will not substantially modify important habitat for the species or disrupt the lifecycle of these species and significant impacts are not predicted.

Fish

A significant impact assessment of the Proposed Action in relation to migratory fish species is presented in **Table 6-15** (pg. 252) of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

Impact on these species as a result of light, underwater noise, routine MODU and marine discharges are expected to be minor or negligible. The risk of injury to whale sharks as a result of a vessel strike has been assessed as low. Given this, the Proposed Action will not substantially modify important habitat for the species or disrupt the lifecycle of these species and significant impacts are not predicted.

4.1.5.7 Do you think your proposed action is a controlled action? *

Yes

4.1.5.8 Please elaborate why you think your proposed action is a controlled action. *

While significant impacts to migratory species are not predicted to occur as a result of the Proposed Action, the Development Area does overlap with the Development Area for the Browse to NWS Project, including the Browse Development Area. The proposed Browse to NWS Project is currently being assessed by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) (EPBC ref 2018 / 8319).

This overlap of Development Areas means that cumulative impacts need to be considered in the assessment of the Proposed Action, and as such, it should be considered a controlled action.

An assessment of the potential cumulative impacts on migratory fauna is presented in **Section 7** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

4.1.5.10 Please describe any avoidance or mitigation measures proposed for this action and attach any supporting documentation for these avoidance and mitigation measures. *

Avoidance and mitigation measures that will be implemented for the Proposed Action are outlined in **Section 5** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

4.1.5.11 Please describe any proposed offsets and attach any supporting documentation relevant to these measures. *

No significant residual impacts from the Proposed Action are expected on migratory species. As such no offsets are proposed.

4.1.6 Nuclear

4.1.6.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.6.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The action does not involve any nuclear related activity.

4.1.7 Commonwealth Marine Area

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Direct impact	Indirect impact	Commonwealth marine area
Yes	No	Browse Basin

4.1.7.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

Yes

4.1.7.2 Briefly describe why your action has a direct and/or indirect impact on these protected matters. *

The receptors relevant to the Commonwealth Marine Area are:

- sediment quality
- water quality
- benthic habitat and communities
- KEFs
- plankton communities
- State and Commonwealth managed fisheries
- other users including tourism, recreation, scientific studies, commercial shipping and industry.

It is noted that threatened and migratory fauna are also part of the Commonwealth Marine Area, however potential impacts to those matters area addressed in the relevant sections above and are not repeated here.

Seabed Disturbance

Seabed disturbance is associated with the temporary or permanent installation, placement and decommissioning of facilities, infrastructure, and equipment, such as the:

- CO2 injection flowline
- 7 wells (3 required at RFSU; 4 contingency wells)
- MODU or support vessel anchors / moorings
- Umbilicals
- Associated subsea structures

This includes other associated activities that may cause seabed disturbance such as seabed intervention, seabed preparation and secondary stabilisation for the or the CO2 Injection Flowline and wet storage of project infrastructure during construction.

A description of the seabed disturbance associated with the Proposed Action and an assessment of the potential impacts is presented in **Section 5.1** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

This assessment concluded that there would be no lasting effect on sediment quality, water quality and KEFs, with a minor impact on deepwater benthic communities and habitats.

Disturbance to other users

Disturbance or displacement of other users from the Development Area may occur due to the physical presence of infrastructure and associated exclusion zones and activities.

A description of the potential disturbance to other users associated with the Proposed Action and an assessment of the potential impacts is presented in **Section 5.2** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

This assessment concluded that there would be a slight impact to managed fisheries, industry and other users as a result of the exclusion zones and no lasting effect on commercial shipping.

Atmospheric Emissions

Atmospheric emissions refer to the discharges to the atmosphere of gases and particulates from an activity or from a facility (e.g. MODU, project vessel) which have a recognised adverse effect on human health and/or an environmental receptor. The main emissions responsible for these effects include carbon monoxide (CO), oxides of nitrogen (NOx), sulphur dioxide (SO2) and particulate matter less than 10 microns (PM10).

A description of the potential atmospheric emissions associated with the Proposed Action and an assessment of the potential impacts is presented in **Section 5.4** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

This assessment concluded that there would be no lasting effect on the Commonwealth Marine Area as a result of atmospheric emissions.

Routine MODU and Vessel Discharges

Routine discharges from the MODU and project vessels include sewage, sullage, treated utility water, foods craps and cooling water. Any such discharge will be undertaken in accordance with relevant legislation.

A description of the routine discharges associated with the Proposed Action and an assessment of the potential impacts is presented in **Section 5.7** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

This assessment concluded that no lasting effect will occur to water quality, plankton or KEFs in the Development Area.

Drilling or Completions Discharges

Development well construction activities associated with the Proposed Action involve the drilling and completion of up to seven injection wells. Drilling and completion of injection wells will generate drill cuttings, require cementing of the casing, and require the use of a range of fluids, that may be discharged to the marine environment, typically at the seabed and at or near the sea surface depending on the hole section.

A description of the discharges associated with the drilling and completion activities associated with the Proposed Action and an assessment of the potential impacts is presented in **Section 5.8** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

This assessment concluded that a minor impact will occur to sediment quality and deepwater benthic habitat and a slight impact will occur to water quality in the immediate vicinity of the drilling activities. No lasting effect is predicted for plankton or the KEFs in the Development Area.

Subsea Control Fluid Discharge

Discharge of subsea control fluid will occur from the valves on the subsea manifolds, the christmas tree at the wellheads, the Blow Out Preventor during drilling and the ROVs during construction and maintenance activities.

Control fluids are composed of low toxicity water-based fluids and are typically water based with additives such as MEG lubricants, corrosion inhibitors, biocides and surfactants.

A description of the subsea control fluids discharges associated the Proposed Action, and an assessment of the potential impacts is presented in **Section 5.9** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

This assessment concluded that there would be a slight impact to water quality in the immediate vicinity of the release and no lasting effect on other receptors.

Marine Discharges: Flowline Dewatering Fluid

Once installation and hook up of the subsea infrastructure is complete, flowline dewatering will be conducted in preparation for the introduction of CO2. The fluid discharged from the CCS Flowline will be discharged directly the Calliance FLETs/ILTs and will consist of various constituents including nitrogen, seawater, biocides, oxygen scavenger, corrosion inhibitors, MEG, and fluorescent dye. The discharge volumes will vary depending on the flowline section to be tested, and the largest individual discharge is expected to be up to 11,400 m3.

A description of the flowline dewatering discharges associated the Proposed Action, and an assessment of the potential impacts is presented in **Section 5.10** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

This assessment concluded that no lasting effect would occur to receptors as a result of flowline dewatering fluid discharge.

Marine Discharges (unplanned): Hazardous and Non-Hazardous Inorganic Waste

Hazardous and non-hazardous waste will be generated from project vessels and the MODU.

Waste material may be lost to the environment due to human error, incorrect waste storage, poor weather, or mechanical failure of equipment used to store wastes.

A description of the hazardous and non-hazardous waste that may be generated by the Proposed Action and the risk presented to the Commonwealth Marine Area by an unplanned released of this waste is presented in **Section 5.11** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

The assessment concluded that given the proposed mitigation measures, an unplanned release of hazardous or non-hazardous waste presents a low risk to Commonwealth Marine Area.

Unplanned introduction of Invasive marine species

IMS can be introduced through a variety of vectors. The key pathways for introduction of IMS to the Development Area is within biofouling on external surfaces of vessels and within internal niche areas and systems, and through vessel's ballast water.

A description of the risk related to the introduction of IMS during the Proposed Action is presented in **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

The assessment concluded that with the planned mitigation measures, the likelihood of IMS being introduced as a result of the Proposed Action and subsequently becoming established in the area is remote.

Unplanned hydrocarbon releases

Woodside has undertaken an assessment including quantitative spill modelling for credible hydrocarbon loss of containment scenario. It is noted that such an event is highly unlikely to occur. This assessment is including in **Section 5.14** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

The assessment details the potential impacts to the Commonwealth Marine Area and concluded that with the planned mitigation measures, it is highly unlikely that a significant loss of containment event occurs and that there is a moderate risk to the Commonwealth Marine Area.

Unplanned Loss of Containment of CO2

Woodside has undertaken an assessment including quantitative spill modelling for credible CO2 loss of containment scenarios. It is noted that such an event is highly unlikely to occur. This assessment is including in **Section 5.15** of **Att 1 – Referral Supporting Document.**

The assessment details the potential impacts to the Commonwealth Marine Environment and concluded that with the planned mitigation measures, it is highly unlikely that a significant loss of containment event occurs and that there is a low risk to the Commonwealth Marine Area.

4.1.7.4 Do you consider this likely direct and/or indirect impact to be a Significant Impact? *

No

4.1.7.6 Describe why you do not consider this to be a Significant Impact. *

Section 6.4 of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document** presents a significant impact assessment of the Proposed Action in relation to the Commonwealth Marine Area. The purpose of this is to determine if a significant impact (as defined by the EPBC Act) is likely to occur to MNES. The assessment utilises the definitions and criteria provided in the MNES Significant Impact Guidelines.

This assessment concluded the significant impacts to the Commonwealth Marine Area are not likely to occur as:

- The likelihood of the introduction and establishment of an invasive marine species in the Development Area is remote.
- Impacts from the Proposed Action will be of negligible to minor impact significance level and will be localised, temporary and of short duration. The impacts will not modify, destroy, fragment, isolate or disturb a substantial area of habitat, and marine ecosystem functioning, and integrity will therefore not be impacted.
- The impacts will not have a substantial effect on a population's life cycle or spatial distribution.
- Impacts to air quality and water quality from the Proposed Action will be of negligible to slight impact significance level and will be localised, temporary and of short duration. There will not be a substantial change in air quality or water quality and therefore no adverse impacts to biodiversity, ecological integrity; social amenity or human health.
- The Proposed Action will not result in harmful chemicals accumulating in the marine environment.

The Proposed Action will not have a substantial adverse impact on heritage values of the Commonwealth marine area.

4.1.7.7 Do you think your proposed action is a controlled action? *

Yes

4.1.7.8 Please elaborate why you think your proposed action is a controlled action. *

While significant impacts to the Commonwealth Marine Area are not predicted to occur as a result of the Proposed Action, the Development Area does overlap with the Development Area for the Browse to NWS Project including the Browse Development Area. The proposed Browse to NWS Project is currently being assessed by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) (EPBC ref 2018 / 8319).

This overlap of Development Areas means that cumulative impacts need to be considered in the assessment of the Proposed Action, and as such, it should be considered a controlled action.

An assessment of the potential cumulative impacts on the Commonwealth Marine Area is presented in **Section 7** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

4.1.7.10 Please describe any avoidance or mitigation measures proposed for this action and attach any supporting documentation for these avoidance and mitigation measures. *

Avoidance and mitigation measures that will be implemented for the Proposed Action are outlined in **Section 5** of **Att 1 Proposed Browse CCS Project Referral Supporting Information Document.**

4.1.7.11 Please describe any proposed offsets and attach any supporting documentation relevant to these measures. *

As detailed above, no significant residual impacts from the Proposed Action are expected on the Commonwealth Marine Area. As such, no offsets are proposed.

4.1.8 Great Barrier Reef

4.1.8.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.8.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The Project Area does not overlap with, or occur in proximity to, the Great Barrier Reef.

4.1.9 Water resource in relation to large coal mining development or coal seam gas

4.1.9.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.9.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed Action does not involve water resource in relation to coal mining or coal seam gas.

4.1.10 Commonwealth Land

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

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4.1.10.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.10.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

No direct activities or disturbance is planned to occur on or to impact Commonwealth Land. The nearest Commonwealth Heritage Place is 'Scott Reef and Surrounds' (ID 10548). The nearest proposal infrastructure to this site is approximately 14km away. The only potential interaction with the proposal and location would occur in the event of a major hydrocarbon spill from a vessel associated with the proposal. The probability of contact with any hydrocarbons and possible contact concentrations from the worst case spill event was modelled and described in further detail within **Att 7 CO2 Release and Hydrocarbon Spill Modelling Report (Appendix C)**. The likelihood of such a spill event occurring is highly unlikely and vessel activities will comply with all relevant Australian and International maritime requirements and other approval conditions as required.

4.1.11 Commonwealth Heritage Places Overseas

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

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4.1.11.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.11.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The Project Area does not overlap with, or occur in proximity to, any Commonwealth Heritage Place overseas.

4.1.12 Commonwealth or Commonwealth Agency

4.1.12.1 Is the proposed action to be taken by the Commonwealth or a Commonwealth Agency? *

No

4.2 Impact summary

Conclusion on the likelihood of significant impacts

You have indicated that the proposed action will likely have a significant impact on the following Matters of National Environmental Significance:

None

Conclusion on the likelihood of unlikely significant impacts

You have indicated that the proposed action will unlikely have a significant impact on the following Matters of National Environmental Significance:

- World Heritage (S12)
- National Heritage (S15B)
- Ramsar Wetland (S16)
- Threatened Species and Ecological Communities (S18)
- Migratory Species (S20)
- Nuclear (S21)
- Commonwealth Marine Area (S23)
- Great Barrier Reef (S24B)
- Water resource in relation to large coal mining development or coal seam gas (S24D)
- Commonwealth Land (S26)
- Commonwealth Heritage Places Overseas (S27B)
- Commonwealth or Commonwealth Agency (S28)

4.3 Alternatives

4.3.1 Do you have any possible alternatives for your proposed action to be considered as part of your referral? *

No

4.3.8 Describe why alternatives for your proposed action were not possible. *

The purpose of the proposed Browse CCS Project is to provide a safe and reliable mechanism to reduce the greenhouse gas emissions of a related project. Therefore, the alternative of not proceeding with the Browse CCS Project is not considered further here.

A wide range of locations have been appraised for their suitability to store Browse CO2. These studies considered many potential sites (>60) that were ruled out following initial screening in 2007 and subsurface modelling 2008-2009, leading to the four best ranked options below. Detailed subsurface and engineering studies and cost evaluations were conducted on these four sites. These were the sites considered likely to be technically suitable to inject and store the required volume of reservoir CO2:

- Calliance down-dip (now known as the Calliance Storage Formation)
- Oobagooma sub-basin
- Pender Terrace East
- Willara.

In 2020, in addition to reviewing the previous evaluations, previous alternatives were also reconsidered to capture updates on producing field status and include new technology options.

Woodside conducted an initial high-level screening of potential CCS injection sites regionally. During the evaluation of regional formations, it became clear that selection of an injection location at or near the Browse fields, if feasible, would represent the optimum outcome due to lower capital expenditure (i.e., flowline length), more favourable commercial conditions, and minimised environmental considerations.

The Calliance Storage Formation was identified as the preferred site to initially investigate in more detail. Primarily, this was because it appeared to have the least amount of subsurface uncertainty when considering the key site parameters of:

- **Capacity**: size of trap or capacity to contain the volume
- **Containment**: risk of out of zone injection, leakage short and long term (100+ years)
- **Injectivity**: rock quality, geomechanical strength, mineralisation and scaling
- **Monitoring**: ability to detect and monitor CO2 movement over project life and long term.

An important commercial consideration by the Browse Joint Venture (BJV) regarding use of the Calliance site was the need to avoid the risk of interaction of stored CO2 with hydrocarbon reserves resulting in CO2 entering the production system and exceeding the current basis of design maximum CO2 specification, which has potential to curtail production of the proposed Browse to NWS Project. Work was conducted in 2021 to address this production risk that led to the selection of the ‘down-dip ‘Calliance Southern Aquifer and the downthrown Brecknock-Calliance Graben Aquifer as the preferred injection locations as they minimise the risk of CO2 contact with the hydrocarbon reserves.

Both aquifers are saline water reservoirs, located several kilometres underground and roughly 300 kms from the nearest coastline. They do not represent potable or usable water sources.

The three other sites have not been considered for further assessment. This is due to multiple factors, including subsurface uncertainties and risk, as well as permitting status, jurisdictional reasons, environmental approvals, commercial agreements with other resource owners, onshore aquifer outcrops, and transportation distance.

The BJV is committed to pursuing the optimal technical, economic and environmental solution for mitigating greenhouse gas emissions from the Browse to NWS Project.

The BJV will continue to monitor the potential of emerging alternative approaches, however there are currently no commercially feasible alternative to the Browse CCS Project that can achieve an equivalent magnitude of greenhouse gas emissions reductions.

5. Lodgement

5.1 Attachments

1.2.1 Overview of the proposed action

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att 1 Proposed Browse CCS Project Referral Supporting Information Document.pdf Referral Supporting Information Document	31/10/2024	No	High
#2.	Document	Att 7 CO2 Release and Hydrocarbon Spill Modelling Report (Appendix C).pdf CO2 Release and Hydrocarbon Spill Modelling Report		No	High
#3.	Document	Att 8 Hydrocarbon Spill EMBA Protected Matters Search Tool Report (Appendix D).pdf Hydrocarbon Spill EMBA Protected Matters Search Tool Report		No	High

1.3.2.17 (Person proposing to take the action) Proposer's history of responsible environmental management

	Type	Name	Date	Sensitivity	Confidence
#1.	Link	Woodside Sustainability Website https://www.woodside.com/sustainability.			High

1.3.2.18 (Person proposing to take the action) If the person proposing to take the action is a corporation, provide details of the corporation’s environmental policy and planning framework

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att 4 Woodside Health and Safety Policy.pdf Health and Safety Policy		No	High
#2.	Document	Att 5 Woodside Quality Policy.pdf Quality Policy		No	High

#3.	Document Environment Policy	Att 6 Woodsides Environment and Biodiversity Policy.pdf		No	High

3.2.1 Flora and fauna within the affected area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document PMST Report (Project Area)	Att 2 Project Area Protected Matters Search Tool Report Appendix A.pdf		No	High
#2.	Document Species Presence Assessment	Att 3 Species Presence Assessment (Appendix B).pdf		No	High

5.2 Declarations

Completed Referring party's declaration

The Referring party is the person preparing the information in this referral.

ABN/ACN	63005482986
Organisation name	WOODSIDE ENERGY LTD.
Organisation address	11 Mount St, Perth WA, 6000
Representative's name	Aaron McDonald
Representative's job title	Environment Approvals Lead - Browse
Phone	0417 683 394
Email	aaron.mcdonald@woodside.com.au
Address	

☑ Check this box to indicate you have read the referral form. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

☑ By checking this box, I, **Aaron McDonald of WOODSIDE ENERGY LTD.**, declare that to the best of my knowledge the information I have given on, or attached to this EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. *

☐ I would like to receive notifications and track the referral progress through the EPBC portal. *

✔ Completed Person proposing to take the action's declaration

The Person proposing to take the action is the individual, business, government agency or trustee that will be responsible for the proposed action.

ABN/ACN	63005482986
Organisation name	WOODSIDE ENERGY LTD.
Organisation address	11 Mount St, Perth, WA 6000
Representative's name	Kimberly Walpot
Representative's job title	Vice President, Browse
Phone	9348 4000
Email	kimberly.walpot@woodside.com
Address	11 Mount St, Perth, WA 6000

☑ Check this box to indicate you have read the referral form. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

☑ I, **Kimberly Walpot of WOODSIDE ENERGY LTD.**, declare that to the best of my knowledge the information I have given on, or attached to the EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. I declare that I am not taking the action on behalf or for the benefit of any other person or entity. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

✔ Completed Proposed designated proponent's declaration

The Proposed designated proponent is the individual or organisation proposed to be responsible for meeting the requirements of the EPBC Act during the assessment process, if the Minister decides that this project is a controlled action.

Same as Person proposing to take the action information.

☑ Check this box to indicate you have read the referral form. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

☑ I, **Kimberly Walpot of WOODSIDE ENERGY LTD.**, the Proposed designated proponent, consent to the designation of myself as the Proposed designated proponent for the purposes of the action described in this EPBC Act Referral. *

☐ I would like to receive notifications and track the referral progress through the EPBC portal. *