



Browse LNG Precinct



Browse Liquefied Natural Gas Precinct

Strategic Assessment Report

(draft for public comment)

December 2010

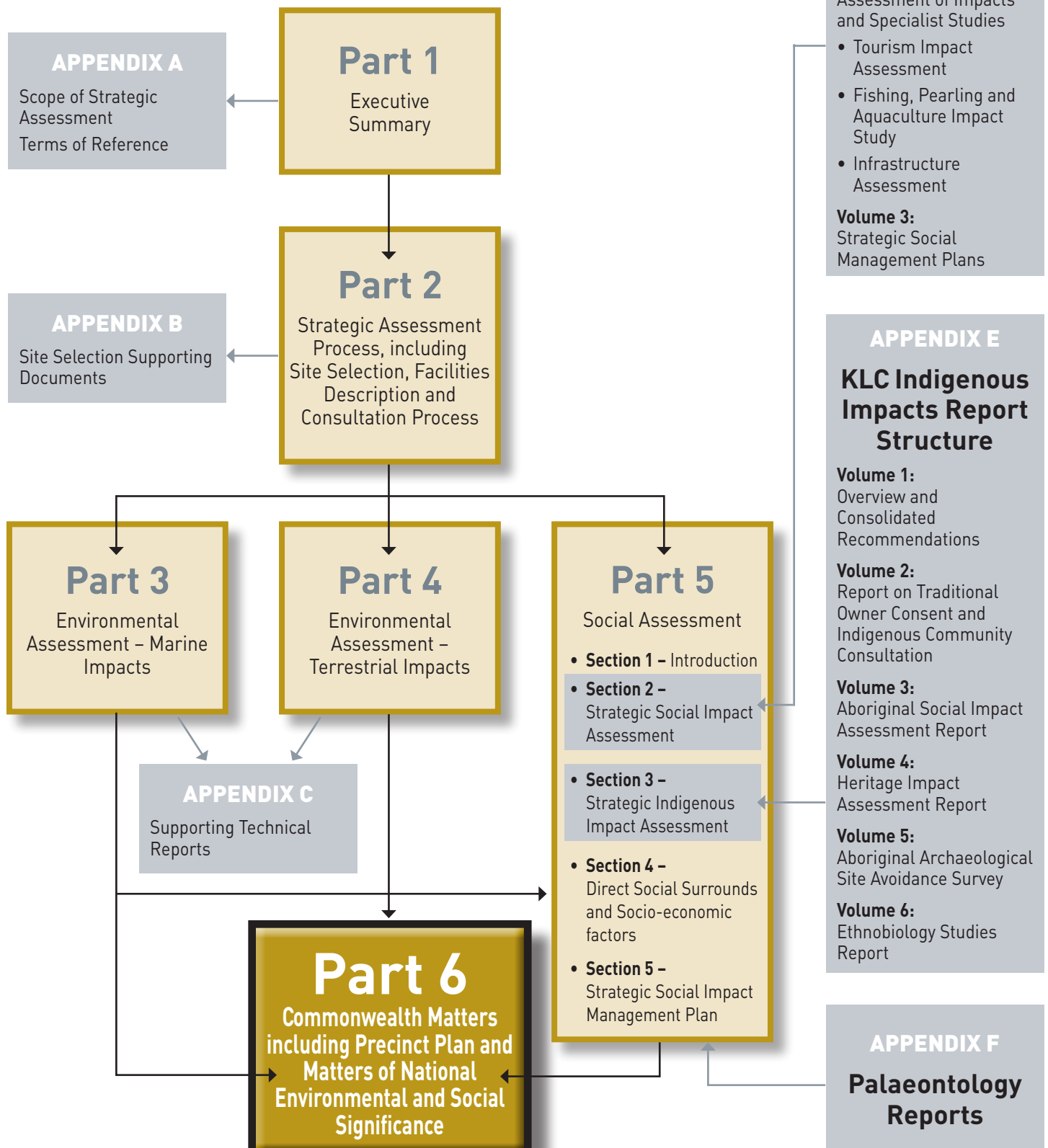
PART 6

Commonwealth Matters including Precinct Plan, Management Arrangements and Matters of National Environmental and Social Significance

Browse LNG Precinct

Strategic Assessment Report – Structure Display

The State of Western Australia, through the Minister for State Development, has developed the Browse LNG Precinct Strategic Assessment Report (SAR) to enable consideration of a proposed common user liquefied natural gas (LNG) Precinct to process natural gas from the Browse Basin gas fields, at a location near James Price Point, approximately 60 kilometres north of Broome. This SAR is presented in six parts as shown in the following diagram. You are invited to make a submission by visiting the Environmental Protection Authority website at <http://public-consult.epa.wa.gov.au/portal>. Appendices are also available at <http://www.dsd.wa.gov.au/browseLNG>.



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Nomenclature, Acronyms, Measurements and Units List

Acronym	Definition
ABS	Australian Bureau of Statistics
ACMC	Aboriginal Cultural Materials Committee
AGRU	Acid Gas Removal Unit
AGT	Aero Derivative Gas Turbines
AH Act	<i>Aboriginal Heritage Act 1972(WA)</i>
AHC	Aboriginal Heritage Commission
AHD	Australian Height Datum
AIHW	Australian Institute of Health and Welfare
AIMS	Australian Institute of Marine Science
aMDEA	activated methyl-di-ethanol amine
AMSA	Australian Maritime Safety Authority
ANZECC	Australian and New Zealand Environment Conservation Council
AQIS	Australian Quarantine Inspection Service
ARI	Average Recurrence Interval
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ARR	Australian Rainfall and Runoff
ARRP Act	<i>Agriculture and Related Resources Protection Act 1976</i>
ASIA	Aboriginal Social Impact Assessment
ASS	Acid Sulphate Soils
ATSIHP Act	<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i>
AWAC	Acoustic Doppler Wave and Current Profiler
BLNG	Browse Liquefied Natural Gas
BLNG Precinct	Browse Liquefied Natural Gas Precinct
BoM	Bureau of Meteorology
BPA	Broome Port Authority
BPMP	BLNG Precinct Environmental Management Plan
BPMF	Broome Prawn Managed Fishery
BPP	Benthic Primary Producer
BPPH	Benthic Primary Producer Habitat
Bq kg ⁻¹	Becquerels per kilogram
BRAC	Broome Recreation and Aquatic Centre
BRAMS	Broome Regional Aboriginal Medical Service
BRUVS	Baited Remote Underwater Video Surveys
BTEX	benzene, toluene, ethylbenzene and xylene
°C	degrees celsius, degrees centigrade
CaCO ₃	Calcium Carbonate
CAEPR	Centre for Aboriginal Economic Policy Research
CALM	Department of Conservation and Land Management , now DEC
CAMBA	China-Australia Migratory Bird Agreement
Category A	These are the core elements of the BLNG Precinct, including associated infrastructure, necessary to process and export hydrocarbons.
Category B	These are indirect activities and actions as a result of the BLNG Precinct that are considered in the impact assessment but do not form part of the approvals process.

Acronym	Definition
Category C	Related projects that are outside the scope of the Strategic Assessment but form part of the cumulative impact assessment.
CCIMP	Committee for Introduced Marine Pest Emergencies
CEMP	Construction Environment Management Plan
CDEP	Community Development Employment Projects
CEO	Chief Executive Officer
CH ₄	Methane
CHMP	Cultural Heritage Management Plan
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CO ₂ -e	Carbon Dioxide Equivalents
CPI	Consumer Price Index
CPRS	Carbon Pollution Reduction Scheme
CSD	Cutter Suction Dredger
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTM	Chemical Transport Model
CWR	Centre for Whale Research
Cwth	Commonwealth
DAFF	Department of Agriculture, Fisheries and Forestry
DAFWA	Department of Agriculture and Food Western Australia
dB	decibels
dB(A)	A-weighted decibels
DCCEE	Department of Climate Change and Energy Efficiency
DDSDMP	Dredging and Dredge Spoil Disposal Management Plan
DEC	Department of Environment and Conservation
DEEWR	Commonwealth Department of Education, Employment and Workplace Relations
DEWHA	Commonwealth Department for the Environment, Water, Heritage and the Arts, now SEWPAC
DIA	Department of Indigenous Affairs
DLGRD	Department of Local Government and Regional Development
DLNG	Darwin Liquefied Natural Gas
DMAG	Dredging Management Advisory Group
DMP	Department of Mines and Petroleum
DoF	Department of Fisheries
DoIR	Department of Industry and Resources
DoLA	Depart of Land Administration
DoP	Department of Planning
DoT	Department of Transport
DoW	Department of Water
DPI	Department for Planning and Infrastructure
DRDL	Department of Regional Development and Lands
DRET	Commonwealth Department of Resources, Energy and Tourism
DRF	Declared Rare Flora
DSD	Department of State Development
DSDG	Dredge Spoil Disposal Ground

Acronym	Definition
DSDMP	Dredging and Dredge Spoil Disposal Management Plan
EAG3	Environmental Assessment Guideline 3
ECHT	Environment and Cultural Heritage Team
EIA	Environmental Impact Assessment
EMP	Environment Management Plan
EP Act	<i>Environmental Protection Act 1986</i>
EPA	Environmental Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
eq.	Acid Equivalents
EVT	Evergreen Vine Thickets
FEED	Front End Engineering Design
FESA	Fire and Emergency Services Authority of Western Australia
FID	Final Investment Decision
FIFO	Fly in/Fly out
FIS	Fishing Industry Impact Study
FLNG	Floating LNG
FM Act	<i>Fish Resources Management Act 1994</i>
Foundation Proponent	Woodside is a potential Foundation Proponent
FRMR	Fisheries Resource Management Regulations 1995
FRP	Filterable reactive phosphorus
GBRMPA	Great Barrier Reef Marine Park Authority
GBS	Gravity Based Structure
GCA	Gaffney Cline and Associates
GDEs	Groundwater Dependant Ecosystems
GDP	Gross Domestic Product
GHG	Greenhouse Gas
G	grams
GJ	gigajoule
GL	gigalitre
GL/yr	gigalitres per year
GGAP	Greenhouse Gas Abatement Plan
GROH	Government Regional Officer Housing
GRP	Gross Regional Product
GSP	Gross State Product
GST	Goods and Services Tax
GWP	Global Warming Potential
H ₂ S	hydrogen sulphide
ha	hectare
HAT	Highest astronomical tide
HCWA	Heritage Council of Western Australia
HDD	Horizontal Directional Drilling
HFCs	Hydrofluorocarbons
HIA	Heritage Impact Assessment
HNO ₃	Nitric Acid

Acronym	Definition
HoA	Heads of Agreement
HONO	Nitrous Acid
HPA	Heritage Protection Agreement
hr	hour
HSE	Health, Safety and Environment
HYPE	Helping Young People Engage
IBRA	Interim Biogeographic Regionalisation of Australia
ICC	Indigenous Coordination Centres
IFPIC	Indigenous Free Prior Informed Consent
IGCC	Integrated Gasification Combined Cycle
ILUA	Indigenous Land Use Agreement
IMO	International Maritime Organisation
IMS	Invasive Marine Species
IMSMP	Invasive Marine Species Management Plan
IP	Important Population
IPCC	Intergovernmental Panel on Climate Change
IS	Integrated System
ISQG	Interim Sediment Quality Guidelines
ITF	Indonesian Throughflow
IUCN	International Union for Conservation of Nature
JAMBA	Japan-Australia Migratory Bird Agreement
JPP	James Price Point
KAMSC	Kimberley Aboriginal Medical Services Council
KAC	Kimberley Aquaculture Corporation
KACS	Kimberley Aged and Community Services
KDC	Kimberley Development Commission
KES	Kullari Employment Services
kg	kilogram
kgCO ₂ -e	kilogram of Carbon Dioxide Equivalents
kmh ⁻¹ , km/h	kilometres per hour
kHz	kilohertz
KLC	Kimberley Land Council
km	kilometre
km ²	square kilometre
kn	knot
KPP	Kadar Pearson and Partners
kt	kilotonne
LAU	Local Assessment Unit
LCUs	Landscape Character Units
LGA	Local Government Area
LIA	Light Industrial Area
LiDAR	Light Detection and Ranging
LIGT	Large Industrial Gas Turbines
LNG	Liquefied Natural Gas
LNG Hub	Alternative wording for BLNG Precinct

Acronym	Definition
LoR	Limit of Reporting
LPG	Liquefied Petroleum Gas
LPS	Local Planning Strategy
LSR	Light Sensitive Receptors
LVIA	Landscape and Visual Impact Assessment
$\mu\text{g}/\text{m}^3$	microgram per cubic metre
$\mu\text{g g}^{-1}$, $\mu\text{g}/\text{g}$	microgram per gram
$\mu\text{g L}^{-1}$, $\mu\text{g}/\text{L}$	microgram per litre
μm	micrometre
$\mu\text{g m}^{-3}$, $\mu\text{g}/\text{m}^3$	microgram per metre cubed
μMol	micromole
m	metre
m^2	square metre
m^3	cubic metre
m^3/hr	cubic metre per hour
m/s	metres per second
Ma	Mega annum (million years)
mAHD	Metres Australian Height Datum
MDS	Multi Dimensional Scaling
MEG	Mono-ethylene glycol
MF	Marine Facility
mg L^{-1} , mg/L	milligram per litre
MIGT	Medium Industrial Gas Turbines
ML	megalitre
mm	millimetre
MMbtu	Millions of British Thermal Units
MNES	Matters of National Environmental Significance
MODIS	Moderate Resolution Imaging Spectroradiometer
MOF	Materials Offloading Facility
mol%	Mole percentage
MPA	Marine Protected Areas
MPB	Microphytobenthos
ms^{-1} , m/s	metre per second
MSL	Metres below sea level
Mt	megatonne (million tonne)
Mtpa	million tonnes per annum
MVT	Monsoon Vine Thicket
MWDMP	Marine Wasterwater Discharge Management Plan
MWh	megawatt hour
NAGD	National Assessment Guidelines for Dredging
NDT	Northern Development Taskforce
NE	North-east
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NES	National Environmental Significance (i.e. matters of NES)

Acronym	Definition
NGA	National Greenhouse Accounts
NGCC	Natural Gas Combined Cycle
NGER Act	<i>National Greenhouse and Energy Reporting Act 2007</i>
NH ₃	Ammonia
NH ₄	Ammonium
NILF	not in labour force
Nm	nautical mile
NNTT	National Native Title Tribunal
NNW	north-north-west
NO ₂	nitrogen dioxide
NO _x	oxides of Nitrogen (NO and NO ₂)
NPI	National Pollutant Inventory
NRIF	<i>National Recreational and Indigenous Fishing Survey</i>
NRM	Natural Resource Management
NSW	New South Wales
NT	Northern Territory
NTA	<i>Native Title Act 1993</i>
NTU	Nephelometric Turbidity Units
NWMR	Northwest Marine Region
NWQMS	National Water Quality Management Strategy
O ₃	Ozone
OSCP	Oil Spill Contingency Plan
PAH	Polycyclic Aromatic Hydrocarbons
PAR	Photosynthetically Available Radiation
PASS	Potential Acid Sulphate Soils
PBC	Prescribed Body Corporate
PCG	Precinct Control Group
PECs	Priority Ecological Communities
Plan	The formal Plan for the BLNG Precinct under Commonwealth legislation (see also Precinct Plan)
PM	particulate matter
PF	Port Facility
PFCEMP	Port Facilities Construction Environmental Management Plan
PFCs	Perfluorocarbons
ppb	Parts per billion
Ppt	parts per thousand
Precinct Plan	The formal Plan for the BLNG Precinct under Commonwealth legislation (see also Plan)
proponent	Commercial proponents will undertake projects within the Precinct.
Proponent	The Proponent for the Precinct is the Minister for State Development
PRRT	Petroleum Rent Resource Tax
PSD	Particle size distribution
PTS	Permanent Threshold Shift
QA/QC	Quality Assurance/ Quality Control
QMP	Quarantine Management Plan
QLD	Queensland

Acronym	Definition
RBA	Reserve Bank of Australia
RBWG	Roebuck Bay Working Group
RIWI Act	<i>Rights in Water and Irrigation Act 1914</i>
RMS	Root Mean Square
RNE	Register of National Estate
RO	Reverse Osmosis
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
RORO	Roll on Roll off
RoW	Right of Way
RTO	Registered Training Organisation
SA	Strategic Assessment
SAA	Strategic Assessment Agreement
SAP	Sediment Sampling and Analysis Plan
SAR	Strategic Assessment Report
SE	south-east
SEL	Sound Pressure Level
SEP	State Environmental Policy
SEWPAC	Commonwealth Department of Sustainability, Environment, Water, Population and Community
SF ₆	Sulphur Hexafluoride
SIA	Social Impact Assessment
SO _x	oxides of sulphur
SO ₂	sulphur dioxide
SOPEP	Shipboard Oil Pollution Emergency Plan
SoSA	Scope of the Strategic Assessment
SPL	Sound Pressure Level
SPMT	Self Propelled Module Trailers
SPRAT	Species Profile and Threats Database
SRE	Short Range Endemic
SRG	Stakeholder Reference Group
SSIMP	Strategic Social Impact Management Plan
STI	Sexually Transmitted Infection
SWIS	South West Interconnected System
TAFE	Technical and Further Education
TAPM	The Air Pollution Model
TBT	Tributyltin
tcf	trillion cubic feet
TCU	Thermal Combustion Units
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
TIA	Tourism Impact Assessment
TJ	terajoules
TM	Thematic Mapper
TN	Total Nitrogen
TOC	Total Organic Carbon
TONC	Traditional Owner Negotiating Committee

Acronym	Definition
ToR	Terms of Reference
TOTF	Traditional Owner Taskforce
TP	Total Phosphorous
tpa	tonne per annum
TPH	Total Petroleum Hydrocarbons
TSHD	Trailer Suction Hopper Dredger
TSS	Total Suspended Solids
TTS	Temporary Threshold Shift
UNDRIP	United Nations Declaration of Rights of Indigenous People
UNFCCC	United Nations Framework Convention on Climate Change
UV	Ultraviolet
VET	Vocational Education and Training
VMP	Vessel Management Plan
VOC	Volatile Organic Compounds
VSR	Visually Sensitive Receptors
WA	Western Australia
WACHS	Western Australian Country Health Service
WALFA	West Arnhem Land Fire Abatement
WAM	Western Australian Museum
WAPC	Western Australian Planning Commission
WC Act	<i>Wildlife Conservation Act 1950</i>
WEED	Weed Education Eradication Delivery
WHO	World Health Organisation
WNW	west-north-west
WONS	Weed of National Significance
Woodside	Woodside Energy Limited
WRC	Water and Rivers Commission, now Department of Water (DoW)
WSW	west-south-west
WWF	World Wildlife Fund
WWTP	Waste Water Treatment Plant

1. Introduction

The State of Western Australia (**WA**), through the Minister for State Development (the **Proponent**), proposes to develop an onshore, common-user Liquefied Natural Gas (**LNG**) precinct to process natural gas from Browse Basin gas fields off the west Kimberley coast. The Department of State Development (**DSD**) has been charged with advancing this proposal under direction of the Proponent.

The Browse Liquefied Natural Gas Precinct (**BLNG Precinct** or **Precinct**) would consist of LNG processing facilities and associated infrastructure, and would be located in the vicinity of James Price Point, approximately 60 kilometres (**km**) north of Broome, on the west Kimberley coast of Western Australia. The BLNG Precinct would provide a location for processing gas and associated products from the Browse Basin with an LNG production capacity of up to 50 million tonnes per annum (**Mtpa**). If it were to occur, full development of the Precinct would most likely be phased in as demand for additional processing capacity arises. The Precinct would accommodate a minimum of two proponents at one location and enable sharing of common-user facilities such as the port, roads, infrastructure corridors and workers' accommodation. A **Precinct Plan** has been developed to meet the requirements of the State and Commonwealth Governments.

Woodside Energy Limited (**Woodside**), on behalf of the Browse LNG Development Joint Venture participants, was appointed as a potential Foundation Proponent for the Precinct under the Preliminary Development Agreement signed in October 2009. This Agreement established Woodside as a partner with the State Government in bringing the project to completion.

A detailed and comprehensive assessment has considered the environmental, social, economic, heritage and strategic implications of the Precinct should it reach its full capacity. The assessment process has involved desktop studies, field surveys, modelling, data analysis, impact assessment and stakeholder consultation, the results of which are documented in the BLNG Precinct Strategic Assessment Report (**SAR**).

The purpose of this Strategic Assessment Report is to meet the requirements of the State and Commonwealth governments in accordance with the Terms of Reference. The Strategic Assessment includes a high level impact assessment (including social factors), a description of the strategic proposal, identifying 'future proposals' (to be approved under the *Environmental Protection Act 1986* (the **EP Act**)) and the Precinct Plan (to be endorsed under the *Environment Protection and Biodiversity Conservation Act 1999* (the **EPBC Act**)), and includes the Proponent's proposed draft conditions that may be applied to future proposals. The document includes a summary of existing information, identifying main impact areas and sets out the proposed management arrangements, mitigation and safeguards to ensure impacts are managed.

The SAR is presented in six parts:

Part 1: Executive Summary

Part 2: Strategic Assessment Process including Site Selection, Facilities Description and Consultation Process

Part 3: Environmental Assessment – Marine Impacts

Part 4: Environmental Assessment – Terrestrial Impacts

Part 5: Social Assessment

Part 6: Commonwealth Matters including Precinct Plan, Management Arrangements and Matters of National Environmental and Social Significance

This document (**Part 6**) of the Strategic Assessment Report compiles the key information relevant to assessment by the Australian Government, including:

- Consolidated summary of the assessment of potential impacts on matters of National Environmental Significance (**NES**); and
- The Plan for the Browse Liquefied Natural Gas Precinct; which must be endorsed by the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities (**SEWPAC**) (formerly the Commonwealth Department for the Environment, Heritage, Water and the Arts (**DEWHA**)) before any action can be approved under the Plan.

Actions taken under the Precinct Plan for the establishment of the BLNG Precinct may adversely affect matters of National Environmental Significance and therefore require assessment under the *Environmental Protection and Biodiversity Conservation Act*. Information relevant to this assessment is consolidated in **Part 6, Section 2**. This section draws on the full Marine and Terrestrial Assessments provided in **Part 3** and **Part 4** of the SAR and cross references some information to minimise repetition within the document.

The strategic assessment process under s146 of the EPBC Act allows the Commonwealth Minister to endorse a “Plan”, following a strategic assessment and subsequently to approve “actions” that are undertaken in accordance with the Plan. The Plan that is to be assessed for endorsement by the Commonwealth Minister (herein after referred to as the Precinct Plan) is included in **Part 6, Section 3**. The Precinct Plan is subject to a strategic assessment as there are multiple future proponents of actions likely and the Commonwealth Government entered into an agreement with the State Government of Western Australia to undertake a strategic assessment.

1.1. Activities Addressed Under the Precinct Plan

This Strategic Assessment addresses a number of activities that will take place through the implementation of the Precinct Plan to establish a BLNG Precinct. These activities may define “future proposals” and “actions” that require approval under the EP Act and EPBC Act and are also referred to in the Strategic Assessment as **Category A** activities.

The Strategic Assessment also addresses activities that may be indirectly related to the BLNG Precinct (**Category B** activities) and other significant related projects in the region (**Category C** activities) to allow consideration of cumulative impacts during assessment. Category B and C activities are not future proposals, actions or classes of actions under this strategic proposal or Precinct Plan and, if these activities eventuate, they would be subject to the assessment provisions of the EP Act and the EPBC Act as necessary.

The categories may be summarised in **Table 1-1**.

■ **Table 1-1 Categories of Facilities and Activities.**

Category	Description	Detail	Examples	Further Details
A	BLNG Precinct	These are the core elements of the BLNG Precinct, including associated infrastructure, necessary to process and export hydrocarbons.	<ul style="list-style-type: none"> • LNG, condensate and other hydrocarbon processing facilities; • Port Facilities (PF); and • Infrastructure within and immediately adjacent to the Precinct. 	Part 2, Section 5.
B	Indirect Activities	These are indirect activities and actions as a result of the BLNG Precinct that are considered in the impact assessment but do not form part of the approvals process.	<ul style="list-style-type: none"> • Broome Airport ; • Broome Port; • Regional roads; • Housing; • Waste Management; and • Material Sourcing. 	Part 2, Section 6.1.
C	Related Projects	Related projects that are outside the scope of the Strategic Assessment but form part of the cumulative impact assessment.	<ul style="list-style-type: none"> • Petroleum Exploration activities; • Browse field development; • Pipelines and infrastructure in Commonwealth waters; • Road to the Precinct; and • Pioneer Camp. 	Part 2, Section 6.2.

2. Matters of National Environmental Significance

This section provides a consolidated summary of the assessment of potential impacts to matters of NES from Category A, B and C activities, and the management arrangements and safeguards and mitigation measures that will be applied to prevent significant impacts on these matters.

Overall, the assessment of the impacts on matters of NES demonstrates that the site selection process undertaken by the Northern Development Taskforce (**NDT**) succeeded in ensuring that most areas of environmental significance or sensitivity were avoided. It also supports the S16(e) advice of the Environmental Protection Authority (**EPA**) that environmental risks and impacts were likely to be manageable (EPA, 2008). For example, in relation to the potential impacts on marine mammals (such as whales and dugongs) and marine turtles it was found that the site selection had avoided the whale aggregation and calving areas towards the northern end of the Dampier Peninsula, as well as turtle nesting areas on the Lacepede Islands. Impacts on significant seagrass areas in Roebuck Bay and Beagle Bay used by dugongs had also been avoided. Similarly for terrestrial impacts the site selection resulted in most of these affecting Pindan vegetation which is very common on the Dampier Peninsula and which, through improved management measures, can have its environmental condition enhanced to maintain or improve overall environmental outcomes on the Peninsula.

2.1. Introduction

Matters protected by the Australian Government EPBC Act are known as matters of NES and include:

- World Heritage Properties and National Heritage Places;
- Wetlands of International Importance;
- Listed threatened species and ecological communities;
- Listed migratory species;
- Nuclear actions; and
- Commonwealth Marine Areas.

The Great Barrier Reef Marine Park is also a listed matter of NES, but not relevant to this proposal.

2.2. Matters of NES Relevant to the Precinct Plan

The matters of NES potentially affected by activities directly or indirectly associated with the implementation of the BLNG Precinct (the Precinct Plan) are:

- Wetlands of International Importance;
- Listed threatened species;
- Listed migratory species; and
- Commonwealth Marine Area.

These matters of NES were identified as relevant based on the following sources:

- The Scope of the Strategic Assessment (**SoSA**) (DSD, 2010b; **Appendix A-2**), which includes an EPBC Act Protected Matters Report conducted 20 April 2009;
- EPBC Act Protected Matters Report of the Dampier Peninsula area (conducted 9 October 2009);
- SEWPAC summary of matters of NES at James Price Point and its surrounds (compiled 12 October 2009); and
- Supplementary advice from SEWPAC officers (October 2009 – September 2010).

These sources use a range of geographical extents for the basis of identifying matters of NES relevant to this Precinct Plan, ranging from James Price Point to the entire Dampier Peninsula. This reflects a requirement to assess impacts on those matters that are relevant to Category A activities (James Price Point coastal area) while considering those that may be affected by Category B and C activities (drawing in the greater Dampier Peninsula and Commonwealth waters beyond 3 nautical miles of the coast).

In addition to the species identified from the sources noted above there are a number of other fauna species protected by the EPBC Act that have been recorded in surveys conducted as part of this assessment. Potential impacts to these species have also been addressed in this section of the SAR.

World Heritage Properties, National Heritage Places and nuclear actions were not identified by the EPBC Act Protected Matters Reports or other sources and are not considered relevant to the BLNG Precinct. In relation to National Heritage Plans, in February 2008 the Australian and Western Australian governments agreed to undertake an assessment of the west Kimberley to identify its National Heritage (and potential international heritage) values. The then responsible Commonwealth Minister subsequently asked the Australian Heritage Council to commence an assessment of the west Kimberley and to provide its advice. In relation to the potential impact of the Precinct Plan on National Heritage Places, the Australian Heritage Council found in its preliminary assessment of National Heritage values that, while James Price Point had heritage values, there was insufficient evidence to demonstrate that they reached the very high threshold required for National Heritage listing.

In relation to listed Threatened Ecological Communities, monsoon vine thickets are not addressed in this Strategic Assessment (**SA**) as a matter of NES but they are addressed separately in this Strategic Assessment in **Part 4, Section 2.4** because they are listed as State threatened ecological community. Management arrangements are also provided to protect the monsoon vine thickets as they are a potential habitat for threatened species under the EPBC Act.

2.2.1. Wetlands of International Importance

Two Wetlands of International Importance are of relevance to this assessment. The James Price Point area is approximately 180 kilometres north of Eighty Mile Beach and 50 kilometres north of Roebuck Bay. Roebuck Bay and Eighty Mile Beach are the most important shorebird sites in northwest Australia at different times of the year supporting hundreds of thousands of migratory shorebirds. Eighty Mile Beach and Roebuck Bay are considered of international importance given the numbers and diversity of birds that feed in these areas seasonally. The State Government has recently announced (October 2010) a proposed marine park for these sites which, under the provisions of the *Conservation and Land Management (CALM) Act 1984*, would be inclusive to the high water mark.

The Eighty Mile Beach Ramsar wetland comprises Eighty Mile Beach and, 40 kilometres to the east, Mandora Salt Marsh. Eighty Mile Beach is a 220 kilometre section of coastline and adjacent intertidal mudflats, with a small number of tidal creeks dissecting the beach, including Salt Creek which is fed partly from groundwater and has permanent surface water. Eighty Mile Beach is characterised by extensive mudflats supporting an abundance of macroinvertebrates that provide food for large numbers of shorebirds. The wetland is considered to be one of the major arrival and departure areas for migratory shorebirds visiting Australia, particularly on the southward migration, with more than 472,000 migratory shorebirds being counted on the mudflats during the September to November period. Additionally, flatback turtles regularly nest at scattered locations along Eighty Mile Beach (Australian Government, 2010).

The intertidal mud and sand flats of Roebuck Bay supports high abundance of benthic dwelling invertebrates, which are a key food source for waterbirds. The site is one of the most important migration stopover areas for shorebirds in Australia and globally. For many shorebirds, Roebuck Bay is the first Australian landfall they reach on the East Asian Australasian Flyway. The numbers of shorebirds using the site each year is estimated at over 300,000. The northern beaches and Bush Point provide important high tide roost sites (Australian Government, 2010).

These wetlands will not be affected by environmental aspects associated with activities directly related to the BLNG Precinct (Category A activities). However, they may have the potential to be affected by indirect activities or related projects that would be assessed separately but which are included in the assessment of cumulative impacts (Category B and/or C activities).

2.2.2. Listed Threatened Species

A total of 32 threatened fauna species listed under the Commonwealth EPBC Act as Endangered or Vulnerable have been identified by SEWPAC, and through surveys, as potentially occurring in the James Price Point coastal area and its surrounds. The threatened fauna include terrestrial and marine species, some of which are also protected by the EPBC Act as migratory species and/or are relevant to potential impacts to the Commonwealth Marine Area.

2.2.2.1. Cetaceans

An assessment of the known or likely occurrence of threatened cetacean species in the James Price Point coastal area, based on desktop review, field surveys and fauna specialist advice, is shown in **Table 2-1**. The key species of focus for the assessment is the humpback whale, which is known to seasonally migrate through the James Price Point coastal area.

■ **Table 2-1 Assessment of Known or Likely Occurrence of EPBC Act Listed Threatened Cetacean Species Identified as Potentially Occurring in the James Price Point Coastal Area.**

Species	Assessment of occurrence
Recorded or likely to occur in the James Price Point coastal area	
<i>Balaenoptera musculus brevicauda</i> (pygmy blue whale) Endangered/Migratory	Recorded in offshore waters between the Lacepede Islands and Scott Reef (RPS, 2010d; Appendix C-10). Also recorded in waters around Quondong Point (DEWHA, 2008a). Blue whales reportedly move between Scott Reef and Browse Island during July (northern migration) and again during October and November as part of their southern migration (DEWHA, 2008a). Subspecies of Blue Whale. Perth Canyon northern side between November – May (DEWHA, 2010a).
<i>Megaptera novaeangliae</i> (Humpback Whale) Vulnerable/Migratory	Recorded throughout the entire James Price Point coastal area from shallow nearshore coastal waters to deep offshore waters, with an average distance from shore of 27km within the survey area of approximately 90km from the shoreline (Jenner and Jenner, 2009; Appendix C-11 and RPS, 2010a; Appendix C-8). Southern Kimberley between Broome and northern Camden Sound. Feeds in Australian Antarctic territory waters (DEWHA, 2009c).
Potentially occurs in James Price Point coastal area but uncommon in local area	
<i>Balaenoptera musculus</i> (Blue Whale) Endangered/Migratory	Possibly occurs within the James Price Point coastal area (DEWHA, 2010a). Perth Canyon northern side between November – May (DEWHA, 2010a).
<i>Balaenoptera musculus intermedia</i> (Southern Blue Whale) Endangered/ Migratory	Possibly occurs within the James Price Point coastal area (DEWHA, 2010a). Subspecies of Blue Whale. Perth Canyon northern side between November – May.
Unlikely to occur in James Price Point coastal area	
N/A	

The Blue Whale species and sub-species listed above are not expected to be affected by the construction and operation of the BLNG Precinct; however, they may be affected by ship movements in the Commonwealth Marine Area. Impacts on Commonwealth marine areas are discussed in **Section 2.2.4**.

The assessment of the impact on humpback whales is discussed in **Section 2.4.2.3**.

2.2.2.2. Turtles

An assessment of the known or likely occurrence of threatened turtle species in the James Price Point coastal area, based on desktop review, field surveys and fauna specialist advice, is shown in **Table 2-2**. The key species of focus are the green turtle and flatback turtle, which are found in higher numbers than other turtle species in the waters off James Price Point.

■ **Table 2-2 Assessment of Known or Likely Occurrence of EPBC Act Listed Threatened Turtle Species Identified as Potentially Occurring in the James Price Point Coastal Area.**

Species	Assessment of occurrence
Recorded or likely to occur in the James Price Point coastal area	
<i>Caretta caretta</i> (Loggerhead Turtle) Endangered/Migratory	Recorded in the study area, latitudinally distributed about 15 – 25km offshore in 20m of water (RPS, 2010b; Appendix C-2). Major rookeries are located between Shark Bay and Ningaloo Reef (RPS, 2010b; Appendix C-2). Requires coastal benthic foraging habitat. The offshore waters of the Dampier Peninsula, including Quondong Point, may be a foraging area for loggerhead turtles (DEWHA, 2008a).
<i>Chelonia mydas</i> (Green Turtle) Vulnerable/Migratory	Recorded throughout the entire James Price Point coastal area from shallow nearshore coastal waters to deep offshore waters (RPS, 2010b; Appendix C-2). Nearby major rookeries located on Lacepede Islands, Cape Leveque, Browse Island and Scott Reef (DEWHA, 2008a and RPS, 2010b; Appendix C-2). Feeds on seagrass, algae and gelatinous plankton (DEWHA, 2010e). The James Price Point coastal area may be used as a foraging area for green turtles.
<i>Eretmochelys imbricata</i> (Hawksbill Turtle) Vulnerable/Migratory	Recorded in study area (RPS, 2010b; Appendix C-2), west of Cape Latreille and Quondong Point. Possibly occurs within the James Price Point coastal area. The nearest major rookeries are located at Cape Leveque and Scott Reef (RPS, 2010b; Appendix C-2). Feeds primarily on sponges and algae on rocky reefs (DEWHA, 2010e). The James Price Point coastal area may be used as a foraging area for green turtles.
<i>Natator depressus</i> (Flatback Turtle) Vulnerable/Migratory	Recorded throughout the entire James Price Point coastal area from shallow nearshore coastal waters to deep offshore waters (RPS, 2010b; Appendix C-2). Nearby major rookeries are located on Lacepede Islands, Cable Beach, Eco Beach and Maret Islands (DEWHA, 2008a and RPS, 2010b; Appendix C-2). Feeds on seagrass, soft invertebrates, sea pens, sea whips and gorgonians (DEWHA, 2010e). The James Price Point coastal area may be used as a foraging area for flatback turtles.
Potentially occurs in James Price Point coastal area but uncommon in local area	
<i>Dermochelys coriacea</i> (Leatherback Turtle) Endangered/ Migratory	Not recorded. Possibly occurs within the study area (RPS, 2010b; Appendix C-2), however leatherbacks are not known to mate, nest, hatch or inter-nest in the Kimberley region (RPS, 2010b; Appendix C-2). Highly pelagic, but ventures to shore during nesting season (DEWHA, 2010a).
<i>Lepidochelys olivacea</i> (Olive Ridley Turtle) Endangered/Migratory	Not recorded. Possibly occurs in the study area (RPS, 2010b; Appendix C-2), however olive ridley turtles have been recorded nesting in the Kimberley region only twice, once from a mainland beach near Cape Leveque (March 2008) and the second from Darcy Island (June 2008) (RPS, 2010b; Appendix C-2). Resides in coastal zones along the northern coast to Australia, forages in shallow benthic habitats in northern WA (DEWHA, 2010a).
Unlikely to occur in the James Price Point coastal area	
N/A	

The assessment of impact on the above turtle species is discussed in **Section 2.4.2.2**.

2.2.2.3. Fish

An assessment of the known or likely occurrence of threatened fish species in the James Price Point coastal area, based on desktop review, field surveys and fauna specialist advice, is shown in **Table 2-3**. The key species of focus are the sawfish species, which may traverse through the James Price Point coastal area as they move between more suitable environments such as estuaries.

■ **Table 2-3 Assessment of Known or Likely Occurrence of EPBC Act Listed Threatened Fish Species Identified as Potentially Occurring in the James Price Point Coastal Area.**

Species	Assessment of occurrence
Recorded or likely to occur in James Price Point coastal area	
<i>Pristis microdon</i> (Freshwater Sawfish) Vulnerable/Migratory	Not recorded. Likely to occur within the James Price Point coastal area (Morgan <i>et al.</i> , 2009; Appendix C-7). No estuarine habitats of importance to this species present. Marine/ estuarine species. Adult stage often in coastal and offshore waters up to 25 metre depth (DEWHA, 2010e).
<i>Carcharodon carcharias</i> (Great White Shark) Vulnerable	Recorded west of Carnot Bay close to the 50m isobath and around 67km north west of James Price Point (RPS, 2010d; Appendix C-10).
Potentially occurs in James Price Point coastal area but uncommon in local area	
<i>Glyphis</i> sp. (Northern River Shark) Endangered	Not recorded. Possibly occurs in the James Price Point coastal area). Nearshore estuarine environment (Morgan <i>et al.</i> , 2009; Appendix C-7).
<i>Pristis clavata</i> (Dwarf Sawfish) Vulnerable/Migratory	Not recorded. Possibly occurs within the James Price Point coastal area (Morgan <i>et al.</i> , 2009; Appendix C-7). Shallow (2-3m) coastal waters and estuarine habitats (DEWHA, 2010e). The majority of capture locations for the dwarf sawfish have occurred within King Sound and the lower reaches (tidally influenced) of the major rivers of King Sound (Fitzroy River, Mary River and Robinson River), as well as from Cape Keraudren and Eighty Mile Beach in the Pilbara (Morgan <i>et al.</i> , 2009; Appendix C-7).
<i>Pristis zijsron</i> (Green Sawfish) Vulnerable/Migratory	Not recorded. Possibly occurs within the James Price Point coastal area (Morgan <i>et al.</i> , 2009; Appendix C-7). Muddy bottom habitats and enters estuaries. Inshore marine waters, estuaries, river mouths, embayments and along sandy and muddy beaches (DEWHA, 2010e). The green sawfish has been recorded from Coral Bay to the WA/NT border in WA (Morgan <i>et al.</i> , 2009; Appendix C-7). However, the majority of capture locations are between Karratha and One Arm Point, with very few specimens recorded in King Sound in contrast to the freshwater sawfish (Morgan <i>et al.</i> , 2009; Appendix C-7).
<i>Rhincodon typus</i> (Whale Shark) Vulnerable/ Migratory	Not recorded. Previously recorded in the Kimberley region (RPS, 2010b; Appendix C-2), therefore may occur within the study area. Tagged sharks are known to have migrated as far north as Ashmore Reef before moving offshore into the Indian Ocean (Wilson <i>et al.</i> , 2006). Oceanic and coastal, tropical to warm temperate waters (DEWHA, 2010e).
Unlikely to occur in the James Price Point coastal area	
N/A	

Pipefish, pipehorse and seahorse (family Syngnathidae) species are also afforded protection under the federal *EPBC Act 1999* and are discussed in **Section 2.4.4.1**.

The three EPBC listed species of sawfish have been observed in greatest numbers in the Fitzroy River, north east of James Price Point. Individuals were also observed at Eighty Mile beach (approximately 197km south of James Price Point), indicating that these species may have migrated past the James Price Point coastal area. The assessment of impacts on sawfish species are discussed in **Section 2.4.2.4**.

Studies within the James Price Point coastal area indicated that the EPBC listed whale shark and great white shark either did not occur in great numbers or were only known to occur as transient or migratory, passing through the area. The northern river shark is not known to exist within the James Price Point coastal area (RPS, 2010d; **Appendix C-10**; Morgan *et al.*, 2009; **Appendix C-7** and DEWHA, 2008a). A justification for the exclusion of these species from this impact assessment is provided below.

Great White Shark (*Carcharodon carcharias*) – Vulnerable

The Great White Shark (*Carcharodon carcharias*) is a wide-ranging global species found throughout temperate and sub-tropical regions, and is most frequently observed and captured in inshore cool to warm temperate continental waters (DEWHA, 2008a). Available data from recent tracking studies show that great white sharks can travel thousands of kilometres, with their movements showing seasonal patterns (DEWHA, 2008a). Although the Canning bioregion is beyond the typical range for the great white shark, one individual was recorded in the study area during an aerial survey (RPS, 2010d; **Appendix C-10**). It was sighted west of Carnot Bay close to the 50 metre isobath and around 67 kilometres north-west of James Price Point. The great white shark is known to follow migrating humpback whales and to undertake extensive migrations that can extend beyond its normal range. This could explain its rare presence off James Price Point. The great white shark is considered to be a rare visitor to the James Price Point coastal area (RPS, 2010d; **Appendix C-10**). There appear to be no characteristics of the marine environment which restricts this shark to the James Price Point coastal area and it is not dependent upon the area and can utilise habitats elsewhere for feeding, growth and reproduction. As such, this species will not be considered further in the impact assessment process.

Northern River Shark (*Glyphis garricki*) – Endangered

The Northern River Shark primarily inhabits nearshore or estuarine environments (Stevens *et al.*, 2005). Most collections and captures in WA have occurred in turbid, macrotidal mangrove systems of King Sound to the north of Dampier Peninsula in salinities greater than twenty parts per thousand and on sandy to silty substrates (Morgan *et al.*, 2009; **Appendix C-7**). Current population numbers are unknown, but are estimated to be small (Pogonoski and Pollard, 2003). The utilisation of the James Price Point coastal area by this species is uncertain due to limited survey work and the level of knowledge of this species, having only been discovered in WA in 2002. Although, it is possible that this species will be found within the James Price Point coastal area, it is unlikely, given its preference for highly turbid, macrotidal mangrove systems and the lack of such habitat within the James Price Point coastal area. As such, this species will not be considered further in the impact assessment process.

Whale Shark (*Rhincodon typus*) – Vulnerable, Migratory

The Whale Shark (*Rhincodon typus*) occurs in both tropical and temperate waters and spends a significant amount of time in shallow water less than 15 metres deep (Wilson *et al.*, 2006). Whale sharks are known to aggregate seasonally from March to June in the coastal waters off Ningaloo Reef and individuals travel north along the coast of WA using both inshore and offshore habitats, spending more than forty percent of their time in shallow waters. Tagged sharks are known to have migrated as far north as Ashmore Reef before moving offshore into the Indian Ocean (Wilson *et al.*, 2006). This species may potentially pass through the Canning marine bioregion between June and October. The whale shark feeds close to the surface (Colman, 1997) and is a suction filter feeder. Its prey includes a variety of plankton and nekton organisms including small crustaceans, sardines, anchovies, mackerel and to a lesser extent small tuna and squid (DEWHA, 2009a). Although Whale Sharks have previously been recorded in the Canning bioregion, they were not observed during the 2009 aerial surveys (RPS, 2010b; **Appendix C-2**). Given the extent of the survey effort, whale sharks were considered to be absent or at extremely low densities in the study area during the survey (RPS, 2010b; **Appendix C-2**). Whale sharks could potentially be present in the area at other times of the year. It is unlikely this species will occur in the area in high numbers (RPS, 2010b; **Appendix C-2**) however, it may utilise waters off the Dampier Peninsula for migration and opportunistic foraging. Given that the James Price Point coastal area is not a known aggregation area for whale sharks, and there has been a low occurrence of individuals migrating through the area, this species will not be considered further in the impact assessment process.

2.2.2.4. Terrestrial Flora

An assessment of the known or likely occurrence of threatened terrestrial flora species in the James Price Point coastal area, based on desktop review, field surveys and flora specialist advice, is shown in **Table 2-4**.

■ **Table 2-4 Assessment of Known or Likely Occurrence of EPBC Act Listed Threatened Terrestrial Flora Species Identified as Potentially Occurring in the James Price Point Coastal Area.**

Species	Assessment of occurrence
Recorded or likely to occur in the James Price Point coastal area	
None	No listed threatened flora species identified by SEWPAC have been recorded or are likely to occur in area.
Potentially occurs in James Price Point coastal area but uncommon in region or local area	
None	No listed threatened flora species identified by SEWPAC have been recorded or are likely to occur in area.
Unlikely to occur in James Price Point coastal area	
<i>Keraudrenia exastia</i> Critically endangered	Occurs on red sand in Pindan and coastal sites, both of which are widespread habitats at James Price Point. However, the nearest known population is over 33 kilometres south of the southern end of the James Price Point coastal area and this species has not been identified in the area to date, despite intensive searches for further populations including targeted searches for the species in 2009 (AECOM, 2010a; Appendix C-19). It is therefore considered highly unlikely to occur in the James Price Point coastal area (Biota, 2009b; Appendix C-17).
<i>Pandanus spiralis</i> var. <i>flammeus</i> Endangered	Unlikely to occur within the precinct footprint due to the absence of preferred habitat and substrate being white clay rockfaces.

No flora species of National Environmental Significance is likely to occur in the area, and therefore flora species will not be considered further.

2.2.2.5. Terrestrial Fauna

An assessment of the known or likely occurrence of threatened fauna species in the James Price Point coastal area, based on desktop review, field surveys and fauna specialist advice, is shown in **Table 2-5**. The key species of focus is the Greater Bilby, of which there is indirect (but inconclusive) evidence of their potential occurrence at Quondong Point to the south of the proposed Precinct area.

■ **Table 2-5 Assessment of Known or Likely Occurrence of EPBC Act Listed Threatened Terrestrial Fauna Species Identified as Potentially Occurring in the James Price Point Coastal Area.**

Species	Assessment of occurrence
Recorded or likely to occur in the James Price Point coastal area	
None	No listed threatened species identified by SEWPAC have been recorded or are likely to occur in area.
Potentially occurs in James Price Point coastal area but uncommon in region or local area	
<i>Isoodon auratus auratus</i> (Golden Bandicoot) Vulnerable	Possibly occurs but no recent recordings in the region. This species is now confined to hummock grass on sandstone, grassy woodlands and vine thickets in the Kimberley region. This species was not recorded at James Price Point during surveys; however, the distribution and habitat requirements (monsoon vine thickets) are such that it may potentially occur within the study area. The last Department of Environment and Conservation (DEC) record was in 1971 from the Coulomb Point Nature Reserve (Biota, 2009b; Appendix C-17).
<i>Macrotis lagotis</i> (Greater Bilby) Vulnerable	The range of the greater bilby is confined to spinifex (<i>Triodia spp.</i>) hummock grassland and Acacia scrub across the deserts of central Australia, with satellite populations in the Kimberley and Warburton regions of WA and in south-west Queensland. The latest DEC record was at Roebuck Bay in 2001. The pindan woodland in the James Price Point coastal area is suitable habitat for the species and there is indirect evidence (possible foraging holes) that the species occurs at Quondong Point to the south of the Precinct Area (AECOM, 2010b; Appendix C-20).
<i>Mesembriomys macrurus</i> (Golden-backed Tree-rat) Vulnerable	Possibly occurs. The species has been recorded near Broome, so it is possible that it could be present within the James Price Point coastal area. No evidence of Golden-backed Tree-rat presence was found; however, appropriate habitat for the species, such as evergreen and deciduous vine thicket, and Pandanus scrub, was identified. The species critical habitat areas in the Kimberley are in a range of habitats including rugged King Leopold and Warton sandstone with <i>Eucalyptus</i> sp. open woodland over hummock grassland and the ecotone between monsoon forest patches and some savanna woodland types (DEWHA, 2010k). Recent information suggests that this species may be regionally extinct from the Dampier Peninsula (AWC, 2010).
<i>Rostratula australis</i> (Australian Painted Snipe) Vulnerable/ Migratory	Not recorded in the study area. This species prefers shallow freshwater swamps, and is most active at night, dawn and dusk. This species has been recorded on the Dampier Peninsula and near the James Price Point coastal area and hence it may occur (Biota, 2009b; Appendix C-17). As preferred habitat not present, considered possible but would be uncommon.
<i>Tyto novaehollandiae kimberli</i> (Masked Owl (northern)) Vulnerable	This subspecies usually keeps to heavier forested eucalypt country, roosting in large hollows in trees, in crevices in cliffs and occasionally in caves. Given the paucity of roosting sites in the James Price Point area and the lack of records from the locality, this species would be unlikely to be resident (Biota, 2009b; Appendix C-17). If roosting habitat further afield, could frequent the area for foraging.
Unlikely to occur in James Price Point coastal area	
<i>Conilurus penicillatus</i> (Brush-tailed Rabbit Rat) Vulnerable	No recent records of this species in the area. Species occurs only in the far northern Kimberley and NT, not in the Dampierland bioregion.

Species	Assessment of occurrence
<i>Ctenotus angusticeps</i> (Airlie Island Ctenotus) Vulnerable	Unlikely to occur. This species occurs on Airlie Island, north-east of Onslow, and has been recorded in low <i>Acacia coriacea</i> shrubland with coastal Spinifex and limestone formations. This species has been recorded south of Broome at Roebuck Bay (DEWHA, 2010e) on coastal mudflats vegetated with spinifex. Neither environment is well-represented in the Precinct Area.
<i>Dasycercus cristicauda</i> (Crest-tailed Mulgara) Vulnerable	Dampier Peninsula is likely to be outside the range of the species and the distinctive burrows, tracks and foraging holes were not found during survey efforts (M. Bamford pers. comm., 2010).
<i>Dasyurus hallucatus</i> (Northern Quoll) Endangered	Not known to occur in the area. Habitat within the BLNG Precinct area unlikely to support northern quoll populations.
<i>Egernia kintorei</i> (Great Desert Skink) Vulnerable	The range of this species is most likely outside the James Price Point coastal area. Usually occurs in sand-dune country with spinifex (<i>Triodia</i>). Very unlikely to be present. Distinctive burrows searched for by AECOM (2010b) (Appendix C-20) but not found.
<i>Erythroriorchis radiates</i> (Red Goshawk) Vulnerable	Habitat comprises taller woodlands, open forests and stream-side galleries of trees. The small number of records from WA is from the far northern Kimberley; hence, this species would therefore be very unlikely to occur within the James Price Point area (Biota, 2009b; Appendix C-17).
<i>Erythrura gouldiae</i> (Gouldian Finch) Endangered/migratory	Gouldians are the only Australian finch species that nests exclusively in tree hollows or in termite mounds. This species usually feeds on a range of seeding grasses. They are partly migratory, following grass seeding patterns. Based on their known distribution, the Gouldian finch does not extend onto the Dampier Peninsula, and this species would therefore be unlikely to occur in the James Price Point area (Biota, 2009b; Appendix C-17).
<i>Polytelis alexandrae</i> (Princess Parrot) Vulnerable	This nomadic species typically inhabits lightly wooded country such as open mallee-spinifex and open gum woodland. The princess parrot was recorded by DEC in Broome in 1999. Although still possible, this species is considered unlikely to occur within the James Price Point area (Biota, 2009b; Appendix C-17).
<i>Xeromys myoides</i> (Water Mouse, False Water Rat) Vulnerable	Not recorded in the Kimberley to date. Occurs in mangrove and salt marsh. No suitable habitat in immediate Precinct Area; Barred Creek area (20km south of James Price Point) may be suitable. (M. Bamford pers. comm., 2010).

Species listed as “unlikely to occur” are not considered further. The assessment of impacts on golden bandicoot, greater bilby, golden-backed tree rat, masked owl and Australian painted snipe are discussed in **Section 2.4.2.1**.

2.2.3. Listed Migratory Species

Seventy-two migratory fauna species under the Commonwealth EPBC Act were identified by SEWPAC as potentially occurring in or near the James Price Point coastal area. This list includes migratory terrestrial, wetland and marine species and migratory birds. In addition, surveys in the area recorded 13 migratory bird species that were not previously identified as potentially relevant to the BLNG Precinct by literature sources. Many of the migratory species are also listed as threatened species under the Commonwealth EPBC Act and/or are relevant to potential impacts to the Commonwealth Marine Area.

An assessment of the known or likely occurrence of non-threatened migratory species in the James Price Point coastal area based on desktop review, field surveys and fauna specialist advice is shown in **Table 2-6**. The key species of focus are the shorebird species that have been recorded along the beaches and intertidal zones of the James Price Point coastal area.

■ **Table 2-6 Assessment of Known or Likely Occurrence of EPBC Act Listed Non-threatened Migratory Species Identified as Potentially Occurring in the James Price Point Coastal Area.**

Species	Assessment of occurrence
Migratory bird species	
Recorded or likely to occur in the James Price Point area	
<i>Actitis hypoleucos</i> (Common Sandpiper) Migratory/listed marine	Recorded in the James Price Point coastal area. Edge of sheltered waters salt or fresh, for example estuaries, mangrove creeks, rocky coasts, near-coastal salt lakes, river pools, lagoons, claypans, drying swamps (Galaxia, 2010; Appendix C-1).
<i>Anous stolidus</i> (Common Noddy) Migratory	Could occur. Typically in blue-water seas remote from mainland, especially about breeding and roosting islands (including Scott Reef and Adele Island) (Galaxia, 2010; Appendix C-1).
<i>Apus pacificus</i> (Fork-tailed Swift) Migratory/listed marine	Recorded in the James Price Point coastal area. Aerial, over open country, from semi-deserts to coasts, islands (Galaxia, 2010; Appendix C-1).
<i>Ardea alba</i> (Great Egret) Migratory/listed marine	Recorded in the James Price Point coastal area. Mainly shallow freshwaters, but also shallow saltwaters (mangrove creeks, tidal pools, samphire swamps) (Galaxia, 2010; Appendix C-1).
<i>Arenaria interpres</i> (Ruddy Turnstone) Migratory/listed marine	Recorded in the James Price Point coastal area. Tidal mud and reef flats, sheltered rocky coasts, stony and seaweed covered beaches and sandpits and pebbly shores of near-coastal saltlakes (Galaxia, 2010; Appendix C-1).
<i>Calidris acuminata</i> (Sharp-tailed Sandpiper) Migratory/listed marine	Recorded in the study area. Typically found on tidal mudflats, saltmarshes, mangroves, shallow fresh, brackish or saline inland wetlands, floodwaters (Galaxia, 2010; Appendix C-1).
<i>Calidris alba</i> (Sanderling) Migratory/listed marine	Recorded in the study area. Mainly steeply shelving sandy beaches exposed to ocean swell. Also sandy inlets, estuarine sandbanks and near-coastal salt lakes (Galaxia, 2010; Appendix C-1).
<i>Calidris canutus</i> (Red Knot) Migratory/listed marine	Recorded in the study area. Mud and sand flats in estuaries and on sheltered coasts, also near-coastal salt lakes (Galaxia, 2010; Appendix C-1).
<i>Calidris ferruginea</i> (Curlew Sandpiper) Migratory/listed marine	Recorded in the study area. Mainly beaches and shallows of estuaries and near-coastal salt lakes, and drying near-coastal freshwater lakes and swamps (Galaxia, 2010; Appendix C-1).
<i>Calidris ruficollis</i> (Red-necked Stint) Migratory	Recorded in the study area. Edge of sheltered salt, brackish or fresh waters; mainly estuaries, beaches, near-coastal salt lakes, and freshwater swamps and lakes (especially when drying) (Galaxia, 2010; Appendix C-1).
<i>Calidris tenuirostris</i> (Great Knot) Migratory/listed marine	Recorded in the study area. Mud or sand flats in estuaries and on sheltered coasts. Also near-coastal salt lakes (Galaxia, 2010; Appendix C-1).
<i>Charadrius leschenaultii</i> (Greater Sand Plover) Migratory/listed marine	Recorded in the study area. Mainly sandy beaches and tidal mud, reef and sand flats. Also shores of near-coastal salt lakes (Galaxia, 2010; Appendix C-1).
<i>Charadrius mongolus</i> (Lesser Sand Plover) Migratory/listed marine	Recorded in the study area. Mainly sandy beaches and tidal estuarine flats. Also near-coastal salt lakes (Galaxia, 2010; Appendix C-1).

Species	Assessment of occurrence
<i>Chlidonias leucopterus</i> (White-winged Black Tern) Migratory/listed marine	Recorded in the study area. Mainly estuaries and sheltered seas in north; also samphire and short-grass flats, salt lakes (Galaxia, 2010; Appendix C-1).
<i>Cuculus saturatus</i> (Oriental Cuckoo) Migratory	Recorded in the James Price Point area. Single specimen recorded in vine thickets at James Price Point (AECOM, 2010b; Appendix C-20).
<i>Egretta sacra</i> (Eastern Reef Egret) Migratory/listed marine	Recorded in the James Price Point coastal area. Tidal reef and mud flats, mangrove creeks and rocky shores (Galaxia, 2010; Appendix C-1).
<i>Fregatta ariel</i> (Lesser Frigatebird) Migratory/listed marine	Recorded in the James Price Point coastal area. Tropical and sub-tropical seas, coasts and islands (Galaxia, 2010; Appendix C-1).
<i>Haliaeetus leucogaster</i> (White-bellied Sea-eagle) Migratory/listed marine	Recorded in the study area. Coasts, islands, estuaries, inlets, large rivers and inland lakes (Galaxia, 2010; Appendix C-1).
<i>Heteroscelus brevipes</i> (Grey-tailed Tattler) Migratory/listed marine	Recorded in the study area. Mainly tidal mud and reef flats. Also estuarine sand flats, beaches and near-coastal fresh and brackish waters (Galaxia, 2010; Appendix C-1).
<i>Hirundo rustica</i> (Barn Swallow) Migratory/listed marine	Likely to occur. Can be expected as a regular summer visitor in small numbers.
<i>Limnodromus semipalmatus</i> (Asian Dowitcher) Migratory/listed marine	Recorded in the study area. Mudflats in tidal creeks (Galaxia, 2010; Appendix C-1).
<i>Limosa lapponica</i> (Bar-tailed Godwit) Migratory/listed marine	Recorded in the study area. Estuarine sand and mudflats and sandy and seaweed covered beaches; also reef flats and near-coastal saltlakes (Galaxia, 2010; Appendix C-1).
<i>Limosa limosa</i> (Black-tailed Godwit) Migratory/listed marine	Recorded in the study area. Shallows of freshwater lakes, swamps and river pools. Also (but mainly in passage) estuarine flats, rocky and muddy coasts and near-coastal salt lakes (Galaxia, 2010; Appendix C-1).
<i>Merops ornatus</i> (Rainbow bee-eater) Migratory/listed marine	Recorded in all habitat types except coastal heath (AECOM, 2010b; Appendix C-20 and Biota, 2009b; Appendix C-17).
<i>Numenius madagascariensis</i> (Eastern Curlew) Migratory/listed marine	Recorded in the study area. Mainly tidal mudflats; also reef flats, sandy beaches and rarely near-coastal lakes (Galaxia, 2010; Appendix C-1).
<i>Numenius phaeopus</i> (Whimbrel) Migratory/listed marine	Recorded in the study area. Mainly tidal mud and reef flats. Occasionally sandy beaches. Also near-coastal salt lakes (Galaxia, 2010; Appendix C-1).

Species	Assessment of occurrence
<i>Oceanites oceanicus</i> (Wilson's Storm-petrel) Migratory/listed marine	Recorded in the study area. Winter visitor to tropical seas (Galaxia, 2010; Appendix C-1).
<i>Oceanodroma leucorhoa</i> (Leach's Storm-petrel) Migratory/listed marine	Recorded in the study area. Migrates to tropical waters. Few Australian records (Galaxia, 2010; Appendix C-1).
<i>Pandion haliaetus</i> (Osprey) Migratory	Recorded in the study area. Coasts, bays, estuaries, inlets, islands and surrounding waters (Galaxia, 2010; Appendix C-1).
<i>Pluvialis fulva</i> (Pacific Golden Plover) Migratory/listed marine	Recorded in the study area. Mainly salt or brackish marshes about estuaries and near-coastal salt lakes. Also near-coastal grassy flats, tidal mudflats, and beaches (Galaxia, 2010; Appendix C-1).
<i>Pluvialis squatarola</i> (Grey Plover) Migratory/listed marine	Recorded in the study area. Mainly sandy and seaweed covered ocean beaches. Also tidal reef and mud flats, shores of near-coastal salt lakes, and occasionally drying freshwater lakes (Galaxia, 2010; Appendix C-1).
<i>Puffinus pacificus</i> (Wedge-tailed Shearwater) Migratory/listed marine	Pelagic so likely offshore. Individuals may be driven to coast during storms.
<i>Sterna albifrons</i> (Little Tern) Migratory/listed marine	Recorded in the study area. Mainly sheltered seas, estuaries and mangrove creeks. Also near-coastal freshwater lagoons and saltwork ponds (Galaxia, 2010; Appendix C-1). Observed during aerial survey (AECOM, 2010b; Appendix C-20).
<i>Sterna caspia</i> (Caspian Tern) Migratory	Recorded in the study area. Mainly sheltered seas, estuaries (north of Adele Island), where mainly a winter visitor (Galaxia, 2010; Appendix C-1).
<i>Sterna dougallii</i> (Roseate Tern) Migratory/listed marine	Recorded in the study area. Blue-water seas close to land (especially islands) (Galaxia, 2010; Appendix C-1).
<i>Sterna hirundo</i> (Common Tern) Migratory	Recorded in the study area. Sheltered seas, including estuaries; also near-coastal saltworks (Galaxia, 2010; Appendix C-1).
<i>Sula leucogaster</i> (Brown Booby) Migratory/listed marine	Recorded in the study area. Winter visitor to tropical seas (Galaxia, 2010; Appendix C-1).
<i>Tringa brevipes</i> (Grey-tailed Tattler) Migratory	Observed within the study area (AECOM, 2010b; Appendix C-20).
<i>Tringa glareola</i> (Wood Sandpiper) Migratory/listed marine	Observed within the study area (AECOM, 2010b; Appendix C-20).
<i>Tringa nebularia</i> (Common Greenshank) Migratory/listed marine	Recorded in the study area. Shallow fresh waters (claypans, lagoons, swamps, river pools, dams) and salt waters (estuaries, mangrove creeks, lakes, samphire flats, reef flats) (Galaxia, 2010; Appendix C-1).

Species	Assessment of occurrence
<i>Tringa totanus</i> (Common Redshank, Redshank) Migratory/listed marine	A regular visitor to the coast around Broome in small numbers (October to March). Might get one or two birds each summer on the coast in the BLNG Precinct Area.
<i>Xenus cinereus</i> (Terek Sandpiper) Migratory/listed marine	Recorded in the study area. Mainly tidal flats. Also saltwork ponds (Galaxia, 2010; Appendix C-1).
Potentially occurs in James Price Point area but uncommon in region or local area	
<i>Ardea ibis</i> (Cattle Egret) Migratory/listed marine	No suitable habitat but possible uncommon visitor. Could be a vagrant on a dam in the north of the BLNG Precinct Area.
<i>Calidris melanotos</i> (Pectoral Sandpiper) Migratory/listed marine	Possibly uncommon visitor. Considered a vagrant in Australia generally; could occur as a vagrant on the coast or on the dam in the north of the BLNG Precinct Area.
<i>Glareola maldivarum</i> (Oriental Pratincole) Migratory/listed marine	Possibly occurs in the James Price Point area but uncommon. A grassland species with occasional massed aggregations on grasslands and nearby coast. Little suitable habitat but individuals may pass through.
<i>Limicola falcinellus</i> (Broad-billed Sandpiper) Migratory/listed marine	Possibly visits infrequently. Limited suitable habitat. A species of very soft muds on tidal flats. Small numbers may visit and pass through occasionally.
<i>Gallinago stenura</i> (Pin-tailed Snipe) Migratory/listed marine	Possibly occurs in the James Price Point area. Does occur in general area but little suitable habitat (flooded grasses) in BLNG Precinct Area. May occur in small numbers occasionally.
<i>Onychoprion anaethetus</i> (Bridled Tern) Migratory/listed marine	Potentially occurs in the James Price Point area in blue-water seas, generally close to breeding sites. Breeds on offshore Islands in the Kimberley such as the Lacepede Islands (Galaxia 2010, Appendix C-1)
<i>Philomachus pugnax</i> (Ruff (Reeve)) Migratory/listed marine	Possible but uncommon vagrant in Australia and therefore potentially, though unlikely, to occur in the James Price Point coastal area.
Unlikely to occur in James Price Point coastal area	
<i>Calidris subminuta</i> (Long-toed Stint) Migratory/listed marine	Unlikely to occur. Uncommon in Australia and generally on freshwater wetlands. No suitable habitat but individuals could visit a dam in the north of the Precinct Area.
<i>Calonectris leucomelas</i> (also called <i>Puffinus leucomelas</i>) (Streaked Shearwater) Migratory/listed marine	Unlikely to occur. Pelagic (living in open oceans or seas) species very rarely seen on the coast.
<i>Charadrius bicinctus</i> (Double-banded Plover), Migratory/listed marine	Unlikely to occur in the Precinct area. It is a species found in South-Eastern Australia and New Zealand, with vagrants to southern WA.
<i>Charadrius dubius</i> (Little-ringed Plover)	Unlikely to occur. Rare vagrant in Australia. Individuals may occur on the coast or in a dam in the north of the Precinct Area.

Species	Assessment of occurrence
Migratory/listed marine	
<i>Charadrius veredus</i> (Oriental Plover) Migratory/listed marine	Unlikely to occur. A shorebird of broad grasslands; sometimes abundant on Roebuck Plains to the south. No suitable habitat but could occur infrequently and in small numbers.
<i>Phalaropus lobatus</i> (Red-necked Phalarope) Migratory/listed marine	Unlikely to occur. A largely pelagic species that may visit and roost on the coast very rarely.
<i>Poecilodryas superciliosa</i> (Derby White-browed Robin) Migratory/listed marine	Not found during the 2009 surveys (AECOM, 2010b; Appendix C-20) so almost certainly not present as this species is fairly conspicuous in vine thicket when present.
<i>Numenius minutus</i> (Little Curlew) Migratory/listed marine	Unlikely to occur. A grassland species that is common in Broome and very abundant on Roebuck Plains, but suitable habitat is limited in the Precinct Area. The species does aggregate on small water bodies during the heat of the day, so the dam in the north may occasionally be visited by flocks, but they would be unable to forage within the Precinct Area. Species may use lawns and open ground created around the project so could increase in abundance.
<i>Sterna anaethetus</i> (Bridled Tern) Migratory/listed marine	A largely ocean-going tern that might roost on the coast. Probably passes along the coast on migration but unlikely to use the Precinct Area.
<i>Tringa stagnatilis</i> (March Sandpiper) Migratory/listed marine	Unlikely to occur in the Precinct Area, however likely in small numbers on a dam north of the Precinct Area.
Migratory marine mammals (non-threatened)	
Recorded or likely to occur in James Price Point coastal area	
<i>Balaenoptera edeni</i> (Bryde's Whale) Migratory	One individual recorded in waters approximately 10km west of Coulomb Point in water approximately 20m deep (RPS, 2010d; Appendix C-10). Typically found in tropical and warm temperate waters between 40°N and 40°S, in both oceanic and inshore waters (DEWHA, 2010c; Bannister <i>et al.</i> , 1996). The Bryde's whale is possibly a resident of the North-West region of Australia throughout the year (DEWHA, 2008c), concentrating its feeding in areas of high productivity over the continental shelf (Mustoe and Edmunds, 2008).
<i>Dugong dugon</i> (Dugong) Migratory	Recorded in the study area (Jenner and Jenner, 2009; Appendix C-11 and RPS, 2010c; Appendix C-9). Frequents coastal waters, estuarine creeks and shallow protected bays. Coincident with large seagrass beds (RPS, 2010c; Appendix C-9).
<i>Physeter macrocephalus</i> (Sperm Whale) Migratory, cetacean	Not recorded. Possibly occurs in the area (DEWHA, 2008a). Inhabits offshore areas in depths greater than 600 metres. Feeds in deep waters (DEWHA, 2010e).
<i>Orcaella heinsohni</i> (Australian Snubfin Dolphin (previously known as Irrawaddy Dolphin)) Migratory	Not recorded in the James Price Point coastal area, but observed in Roebuck Bay (RPS, 2010d; Appendix C-10). Coastal and estuarine waters. Forage in mangrove to sandy bottom estuaries and embayments to rocky coral reefs. Primarily in shallow waters less than 20 metres (DEWHA, 2010e).
<i>Orcinus orca</i> (Killer Whale)	There were two sightings of killer whales within the James Price Point coastal area, one of which was approximately 35km north-west of James Price Point (RPS, 2010d; Appendix

Species	Assessment of occurrence
Migratory	C-10). This transient species follows the migratory path of their food source (DEWHA, 2010e), and may be present along the Dampier Peninsula during the winter season (RPS, 2010d; Appendix C-10).
<i>Sousa chinensis</i> (Indo-pacific Humpback Dolphin) Migratory	Two sightings comprising a total of seven individuals were recorded in waters 20m deep, one group off Quondong Point, the other west of Coulomb Point (RPS, 2010d; Appendix C-10). The species is known to occur between estuarine and continental shelf waters, but is more commonly located in shallow coastal waters in depths of less than 20 metres (Mustoe and Edmunds, 2008 and DEWHA, 2008a).
<i>Tursiops aduncus</i> (Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)) Migratory	Recorded in the study area (RPS, 2010d; Appendix C-10). Inshore areas such as bays and estuaries, nearshore waters, open coastal environment and shallow offshore waters (DEWHA, 2010e).
Potentially occurs in James Price Point coastal area	
N/A	
Unlikely to occur in James Price Point coastal area	
<i>Balaenoptera bonaerensis</i> (Antarctic Minke Whale) Migratory	Unlikely to occur in the James Price Point coastal area. One minke whale was recorded approximately 60 kilometres north northwest of James Price Point (Jenner and Jenner, 2009; Appendix C-11). Primarily offshore and pelagic habitats within cold temperate waters (DEWHA, 2010e).
Crocodile species	
Recorded or likely to frequently occur in the James Price Point coastal area	
<i>Crocodylus porosus</i> (Estuarine Crocodile, Salt-water Crocodile) Migratory	Indirectly recorded in study area on Manari Beach, approximately 10km north of James Price Point (RPS, 2010d; Appendix C-10). Species inhabit coastal rivers, mangroves, swamps and open sea in northern Australia, extending inland via major rivers and floodplains. The habitat in the Precinct Area is not considered to be suitable for this species; however, individuals may pass through the area to access suitable mangrove habitat further south of the Precinct Area.
Potentially occurs in the James Price Point coastal area but uncommon in local area	
N/A	
Unlikely to occur in the James Price Point coastal area	
N/A	

Of the migratory bird species, 21 shorebird species were recorded and another five have the potential to occur in the James Price Point coastal area. As more than 15 migratory shorebird species were recorded during the surveys, when the survey area is considered in its entirety as one habitat, it may be classed as “important habitat” for shorebirds according to the Draft *EPBC Act Policy Statement 3.21 – Significant Impact Guidelines for 36 Migratory Shorebird Species* (DEWHA, 2010). Other non-shorebird migratory bird species may also utilise the coastal habitats present at James Price Point. The impacts on these species and their habitat are discussed in **Section 2.4.3.1**.

The impacts on migratory marine mammals are mostly applicable to the Commonwealth Marine Area where these species are generally observed and is discussed in **Section 2.2.4**. Predicted impacts on dugongs are discussed separately in **Section 2.4.3.2**.

Crocodiles are unlikely to be affected by the BLNG Precinct but are discussed further in **Part 3, Section 2.7** (Marine Reptiles).

2.2.4. Commonwealth Marine Area

The Commonwealth Marine Area is any part of the sea, including the waters, seabed and airspace, within Australia's exclusive economic zone and/or over the continental shelf of Australia, that is not State or NT waters. The Commonwealth Marine Area stretches from 3 to 200 nautical miles from the coast.

Associated with the Commonwealth Marine Area, the presence of 113 listed marine species and cetaceans is required to be examined in this SA (**Table 2-7**). Some of the listed marine species and cetaceans are also protected by the EPBC Act as threatened species and/or migratory species, and where this is the case, they are identified in the preceding threatened species and/or migratory species sections.

■ **Table 2-7 Summary of all Listed Marine Species and Cetaceans Relevant to the Commonwealth Marine Area Discussed as Applicable in Previous Sections of Part 6 and in Part 3.**

Species	EPBC Act Status
<i>Acalyptophis peronii</i> (Horned Sea Snake)	Listed marine
<i>Actitis hypoleucos</i> (Common Sandpiper)	Migratory/listed marine
<i>Aipysurus apraefrontalis</i> (Short-nosed Sea Snake)	Listed marine
<i>Aipysurus duboisii</i> (Dubois' Sea Snake)	Listed marine
<i>Aipysurus eydouxii</i> (Spine-tailed Sea Snake)	Listed marine
<i>Aipysurus laevis</i> (Olive Sea Snake)	Listed marine
<i>Aipysurus tenuis</i> (Brown-lined Sea Snake)	Listed marine
<i>Anseranas semipalmata</i> (Magpie Goose)	Listed marine
<i>Apus pacificus</i> (Fork-tailed Swift)	Migratory/listed marine
<i>Ardea alba</i> (Great Egret)	Migratory/listed marine
<i>Ardea ibis</i> (Cattle Egret)	Migratory/listed marine
<i>Arenaria interpres</i> (Ruddy Turnstone)	Migratory/listed marine
<i>Astrotia stokesii</i> (Stokes' Sea Snake)	Listed marine
<i>Balaenoptera musculus</i> (Blue Whale)	Migratory
<i>Balaenoptera musculus brevicauda</i> (Pygmy Blue Whale)	Migratory
<i>Balaenoptera musculus intermedia</i> (Southern Blue Whale)	Migratory
<i>Calidris acuminata</i> (Sharp-tailed Sandpiper)	Migratory/listed marine
<i>Calidris alba</i> (Sanderling)	Migratory/listed marine
<i>Calidris canutus</i> (Red Knot)	Migratory/listed marine
<i>Calidris ferruginea</i> (Curlew Sandpiper)	Migratory/listed marine
<i>Calidris melanotos</i> (Pectoral Sandpiper)	Migratory/listed marine
<i>Calidris subminuta</i> (Long-toed Stint)	Migratory/listed marine
<i>Calidris tenuirostris</i> (Great Knot)	Migratory/listed marine
<i>Calonectris leucomelas</i> (also called puffinus leucomelas) (Streaked Shearwater)	Migratory/listed marine
<i>Campichthys tricarinatus</i> (Three-keel Pipefish)	Listed marine
<i>Charadrius bicinctus</i> (Double-banded Plover)	Migratory/listed marine
<i>Charadrius dubius</i> (Little-ringed Plover)	Migratory/listed marine
<i>Charadrius leschenaultii</i> (Greater Sand Plover)	Migratory/listed marine
<i>Charadrius mongolus</i> (Lesser Sand Plover)	Migratory/listed marine
<i>Charadrius ruficapillus</i> (Red-capped Plover)	Listed marine
<i>Charadrius veredus</i> (Oriental Plover)	Migratory/listed marine
<i>Chlidonias leucopterus</i> (White-winged Black Tern)	Migratory/listed marine
<i>Choeroichthys brachysoma</i> (Pacific Short-bodied Pipefish)	Listed marine
<i>Choeroichthys suillus</i> (Pig-snouted Pipefish)	Listed marine
<i>Corythoichthys flavofasciatus</i> (Yellow-banded Pipefish)	Listed marine
<i>Cosmocampus banner</i> (Roughridge Pipefish)	Listed marine

Species	EPBC Act Status
<i>Crocodylus johnstoni</i> (Freshwater Crocodile)	Listed marine
<i>Delphinus delphis</i> (Common Dolphin)	Cetacean
<i>Disteira kingii</i> (Spectacled Sea Snake)	Listed marine
<i>Disteira major</i> (Olive-headed Sea Snake)	Listed marine
<i>Doryrhamphus dactyliophorus</i> (Ringed Pipefish)	Listed marine
<i>Doryrhamphus excises</i> (Indian Blue-stripe Pipefish)	Listed marine
<i>Doryrhamphus janssi</i> (Cleaner Pipefish)	Listed marine
<i>Egretta sacra</i> (Eastern Reef Egret)	Migratory/listed marine
<i>Emydocephalus annulatus</i> (Turtle-headed Sea Snake)	Listed marine
<i>Ephalophis greyi</i> (North-western Mangrove Sea Snake)	Listed marine
<i>Filicampus tigris</i> (Tiger Pipefish)	Listed marine
<i>Fregatta ariel</i> (Lesser Frigatebird)	Migratory/listed marine
<i>Gallinago stenura</i> (Pin-tailed Snipe)	Migratory/listed marine
<i>Glareola maldivarum</i> (Oriental Pratincole)	Migratory/listed marine
<i>Grampus griseus</i> (Risso's Dolphin)	Cetacean
<i>Haliaeetus leucogaster</i> (White-bellied Sea-eagle)	Migratory/listed marine
<i>Halicampus brocki</i> (Brock's Pipefish)	Listed marine
<i>Halicampus grayi</i> (Mud Pipefish)	Listed marine
<i>Halicampus nitidus</i> (Glittering Pipefish)	Listed marine
<i>Halicampus spinirostris</i> (Spiny-snout Pipefish)	Listed marine
<i>Hallichthys taeniophorus</i> (Ribbioned Seadragon)	Listed marine
<i>Heteroscelus brevipes</i> (Grey-tailed Tattler)	Migratory/listed marine
<i>Himantopus himantopus</i> (Black-winged Stilt)	Listed marine
<i>Hippichthys penicillus</i> (beady pipefish)	Listed marine
<i>Hippocampus angustus</i> (western spiny seahorse)	Listed marine
<i>Hippocampus histrix</i> (Spiny Seahorse)	Listed marine
<i>Hippocampus kuda</i> (Spotted Seahorse)	Listed marine
<i>Hippocampus planifrons</i> (Flat-face Seahorse)	Listed marine
<i>Hippocampus spinosissimus</i> (Hedgehog Seahorse)	Listed marine
<i>Hirundo rustica</i> (Barn Swallow)	Migratory/listed marine
<i>Hydrelaps darwiniensis</i> (Black-ringed Sea Snake)	Listed marine
<i>Hydrophis elegans</i> (Elegant Sea Snake)	Listed marine
<i>Hydrophis mcdowelli</i>	Listed marine
<i>Hydrophis ornatus</i>	Listed marine
<i>Lapemis hardwickii</i> (Spine-bellied Sea Snake)	Listed marine
<i>Limicola falcinellus</i> (Broad-billed Sandpiper)	Migratory/listed marine
<i>Limnodromus semipalmatus</i> (Asian Dowitcher)	Migratory/listed marine
<i>Limosa lapponica</i> (Bar-tailed Godwit)	Migratory/listed marine
<i>Limosa limosa</i> (Black-tailed Godwit)	Migratory/listed marine
<i>Megaptera novaeangliae</i> (Humpback Whale)	Migratory
<i>Merops ornatus</i> (Rainbow Bee-eater)	Migratory/listed marine
<i>Micrognathus micronotopterus</i> (Tidepool Pipefish)	Listed marine
<i>Numenius madagascariensis</i> (Eastern Curlew)	Migratory/listed marine
<i>Numenius minutus</i> (Little Curlew)	Migratory/listed marine
<i>Numenius phaeopus</i> (Whimbrel)	Migratory/listed marine
<i>Oceanites oceanicus</i> (Wilson's Storm-petrel)	Migratory/listed marine
<i>Oceanodroma leucorhoa</i> (Leach's Storm-petrel)	Migratory/listed marine
<i>Onychoprion anaethetus</i> (Bridled Tern)	Migratory/listed marine

Species	EPBC Act Status
<i>Pelamis platurus</i> (Yellow-bellied Sea Snake)	Listed marine
<i>Phalaropus lobatus</i> (Red-necked Phalarope)	Migratory/listed marine
<i>Philomachus pugnax</i> (Ruff (Reeve))	Migratory/listed marine
<i>Pluvialis fulva</i> (Pacific Golden Plover)	Migratory/listed marine
<i>Pluvialis squatarola</i> (Grey Plover)	Migratory/listed marine
<i>Pseudorca crassidens</i> (False Killer Whale)	Cetacean
<i>Puffinus pacificus</i> (Wedge-tailed Shearwater)	Migratory/listed marine
<i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)	Listed marine
<i>Solegnathus hardwickii</i> (Pipehorse)	Listed marine
<i>Solegnathus lettiensis</i> (Indonesian Pipefish)	Listed marine
<i>Solenostomus cyanopterus</i> (Blue-finned Ghost Pipefish)	Listed marine
<i>Stenella attenuata</i> (Spotted Dolphin)	Migratory/listed marine
<i>Stenella longirostris</i> (Long-snouted Spinner Dolphin)	Migratory/listed marine
<i>Sterna albifrons</i> (Little Tern)	Migratory/listed marine
<i>Sterna anaethetus</i> (Bridled Tern)	Migratory/listed marine
<i>Sterna dougallii</i> (Roseate Tern)	Migratory/listed marine
<i>Stiltia isabella</i> (Australian Pratincole)	Listed marine
<i>Sula leucogaster</i> (Brown Booby)	Migratory/listed marine
<i>Syngnathoides biaculeatus</i> (Double-ended Pipehorse)	Listed marine
<i>Thinornis rubricollis</i> (Hooded Plover)	Listed marine
<i>Trachyrhamphus bicoarctatus</i> (Bend Stick Pipefish)	Listed marine
<i>Trachyrhamphus longirostris</i> (Long-nosed Pipefish)	Listed marine
<i>Tringa glareola</i> (Wood Sandpiper)	Migratory/listed marine
<i>Tringa nebularia</i> (Common Greenshank)	Migratory/listed marine
<i>Tringa stagnatilis</i> (Marsh Sandpiper)	Migratory/listed marine
<i>Tringa tetanus</i> (Common Redshank, Redshank)	Migratory/listed marine
<i>Tursiops aduncus</i> (Indian Ocean Bottlenose Dolphin)	Migratory/listed marine
<i>Tursiops truncatus</i> s. Str. (Bottlenose Dolphin)	Cetacean
<i>Xenus cinereus</i> (Terek Sandpiper)	Migratory/listed marine

Impacts on the Commonwealth Marine Area are discussed in previous sections of this document (**Part 6, Section 2**) and elsewhere in the SAR (**Part 3**).

2.3. Key Environmental Aspects

The key aspects of the Precinct Plan that may affect matters of NES have been determined based on the assessments for marine and terrestrial factors (**Part 3** (Marine) and **Part 4** (Terrestrial)).

Key aspects associated with the implementation of the Precinct Plan that may affect matters of NES include:

- Vegetation and habitat clearing, which may affect:
 - Refuge value for terrestrial fauna – clearing may result in the loss of or fragmentation of fauna habitats, particularly within narrow linear coastal habitats such as monsoon vine thickets and coastal heath; and
 - Fauna – areas of potential habitat for some species would be removed and there may be injury and mortality of fauna species and conservation significant fauna species during the clearing activity.
- Noise and vibration – noise and vibration from the construction and operation of the Precinct may affect terrestrial and marine fauna;
- Light emissions – the behaviour and movement of terrestrial and marine fauna may be affected by anthropogenic light emissions from the precinct facilities and associated infrastructure;
- Marine site disturbance and excavation – results in the removal of benthic habitat and development of the littoral zone which potentially affects foraging areas for turtles and marine mammals;
- Physical presence – infrastructure and plant areas may represent physical barriers to the movement of fauna across the Precinct Area and drainage infrastructure may change terrestrial hydrological regimes on which particular fauna habitats exist;
- Sediment deposition and turbidity – suspended sediment and sedimentation attenuates light or smothers benthic habitats including macroalgae and filter feeding communities (and low density of hard corals and seagrass) used for foraging and habitat;
- Vessel movements – increased vessel movement in the area may result in marine fauna injury and mortality; and
- Marine discharge and spills – non-routine discharges such as spills into the marine environment may detrimentally affect marine water quality and have subsequent impacts on turtles, cetaceans, migratory birds and their habitats.

In addition to activities in the Precinct Plan (Category A activities), some indirect (Category B) and related (Category C) activities have the potential to affect matters of NES.

2.4. Assessment of Potential Impacts, Safeguards and Mitigation Measures

Sections 2.4.1 to Section 2.4.4 provide an assessment of the potential impacts on Wetlands of International Importance, listed threatened species, listed migratory species and Commonwealth Marine Areas and associated listed marine species and cetaceans.

2.4.1. Wetlands of International Importance

Implementation of the BLNG Precinct (Category A activities) will not result in direct impacts to Eighty Mile Beach or Roebuck Bay. Previously identified threats to Eighty Mile Beach and Roebuck Bay include pest animal species, weed species outcompeting native species and changing the habitat of the wetland and public access (Australian Government, 2010).

Potential impacts from Category B (indirect) activities are primarily that associated with pressures from a population increase in Broome and associated development, arising from increased workforce and associated service industries, such as:

- Increased recreation use of Roebuck Bay Eighty Mile Beach;
- Storm water runoff from new industrial land into Roebuck Bay;
- Disturbance to the hinterland of Roebuck Bay through new developments in Broome;
- Increased vessel movements at Broome Port;

- Disturbance to birds from aircraft (including helicopters) flying low over the Ramsar site, deviating from agreed flight plans for the purposes of sightseeing; and
- Increased urban run-off and waste water (effluent) disposal, increasing the risk of blue-green algae and a resulting reduction in benthic invertebrates which are a food source for birds.

Quantitative assessment of the extent of potential impacts on these wetlands is difficult to assess. However, management will involve an integrated State agency, local government and community approach to protect the values of Roebuck Bay and Eighty Mile Beach. The prediction of impact of the Precinct Plan is also difficult to isolate from impacts arising from existing environmental issues and threatening processes.

There are already existing pressures on these wetlands from recreation use, but these pressures are expected to increase as the population of Broome increases. Numerous site management measures in these areas are already implemented including:

- A program to minimise disturbance to northern shores;
- A port emergency response plan; and
- Fishing sustainability assessment.

Further development and implementation of options for the future management of Roebuck Bay are dependent on extensive consultation with numerous community and Aboriginal stakeholders. The Roebuck Bay Working Group (**RBWG**) has been established to facilitate this process with the objective of developing a community based management planning process to protect, restore and maintain Roebuck Bay into the future. The RBWG is a collaboration of Traditional Owners and representatives, government agencies, industry, community and local government, with Secretariat support provided by World Wildlife Fund (**WWF**) - Australia (WWF-Australia, 2005). The RBWG will continue to exist, whether or not the BLNG Precinct proceeds. The RBWG has produced Interim Management Guidelines for Roebuck Bay (RBWG, 2009) based on the following principles:

- Maintain the cultural, spiritual, sustenance and economic values of Roebuck Bay for Yawuru Traditional Owners;
- Minimise activities likely to cause disturbance to shorebirds and other species important to the ecological and cultural values of Roebuck bay;
- Minimise loss of habitat significant to shorebirds and other species in Roebuck Bay; maintain and restore the biodiversity in the area;
- Maintain and restore water quality across Roebuck Bay;
- Ensure that natural surface and groundwater flows are maintained as far as possible;
- Prevent the introduction of invasive plants and animals into Roebuck Bay; contain and/or eradicate invasive species where infestations have occurred;
- Promote environmentally sustainable economic uses of Roebuck Bay; and
- Increased human use and visitation should not be permitted to damage the natural and cultural values of Roebuck Bay.

The RBWG is now in the process of developing a Preliminary Draft Roebuck Bay Ramsar Site Management Plan.

Eighty mile beach is a combination of crown land and pastoral lease. Currently, no management plans have been developed for the area's protection, however the creation of a marine park recently announced will require the development of an Indicative Management Plan for consultation before a final management plan is developed.

Further protection of both sites is likely to be afforded in the near future through the creation of marine conservation areas under the CALM Act as announced by the WA Government on 22 October 2010. This will lead to formal protection of marine and intertidal parts of the Roebuck Bay and Eighty Mile Beach.

2.4.2. Listed Threatened Species

The following sections summarise the predicted impacts for groups of listed threatened species from Category A, B and C activities.

2.4.2.1. Terrestrial Fauna

There are up to five threatened terrestrial species that could be affected by the Precinct Plan, specifically associated with the key aspects of vegetation and habitat clearing, noise and vibration and light emissions:

- Greater Bilby (*Macrotis lagotis*) – Vulnerable;
- Golden Bandicoot (*Isodoodon auratus*) – Vulnerable;
- Golden-backed Tree-rat (*Mesembriomys macrurus*) – Vulnerable;
- Australian Painted Snipe (*Rostratula australis*) – Vulnerable; and
- Masked Owl (northern) (*Tyto novaehollandiae kimberli*) – Vulnerable.

Of these, only the Australian painted snipe has recently been recorded in the vicinity of the James Price Point coastal area (Biota, 2009b; **Appendix C-17**).

The predicted impacts on these species from construction and operation of the BLNG Precinct Project are described in **Part 4, Section 2.6** (Terrestrial Fauna) and summarised below. There has only been unconfirmed indirect evidence of the Greater Bilby occurring as it could not be determined whether foraging holes found were a result of bilby foraging activity or a varanid lizard species. Thus the assessment is based on presence of potential habitat only. The assessment of the other four species is also based on the presence of potential habitat only.

Greater Bilby (*Macrotis lagotis*) – Vulnerable (EPBC Act)

Potential impacts to the Greater Bilby are primarily associated with vegetation and habitat clearing, vehicle movements, terrestrial site disturbance and excavation, noise and vibration and terrestrial discharges and spills.

The Greater Bilby is historically known to occur in the Gourdon Bay area, while there is a population known to exist in the Beagle Bay area, to the North of James Price Point (ENV, 2008c; **Appendix C-16**) and it is occasionally seen as roadkill on an adjacent section of the Great Northern Highway. The latest DEC record was at Roebuck Bay in 2001. Based on these recordings, it is likely this species occupies most of the Dampier Peninsula in very low densities (ENV, 2008c; **Appendix C-16**).

There was no conclusive evidence of Greater Bilby presence during any of the fauna surveys. During the AECOM (2010b) (**Appendix C-20**) survey some foraging holes identified that were indicative of this species, however it could not be determined whether this was a result of bilby foraging activity or a varanid lizard species. These foraging holes were recorded near Quondong Point in pindan shrubland. The number of foraging holes recorded near Quondong Point suggests they belong to a small number of individuals present in the area, rather than a resident colony (AECOM, 2010b; **Appendix C-20**).

Quondong Point is more than two kilometres from the BLNG Precinct area and will not be directly affected by the Precinct. However, the Greater Bilby is highly mobile, and can have large foraging ranges, moving up to five kilometres between burrows on consecutive days (DEWHA, 2010f). Therefore, it is possible that individuals, if present at Quondong Point, may forage within the Precinct Project area.

Pindan woodland and shrubland habitats of the James Price Point coastal area are considered to provide the most likely habitat types for this species. Approximately 2,861 hectares (**ha**) of pindan vegetation will be cleared as a result of the BLNG Precinct. However, approximately 25,000 hectares will remain within the James Price Point coastal area after construction. As male bilbies have an average home range of approximately three square kilometres (DEWHA, 2010f), this amount of area remaining is considered a sufficiently sized foraging territory to support these individuals.

Direct loss of, or injury to greater bilbies may occur as a result of vehicle strikes when individuals are crossing tracks and roads in the area during the construction and operational phases of the project. Whilst some impacts (including injuries or mortalities) currently may occur in the locality as a result of vehicle traffic along Manari Road, the construction of

additional transport corridors may result in an increase in injury or mortality. The loss of or injury to greater bilbies due to vehicle strike is likely to result in only individual impacts, and therefore is unlikely to affect its conservation status.

Injury or mortality of greater bilbies may result from individuals becoming accidentally trapped in excavation trenches associated with the construction areas and exposed to various factors, such as stress, predators, effects from the sun and subsequent dehydration. A variety of management measures will be adopted to prevent individual bilbies from falling into the trench in the first instance, as well as facilitating their escape or removal.

Based on existing evidence, it is considered likely that greater bilbies may exhibit short-term displacement initially to infrequent loud noises associated with the BLNG Precinct such as blasting, piling and discharge of the gas flare(s), but then will habituate. Slight changes to local population (if present) may result from noise effects, but is unlikely to constitute a significant impact.

Non-routine discharges such as spills into the terrestrial environment may detrimentally affect vegetation communities, surface water and ground water, and may ultimately result in direct poisoning of fauna or the restriction of habitat for terrestrial fauna species. Non-routine discharges are unlikely; however, spill response procedures will be implemented to contain and rectify any spills and minimise adverse impacts to fauna habitat.

The key focus for management of the Greater Bilby will be to confirm the species presence in the area and if present to minimise impacts to potential habitat and develop a regional strategy to protect the species.

Golden-backed Tree-rat (*Mesembriomys macrurus*) - Vulnerable

Potential impacts to the Golden-backed Tree-rat are primarily associated with vegetation and habitat clearing, vehicle movements, terrestrial site disturbance and excavation, noise and vibration, dust emissions, groundwater abstraction (effect on habitat), physical presence (altered hydrology), altered fire regimes and terrestrial discharges and spills.

The vast majority of records of the golden-backed tree-rat are located north of Derby extending up to the Mitchell Plateau, however, these species have been recorded near Broome. It is possible the species may be or has been present within the James Price Point coastal area. Monsoon vine thicket, pindan woodland and areas of pandanus scrub within the drainage basin provide suitable habitat for the golden-backed tree-rat. No evidence of the occurrence of this species was found during surveys of James Price Point coastal area and recent information suggests that the golden-backed tree-rat may be regionally extinct from the Dampier Peninsula (AWC, 2010).

It is unlikely that the species will be significantly affected by the BLNG Precinct as the species would only exist in very low densities, if at all, given the patchy nature of food resources and lack of evidence of the species presence. In addition, habitat clearing is not listed as a threat to the survival the species rather the most significant threats are predation by feral cats and changed fire regimes (DEWHA, 2010k). Both of these aspects are proposed to be adequately controlled in the James Price Point coastal area as part of the BLNG Precinct and are discussed in more detail in **Part 4, Section 2.7** (Ecosystem Integrity).

Direct loss of, or injury to golden-backed tree-rats may occur as a result of vehicle strikes when individuals are crossing tracks and roads in the area during the construction and operational phases of the project. While some impacts may currently occur in the locality as a result of vehicle traffic along Manari Road, the construction of additional transport corridors may result in an increase in injury or mortality. The loss of or injury to golden-backed tree-rats due to vehicle strike is likely to result in only individual impacts, and therefore is unlikely to affect its conservation status.

Injury or mortality of golden-backed tree-rats may result from individuals becoming accidentally trapped in excavation trenches associated with the construction areas and exposed to various factors, such as stress, predators, effects from the sun and subsequent dehydration. A variety of management measures will be adopted to prevent individuals from falling into the trench in the first instance, as well as facilitating their escape or removal.

Based on existing evidence, it is considered likely that golden-backed tree-rats may exhibit short-term displacement initially to infrequent loud noises associated with the BLNG Precinct such as blasting, piling and discharge of the gas flare(s), but then will habituate. Slight changes to local population may result from noise effects, but is unlikely to constitute a significant impact.

Dust emissions may be deposited on nearby vegetation communities and may result in their potential degradation through reducing access to light, water and nutrients. Degradation to fauna habitats may cause golden-backed tree-rats to re-locate to more pristine versions of these habitats elsewhere leading to a decrease in local fauna abundance, a decrease in fitness or possible mortality due to a demise in suitable resources. Golden-backed tree-rats could be affected if unable to relocate to more suitable habitat. The local viability of populations of golden-backed tree-rats is unlikely to be significantly compromised by dust deposition as a range of dust suppressant techniques will be adopted to minimise dust emissions.

Groundwater drawdown may potentially affect areas of vegetation that are groundwater dependent. Areas of monsoon vine thicket and drainage basin communities, which are important habitats for golden-backed tree-rats, may be groundwater dependent. Based on current borefield designs, it is unlikely that groundwater would be extracted in close proximity to coastal vegetation such as vine thicket; this may limit the potential for drawdown to affect habitats such as vine thicket.

Fauna habitats within the site which may be sensitive to surface water flows (or altered hydrology) include the drainage basin habitat and the monsoon vine thicket habitat. Degradation to fauna habitats may cause golden-backed tree-rats to re-locate to more pristine versions of these habitats elsewhere leading to a decrease in local fauna abundance, a decrease in fitness or possible mortality due to a demise in suitable resources. It is proposed that an Ecological Surface Water Requirements Management Plan be developed to prevent, as far as practicable, impacts to surface water dependant vegetation and habitat types. As a result, it is unlikely that the local viability of populations of golden-backed tree-rats will be significantly compromised by altered surface water flows as a result of the BLNG Precinct.

Changes in fire regimes may have the potential to reduce the habitat availability of the James Price Point coastal area for golden-backed tree-rats. A fire management program, together with a reduction in informal access, within the James Price Point coastal area is likely to reduce the incidence of late dry season wildfires, which are known to be particularly damaging to vegetation communities and associated fauna habitats. It is expected that the management of fire within the James Price Point coastal area has the potential to improve fauna habitat quality over time.

Non-routine discharges such as spills into the terrestrial environment may detrimentally affect vegetation communities, surface water and ground water, and may ultimately result in direct poisoning of fauna or the restriction of habitat for terrestrial fauna species. Non-routine discharges are unlikely; however, spill response procedures will be implemented to contain and rectify any spills and minimise adverse impacts to fauna habitat.

The key focus for management of the golden-backed tree-rat will be to minimise local impacts to vine thickets, prioritise vine thickets outside the precinct for conservation, implement a regional fire management strategy and undertake feral animal control in conservation reserves.

Golden Bandicoot (*Isodood auratus*) - Vulnerable (EPBC Act), Schedule 1 (WC Act)

Potential impacts to the Golden Bandicoot are primarily associated with vegetation and habitat clearing, vehicle movements, terrestrial site disturbance and excavation, noise and vibration, dust emissions, groundwater abstraction (effect on habitat), physical presence (altered hydrology), altered fire regimes and terrestrial discharges and spills.

This species was not recorded at James Price Point during recent surveys; however suitable habitat of monsoon vine thickets, pindand shrubland and open forest, occurs within the area. The last DEC record was in 1971 from the Coulomb Point Nature Reserve (Biota, 2009b; **Appendix C-17**) and currently there are no known populations of the species on the Dampier Peninsula. All known populations on the Kimberley mainland are further north at Yampi Peninsula, Prince Regent Nature Reserve and Mitchell Plateau (DEWHA, 2010g). Based on these records it is unlikely that a population of this species occurs within the James Price Point coastal area. In addition, habitat clearing is not listed as a threat to the survival the species rather the most significant threats are predation by feral cats and changed fire regimes (DEWHA, 2010g). Both of these aspects are proposed to be adequately controlled in the James Price Point coastal area as part of the BLNG Precinct Project and are discussed in more detail in **Part 4, Section 2.7** (Terrestrial Ecosystem Integrity).

Direct loss of, or injury to golden bandicoots may occur as a result of vehicle strikes when individuals are crossing tracks and roads in the area during the construction and operational phases of the project. While some impacts may currently occur in the locality as a result of vehicle traffic along Manari Road, the construction of additional transport corridors may result in an increase in injury or mortality. The loss of or injury to golden bandicoots due to vehicle strike is likely to result in only individual impacts, and therefore is unlikely to affect its conservation status.

Injury or mortality of golden bandicoots may result from individuals becoming accidentally trapped in excavation trenches associated with the construction areas and exposed to various factors, such as stress, predators, effects from the sun and subsequent dehydration. A variety of management measures will be adopted to prevent individuals from falling into the trench in the first instance, as well as facilitating their escape or removal.

Based on existing evidence, it is considered likely that golden bandicoots may exhibit short-term displacement initially to infrequent loud noises associated with the BLNG Precinct such as blasting, piling and discharge of the gas flare(s), but then will habituate. Slight changes to local population may result from noise effects, but is unlikely to constitute a significant impact.

Dust emissions may be deposited on nearby vegetation communities and may result in their potential degradation through reducing access to light, water and nutrients. Degradation to fauna habitats may cause golden bandicoots to re-locate to more pristine versions of these habitats elsewhere leading to a decrease in local fauna abundance, a decrease in fitness or possible mortality due to a demise in suitable resources. Golden bandicoots could be affected if unable to relocate to more suitable habitat. The local viability of populations of golden bandicoots is unlikely to be significantly compromised by dust deposition as a range of dust suppressant techniques will be adopted to minimise dust emissions.

Groundwater drawdown may potentially affect areas of vegetation that are groundwater dependent. Areas of monsoon vine thicket, which is an important habitat for golden bandicoots, may be groundwater dependent. Based on current borefield designs, it is unlikely that groundwater would be extracted in close proximity to coastal vegetation such as vine thicket; this may limit the potential for drawdown to affect habitats such as vine thicket.

Fauna habitats within the site which may be sensitive to surface water flows (or altered hydrology) include the monsoon vine thicket habitat. Degradation to fauna habitats may cause golden bandicoots to re-locate to more pristine versions of these habitats elsewhere leading to a decrease in local fauna abundance, a decrease in fitness or possible mortality due to a demise in suitable resources. It is proposed that an Ecological Surface Water Requirements Management Plan be developed to prevent, as far as practicable, impacts to surface water dependant vegetation and habitat types. As a result, it is unlikely that the local viability of populations of golden bandicoots will be significantly compromised by altered surface water flows as a result of the BLNG Precinct.

Changes in fire regimes may have the potential to reduce the habitat availability of the James Price Point coastal area for golden bandicoots. A fire management program, together with a reduction in informal access, within the James Price Point coastal area is likely to reduce the incidence of late dry season wildfires, which are known to be particularly damaging to vegetation communities and associated fauna habitats. It is expected that the management of fire within the James Price Point coastal area has the potential to improve fauna habitat quality over time.

Non-routine discharges such as spills into the terrestrial environment may detrimentally affect vegetation communities, surface water and ground water, and may ultimately result in direct poisoning of fauna or the restriction of habitat for terrestrial fauna species. Non-routine discharges are unlikely; however, spill response procedures will be implemented to contain and rectify any spills and minimise adverse impacts to fauna habitat.

The key focus for management of the golden bandicoot will be to minimise local impacts to vine thickets, prioritise vine thickets outside the precinct for conservation, implement a regional fire management strategy and undertake feral animal control in conservation reserves.

Australian Painted Snipe (*Rostratula australis*) – Vulnerable (EPBC Act), Migratory (EPBC Act)

Potential impacts to the Australian Painted Snipe are primarily associated with vegetation and habitat clearing and terrestrial discharges and spills.

This species has been recorded near the James Price Point coastal area and has the potential to occur in the current area (Biota, 2009b; **Appendix C-17**). Although its preferred habitat is shallow freshwater swamps, which are not present in the James Price Point coastal area, it may frequent the drainage basin habitat of the area following wet season rainfall. This area of potential habitat will not be removed as a result of BLNG Precinct construction and additional areas of similar habitat are known to occur at Flat Rock to the north which will not be affected. The BLNG Precinct is unlikely to significantly affect the availability of habitats for this species within the local or regional area.

Non-routine terrestrial discharges are unlikely however, spill response procedures will be implemented to contain and rectify any spills and minimise adverse impacts to fauna habitat such as the drainage basin habitat.

Masked Owl (northern) (*Tyto novaehollandiae kimberli*) - Vulnerable (EPBC Act)

Potential impacts to the Masked Owl are primarily associated with vegetation and habitat clearing.

Whilst there is a single record of the northern masked owl in the vicinity of Broome, there have been no other records of the subspecies from the Dampier Peninsula. The masked owl may utilise the open forest and pindan shrubland habitats of the BLNG Precinct area and wider Dampier Peninsula as part of larger foraging territory as no roosting sites are present. Given the lack of records from the locality, and large areas of similar foraging areas, habitat loss associated with the BLNG Precinct area is unlikely to significantly impact the masked owl.

The key focus for management of the masked owl will be to prioritise areas of more degraded pindan habitat for placement of infrastructure over that in relative better condition and improved fire management throughout the Dampier Peninsula.

Potential for Cumulative Impacts

Cumulative impacts of Category A, B and C activities include additional habitat clearing, however the habitat affected will depend on the location of future facilities and infrastructure. Fauna studies have been conducted at the housing development site proposed by LandCorp (Broome North development), with no conservation significant fauna species identified in the development area, therefore cumulative impacts from this development on conservation significant fauna identified in the BLNG Precinct are unlikely.

Most Category B activities within and near Broome and the Precinct road construction (Category C) are likely to be developed on pindan vegetation, which may support the Greater Bilby and masked owl; however over 4,000,000 hectares of pindan shrubland exists within the Dampierland subregion (Graham, 2001). Cumulatively, clearing of pindan shrubland for Category A, B and C activities is unlikely to have a significant impact on its abundance and diversity. However, pindan vegetation in the Dampier Peninsula is currently in advanced decline due to excessive fire frequency over most of its range (Biota, 2009c; **Appendix C-18**), therefore avoiding good examples of this vegetation type is desirable. Prioritisation of pindan vegetation in good condition for conservation will assist in maintaining diversity.

Implementation of further terrestrial developments may result in changes to the surface water regime, which may affect adjacent habitat including monsoon vine thickets on the west coast of Broome or the mangrove communities surrounding Roebuck Bay. Increased public access and recreation may affect habitat value through destruction of habitat and spread of weeds. The State, as part of its statewide conservation reserve management approach, will progressively prepare management strategies or plans to protect the values of these areas where required.

The management arrangements for terrestrial species are outlined in **Table 3-2** in **Part 6, Section 3**.

2.4.2.2. Turtles

All six marine turtle species present in Australian waters may utilise the marine habitat offshore from Dampier Peninsula (including the James Price Point coastal area) during migrations and possibly as foraging habitat and nesting. Vessel based surveys in 2009 (RPS, 2010b; **Appendix C-2**) identified that the largest proportion of turtle sightings adjacent to James Price Point were flatback turtles (45%, 18 turtles), followed by green turtles (30%, 12 turtles) and then loggerhead turtles (10%, 10 turtles).

Available survey information (RPS, 2010b; **Appendix C-2**) indicates that the James Price Point coastal area does not support consistently high densities of turtles. Relatively high densities of turtles (157: 0.33 turtles per square kilometre) were observed approximately 13 kilometres offshore between Coulomb Point and James Price Point in March 2009, however in subsequent surveys (December 2009 and February 2010), turtle densities were much lower (0.2 turtles per square kilometre). The area is likely used as short-term habitat by inter-nesting turtles from nearby rookeries or post-nesting turtles migrating to foraging areas in the north (RPS, 2010b; **Appendix C-2**).

The foraging habitats of green and flatback turtles along the Dampier Peninsula are largely unknown. However, as sparse seagrass and macroalgal communities exist along the James Price Point coastal area, it is possible that inter-nesting and post-nesting green turtles forage in these areas.

Potential impacts to turtles are primarily associated with marine site disturbance and excavation, light emissions, vessel movements, noise and vibration, and marine discharges.

Site disturbance and excavation (and associated sediment deposition and turbidity) will lead to direct and indirect loss of potential foraging habitat within the BLNG Port Precinct area and within a 200m zone around this area, see **Part 3, Section 2.6.3.2** (Sediment Deposition, Turbidity, Marine Site Disturbance and Excavation) for further discussion regarding impacts on turtles from site disturbance and excavation). Considering that the James Price Point coastal area is most likely a short-term habitat and more extensive foraging areas exist throughout the adjacent coastal region, the effects of removing this amount of potential habitat on turtles is not likely to be significant. In addition, the indirect loss of foraging habitat is anticipated to be temporary with habitats and ecosystem function recovering within five years once construction of the Precinct has been completed. More suitable turtle foraging areas have been identified off Carnot Bay, Cape Latreille, Roebuck Bay and Lagrange Bay, based on high turtle densities in non-breeding periods. These areas will not be affected by Category A activities of the BLNG Precinct.

Removal of the foraging habitat described above is unlikely to affect flatback turtles as their diet consists mainly of jellyfish and other invertebrates (RPS 2010b; **Appendix C-2**) and they tend to forage in turbid, shallow, soft-bottomed inshore waters in depths of 5 to 30 metres (Bjorndal, 1997). High densities of large jellyfish have been observed in nearshore waters of the James Price Point coastal area (D. Waayers pers. Obs as cited in RPS 2010b; **Appendix C-2**); however, it is not known whether these are a favoured food species. Site disturbance may have some effect on the available foraging habitat for this species as they have been observed in the area; however, impacts cannot be quantified as the distribution of foraging habitat in the region is largely unknown.

Construction of the shore crossing will also result in removal of approximately 1.5 kilometres of shoreline at the James Price Point coastal area with an additional one kilometre temporarily disturbed for pipeline construction. Surveys conducted in the James Price Point coastal area identified three tracks and one potential nest over the 2009-2010 nesting season (RPS, 2010b; **Appendix C-2**). These numbers are very low in comparison to significant turtle nesting beaches in the region such as the Lacepede Islands (approximately 65 kilometres north) where up to 1,600 turtles per night have been recorded (DEC, 2009b and Pendoley, 2005). The James Price Point coastal area is considered unsuitable for nesting due to characteristics such as the periods of inundation from spring high tides, incline of the beach rocky substrate around the coastal zone and limited space for nesting between the Aeolian sands and the intertidal platform (Biota, 2009b; **Appendix C-17** and RPS, 2010b; **Appendix C-2**). Based on the very low nesting densities, characteristics of the coastline and the small proportion of the coastline affected, the impact on marine turtle nesting is not expected to be significant.

Light emissions from the BLNG Precinct may also affect nesting turtles and the behaviour of turtle hatchlings, see **Part 3, Section 2.7.3.4** (Light Emissions) for further discussion regarding impacts turtles from light emissions). Indicative modelling from a similar LNG project has shown that impacts from lighting are not expected to be significantly altered at distances more than 400 metres from the BLNG Precinct (Chevron Australia, 2008). The BLNG Precinct will be set back from the beach by approximately one kilometre therefore the coastal topography will create a shading effect over the low-lying beach such that point sources are unlikely to be visible to turtles or hatchlings at beach level. Given this and the absence of significant nesting beaches in the immediate area, the impact on turtles from light emissions is expected to be minimal.

An increase in the number of vessel movements in the area could potentially cause an increase in boat-strike, see **Part 3, Section 2.7.3.5** (Vessel Movements) for further discussion regarding impacts turtles from vessel movements). While there is a potential for individuals to be affected, it is anticipated the potential exposure of turtles to vessel collision and entrainment is considered to be low, due to their relatively low density and occurrence in the James Price Point coastal area.

Some avoidance behaviour is likely to be exhibited in association with noise and vibration, see **Part 3, Section 2.7.3.1** (Marine Noise and Vibration) for further discussion regarding impacts on turtles from noise and vibration). The primary impact on marine reptiles from blasting and piling activities will be focused within the nearshore area with sound exposure levels of diminishing power dissipating with increasing distance from the source. This area does not contain critical nesting beaches nor is it noted for key foraging areas. In addition, the peak of the noise levels is associated with the construction of the marine facilities and is therefore temporary in nature. Post-construction, it is likely that individuals will resume use of the area.

Marine discharges, including both routine and non-routine (accidental spills or leaks) from the BLNG Precinct facilities and associated vessels will cause a localised reduction in water quality. This, in turn, presents a risk of indirect effects on turtles that swim through the vicinity of those discharge zones, see **Part 3, Section 2.7.3.3** (Marine Discharges) (including non routine discharges)) for further discussion regarding impacts turtles from marine discharges). Given the low concentrations of contaminants expected in the BLNG Precinct treated wastewater, the high rates of dilution at the points of discharge and the reduced extent of the mixing zone resulting in intermittent exposure of turtles to this area, it is highly unlikely marine discharges will have any impact on turtles. Non-routine events arising from accidental spillages could result in the release of a large volume of LNG, Liquid Petroleum Gas (LPG), condensate, diesel or fuel oil. However, the likelihood of such an event is very remote, considering the industry standard risk and operations management measures to be implemented. Nevertheless, although the occurrence is extremely unlikely, a large scale spill of hydrocarbons within the marine environment would result in temporary reduction in water quality, which may result in avoidance of the area by turtles.

The key focus for management of turtles will be avoiding impacts on regionally significant nesting and foraging areas, minimising construction impacts and identifying areas of high value to turtle species in proximity of Dampier Peninsula for protection and exclusion of disruptive activities.

Cumulative impacts may arise from additional marine facilities, associated with Category C activities that may be constructed in the future, with these potentially affecting suitable habitat for these species. It is difficult to determine impacts at this stage and will be addressed by proponents of these facilities under assessment provisions of the EPBC Act. Increased public access and recreation arising from population increases (Category B) may affect habitat values and nesting of flatback turtles at locations along Eighty Mile Beach. The State as part of its statewide conservation reserve management approach will progressively prepare management strategies or plans to protect the values of these areas where required. The following potential impacts may occur:

- the number and type of vessels operating within the area will increase as a result of the construction and operation of the BLNG Precinct, leading to a potential increase in impacts on this species through boat-strike;
- seabed disturbance and excavation may result in the direct loss of foraging habitat for the species, with increased water turbidity potentially leading to further indirect losses of foraging habitat;
- increased turbidity in open water is likely to result in avoidance behaviour by this species, with this impact expected to be temporary (as it is associated with a construction activity);
- the marine activities that are considered to be the most noise intensive sources are nearshore blasting and piling works. Impacts to turtles as a result of noise include injury to hearing or other organs, interference with other biologically important sounds (such as vocal communication) and temporary displacement of the species from the affected area; and
- Additional marine facilities may be constructed in the future and these may further impact suitable habitat for this species, however this is difficult to determine at this stage and will be addressed by proponents of these facilities under assessment provisions of the EPBC Act.

The management arrangements for turtles are outlined in **Table 3-5** in **Part 6, Section 3**.

2.4.2.3. Humpback Whales

Potential impacts to humpback whales are primarily associated with vessel movements, noise and vibration, sediment deposition and turbidity (as a result of seabed disturbance and excavation) and marine discharges.

Increased vessel movements in the area during construction and operation may result in increased boat-strike with humpback whale individuals, see **Part 3, Section 2.6.3.4** (Vessel Movement) for further discussion regarding impacts to humpback whales from vessel movements. While the James Price Point coastal area is not recognised as a humpback aggregation area, it does host whales transiting the area during their migration period. Therefore, the movement of vessels through their migratory routes does create a potential risk of vessel collision. The risk of vessel interaction is primarily from large vessels approaching or departing from the BLNG Precinct. It is noted that vessel collision poses a greater risk to humpback whales in areas used by nursing or juvenile animals, where they generally have longer or more frequent surface intervals (Laist *et al.*, 2001). Female-calf pairs occur offshore from James Price Point from July to October (RPS, 2010a; **Appendix C-8**); however, the majority of calf sightings during the migration corridor survey were recorded further than 8.6km off the shore and no calves were recorded within 5km of the shore near James Price Point.

Though the risk of vessel strikes on individual humpbacks is proportionally increased over the current level of risk from vessel strike on the migration route; mitigation measures implemented through the vessel management plan will reduce this risk.

High intensity impulsive noise emitted during blasting and piling will overlap the frequency range of hearing in humpback whales and has the potential to cause physiological injuries at close ranges; however, this noise will be restricted to the BLNG Precinct Port area. The continuous noise emitted from vessels and constructed related activities will be at levels less than that considered to cause physiological injuries but may have the potential to cause behavioural responses, although no significant behaviour changes are expected. See **Part 3, Section 2.6.3.1** (Marine Noise and Vibration) for further discussion regarding impacts to humpback whales from noise and vibration).

Humpback whales are thought to rely on acoustic senses for navigation and to monitor their environment, rather than visual sources (Simmonds *et al.*, 2004). Therefore, humpback whales are not likely to demonstrate a behavioural or physiological response to a reduction in water quality (e.g. turbidity) associated with increased suspended sediments or sediment deposition, see **Part 3, Section 2.6.3.2** (Sediment Deposition, Turbidity, Marine Site Disturbance and Excavation) for further discussion regarding impacts to humpback whales from turbidity.

Impacts from noise and vibration and increased turbidity are likely to be limited to avoidance behaviour, which will be a temporary impact during construction. From *EPBC Act Policy Statement 2.1 - Interaction between offshore seismic exploration and whales* - there are a wide range of perceptual and behavioural effects that may result from the interaction of marine mammals with human-made underwater sounds (DEWHA, 2008d). These include the masking of biologically relevant sounds, interruption of feeding, breeding and nursing, changes in diving or respiratory behaviour, and both long and short-term displacement from an area. However, because of the management and mitigation measures that will be implemented to reduce the risks to humpbacks, these impacts are expected to be negligible.

Routine marine discharges from the BLNG Precinct facilities and associated vessels will cause a localised reduction in water quality, predominately within the mixing zone. This could cause an impact (behavioural or physiological) on marine mammals, see **Part 3, Section 2.6.3.3** (Marine Discharges (including non-routine discharges)) for further discussion regarding impacts to humpback whales from marine discharges. Given the low concentrations of contaminants expected in the BLNG Precinct treated waste water, the high rates of dilution at the points of discharge and the reduced extent of the mixing zone resulting in intermittent exposure of marine mammals to this area, it is highly unlikely that controlled marine discharges will have any impact on marine mammals. Non-routine events arising from accidental spillages could result in the release of a large volume of LNG, LPG, condensate, diesel or fuel oil. Whales surface to breathe, at which point they may inhale hydrocarbon fumes that have the potential to cause lung injuries (USEPA, 1999). They may also inhale hydrocarbons directly; resulting in toxicity effects and may experience eye irritations. However, the risk of such an event is very low, considering the industry standard risk and operations management measures to be implemented. Nevertheless, although the occurrence is unlikely, a large scale spill of hydrocarbons within the marine environment would result in temporary reduction in water quality, which may result in physiological impacts or avoidance of the area by humpback whales.

The key focus for management of humpback whales is avoiding impacts on regionally significant aggregation areas as a result of vessel strike, minimising construction impacts, identifying areas of high value to humpback whale migration and calving in proximity of Dampier Peninsula for protection and exclusion of disruptive activities and noise and vibration impacts.

Cumulative impacts from Category B activities such as increases in recreational boat traffic associated with increased population are unlikely as these increases are most likely to occur near shore and not affect migratory pathways. Increased vessel movement during exploration, construction and operation of the upstream resource (Category C) may affect the humpback whale through boat-strike. This will be limited to the seasonal period of their annual migrations. Limited habitat and food-source reduction via the installation of infrastructure and moorings and noise emissions from construction are expected to be localised and not affect numbers or viability overall of any marine mammal population.

The management arrangements for cetaceans (including whales) are outlined in **Table 3-4** in **Part 6, Section 3**.

2.4.2.4. Sawfish

Potential impacts to sawfish are primarily associated with marine site disturbance and excavation (turbidity and sedimentation), marine discharges and invasive marine species,

There was no evidence of sawfish species (*Pristis microdon*, *P. zijsron* and *P. clavata*) in the BLNG Precinct area (Cappo *et al.*, 2010b; **Appendix C-6**); however, they may still occur as all species are known to utilise inshore coastal waters. Occurrences of these species in the area are most likely to be transient (Morgan *et al.*, 2009; **Appendix C-7**), as they migrate through James Price Point coastal area to more suitable habitats such as estuaries.

Marine site disturbance and excavation is likely to result in the permanent and temporary loss of benthic habitat potentially used by sawfish, see **Part 3, Section 2.5.4.2** (Marine Site Disturbance and Excavation) for further discussion regarding impacts to sawfish from turbidity and sedimentation). The direct burial and/or removal of benthic habitat by the proposed infrastructure will result in the permanent loss of habitat within the footprint of the BLNG Precinct. Other areas outside the footprint will only be temporally affected. The impacts to sawfish from habitat loss are not likely to be significant, given that habitats within the James Price Point coastal area are unlikely to represent unique or critical sawfish habitat.

Sawfish species may come into contact with areas of increased turbidity during construction. These species inhabit estuarine and near coastal waters, which are typically naturally turbid, and are thus adapted to finding prey in these muddy waters and not expected to suffer any adverse affects from high turbidity.

Routine marine discharges can affect the marine environment generally through a reduction in water quality, see **Part 3, Section 2.5.4.5** (Marine Discharges) for further discussion regarding impacts to sawfish from marine discharges). Discharges can cause changes to salinity, oxygen content, nutrient concentrations and potentially organic or elemental contaminants. Water quality is likely to be altered beyond background conditions within a small defined mixing zone (e.g. 50 metres) surrounding marine outfalls. Beyond this mixing zone, water quality is expected to fall within background levels. The potential for significant water quality decline is low given the dynamic nature of the marine environment, resulting in diurnal flushing of nearshore waters by the strong tidal movement. Mobile species, including sawfish, can move away from the affected area and are likely to avoid any deleterious effects.

The introduction and establishment of invasive marine species (IMS) could have an adverse impact on sawfish species through competition for food and habitat, alteration of habitat and introduction of parasites and diseases, see **Part 3, Section 2.5.4.6** (Invasive Marine Species) for further discussion regarding impacts to sawfish from invasive marine species). It is generally considered unlikely that an IMS would successfully establish and have an impact on sawfish given the resilience of the fauna within the study area (Hutchings *et al.*, 2002). The lack of IMS across northern Australia suggests that the marine ecosystem is relatively resistant to establishment of IMS.

It is expected that the impact to sawfish species will be largely avoidance behaviour primarily during the construction period. It is most likely that sawfish will be in very low numbers in area if at all; therefore, the Precinct Plan is not expected to have a significant impact on populations of these species. Therefore, no management arrangement is proposed to directly target the sawfish species, although management arrangements for other marine species will ensure that any potential impact to the sawfish is minimised.

The freshwater sawfish has been recorded at Eighty Mile Beach and Roebuck Bay, with potential impacts from Category B activities at these areas associated with changes in the surface water regime potentially affecting mangrove communities surrounding Roebuck Bay and increased public access and recreation affecting habitat value through degradation of habitat. Fishing, particularly net fishing is a major threat to these species; therefore, increases in recreation as a result of population increase in the area may affect the populations of sawfish in more critical habitats.

2.4.3. Listed Migratory Species

The following sections summarise the predicted impacts for groups of listed migratory species.

2.4.3.1. Migratory Birds

Potential impacts to the migratory birds are primarily associated with vegetation and habitat clearing, light emissions and marine discharges and spills.

A total of 21 migratory shorebird species have been observed along the length of the James Price Point coastal area, therefore if considered in its entirety, the area can be considered “important habitat” for shorebirds according to the Draft *EPBC Act Policy Statement 3.21 – Significant Impact Guidelines for 36 Migratory Shorebird Species* (DEWHA, 2010) which sets a threshold of 15 species for this importance classification. In addition, a number of other migratory bird species frequent or forage along the coastal fringe. It is highly likely that this is the case for the length of the coastline along the western side of the Dampier Peninsula.

Approximately one kilometre of shoreline of the James Price Point coastal area will be permanently modified for the shore crossing, with temporary disturbance of an additional one kilometre for pipeline corridors. Based on the findings of Galaxia (2010) (**Appendix C-1**), this removal of nearshore and coastal habitat is unlikely to have a significant impact on migratory shorebird species for the reasons listed below:

- The 21 shorebird species were recorded during surveys that covered approximately 35 kilometres of coastline, hence, the permanent removal of one kilometre of this coastline equates to approximately 3% of this length. The habitats of this section of coastline are represented all along the hundreds of kilometres of Dampier Peninsula shoreline.
- The number of migratory shorebirds recorded in the James Price Point coastal area are considered very low when compared to other areas on or near the Dampier Peninsula (for example Roebuck Bay, Eighty Mile Beach, Bidyadanga and Dessault Bay).
- The James Price Point coastal area does not include any intertidal or coastal strip habitats that are not well represented in the region, and hence, is unlikely to host any regionally significant populations of migratory birds showing a preference for these habitats.
- Far more extensive and important feeding and roosting areas for migratory shorebirds (e.g. intertidal sand and mudflats, tidal creeks and mangals) on the Dampier Peninsula are likely to be located both south and north of the James Price Point coastal area, such as Willie Creek and Barred Creek to the south; and Carnot Bay, Baldwin Creek, Camp Inlet, Beagle Bay, Tappers Inlet, Pender Bay, Chile Creek and Thomas Bay to the north.

The light emissions associated with the BLNG Precinct have the potential to disrupt migratory birds behaviour. Migratory birds can become disoriented by the strong light of gas flares. Considering the area is not regarded as a primary habitat for migratory birds in comparison to other coastal areas and offshore islands, the possible impact to these species from light emissions is considered to be low. Furthermore, impacts are likely to be restricted to individuals and unlikely to compromise the conservation status of the species.

Light emissions from the BLNG Precinct are considered unlikely to impact the nearest significant area for migratory birds, Ramsar wetland at Roebuck Bay, as the site is located greater than 60 kilometres away. Lighting from the town of Broome, which is approximately 10 kilometres from the Roebuck Bay Ramsar site, is expected to represent a much larger source of light in comparison with light emissions from the BLNG Precinct (Galaxia, 2010; **Appendix C-1**).

The James Price Point coastal area is not considered to provide any regionally significant habitat for migratory bird species. Routine discharges are expected to be treated to an acceptable standard and released in a manner to maximize dispersion and at a location to minimise potential contact with sensitive receptors or accumulation of contaminants. The discharge is highly unlikely to be toxic to marine birds and as they are highly mobile any contact is likely to be very short duration. Indirect impacts are only possible if levels of contaminants are able to accumulate where birds are feeding for example in intertidal areas. Non-routine discharges are unlikely however, spill response procedures will be implemented to contain and rectify any spills and minimise adverse impacts to fauna habitat.

The key focus for management of migratory birds will be minimising impacts of coastal habitats and prioritising areas of high value to migratory birds on the Dampier Peninsula for conservation.

Other non-shorebird migratory bird species may also utilise the coastal habitats present at James Price Point. These species are generally widespread and are not expected to be reliant on the habitat present in the proposed Precinct and surrounds. The key approach to management of impacts to these species will be to minimise disturbance through the narrow coastal habitat fringes.

The main potential for cumulative impacts from Category B and C activities arises from increased public access and recreation that may affect habitat value through destruction of habitat and spread of weeds, including that located at Roebuck Bay and Eighty Mile Beach. Additional marine facilities may be constructed along the coastline in the future

and these may further impact suitable habitat for some species, however this is difficult to determine at this stage and will be addressed by proponents of these facilities under assessment provisions of the EPBC Act. Implementation of further terrestrial developments may result in changes to the surface water regime, which may affect adjacent habitat including monsoon vine thickets on the west coast of Broome or the mangrove communities surrounding Roebuck Bay. The State as part of its statewide conservation reserve management approach will progressively prepare management strategies or plans to protect the values of these areas where required.

The management arrangements for migratory birds are outlined in **Table 3-3** in **Part 6, Section 3**.

2.4.3.2. Dugongs

Dugongs have been observed within the James Price Point coastal area and therefore may be affected by the construction and operation of the BLNG Precinct. Potential impacts to dugongs are primarily associated with vessel movements, noise and vibration, marine site disturbance and excavation, and marine discharges.

The James Price Point coastal area has not been found to support any significant seagrass beds in terms of distribution and abundance in comparison with favoured dugong foraging habitats such as Roebuck Bay (RPS, 2010c; **Appendix C-9**). Site disturbance and excavation will result in the direct removal of benthic habitat within the footprint of the BLNG Precinct nearshore marine facilities see **Part 3, Section 2.6.3.2** (Sediment Deposition, Turbidity, Marine Site Disturbance and Excavation) for further discussion regarding impacts to dugongs from site disturbance and excavation). This may indirectly impact dugongs through a subsequent loss of seagrass foraging habitat. In addition, the reduction in benthic light availability is predicted to result in further more wide-scale temporary impacts on seagrass. This loss is not expected to impact on food resource availability for dugongs given the occurrence of seagrass communities throughout the Dampier Peninsula coastal region and as dugongs have been known to relocate to adjacent areas in search of seagrass beds following losses within their home range. Further, the number of individuals predicted to occur within the James Price Point coastal area represents, approximately only one percent (0.75 percent for July 2009 survey and 1.2 percent for September 2009 survey) of the total population estimated to be between Cape Leveque and Lagrange Bay. Therefore, the loss of foraging habitat will not affect the overall population viability of the dugongs.

Currently there is no information that documents the susceptibility or sensitivity of dugongs to routine and non-routine hydrocarbon spills. It is likely that dugongs may display similar behavioural and physiological characteristics to humpback whales when exposed to marine discharges (including non-routine discharges). See **Part 3, Section 2.6.3.3** (Marine Discharges (including non-routine discharges) for further discussion regarding impacts to dugongs and humpback whales from marine discharges). Dugongs may be affected by ingestion of hydrocarbons while they are breathing on the surface and through irritation of the eyes. As with most animals, juveniles are most at risk. Longer term chronic effects may also be experienced when migrating through hydrocarbon contaminated waters. In addition, dugongs are likely to suffer secondary effects from the hydrocarbon spill through habitat disturbance and damage particularly to seagrass habitats.

Dugongs may potentially be present in the BLNG Precinct Port area and potentially at risk of impact from marine noise associated with activities such as blasting and piling (see **Part 3, Section 2.6.3.1** for further discussion regarding impacts to dugongs from noise and vibration). For blasting and piling, at close ranges (<25m and 60m respectively) there is a potential for individuals to be exposed to levels above threshold levels; however, high intensity impulsive noise activities during construction are likely to result in the localised avoidance of individuals from the BLNG Precinct Port area, thus minimising the risk of exposure. The BLNG Precinct Port area is not considered regionally significant for dugongs (refer to **Part 3, Section 1.1** (Existing Marine Environment)), and the wider Dampier Peninsula supports established populations. Therefore, it is likely that any dugongs displaced from the BLNG Precinct Port area will find suitable habitats within the wider Kimberley region during the construction period, and that this displacement will not have a significant impact on the dugong population on a local and regional level.

Dugongs are susceptible to injury or mortality resulting from interaction with vessels, particularly when they rise to the surface to breathe, rest or forage in shallow waters. It is likely that dugongs will be at the most significant risk of vessel strikes during construction, when vessel activity is highest and faster vessels (e.g. supply vessels) are common, due to their delayed flight response, see **Part 3, Section 2.6.3.4** (Vessel Movement) for further discussion regarding impacts to dugongs from vessel movements. Dugongs are known to occur along James Price Point coastal area; however, the James Price Point coastal area is not a regionally significant foraging or aggregation area. As less than 1% of the total population is estimated to occur between Cape Leveque and Cape Bossut, it is likely that a small number of individuals

may be affected by vessel activity associated with the BLNG Precinct Port area; however, no significant impact to population viability is anticipated.

For vessels entering and exiting the BLNG Precinct, operational measures such as speed limits and vessel routing will help to minimise the risk of vessel collision on marine mammals. As dugongs have a delayed response to approaching vessels, speed restrictions have been used in the past as a management tool for reducing vessel impacts on them in Queensland waters (Preen, 2001 and Hodgson, 2004).

A key focus for management will be avoiding impacts on regionally significant aggregation areas as a result of vessel strike and identifying areas of particular value for calving and foraging in the region for potential conservation.

Increased port operations, public access and recreation arising from population increases in Broome (Category B) may affect dugong habitat values in Roebuck Bay and other recreational areas and lead to increase in impacts on this species through boat strike. The incremental level of effect on dugongs from additional boat movements and port operations is likely to be small and localised. However, the successive growth in activity in the area should be monitored and long-term effects evaluated. Campaigns to educate boaters to the presence of local marine mammals and appropriate actions to take to minimise impacts should be implemented.

The State as part of its statewide conservation reserve management approach will progressively prepare management strategies or plans to protect the values of these areas where required.

The management arrangements for dugongs are outlined in **Table 3-5** in **Part 6, Section 3**.

2.4.3.3. Crocodiles

The salt-water crocodile inhabits coastal rivers, mangroves and open seas in northern Australia, extending inland via major rivers and floodplains. The habitat in the Precinct Area is not considered suitable for this species, however individuals may pass through the area as they access suitable mangrove habitat further south. Those individuals that do pass through the area may be subject to noise and vibration emissions primarily during construction or be struck by moving vessels. These impacts are not expected to significantly affect the population of this species.

2.4.4. Commonwealth Marine Area

There are 21 listed pipefish species, five seahorse species, 17 sea snakes and seven cetaceans to be addressed in regards to potential impacts to the Commonwealth Marine Area. Bird species are unlikely to be susceptible to impacts from the proposed marine activities in the Commonwealth Marine Area. The key aspects of the Precinct Plan that could affect listed pipefish, seahorses, sea snakes and cetaceans in the Commonwealth Marine Area, specifically include vessel movements and marine discharges, introduction of invasive marine species, turbidity and sediment deposition as a result of site disturbance and excavation for the Precinct development, and noise and vibration emissions from drilling and blasting activities. In addition, upstream (Category C) activities such as vessel movements and pipeline construction will affect the Commonwealth Marine Area.

The management arrangements for Commonwealth Marine Areas are outlined in **Table 3-6** in **Part 6, Section 3**.

2.4.4.1. Pipefish and Seahorses

Twenty-one pipefish species, five seahorse species and one seadragon species have been identified and are listed marine species to be addressed in terms of potential impacts to the Commonwealth Marine Area. Pipefishes are most likely to occur in seagrass meadows formed by species of the Order Potamogetonales, with seahorses most likely to occur in macroalgal habitats. However, given the limited nature of these seagrass habitats, pipefish generally are not expected to be abundant or diverse. Macroalgae habitat is predicted to have a widespread distribution and to be broadly represented throughout the region.

Changes to water quality is the most likely impact of the Precinct Plan to affect pipefish and seahorses, however increased turbidity resulting from disturbance associated with dredging or installation of pipelines in the Commonwealth Marine Area are unlikely to cause significant impacts to pipefish and seahorses as the areas affected are not likely to provide significant habitat to pipefish or seahorses and relatively low numbers in the James Price Point coastal area would be at risk.

The number and type of vessels operating within the Commonwealth Marine Area will increase as a result of the construction and operation of the BLNG Precinct; however, vessel movements are unlikely to directly lead to a potential impact to pipefish and seahorses due to fish habitation of relatively shallow water. Noise and vibration will result from some activities, with the greatest impact resulting from construction related activities emitting intense levels of noise (blasting and piling). The Commonwealth Marine Area is considered beyond the area for which noise and vibration associated with these activities, occurring in the proposed port area, would affect pipefish and seahorses, with avoidance being the only behavioural characteristic exhibited, if any. Noise affects would be temporary (for the period of blasting) and animals would recolonise substrate after cessation of activity.

The introduction and establishment of invasive marine species could have an adverse impact on fish species through competition for food and habitat, alteration of habitat, predation and introduction of parasites and diseases. It is generally considered unlikely that an IMS would successfully establish and have an impact on fish given the resilience of the fauna within the study area (Hutchings *et al.*, 2002). The lack of IMS across northern Australia suggests that the marine ecosystem is relatively resistant to establishment of IMS.

2.4.4.2. Sea Snakes

Seventeen listed marine sea snakes may occur within the Commonwealth Marine Area and have the potential to be affected by the implementation of the Precinct Plan. Reefs (especially off-shore) are important areas for sea snakes, with large populations being recorded from Ashmore Reef (approximately 330 nautical miles (Nm) north of Broome) (Guinea & Whiting, 2005). Sea snakes were widely distributed and abundant along the Dampier Peninsula coastline (including Lagrange Bay, Broome, Pender Bay and Scott Reef), however they were not as common along the James Price Point coastal area. The majority of sea snake sightings were in waters between 10 to 50m deep. The highest relative densities of sea snakes were recorded in July and September approximately 30km west of Broome outside of the 10m isobath. During marine megafauna surveys, very few sea snakes were recorded in the area near James Price Point and only one was recorded in Roebuck Bay (RPS, 2010d; **Appendix C-10**).

Impacts to sea snakes in the Commonwealth Marine Area are most likely to be associated with changes to water quality, specifically turbidity resulting from site disturbance and excavation and spoil disposal. These aspects are considered unlikely to cause significant impacts to sea snakes as they are highly mobile species and will avoid the area until the disturbance ceases (with these disturbances expected to be short-term and temporary).

The number and type of vessels operating within the Commonwealth Marine Area will increase as a result of the construction and operation of the BLNG Precinct; however, vessel movements are unlikely to directly affect sea snakes due to their fast movement and good auditory perception for avoidance. Noise and vibration, associated with blasting and piling closer to the coast, is unlikely to affect sea snake species given the distance these emissions would be required to travel. Avoidance of the area, if any, may be the only behavioural characteristic exhibited.

2.4.4.3. Cetaceans

There are seven cetaceans listed to be addressed in regards to potential impacts to the Commonwealth Marine Area, with all species possibly or likely to occur in this area. Impacts to these species could be from vessel strike, noise and vibration, or changes to water quality.

The number and type of vessels operating within the Commonwealth Marine Area will increase as a result of the construction and operation of the BLNG Precinct, leading to a potential increase in the probability of boat-strike. Vessel strikes through direct contact with vessel hulls or propellers can cause direct lethal injuries to marine mammals (Bechdel *et al.*, 2009), with this being more common in species that are slow-moving, species whose behaviour includes extended surface 'milling' time, species that demonstrate a lack of avoidance behaviour to approaching vessels, and cetacean calves and juveniles (Vanderlaan & Taggart, 2007; Laist *et al.*, 2001; Nowacek *et al.*, 2007; Stevick, 1999; and Szabo and Duffus, 2007).

The marine activities that are considered to be the most noise intensive sources are nearshore blasting and piling works. Behavioural impacts resulting from marine noise may include interference in communication, localised deviations in migratory patterns and displacement from foraging or resting areas (McCauley *et al.*, 2000; Weilgart, 2007; and Tyack, 2008). High intensity impulsive noise emitted during blasting and piling will overlap the frequency range of hearing in cetaceans and has the potential to cause Temporary Threshold Shift (TTS) or Permanent Threshold Shift (PTS) in the hearing of individuals at close ranges predicted to be restricted to the BLNG Precinct Port area, as well as behavioural

disturbance at further distances. The continuous noise emitted from vessels and construction related activities (dredging, pipe laying), whilst overlapping the frequency range of hearing in cetaceans, will be at levels less than that considered to affect hearing, but may have the potential to cause behavioural responses. Noise impacts due to construction activities would be managed through a Port Facilities Construction Environmental Management Plan which would include a range of measures to manage marine mammal interactions such as use of warning charges and soft-start piling, where practicable to encourage animals to move away from the construction area.

Several marine construction activities associated with the implementation of the Precinct Plan could affect the water quality of the Commonwealth Marine Area, specifically increasing turbidity. Sedimentation may also affect the existing substrate. These impacts are not considered likely to result in significant impacts to cetaceans, with any turbidity generated being a temporary impact. Cetaceans may alter their behaviour and avoid the affected area; however, this is not expected to significantly affect the population of any cetacean species.

The key focus for management of the Commonwealth Marine Area will be the management of vessel movements, marine discharges, marine pest hygiene measures and noise and vibration.

The management arrangements for cetaceans are outlined in **Table 3-4**, in **Part 6, Section 3**.

3. The Plan to Establish an LNG Precinct

3.1. Definition of the Plan and the Proponent

The State of Western Australia (**WA**), through the Minister for State Development has prepared the Plan for a common-user Browse Liquefied Natural Gas (**BLNG**) Precinct south of James Price Point on the Dampier Peninsula, approximately 60 kilometres (**km**) north of Broome in Western Australia.

The Plan has been developed in accordance with the Terms of Reference specified in the Strategic Assessment Agreement between the State and Australian Governments. In accordance with the Terms of Reference, the Plan for a common user BLNG Precinct includes:

- responsibilities for implementation of the Plan;
- legal structure under which the Plan will be implemented;
- activities that can occur under the Plan; and
- management arrangements required to ensure the Plan is implemented successfully.

The Plan has been developed in consultation with: Woodside Energy Limited (**Woodside**); the Kimberley Land Council (**KLC**) on behalf of the Traditional Owners; the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (**SEWPAC**); and the Western Australian Office of the Environmental Protection Authority (**EPA**).

The terminology 'Plan' is used in this section to comply with the formal legal definition. However, in the other sections of the SAR, the term 'Precinct Plan' is used to denote the 'Plan' to avoid confusion with the range of social and environmental plans described in the Strategic Assessment Report (**SAR**).

3.2. Purpose of this Plan

This Plan is subject to strategic environmental impact assessment under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**), based on the possibility that the implementation of actions under the Plan may adversely affect matters of National Environmental Significance (**NES**). The Strategic Assessment process under the EPBC Act allows the Minister to endorse a Plan, following a Strategic Assessment and also to approve actions that are undertaken in accordance with the Plan.

The Strategic Assessment Agreement was established under Section 146(1) of the EPBC Act and Section 38 of the *Environmental Protection Act 1986* (**EP Act**). It provides for the assessment of impacts of actions under the Plan for a common-user LNG Precinct on all matters protected by Part 3 of the EPBC Act.

The Strategic Assessment Report (SAR) provides the Federal Minister for Sustainability, Environment, Water, Population and Communities with the information required to make a decision on whether to endorse this Plan (Section 146B of the EPBC Act).

3.3. Precinct Purpose

The BLNG Precinct is being proposed to provide an onshore location for processing and subsequent export of gas and associated products from the Browse Basin, located off the north-west coast of Western Australia.

The Browse Basin has gas reserves of some 34.6 trillion cubic feet (**tcf**) of gas and some 600 million barrels of condensate, making it comparable to the reserves associated with the North West Shelf Venture. The Browse Basin gas reserves are already being developed and the key question for the State of Western Australia is how best to develop the Browse Basin resource to maximise long term social and economic benefit for Western Australia and the local region while protecting the environment, cultural and heritage values.

The State Government is seeking to develop the BLNG Precinct to:

- provide long term economic prosperity for the Kimberley Region and Western Australia;
- minimise the environmental footprint associated with processing gas from the Browse Basin; and
- work with industry to ensure that the potential socio-economic benefits of such a major development are realised while the risks, especially at the local and regional scale, are minimised.

The BLNG Precinct will enable processing of the Browse Basin gas reserves at a single location and proponents to utilise common, fit for purpose infrastructure. A single location with common use infrastructure will minimise the environmental footprint of the gas processing. The implementation of the Plan will also provide certainty to future proponents that there is a “project ready” location where the establishment of LNG facilities is streamlined.

3.4. Precinct Location Selection Process

The proposed location for the BLNG Precinct is south of James Price Point, approximately 60 kilometres north of Broome, Western Australia (**Figure 3-1**).

The site was selected following an extensive site selection process to identify a suitable location for co-locating LNG developments. The site selection process included consideration of heritage, technical and environmental criteria, including consideration of matters of National Environmental Significance (**NES**), and stakeholder consultation (with particular assistance from Traditional Owners) starting from a potential 43 sites, with detailed evaluation and studies completed on 11 sites. In addition, sites within the Pilbara and Northern Territory were considered as well as offshore options such as floating LNG and gravity based structures. All of these options were rejected based on a range of criteria. Interstate locations were rejected as being remote from the Browse Basin and not in the best economic interest of Western Australia.

The west Kimberley coastline location was chosen based on evaluation of numerous criteria, the most notable being that it is outside of the remote rocky wilderness areas of the Kimberley whilst still being in relatively close proximity to the Browse Basin and relatively close to existing infrastructure.

Consideration was given to technical, environmental and heritage constraints in developing the Plan for the establishment of a BLNG Precinct south of James Price Point. Options north and south of James Price Point were considered. The northern option will require more dredging and blasting than south of James Price Point, thereby affecting more benthic primary producer habitat (**BPPH**). The southern option was chosen once the Traditional Owners had agreed that the site was acceptable.

The final BLNG Precinct layout has all processing activities set back from the coast with a minimum 1.5km set-back between the industrial blocks and the Port Facility (**PF**). The coastal set back was designed to minimise the impact on monsoon vine thicket that exists along the coast, minimise impacts on the coastal dune system and avoid direct impacts on James Price Point itself which has environmental, landscape, recreation and heritage values.

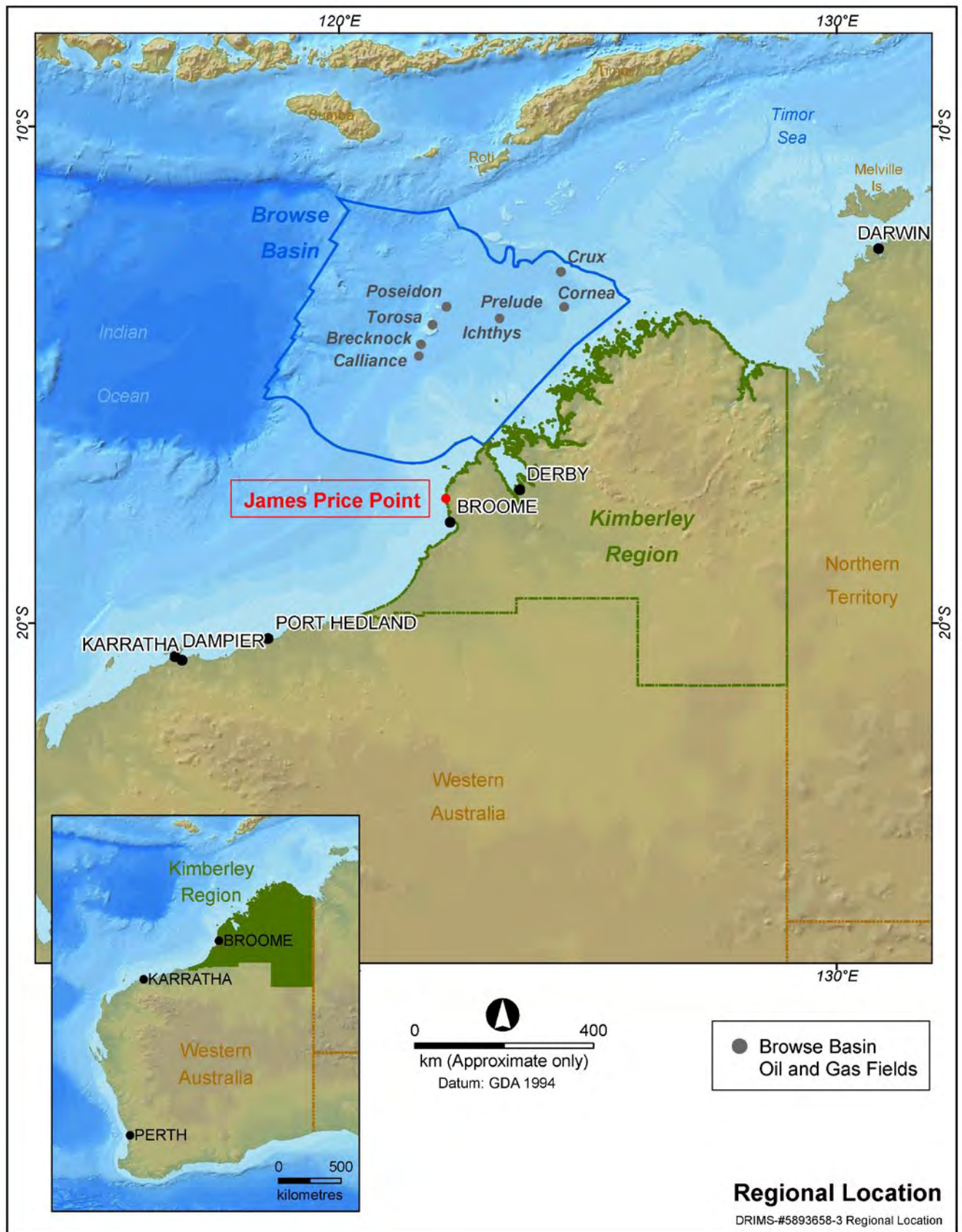
3.5. Intentions for Changing Status of the Land

The land required for the BLNG Precinct is comprised entirely of unallocated Crown land, which includes the seabed out to the three nautical mile (**Nm**) State territorial limit. It is located on part of the land and adjacent waters subject to a registered claim under the *Native Title Act 1993 (C’th)* (**NTA**) by the Goolarabooloo Jabirr Jabirr native title claimant group. Development of the BLNG Precinct cannot proceed in the absence of the appropriate land tenure being granted under the *Land Administration Act 1997 (WA)*, with the granting of such tenure being subject to acquiring the native title rights and interests over the area of land required.

The State Government has been negotiating with the KLC, who represents the registered native title claimant group, since January 2008 to secure the areas required for the BLNG Precinct. It is the State Government’s preference to secure the land required via an Indigenous Land Use Agreement (**ILUA**) under the NTA, which will ultimately register the consent of the claimant to the establishment and operation of the BLNG Precinct. However, given continued questions about the authority of parties to negotiate such an Agreement and the timing issues that this presents, in September 2010, the State announced that it will commence a formal process under the *Native Title Act 1993*. This process involves negotiating, in good faith, with registered native title claimants for a six-month period. If agreement cannot be

reached, the State will refer the matter to the National Native Title Tribunal for arbitration for up to a further six months, after which the Tribunal determines if the development may be done, and if so, under what conditions.

Land tenure will ultimately be granted by the State of Western Australia to individual project proponents in the form of leases, easements or licences, granted through the State land management body LandCorp under the *WA Land Authority Act 1992* and the Broome Port Authority which will be responsible for management of the Port under the *Port Authority Act 1999*. Freehold land will not be granted to individual project proponents.



• **Figure 3-1 Regional Location of James Price Point.**

The State Government and Woodside (as a potential Foundation Proponent) have together committed to delivering about \$1.5 billion of social and economic benefits to local Aboriginal communities, under a Heads of Agreement (**HoA**) signed by the Kimberley Land Council on behalf of the Goolarabooloo Jabirr Jabirr claimants in April 2009. The HoA includes:

- recognition of the claimants as Traditional Owners of the affected land;
- providing an area of land, equivalent to that required for the precinct, to the Traditional Owners under freehold title;
- creating new economic opportunities, including in business development and trade training;
- strengthening environmental and heritage protection including creating new conservation reserves on the Dampier Peninsula;
- reforming of indigenous land tenure to help establish appropriate titles for home ownership and economic development in Dampier Peninsula communities;
- creating Traditional Owner controlled funds for economic development, housing, education and cultural preservation;
- increasing funding to improve Government facilities and services for the wider community;
- when the land is no longer needed, returning it fully remediated to the Traditional Owners; and
- requiring an equivalent level of commitments from future proponents as and when they undertake projects at the Precinct.

3.6. Description of the Plan

3.6.1. Key Activities and Locations that Activities will Occur in the Plan Area

The following construction, operation, maintenance, modification, expansion, replacement and decommissioning of the following facilities will occur under the Plan (**Table 3-1**):

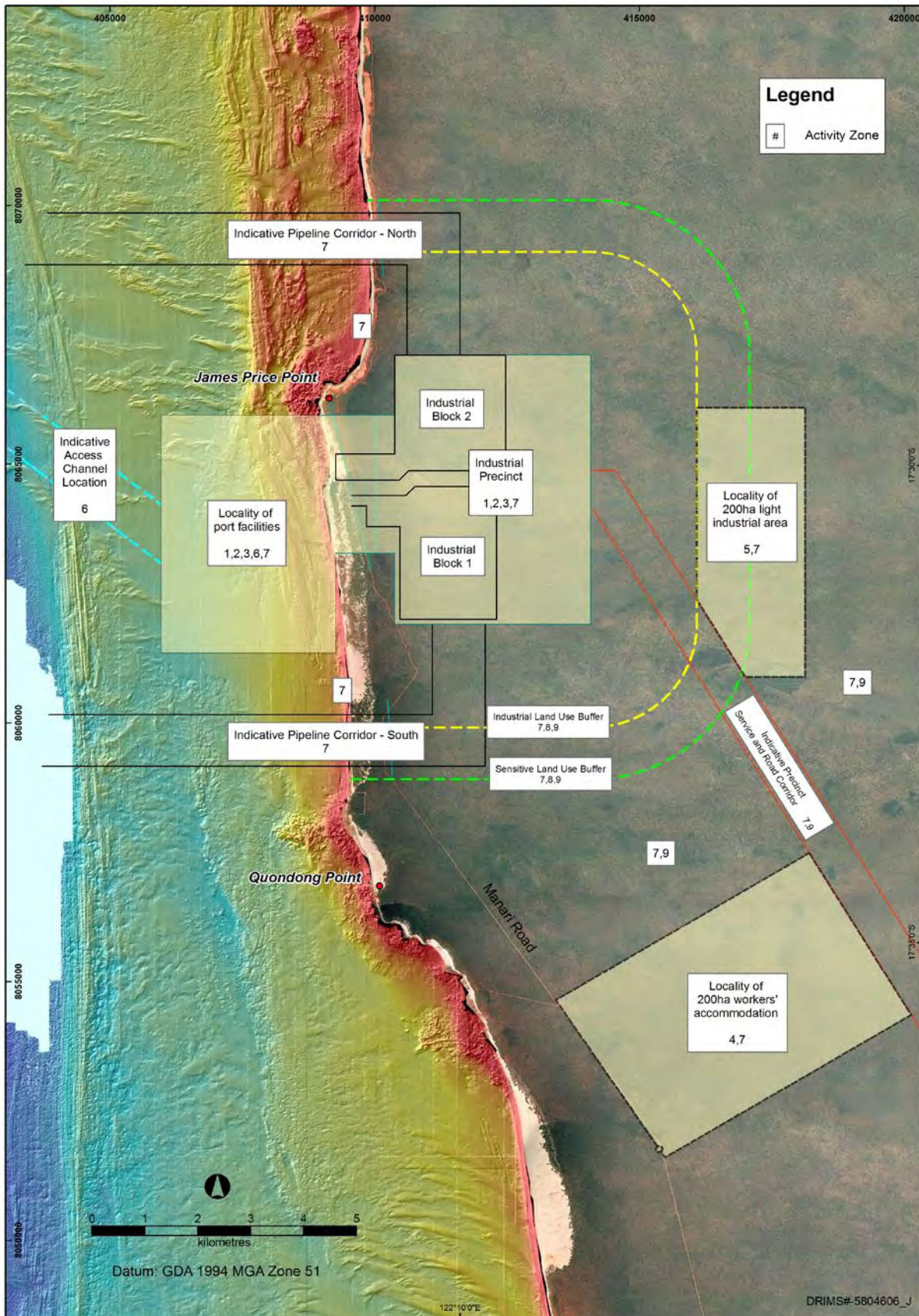
• **Table 3-1 Key Characteristics Table of Facilities under the Precinct Plan (Category A).**

Activity Zone (see Figure 3-2)	Activity	Description of Activity
1	LNG-related hydrocarbon processing.	Receival, transportation and processing of hydrocarbons including liquefaction of gas into LNG and other products for export and any other facilities necessary for that purpose and any other activities necessary or ancillary to such Activities to a plant capacity limit equivalent to 50 million tonnes of LNG per annum.
2	Product Storage.	Storage, handling and delivery of products derived from the processing of hydrocarbons including liquefaction of gas into LNG and other products and any other requirements necessary or ancillary to such Activities.
3	Product Export.	Port and marine facilities for product export.
4	Workers' Accommodation.	Accommodating workers associated with the above Activities.
5	Light Industrial Area.	Light Industrial Area facilities ancillary to the above Activities.
6	Port Facilities.	Port and marine facilities to support the above Activities.
7	Supporting Infrastructure.	Supporting infrastructure including roads, borefields, pipelines, fire management, power/water transmission utilities, etc associated with the above Activities.
8	Buffer Zones.	Industrial and sensitive land use buffers and Manari Road diversion.
9	Fire Management.	Management of fire within buffer zones and the wider Dampier Peninsula.

3.6.1.1. Decommissioning

Once the land is no longer required for the LNG Precinct, the facilities will be decommissioned, rehabilitated for the end land use and returned to the Traditional Owners.

Zones within which activities outlined above will take place are shown on **Figure 3-2**.



• **Figure 3-2 Area within Which the Plan and its Activities will be Implemented.**

3.6.2. Activities That Are Not Included in the Plan

The Plan does not include upstream development of the gas reserves. Public road upgrades to the BLNG Precinct area are also excluded from the Plan (with the exception of Manari Road diversion). Finally, activities that occur away from the Precinct that will be associated with derived proposals but are subject to their own approval processes are also excluded. These may include fabrication yards in other regions or overseas and shipping activities beyond the immediate Precinct area.

3.7. Matters of National Environmental Significance and Heritage

3.7.1. Matters of NES Relevant to the Implementation of the Plan

The Strategic Assessment has identified the following key matters of NES based on the following rationale:

- 1) **Listed threatened terrestrial species** - the greater bilby (*Macrotis lagotis*) on the basis that it has the potential to occur in pindan woodland in the James Price Point coastal area and indirect evidence (possible foraging burrows) that the species occurs at Quondong Point to the south of the BLNG Precinct area. Other species of interest based on the possibility that they may occur in the area because of the presence of suitable habitat (but which have not been recorded during the course of surveys) include:

- Golden Bandicoot (*Isodon auratus auratus*);
- Golden-backed Tree Rat (*Mesembriomys macrurus*);
- Australian Painted Snipe (*Rostratula australis*); and
- Masked Owl (northern) (*Tyto novaehollandiae kimberli*).

The habitat of these species may be potentially affected by activities associated with the implementation of the Plan.

- 2) **Listed migratory bird species** - shoreline wader birds and threatened/migratory bird species utilising coastal habitat as a number of these species have been recorded or are likely to occur in the James Price Point coastal area as part of the broad migratory pathway and may be affected by disturbance to coastal or shoreline habit by the implementation of the Plan.
- 3) **Listed threatened whale species** - Humpback whales (*Megaptera novaeangliae*) as this species has been recorded within the James Price Point coastal area and may potentially interact with vessel movements, site disturbance and excavation and other aspects associated with the implementation of the Plan.
- 4) **Other listed marine mammals** – The Dampier Peninsula coastline between Cape Leveque (approximately 150km north east of James Price Point) and Cape Bossut (approximately 130km south west of James Price Point) provides important foraging habitat and supports a transient population of dugongs (*Dugong dugon*) which forage on seagrass beds. This species may be affected by various aspects associated with the implementation of the Plan including direct impacts from marine site disturbance and excavation and indirect impacts associated with loss of foraging habitat associated with sediment deposition and turbidity.
- 5) **Listed threatened turtles** – The James Price Point coastal area does not support consistently high densities of turtles, however, the area is used infrequently by inter-nesting and foraging turtles from nearby rookeries or post-nesting turtles migrating north or south to foraging areas; typically green (*Chelonia mydas*) and flatback turtles (*Natator depressus*). No significant green or flatback turtle nesting areas were identified on the mainland coast within the James Price Point coastal area. Other marine turtle species including hawksbill, loggerhead, leatherback and olive ridley turtles are not present in significant numbers in the vicinity of the James Price Point coastal area and do not commonly use the area for foraging or breeding. Habitat of these species may be disturbed by activities associated with the implementation of the Plan.
- 6) **Commonwealth Marine Area** – as this area is potentially affected by activities occurring in the vicinity of the 3Nm boundary associated with the implementation of the Plan.
- 7) **Wetlands of international importance** - Roebuck Bay is a Ramsar wetland and may be potentially affected by activities that may arise indirectly from the implementation of the Plan, largely associated with activities occurring within the vicinity of Broome.
- 8) **Monsoon vine thickets** - The monsoon vine thickets are not addressed in this Plan as a matter of NES but they are addressed in **Part 4, Section 2.4** as State Threatened Ecological Community (**TEC**). Management

arrangements are also provided in this Plan to protect the monsoon vine thickets as they are a potential habitat for threatened species.

3.7.2. Management Arrangements for Achieving Conservation Outcomes

The term ‘management arrangements’ is defined for the purposes of this document as being those processes and outcomes that the State will administer to ensure the overarching outcomes for conservation are achieved unless attributable to factors outside of the control of the State. Under the EPBC Act, a management arrangement is defined as a management plan, regime or policy. The management arrangements are a subset of all the mitigation measures or safeguards developed that are relevant to the protection of matters of NES and are outlined in **Table 3-3** to **Table 3-8**.

In addition to the management arrangements outlined in **Table 3-3** to **Table 3-8**, the State Government has committed to managing the construction workforce to minimise their potential impacts on the local environment. The strategy is based on managing the exit and entry of the workforce and external entry by people not legitimately at the Precinct by means of a managed access construction camp will. This arrangement requires that all commercial proponents accommodate workers for the construction of the Port Facility and LNG facility at workers’ accommodation outside of Broome where worker activities can be managed to ensure potential impacts on the environment are not significant. The strategy is summarised in **Table 3-2**.

- **Table 3-2 Management Arrangements for the Management of Construction Workers (Managed-access Construction Camp).**

Objective:				
<ul style="list-style-type: none"> • To mitigate the potential for negative impact on the communities and environment of Broome and the Dampier Peninsula from the construction work force associated with the BLNG Precinct. 				
Outcomes	Time	Phase/s	Responsibility	
Responsible management of the effects of a large scale construction workforce on the local communities.	On-going.	Construction.	Lead Commercial Proponent(s).	Secondary Precinct Management.
Planned and managed interaction with the local population during transit between the airport, the workers’ accommodation and Precinct and when on recreational breaks.	On-going.	Construction.		
Output				
A management plan to ensure the effective management of the construction workforce (especially FIFO workers), developed with all relevant stakeholders, within the stated timeframe, with relevant targets and performance indicators such as: <ul style="list-style-type: none"> • the percentage of workforce living at the managed access camp versus those living in Broome and the region. 	Pre-Construction.	Construction.		

3.7.3. Protection of Cultural Heritage Values

There are no places currently on the national heritage list within the area directly affected by the Precinct Plan or the HIA area more broadly. The preliminary assessment by the Australian Heritage council did not find sufficient evidence that heritage values of James Price Point met the very high threshold of significance for National Heritage. The Council’s final assessment will be publicly available following the decision by the Commonwealth Minister for the Environment on whether to include any part of the West Kimberley in the National Heritage List.

The cultural heritage management strategies outlined in Section 3, Part 5 of the SAR have been designed to address expectations and requirements at both the State and Federal levels, including the AH Act (WA), and the Commonwealth EPBC and ATSIHP Acts (as outlined below in 3.8.2).

In particular, potential cultural heritage impacts will be managed in consultation with the Traditional Owners, undertaking further heritage surveys and through the development of a Cultural Heritage Management Plan (currently under negotiation with Traditional Owners). These will be undertaken in accordance with the Browse LNG Heritage Protection Agreement and AH Act processes.

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• **Table 3-3 Management Arrangements to Achieve Conservation Outcomes for Terrestrial Species (Including Non-Migratory Birds).**

Key species of focus:

- greater bilby (*Macrotis lagotis*) – Vulnerable (EPBC Act), Schedule 1 *Wildlife Conservation Act 1950 (WC Act)*. There was no conclusive evidence of greater bilby presence during any of the fauna surveys; however, during the AECOM (AECOM, 2010b; **Appendix C-20**) survey some evidence of foraging activity was observed. It could not be determined whether this was a result of Bilby foraging activity or a varanid lizard species. Some foraging holes were identified that were indicative of this species, recorded in the vicinity of the BLNG Precinct area and south towards Quondong Point in pindan shrubland.

Other species potentially benefiting from measures:

- Golden bandicoot (*Isodon auratus auratus*) – Vulnerable (EPBC Act), Schedule 1 (WC Act). The last Department of Environment and Conservation record was in 1971 from the Coulomb Point Nature Reserve (Biota, 2009b; **Appendix C-17**) and currently there are no known populations of the species on the Dampier Peninsula. This species was not recorded at James Price Point during recent surveys; however suitable habitat of monsoon vine thickets, drainage basin and pindan vegetation, occurs within the area.
- Golden-backed tree rat (*Mesembriomys macrurus*) – Vulnerable (EPBC Act). No evidence of the occurrence of this species was found during surveys of James Price Point coastal area. Recent information suggests that the golden-backed tree rat may be regionally extinct from the Dampier Peninsula (AWC, 2010).
- Australian painted snipe (*Rostratula australis*) – Vulnerable/Migratory (EPBC Act). This species has been recorded near the James Price Point coastal area by the DEC (Biota, 2009b; **Appendix C-17**), however, this species was not recorded in any of the site surveys by Biota, AECOM or ENV. Although its preferred habitat is shallow freshwater swamps which are not present in the James Price Point coastal area, it may occur within the drainage basin habitat of the area following wet season rainfall.
- Masked owl (northern) (*Tyto novaehollandiae kimberli*) - Vulnerable (EPBC Act). Whilst there is a single record of the northern masked owl in the vicinity of Broome, there have been no other records of the subspecies from the Dampier Peninsula. The masked owl has broad habitat requirements and may utilise all habitat types within the BLNG Precinct area, and wider Dampier Peninsula as part of larger foraging territory.

Of these, only the Australian painted snipe has recently been recorded in the vicinity of the James Price Point coastal area (Biota, 2009b; **Appendix C-17**).

Species and conservation outcome	Management activities to achieve outcome	Rationale for management	Monitoring	Responsibility and Delivery mechanism	Timing	Performance measure/ target
Greater bilby <ul style="list-style-type: none"> Species protected from significant adverse impacts Ecosystem function of habitat maintained. 	<u>Avoid impact:</u> Construction activities will not be permitted within the vicinity of potential greater bilby habitat around Quondong Point.	Foraging holes potentially attributable to greater bilby activity have been observed south at Quondong Point. If occurring at Quondong Point, most likely to be present as transient individuals rather than an established resident population.	Further surveys will be conducted at Quondong Point to establish presence/absence of greater bilby population to determine the size and range of the population.	DSD as a State Commitment. Proposals will only be approved as derived proposals under the State EP Act if they have been assessed through the Strategic Assessment. Therefore, no disturbance near Quondong Point will be approved as part of this Plan.	Prior to construction within Precinct.	Should surveys identify a viable established population of greater bilbies, the performance measure will be to ensure the maintenance and protection of a viable bilby population at or better than pre-development baseline population at Quondong Point unless attributable to factors outside of the control of the State.
Greater bilby (Mitigation will also benefit masked owl if present) <ul style="list-style-type: none"> Species protected from significant adverse impacts; and Ecosystem function of habitat maintained. 	<u>Mitigate impact:</u> Proponents will be required to submit a design rationale demonstrating that the location of Light Industrial Area, workers' accommodation and the plant and infrastructure design and layout and alignment of onshore pipelines and ancillary infrastructure has prioritised areas of more degraded pindan habitat over that in relative better condition.	Although greater bilby has not been recorded within the Precinct area, if it occurs at Quondong Point, suitable habitat in the form of Pindan woodland and shrubland does exist inland at James Price Point and could be used by the species if within the range of Quondong Point individuals. Pindan woodland may also represent potential foraging habitat for the masked owl.	Review of design rationale.	Proponents for Light Industrial Area, workers' accommodation, plant and infrastructure, onshore pipelines and ancillary infrastructure will be required to submit their design rationale as part of their derived proposal referral under the EP Act.	At submission of related derived proposal referrals.	Submission of design rationale.
Greater bilby <ul style="list-style-type: none"> Species protected from significant adverse impacts; Existing threatening processes (being feral animals, fire and uncontrolled access) improved locally and regionally; and Ecosystem function of habitat maintained. 	<u>Mitigate impact:</u> If a greater bilby population is identified at Quondong Point following further surveys, a management plan for the species on the Dampier Peninsula shall be prepared to address management of access, feral animal control and monitoring of populations. The Plans will be prepared in accordance with relevant Threat Abatement Plans and the National Recovery Plan for the greater bilby .	To provide for the State to allocate additional resources for the management of greater bilby if the presence of the species is confirmed at Quondong Point.	If a greater bilby population is identified at Quondong Point, a management plan for the species on the Dampier Peninsula shall be prepared to address ongoing monitoring of populations including at Quondong Point and in established conservation areas.	DSD, through their involvement in the BLNG Precinct Control Group.	A targeted search for greater bilbies will be undertaken prior to the commencement of construction. If the species is identified, a management plan for the species will be submitted to DEC and SEWPAC within three months of the BLNG Precinct Control Group receiving the survey results.	Should surveys identify a viable established population of greater bilbies, performance measure will be to ensure the maintenance and protection of a viable bilby population at or better than pre-development baseline population at Quondong Point, and at monitoring sites elsewhere on Dampier Peninsula, unless attributable to factors outside of the control of the State.
Greater bilby (Mitigation will also benefit masked owl if present)	<u>Offset:</u> If a greater bilby population is identified at Quondong Point, then primary greater bilby habitat	To provide for the protection of known habitat of greater bilby if the presence of the species is	If a greater bilby population is identified at Quondong Point, a management plan	DSD, through their involvement in the BLNG Precinct Control Group.	The State Government is currently preparing a Kimberley Science and Conservation Strategy .	Should surveys identify a viable established population of greater bilbies, performance measure will

Species and conservation outcome	Management activities to achieve outcome	Rationale for management	Monitoring	Responsibility and Delivery mechanism	Timing	Performance measure/ target
<ul style="list-style-type: none"> Existing threatening processes (being feral animals, fire and uncontrolled access) improved locally and regionally; and Ecosystem function of habitat maintained. 	(Pindan dune swale system of Dampier Peninsula) in good condition (based on fire history) will be a key consideration in establishment of future terrestrial conservation areas on the Dampier Peninsula.	confirmed at Quondong Point.	for the species on the Dampier Peninsula shall be prepared to address ongoing monitoring of populations including at Quondong Point and in established conservation areas.		Extension of the reserve system on the Dampier Peninsula to be substantially progressed including negotiations with all relevant parties at the commencement of LNG facilities.	be to ensure the maintenance and protection of a viable bilby population at or better than pre-development baseline population at monitoring sites in future terrestrial conservation areas, unless attributable to factors outside of the control of the State.
<p>Greater bilby Golden bandicoot Golden-backed tree rat Masked owl Painted snipe</p> <ul style="list-style-type: none"> Existing threatening processes (being fire) improved locally and regionally; and Ecosystem function of habitat maintained. 	<u>Mitigate impact:</u> Fire Management Strategy will be developed for the Dampier Peninsula in cooperation with Traditional Owners and Pastoralists to include measures as determined during preparation of the Strategy that will reduce the number of late season fires and increase the time between fires in any given area.	The occurrence of hot intense late season fires and high frequency of fires prevents the full recovery of pindan woodland and alters its habitat values over time for greater bilby, masked owl and painted snipe while causing the retreat of monsoon vine thickets, potentially inhabited by golden bandicoot in the northern Dampier Peninsula. The proposed measure will aim for a cooperative program on the Dampier Peninsula to reduce these processes.	Fire history records will be maintained by the DEC.	DSD, through their involvement in the BLNG Precinct Control Group. The Fire Management Strategy will be facilitated through the State Government funding committed to the Kimberley Science and Conservation Strategy . DEC has identified fire management as the key conservation management priority in the Kimberley.	Prior to commencement of construction of terrestrial facilities.	Reduction in number of late season fires (taking into account natural variability and other influencing factors) on Dampier Peninsula and increase in time between fires in any given area.
<p>Australian painted snipe</p> <ul style="list-style-type: none"> Species protected from significant adverse impacts; and Ecosystem function of habitat maintained. 	<u>Avoid impact:</u> Drainage basin community will not be directly disturbed for Precinct construction or operation.	Although its preferred habitat is shallow freshwater swamps which are not present in the James Price Point coastal area, the painted snipe may occur within the drainage basin habitat of the area following wet season rainfall.	Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance - with particular reference to Monsoon Vine Thicket and Drainage Basin communities will be implemented that includes condition and health monitoring.	Commercial proponents The State Ministerial Statements under the EP Act will limit approved footprints to that shown in Figure 3-2 , which avoids direct disturbance of the drainage basin community.	During construction and operation.	No clearing in drainage basin during construction or operation.
<p>Australian painted snipe</p> <ul style="list-style-type: none"> Species protected from significant adverse impacts; Existing threatening processes (being feral animals, fire and uncontrolled access) improved locally and regionally; and Ecosystem function of habitat maintained. 	<u>Mitigate impact:</u> Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance and Ecological Surface Water Requirements Management Plan will be implemented to control access, manage fire and weeds, and ensure the hydrology of the drainage basin is not altered such that the condition of the vegetation declines as a result of the LNG Precinct construction and operation activities.	Uncontrolled access into drainage basin community and changes to stormwater flow may affect its habitat value for species.	Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance - will address monitoring of vegetation condition of the drainage basin community. Weed infestation will be addressed through a Weed Management Plan . Ecological Surface Water Requirements Management Plan - will include monitoring of surface water flows into and groundwater levels under the drainage basin for comparison with vegetation condition monitoring.	Commercial proponents to prepare and implement the management plans as a requirement of approval under the State EP Act. The management plans will be required to be prepared to the satisfaction of the State Minister for Environment, in consultation with SEWPAC.	During construction and operation.	No significant decline in vegetation condition in drainage basin during construction and operation attributable to Precinct development and operation.
<p>Golden bandicoot Golden-backed tree rat</p> <ul style="list-style-type: none"> Species protected from significant adverse impacts; Existing threatening processes (being feral animals, fire and uncontrolled access) improved 	<u>Mitigate impact:</u> Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance and Ecological Surface Water Requirements Management Plan will be implemented to control access, manage fire and weeds,	Changes in habitat value in areas of retained monsoon vine thicket could occur from alteration of surface hydrology and uncontrolled access and fire regimes.	Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance - will address monitoring of vegetation condition of the drainage basin community. Weed	Commercial proponents to prepare and implement the management plans as conditions of approval under the State EP Act. The management plans will be required to be prepared to the satisfaction of the State Minister for Environment in consultation with SEWPAC.	During construction and operation.	No significant decline in vegetation condition in areas of monsoon vine thicket retained around the Precinct attributable to Precinct development and operation.

Species and conservation outcome	Management activities to achieve outcome	Rationale for management	Monitoring	Responsibility and Delivery mechanism	Timing	Performance measure/ target
<p>locally and regionally; and</p> <ul style="list-style-type: none"> Ecosystem function of habitat maintained. 	<p>and ensure the hydrology of the retained monsoon vine thicket is not altered such that the condition of the vegetation declines.</p>		<p>infestation will be addressed through a Weed Management Plan.</p> <p>Ecological Surface Water Requirements Management Plan - will include monitoring of surface water flows into and groundwater levels under the monsoon vine thicket for comparison with vegetation condition monitoring.</p>			
<p>Golden bandicoot Golden-backed tree rat</p> <ul style="list-style-type: none"> Existing threatening processes (being fire) improved locally and regionally; and Ecosystem function of habitat maintained. 	<p>Offset: Manari Road will be realigned/relocated away from its existing route through monsoon vine thickets between Quondong Point and James Price Point and the old road rehabilitated to restore monsoon vine thicket. The rehabilitation program will be described in the Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance.</p>	<p>Relocation of the road will reduce fragmentation of the monsoon vine thicket and edge effects (e.g. erosion, weed infestation) and the rehabilitation of the habitat will aim to offset a proportion of the loss arising from clearing for the Precinct.</p>	<p>Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance - will include a monitoring program for assessment of the success of rehabilitation. It is anticipated this will include monitoring of species richness, weed species richness, % cover, % weed cover, and vegetation health in quadrats in rehabilitation areas as compared to surrounding areas.</p>	<p>DSD, through their involvement in the BLNG Precinct Control Group.</p>	<p>Relocation of Manari Road and commencement of rehabilitation prior to LNG facility operation.</p>	<p>Increase in native species richness and cover and decrease in weeds species richness and cover over time and/or other completion criteria as agreed with DEC and Traditional Owners.</p>

• **Table 3-4 Management Arrangements to Achieve Conservation Outcomes for Migratory Bird Species.**

Key species of focus:

- Migratory bird species (shoreline waders). A total of 39 bird species listed as 'migratory' under the EPBC Act have been recorded within the James Price Point. This suite of species, and suitable habitats, are widespread and well-represented on the Dampier Peninsula (Galaxia, 2010; **Appendix C-1**) of the migratory bird species, 21 shorebird species were recorded.

Other species potentially benefiting from measures:

- threatened/migratory species utilising coastal habitat – any other EPBC Listed species that may utilise the broader area.

Species and conservation outcome	Management activities to achieve outcome	Rationale for management	Monitoring	Responsibility and Delivery mechanism	Timing	Performance measure/ target
Migratory bird species (shoreline waders) • Species protected from significant adverse impacts.	<u>Avoid impact:</u> No areas of high value to migratory birds, such as mudflats and mangroves, will be directly impacted by development of the BLNG Precinct.	Mudflat and mangrove habitats are known to be of higher value to migratory birds.	N/A	Actions will only be able to be approved under the Plan as endorsed by the Federal Minister if they are part of the Plan and have been assessed through the Strategic Assessment. As there are no mudflats or mangroves within the Precinct footprint, no impact on these areas will be approved as part of this Plan.	During construction and operation.	No new disturbance in areas of mudflat or mangrove habitat on Dampier Peninsula attributable to Precinct development.
Migratory bird species (shoreline waders) • Species protected from significant adverse impacts; • Existing threatening processes (being feral animals, fire and uncontrolled access) improved locally and regionally; and • Ecosystem function of habitat maintained.	<u>Mitigate impact:</u> Proponents will be required to submit a design rationale demonstrating how working widths and infrastructure corridors have been reduced to the narrowest practicable to minimise disturbance within the sections of shoreline designated for development for the BLNG Precinct.	Modification of shoreline will reduce local extent of coastal habitat of moderate value available for migratory bird species. Up to one kilometre of shoreline will be permanently modified for the shore crossing, with temporary disturbance of an additional one kilometre for pipeline corridors.	Review of design rationale.	Commercial proponents will be required to submit their design rationale as part of their derived proposal referral under the EP Act.	At submission of derived proposal referral.	Submission of design rationale to satisfaction of the EPA.
Migratory bird species (shoreline waders) • Species protected from significant adverse impacts; and • Ecosystem function of habitat maintained.	<u>Mitigate impact:</u> Areas disturbed during construction but not required for permanent development of the BLNG Precinct will be rehabilitated and stabilised according to a Rehabilitation Plan to be prepared by LNG Proponents.	There are opportunities to rectify a substantial portion of the direct disturbance arising from shoreline construction through rehabilitation of land that is able to be restored over constructed infrastructure and in temporary construction areas (e.g. working areas).	Rehabilitation monitoring program to be detailed in Rehabilitation Plan for assessment against completion criteria agreed with DEC and Traditional Owners.	Commercial proponents to prepare and implement Rehabilitation Plans as conditions of approval under the State EP Act. The management plans will be required to be prepared to the satisfaction of the State Minister for Environment in consultation with SEWPAC.	Plans to be prepared and approved prior to operation.	Rehabilitation completion criteria to be agreed with DEC.
Migratory bird species (shoreline waders) • Existing threatening processes improved locally and regionally; and • Ecosystem function of habitat maintained.	<u>Offset:</u> Areas of high value to migratory birds such as mudflats and mangroves will be a key consideration in establishment of future terrestrial and marine conservation areas on and around the Dampier Peninsula. Establishment of conservation reserves will also ensure protection of coastal areas similar to those directly impacted by the development.	Mudflats and mangroves are considered important habitats for migratory bird species. The conservation of these habitats will help ensure the long term conservation of these species on the Dampier Peninsula.	Surveys of areas identified for potential conservation will be conducted to confirm high usage by migratory birds prior to designation of conservation areas.	DSD, through their involvement in the BLNG Precinct Control Group.	The State Government is currently preparing a Kimberley Science and Conservation Strategy . Extension of the reserve system on the Dampier Peninsula to be substantially progressed including negotiations with all relevant parties at the commencement of LNG facilities.	Establishment of conservation areas within time period and demonstrated to include areas of high value/use to migratory birds.

• **Table 3-5 Management Arrangements to Achieve Conservation Outcomes for Cetaceans (Including Whales).**

Key species of concern:

- Humpback whales (*Megaptera novaeangliae*) - Threatened (EPBC Act) Schedule 1 (WC Act). Coastal waters of the Dampier Peninsula form part of the Group IV humpback whale migration route from early June to November. Key regionally important areas include Camden Sound (approximately 344km north of James Price Point), and Pender Bay (approximately 103km north east of James Price Point) as calving, staging and resting areas.

Other marine cetacean matters of NES potentially benefiting from measures:

- Other marine mammal species such as the bottlenose (*Tursiops* spp.) and spinner (*Stenella longirostris*) dolphin were widespread and commonly recorded in the Canning Marine Bioregion. Other species such as Indo-Pacific humpback dolphin (*Sousa chinensis*), snubfin dolphin (*Orcaella heinsohni*) and killer whale (*Orcinus orca*) were recorded in very low numbers in the Canning Marine Bioregion (including in the vicinity of James Price Point), despite considerable survey effort.

Species and conservation outcome	Management activities to achieve outcome	Rationale for management	Monitoring	Responsibility and Delivery mechanism	Timing	Performance measure/ target
Humpback whales <ul style="list-style-type: none"> • Species protected from significant adverse impacts. 	Avoid impact: Provide information to LNG and condensate tankers regarding whale aggregation areas around Camden Bay and Pender Bay resting and calving area.	High numbers of humpback whales aggregate in Camden Bay and Pender Bay to rest and calve (DEWHA, 2009a). The management arrangement is focussed on avoiding impacts on regionally significant aggregation areas as a result of vessel strike.	Record the movement of LNG and condensate tankers entering and exiting the BLNG Precinct port using AIS transponders or equivalent.	Broome Port Authority will provide information to tankers as part of the Vessel Management Plan to be prepared and implemented as a condition under the State EP Act, to the satisfaction of the State Minister for Environment in consultation with SEWPAC.	Plan to be prepared and approved prior to LNG export.	No LNG and condensate tankers associated with the BLNG Precinct entering the Camden Sound/Pender Bay calving and resting area.
Humpback whales <ul style="list-style-type: none"> • Species protected from significant adverse impacts; and • Ecosystem function of habitat maintained. 	Mitigate impact: Limit disturbance to migration pathways for humpback whales during pipeline and BLNG Precinct port construction. Measures will be detailed in the Port Facilities Construction Environmental Management Plan , Vessel Management Plan , and Dredging Spoil Disposal Management Plan relating to mitigating impacts on humpback whale migration.	The Group IV humpback whale population migrates past the James Price Point coastal area on northern and southern migration pathways between June and November each year. The majority of the population migrate between approximately 8km and 42km offshore. Pipeline construction activities may impact on humpback whale migration behaviour as proposed feedstock pipelines intersect pathways. The remainder of construction activities and vessel movements for the BLNG Precinct will be concentrated in the port area and are unlikely to affect migration.	Record numbers of humpback whales using aerial surveys in the migration corridor offshore of James Price Point.	The proponent(s) for the port and pipelines will be required to prepare and implement management plans as conditions of approval under the State EP Act. The management plans will be required to be prepared to the satisfaction of the State Minister for Environment in consultation with SEWPAC.	Plans to be prepared and approved prior to marine construction activities commencing.	No significant effect on regional population of humpback whales (including migration behaviour) as a result of pipeline and port construction activities, taking into account natural variability and other influencing factors on population dynamics.
Humpback whales <ul style="list-style-type: none"> • Existing threatening processes improved locally and regionally; and • Ecosystem function of habitat maintained. 	Offset: Known resting and/or calving areas for Group IV humpback whales, as indicated by migration surveys, will be a key consideration in establishment of marine conservation areas in Western Australia, including means to manage shipping in these areas.	Construction activities may impact on humpback whale migration behaviour along migration pathways. Conservation efforts will focus of offsetting any such impacts by identifying areas of high value to humpback whale migration and calving in proximity of Dampier Peninsula for protection and exclusion of disruptive activities.	Record numbers of humpback whales using aerial surveys in the migration corridor offshore of James Price Point.	DSD, through their involvement in the BLNG Precinct Control Group.	The State Government is currently preparing a Kimberley Science and Conservation Strategy . Extension of the reserve system on the Dampier Peninsula to be substantially progressed including negotiations with all relevant parties at the commencement of LNG facilities.	Establishment of marine conservation areas within time period and demonstrated to include known resting and/or calving areas.

• **Table 3-6 Management Arrangements to Achieve Conservation Outcomes for Dugongs and Turtles.**

Key species of concern:

- Dugongs (*Dugong dugon*) - migratory marine mammal (EPBC) Schedule 1 (WC Act). The Dampier Peninsula coastline between Cape Leveque and Cape Bossut (approximately 130km south west of James Price Point) (including James Price Point coastal area) provides foraging habitat and supports a transient population of dugongs.

Other species potentially benefiting from measures:

- Loggerhead turtle (*Caretta caretta*) - endangered/migratory - not present in significant numbers in the vicinity of the James Price Point coastal area and this species does not commonly use the area for foraging or breeding.
- Green turtle (*Chelonia mydas*) - vulnerable/migratory - this species may use the James Price Point coastal area infrequently during inter-nesting from nearby rookeries or when migrating north or south to foraging areas. No significant green turtle nesting areas were identified on the mainland coast within the James Price Point coastal area.
- Hawksbill turtle (*Eretmochelys imbricate*) - vulnerable/migratory - not present in significant numbers in the vicinity of the James Price Point coastal area and this species does not commonly use the area for foraging or breeding.
- Flatback turtle (*Natator depressus*) - vulnerable/migratory - this species may use the James Price Point coastal area infrequently during inter-nesting from nearby rookeries or when migrating north or south to foraging areas. No significant flatback turtle nesting areas were identified on the mainland coast within the James Price Point coastal area.
- Olive ridley turtle (*Lepidochelys olivacea*) - not present in significant numbers in the vicinity of the James Price Point coastal area and this species does not commonly use the area for foraging or breeding.
- Leatherback turtle (*Dermochelys coriacea*) - not present in significant numbers in the vicinity of the James Price Point coastal area and this species does not commonly use the area for foraging or breeding.

Species and conservation outcome	Management activities to achieve outcome	Rationale for management	Monitoring	Responsibility and Delivery mechanism	Timing	Performance measure/ target
Dugongs <ul style="list-style-type: none"> Species protected from significant adverse impacts Ecosystem function of habitat maintained. 	<u>Avoid impact:</u> LNG and condensate tanker movements will be provided with information regarding dugong aggregation areas. Vessels associated with construction will be prevented from entering Carnot Bay, Roebuck Bay Ramsar Wetland, and inshore of the Lacepede Islands, unless demonstrated that there is no practicable alternative available.	Areas inshore of the Lacepede Islands (offshore of Beagle Bay) around Carnot Bay and Roebuck Bay are considered to be important areas for dugongs based on relative densities. Roebuck Bay appeared to consistently have the highest concentrations of dugongs, including calves in the survey area. The management arrangement is focussed on avoiding impacts on regionally significant aggregation areas as a result of vessel strike.	Survey dugong populations in the vicinity of James Price Point and other areas on the Dampier Peninsula to determine changes over time. Record dugong strike and mortality. Record frequency, pathway and speed of vessel movements.	Vessels associated with construction will be managed in accordance with the Port Facilities CEMP and Vessel Management Plan that will be required to be prepared as a condition of approval under the State EP Act, to the satisfaction of the State Minister for Environment in consultation with SEWPAC.	Plans to be prepared and approved prior to marine construction activities commencing.	No tankers associated with the BLNG Precinct to enter inshore of the Lacepede Islands (offshore of Beagle Bay) around Carnot Bay and Roebuck Bay Ramsar Wetland No dugong-vessel interactions in Carnot Bay, Roebuck Bay Ramsar Wetland, and inshore of the Lacepede Islands during construction, as determined by DEC.
Dugongs <ul style="list-style-type: none"> Species protected from significant adverse impacts; and Ecosystem function of habitat maintained. 	<u>Mitigate impact:</u> Prepare and implement a vessel management plan that includes a procedure that prevents vessels associated with construction activities entering Carnot Bay, Roebuck Bay Ramsar Wetland, and inshore of the Lacepede Islands, without specific approval from the Broome Port Authority.	As above.	As above.	The proponent(s) for marine construction activities will be required to prepare and implement Vessel Management plans as conditions of approval under the State EP Act. The management plans will be required to be prepared to the satisfaction of the State Minister for Environment in consultation with SEWPAC.	Plans to be prepared and approved prior to marine construction activities commencing.	No dugong-vessel interactions in Carnot Bay, Roebuck Bay Ramsar Wetland, and inshore of the Lacepede Islands during construction, as determined by DEC
Dugongs <ul style="list-style-type: none"> Species protected from significant adverse impacts; and Ecosystem function of habitat maintained. 	<u>Mitigate impact:</u> Manage vessel navigation, operations and movements within the port area to minimise the likelihood of dugong/vessel interactions. This will be addressed in a Port Facilities Construction Environmental Management Plan .	There is some potential for construction activities and vessel movements for the BLNG Precinct, mostly concentrated in the port area, to interact with dugongs migrating past James Price Point. Past surveys have indicated a transient population of dugongs are likely to move between more commonly used areas such as Beagle Bay and Montgomery Islands (Prince, 1984) probably shifting between Roebuck Bay, the Dampier Peninsula and south of Beagle Bay depending on the time of year (SKM, 2009c and RPS, 2010c; Appendix C-9).	Record dugong strike and mortality. Record frequency and speed of vessel movements. Record the numbers of dugongs during the observation period and the management response undertaken by the vessel operator.	Broome Port Authority through their authority to control vessel movements within the port under the <i>Port Authorities Act 1999</i> .	Plans to be prepared and approved prior to marine construction activities commencing.	No unacceptable number of dugong/vessel interactions or mortalities as agreed with DEC and SEWPAC in Port Facilities Construction Environmental Management Plan .

Species and conservation outcome	Management activities to achieve outcome	Rationale for management	Monitoring	Responsibility and Delivery mechanism	Timing	Performance measure/ target
		Numbers of dugongs present within the port area at any time will vary seasonally ranging between 5 (March survey estimates) and 20 (September survey estimates) (roughly 1% of the estimated regional population).				
Dugongs <ul style="list-style-type: none"> Species protected from significant adverse impacts. 	<u>Mitigate impact:</u> Establish dugong observation and notification program during dredging and spoil disposal to ensure that dugongs are not harmed or killed during the course of these activities.	As above.	Observation records to be maintained by LNG Proponents.	The proponent(s) for dredging activities will be required to prepare and implement Dredging and Dredge Spoil Disposal Management Plan and marine fauna and vessel interaction management and monitoring strategy as conditions of approval under the State EP Act, to the satisfaction of the Minister for Environment in consultation with SEWPAC.	Plans to be prepared and approved prior to the commencement of dredging.	No injuries or mortality of dugongs during dredging and spoil disposal attributable to these activities.
Dugongs <ul style="list-style-type: none"> Species protected from significant adverse impacts; and Ecosystem function of habitat maintained. 	<u>Mitigate impact:</u> Prepare and implement a Dredging and Dredge Spoil Disposal Management Plan that addresses the minimisation of impact to seagrass areas.	Seagrass meadows providing foraging habitat for dugongs can be affected by site disturbance and excavation and through deposition of sediment or loss/reduction of light from increased turbidity in the water column from dredge plumes.	Water quality monitoring program to be agreed with EPA and DEC in Dredging and Dredge Spoil Disposal Management Plan .	The proponent(s) for dredging activities will be required to prepare and implement Dredging and Dredge Spoil Disposal Management Plan and marine fauna and vessel interaction management and monitoring strategy as conditions of approval under the State EP Act, to the satisfaction of the Minister for Environment in consultation with SEWPAC.	Plans to be prepared and approved prior to the commencement of dredging.	Extent of direct seagrass disturbance does not exceed that predicted in Strategic Assessment. Criteria and triggers for seagrass loss defined in the Dredging and Dredge Spoil Disposal Management Plan prepared to satisfaction of EPA and DEC.
Dugongs <ul style="list-style-type: none"> Species protected from significant adverse impacts; Existing threatening processes improved locally and regionally; and Ecosystem function of habitat maintained. 	<u>Offset:</u> Known aggregation and calving areas for dugongs, as indicated by prior vessel and aerial surveys, will be a key consideration in establishment of marine conservation areas around the Dampier Peninsula.	Construction activities may impact on dugongs; largely in the BLNG Precinct port area. Conservation efforts will focus of offsetting any such impacts by identifying areas of high value to dugongs in proximity of Dampier Peninsula for protection and exclusion of disruptive activities.	Extensive baseline information exists on dugong aggregation areas in the Dampier Peninsula. Monitoring as per the proposed Marine Conservation Area Management Plan that will require long term monitoring programs.	DSD, through their involvement in the BLNG Precinct Control Group.	The State Government is currently preparing a Kimberley Science and Conservation Strategy . Extension of the reserve system on the Dampier Peninsula to be substantially progressed including negotiations with all relevant parties at the commencement of LNG facilities.	Establishment of marine conservation areas within the time period and demonstrated to include known dugong aggregation and calving areas.
Loggerhead turtle Green turtle Hawksbill turtle Flatback turtle Olive ridley turtle Leatherback turtle <ul style="list-style-type: none"> Species protected from significant adverse impacts; and Ecosystem function of habitat maintained. 	<u>Avoid impact:</u> No known significant turtle nesting beaches will be directly impacted by development.	The location for the BLNG Precinct port area at James Price Point has been shown to be of low use by turtle species for nesting. Development associated with the Precinct is to ensure no nesting areas to be disturbed.	N/A	Actions will only be able to be approved under the Plan as endorsed by the Federal Minister if they are part of the Plan and have been assessed through the Strategic Assessment. As there are no mudflats or mangroves within the Precinct footprint, no impact on these areas will be approved as part of this Plan.	During construction and operation.	No new disturbance in known significant turtle nesting areas on the Dampier Peninsula coast attributable to Precinct development.
Loggerhead turtle Green turtle Hawksbill turtle Flatback turtle Olive ridley turtle Leatherback turtle <ul style="list-style-type: none"> Existing threatening processes improved locally and regionally; and Ecosystem function of habitat maintained. 	<u>Offset:</u> Known concentrations of turtle nesting activity will be a key consideration in establishment of marine conservation areas around the Dampier Peninsula.	Conservation efforts will focus on providing net environmental benefits from the Plan by identifying areas of high value to turtle species in proximity of Dampier Peninsula for protection and exclusion of disruptive activities.	Extensive baseline information exists on turtle nesting areas on the Dampier Peninsula. Monitoring as per the proposed Marine Conservation Area Management Plan that will require long term monitoring programs.	DSD, through their involvement in the BLNG Precinct Control Group.	The State Government is currently preparing a Kimberley Science and Conservation Strategy . Extension of the reserve system on the Dampier Peninsula to be substantially progressed including negotiations with all relevant parties at the commencement of LNG facilities.	Establishment of marine conservation areas within the time period and demonstrated to include known areas where turtle nesting is concentrated.

• **Table 3-7 Management Arrangements to Achieve Conservation Outcomes for Commonwealth Marine Area.**

Intended conservation outcome	Management activities to achieve outcome	Rationale for management	Monitoring	Responsibility and Delivery mechanism	Timing	Performance measure/ target
Commonwealth Marine Area <ul style="list-style-type: none">Species protected from significant adverse impacts;Existing threatening processes improved locally and regionally; andEcosystem function of habitat maintained.	The following management plans will be implemented in the Commonwealth marine area: <ul style="list-style-type: none">Port Facilities Construction Environmental Management Plan.Vessel Management Plan.Dredging and Dredge Spoil Disposal Management Plan.Hydrocarbon and Chemical Spills Contingency Response Plan.Ship-board Oil Pollution Emergency Plan.Invasive Marine Species Management Plan.	Some marine construction activities will extend into Commonwealth Marine Areas, which may represent an increased risk of vessel strike and dredging activities affecting water quality, and invasive marine species being introduced, which could affect marine species.	Incident reporting and monitoring, as required by the relevant management plans.	The proponent(s) for activities within the Commonwealth Marine Area will be required to prepare the management plans as conditions of approval under the State EP Act, to the satisfaction of the Minister for Environment in consultation with SEWPAC.	Plans to be prepared and approved prior to the commencement of construction.	Implementation of the management plans with compliance with relevant performance measures therein.

• **Table 3-8 Management Arrangements to Achieve Conservation Outcomes for Ramsar Wetlands.**

Sites addressed:

- Roebuck Bay – Roebuck Bay is 60km from the BLNG Precinct area and is unlikely to be directly affected by the development. Indirect effects from the increased population in Broome may occur.
- Eighty Mile Beach – Eighty Mile Beach is more than 180km from the BLNG Precinct area and is unlikely to be directly affected by the development. Indirect effects from the increased population in Broome and their recreation activities may occur.

Ramsar site and conservation outcome	Management activities to achieve outcome	Rationale for management	Monitoring	Responsibility and Delivery mechanism	Timing	Performance measure/ target
Roebuck Bay Eighty Mile Beach <ul style="list-style-type: none">• Species protected from significant adverse impacts;• Existing threatening processes improved locally and regionally; and• Ecosystem function of habitat maintained.	<u>Offset</u> : Support development of Roebuck Bay Management Plan and DEC's management of Eighty Mile Beach.	Disturbance of Roebuck Bay and Eighty Mile Beach may occur from increased recreation use arising from any increase in population in Broome.	To be determined in management plans for Ramsar sites.	DSD, through their involvement in the BLNG Precinct Control Group.	As appropriate.	Establishment of Roebuck Bay Management Plan .

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3.8. Plan Implementation

A tiered approach is proposed for environmental management of the Precinct:

- *Tier 1 - State Government Measure*

State government measures have been developed to address environmental aspects associated with the BLNG Precinct with the highest potential environmental impact significance or uncertainty. State government measures provide a means by which regional scale mitigations or protection measures are realised and also ensure state government involvement in relevant precinct matters. Various state government agencies are responsible for supporting the implementation of these state government measures.

- *Tier 2 - Proposed Condition for the Strategic Proposal*

Conditions of approval for the strategic proposal have been proposed to address impacts from activities considered to be of moderate or high potential significance or uncertainty. The proposed conditions can be issued under section 45 of the EP Act and shall be met by derived proposal proponents, where a proposal relates, or is relevant to such conditions. These conditions will require sign-off by the State Minister for Environment or delegated authority.

- *Tier 3 - Requirements for Derived Proposals*

Additional requirements for derived proposal proponents have been proposed to address medium or low environmental impact significance from activities associated with the BLNG Precinct. These requirements will be implemented by derived proposal proponents at various stages of the development as applicable to the activity being undertaken. Some proposed requirements will require sign-off by the Minister for Environment or delegated authority.

3.8.1. Legal and Planning Framework

A number of controls exist or will be in place to ensure appropriate environmental outcomes are achieved and management applied during the implementation of the Plan. Key arrangements include:

- proposed environmental conditions issued by the State Minister for Environment to apply to derived proposals;
- conditions applying to approved actions or classes of actions to be implemented under the Plan to be imposed by the Commonwealth Minister for Environment, Water, Heritage and the Arts;
- requirements of works approvals and environmental licences and general environmental harm and pollution offences, under Part V of the EP Act;
- future planning controls under Regional or Town Planning Schemes;
- lease conditions to be applied to leaseholders in the BLNG Precinct; and
- other statutes (**Table 3-9** below).

3.8.2. Other Legislation Applying to the Implementation of the Plan

The BLNG Precinct Proponent, the Foundation Proponent and other future commercial proponents will also be required to comply with relevant legislation and regulations as summarised in **Table 3-9**.

• **Table 3-9 Summary of Legislation Applicable to the BLNG Precinct.**

Legislation	Relevance	Regulatory authority
Australian Government legislation		
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i>	Preserves and protects places, areas and objects of particular significance to Aboriginals and for related purposes.	SEWPAC
<i>Australian Maritime Safety Authority Act 1990</i>	Establishes a Maritime Safety Authority to combat marine pollution, enable search and rescue and other related purposes.	Australian Maritime Safety Authority (AMSA)
<i>Energy Efficiency Opportunities Act 2006</i>	Encourage more efficient use of energy by large energy using businesses and related purposes.	Department of Resources, Energy and Tourism (DRET)
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Protection of matters of National Environmental Significance.	SEWPAC
<i>Environment Protection (Sea Dumping) Act 1981</i>	Regulating dumping into the sea, incineration at sea and artificial reef placements and for related purposes.	SEWPAC
<i>Native Title Act 1993</i>	Recognises and protects Native Title in relation to land or waters and for related purposes and establishes a National Native Title Tribunal.	National Native Title Tribunal (NNTT)
<i>National Greenhouse and Energy Reporting Act 2007</i>	Reporting requirements with respect to greenhouse gas emissions, reductions, removals and offsets, and energy consumption and production.	Department of Climate Change and Energy Efficiency
<i>Navigation Act 1912</i>	Shipping and navigation.	Australian Maritime Safety Authority/Department of Infrastructure, Transport, Regional Development and Local Government
<i>Protection of the Sea (Prevention of Pollution from Ships) Act 1983</i>	Prevention of pollution from ships.	Department of Infrastructure, Transport, Regional Development and Local Government
<i>Quarantine Act 1908</i>	Examination, isolation, protection, treatment and regulation of vessels, installations, human beings, animals, plants or other goods or things.	Australian Quarantine and Inspection Service (AQIS), Department of Agriculture, Fisheries and Forestry (DAFF)
<i>Sea Installations Act 1987</i>	Permits to use and operate certain installations in the sea.	SEWPAC
State legislation		
<i>Environmental Protection Act 1986</i>	Prevention, control and abatement of pollution and environmental harm, conservation, preservation, protection, enhancement and management of the environment.	DEC
<i>Rights in Water and Irrigation Act 1914</i>	Requirements of allocation licences issued under the Act - dewatering and abstraction.	Department of Water (DoW)
<i>Aboriginal Heritage Act 1972</i>	Protection of Aboriginal heritage sites.	Department of Indigenous Affairs (DIA)
<i>Agriculture and Related Resources Protection Act 1976</i>	Management of declared plants (weeds).	Department of Agriculture and Food Western Australia (DAFWA)
<i>Bush Fires Act 1954</i>	Prevention, control and extinguishment of bushfires.	Fire and Emergency Services Authority (FESA)
<i>Conservation and Land Management Act 1984</i>	Use, protection and management of certain public lands, waters and flora and fauna.	DEC

Legislation	Relevance	Regulatory authority
<i>Contaminated Sites Act 2003</i>	Regulates matters relating to the identification, assessment, recording, management and cleanup of contaminated land.	DEC
<i>Dangerous Goods Safety Act 2004 (and associated regulations)</i>	Specifies requirements for storage and handling of dangerous goods.	Department of Minerals and Petroleum (DMP)
<i>Environmental Protection Act 1986</i>	Prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment	DEC
Environmental Protection (Controlled Waste) Regulations 2004	Transportation and disposal of 'controlled' (generally hazardous) wastes.	DEC
Environmental Protection (Noise Regulations) 1997	Specifies noise levels and air blast criteria.	DEC
Environmental Protection (Unauthorised Discharges) Regulations 2004	Requirements with respect to materials that must not be burnt or discharged into the environment.	DEC
<i>Fish Resources Management Act 1994</i>	Management of fish resources.	Department of Fisheries (DoF)
<i>Health Act 1911</i>	Disposal of wastewater (sewage).	Department of Health
Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974	Disposal of wastewater (sewage).	Department of Health
<i>Heritage of Western Australia Act 1990</i>	Conservation of places which have significance to the cultural heritage of the State.	Heritage Council of Western Australia (HCWA)
<i>Land Administration Act 1997</i>	Crown land and land acquisition.	Department of Land Administration (DoLA)
<i>Local Government Act 1995</i>	Local government – local planning schemes.	Department of Local Government and Regional Development (DLGRD)
<i>Marine and Harbours Act 1981</i>	Efficient and safe shipping and effective boating and port administration through the provision of certain facilities and services.	Department of Transport (DoT)
<i>Occupational Safety and Health Act 1984</i>	Promote and improve standards for occupational safety and health.	Department of Commerce
<i>Petroleum Act 1967</i>	Exploration and exploitation of petroleum resources.	DMP
<i>Petroleum Pipeline Act 1969</i>	Construction, operation and maintenance of pipelines for the conveyance of petroleum.	DMP
<i>Petroleum (Submerged Lands) Act 1982</i>	Exploration and exploitation of petroleum resources of submerged lands.	DMP
<i>Planning and Development Act 2005</i>	Land use planning and development.	Department of Planning (DoP)
<i>Pollution of Waters by Oils and Noxious Substances Act 1987</i>	Protection of the sea and certain waters from pollution by oil and other noxious substances discharged from ships and places on land.	DEC
<i>Shipping and Pilotage Act 1967</i>	Shipping and pilotage in and about ports.	Department of Transport (DoT)
<i>Soil and Land Conservation Act 1945</i>	Deals with the conservation of soil and land resources and with the mitigation of the effects of erosion.	DAFWA
<i>Wildlife Conservation Act 1950</i>	Protection of DRF and rare or endangered fauna and flora species.	DEC

3.8.3. State Management Framework for the Implementation of the Plan

The implementation of the Plan will involve an integrated and coordinated interaction between the government administrative and regulatory authorities and the proponents that will be overseen by a BLNG Precinct Control Group (PCG) who will report to the Minister for State Development and other Ministers as required. The Membership of the BLNG Precinct Control Group will be limited to key agencies (DSD, LandCorp and the Broome Port Authority (BPA)) and will be supported and advised by committees formed from the relevant agency, local government, Traditional Owners and industry proponent representatives (Figure 3-3).

The governance arrangements to be implemented by the State Government through the Department of State Development to manage implementation of the Plan involve the following entities:

- the BLNG Precinct Control Group; and
- various Support Committees.

3.8.4. Role of the BLNG Precinct Control Group

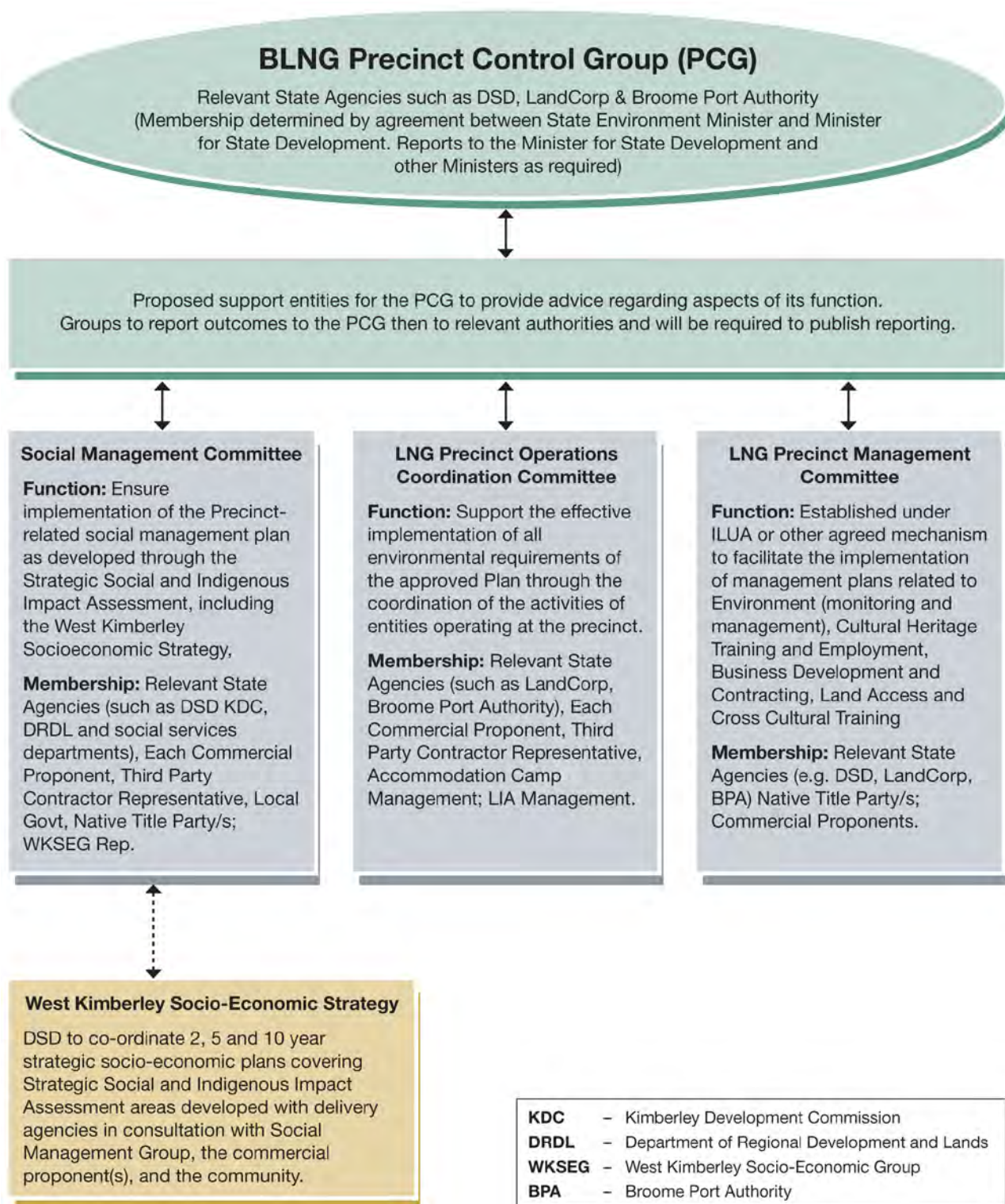
DSD will establish the BLNG Precinct Control Group to oversee and coordinate the implementation of the Plan in accordance with management arrangements and safeguards described in this Plan. The role and responsibilities of the BLNG Precinct Control Group in environmental management of the BLNG Precinct will be established by the State Minister for Environment through a procedure in *Implementation Statements* to be applied to future derived proposals. LandCorp and the Broome Port Authority will have authority for ensuring compliance by operators at the site through contractual arrangements such as lease and licence requirements. Lease agreements with proponents of future actions will be developed to institutionalise the PCG's role of monitoring the cumulative impacts of occupiers, coordinate and ensure the implementation of management arrangements (by both the State and proponents) specified in this Plan to the satisfaction of State and Commonwealth regulators.

The PCG will be responsible for the following actions:

- Monitor and report on overall performance of occupants of the Precinct and the implementation of management arrangements.
- Ensure cumulative impacts are monitored in accordance with requirements of management arrangements in this Plan.
- Coordinate the implementation and development of the Monitoring and Adaptive Management Program and emergency response and fire management.
- Establish advisory groups as necessary.
- Advise responsible authorities on lease conditions in order to give effect to management arrangements.
- Review proponent management plans to ensure consistency or compatibility where applicable (e.g. fire management).
- Make decisions regarding the allocation of any funds generated by the Precinct and administered by the State.
- Monitor and facilitate implementation of social agreements, as described in the SAR.
- Coordinate the dispersal of funds to manage cumulative impacts.
- Liaise with all parties that have an interest in the Precinct or surrounds.

Commitments as described in the SAR and management oversight of implementation by the PCG will be funded through a range of mechanisms including, but not limited to, the following:

- initial setup funding by the State Government;
- lease payments from proponents;
- State government funding for conservation through agreements with the traditional owners; and
- State government funding for the development of the Kimberley Science and Conservation Strategy.



• **Figure 3-3 BLNG Precinct Management Structure.**

3.8.5. Support Committees

Three committees will initially be established to support the PCG and provide advice regarding aspects of its function:

- Social Management Committee – to ensure the further development and implementation of the Precinct related social management plans developed through the Strategic Social and Indigenous Impacts Assessment, including the west Kimberley Socioeconomic Strategy and the Broome Social Services Strategy.
- LNG Precinct Operations Coordination Committee – to support the effective implementation of all environmental requirements of the approved precinct plan through the coordination of the activities of entities operating at the precinct.
- LNG Precinct Management Committee – to be established as part of the HoA between the State, Woodside and the KLC on behalf of the Goolarabooloo Jabirr Jabirr to facilitate the implementation of management plans related to Environment, Cultural Heritage Training and Employment, Business Development and Contracting, Land Access and Cross Cultural Training.

In the absence of formal social impact compliance mechanisms, the PCG will have a role in liaising with other relevant government agencies and commercial proponents to ensure that commitments, monitoring and reporting on social impacts and management is undertaken.

The incorporation of social impacts and management in the annual report on the implementation of the requirements of the SA which will be released to the public will help ensure transparency of the implementation of social impact management commitments and allow the Broome community to respond through DSD which in turn, will be responsible for following up implementation shortfalls or other issues with relevant agencies.

3.8.6. Land and Asset Tenure

As a precursor to an ILUA, a HoA between the State of Western Australia, the KLC and Woodside has been executed that outlines a range of commitments, including:

- taking only that land which is required for the BLNG Precinct, when it is required;
- when the land is no longer needed, returning it remediated to future land use to the Traditional Owners; and
- providing an area of land equivalent to that required for the BLNG Precinct, under freehold title, to the Traditional Owners, which they could develop.

Land tenure will ultimately be granted by the State of Western Australia to individual commercial proponents in the form of leases, easements or licences, in accordance with the *Land Administration Act 1997*, the *Western Australian Land Authority Act* or the *Port Authorities Act 1999*.

LandCorp will manage the onshore tenure arrangements granted under the *Land Administration Act 1997* or the *Western Australian Land Authority Act* while the Broome Port Authority will manage tenure arrangements granted under the *Port Authorities Act 1999*. It is anticipated that subleases may be granted by individual proponents depending on their commercial arrangements (for example sub-lease of BLNG Precinct land to third-party contractors). Importantly, these leases (and subleases), easements or licenses and their conditions must be consistent with the ILUA or applicable agreement.

3.9. Monitoring and Adaptive Management

The Monitoring and Adaptive Management Program is based on continually evaluating and validating the predictions of the extent of environmental impact made in the Strategic Assessment, and ensuring there is a response.

Monitoring programs will be undertaken by both the State and commercial proponents for the approved activities under the Plan to ensure implementation of proposed management and assessment performance against the established performance measures/targets (**Table 3-10**).

All management plans prepared under the proposed management arrangements will include contingency measures / remedial actions to be triggered should monitoring indicate that performance measures / targets have not, are not being, or are not likely to be achieved (**Table 3-10**).

• **Table 3-10 Monitoring and Adaptive Management Program.**

Performance measure/ target	Monitoring	Adaptive management response
Threatened terrestrial fauna		
Should surveys identify a viable established population of greater bilbies, performance measure will be to ensure the maintenance and protection of a viable bilby population at or better than pre-development baseline population at Quondong Point, and at monitoring sites elsewhere on Dampier Peninsula, unless attributable to factors outside of the control of the State.	Further surveys will be conducted at Quondong Point to establish presence/absence of greater bilby population and determine the size and range of the population. A management plan for the species shall be prepared to address ongoing monitoring of populations including at Quondong Point.	Greater Bilby Management Plan - to address responses to a decline in bilby population over time (if present) at Quondong Point and monitoring sites elsewhere on Dampier Peninsula, including: <ul style="list-style-type: none"> investigate likely cause of decline in population; rectify habitat impacts if the decline has occurred in association with Precinct development or operation; review regional management strategies for species, particularly in regard to feral animal control and fire management; and establish recovery program for species on Dampier Peninsula if regional decline or local recovery program if only local.
No clearing in drainage basin during construction or operation.	Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance - with particular reference to Monsoon Vine Thicket and Drainage Basin communities will be implemented that includes routine inspections of the drainage basin for signs of incursion.	Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance - to address responses to a clearing incident in drainage basin community, including: <ul style="list-style-type: none"> investigate cause of clearing; review clearing procedures and induction program for site personnel; and rectify/rehabilitate drainage basin vegetation.
No significant decline in vegetation condition in drainage basin during construction and operation attributable to Precinct development and operation.	Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance - will include routine inspections of the drainage basin for signs of disturbance, changes in vegetation condition and weed infestation. Ecological Surface Water Requirements Management Plan - will include monitoring of surface water flows into and groundwater levels under the drainage basin for comparison with vegetation condition monitoring.	Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance - to address responses to signs of disturbance, changes in vegetation condition and weed infestation, including: <ul style="list-style-type: none"> investigate cause/source of impact; review adequacy of management measures and induction program for site personnel; and rectify/rehabilitate drainage basin vegetation. Ecological Surface Water Requirements Management Plan - will include the following response to significant changes in vegetation health attributable to drought stress: <ul style="list-style-type: none"> investigate current hydrological regime; evaluate whether supplementation or diversion of stormwater feasible/warranted; and rectify/rehabilitate drainage basin vegetation.
Submission of design rationale demonstrating how the location of Light Industrial Area and workers' accommodation and determination of plant and infrastructure design and layout and alignment of onshore pipelines and ancillary infrastructure has prioritised	Review of design rationale.	None warranted.

Performance measure/ target	Monitoring	Adaptive management response
areas of more degraded pindan habitat over that in relative better condition, prior to construction.		
Reduction in number of late season fires (taking into account natural variability and other influencing factors) on Dampier Peninsula and increase in time between fires in any given area.	Fire history records will be maintained by the DEC.	Dampier Peninsula Fire Management Strategy - to address responses to any increase in fire frequency or occurrence of late season fires. These responses will be developed in consultation with Traditional Owners and Pastoralists.
No significant decline in vegetation condition in areas of monsoon vine thicket retained around the Precinct attributable to Precinct development and operation.	<p>Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance - will include routine inspections of the drainage basin for signs of disturbance, changes in vegetation condition and weed infestation.</p> <p>Ecological Surface Water Requirements Management Plan - will include monitoring of surface water flows into and groundwater levels under the drainage basin for comparison with vegetation condition monitoring.</p>	<p>Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance - to address responses to signs of disturbance, changes in vegetation condition and weed infestation, including:</p> <ul style="list-style-type: none"> investigate cause/source of impact; review adequacy of management measures and induction program for site personnel; and rectify/rehabilitate monsoon vine thicket vegetation. <p>Ecological Surface Water Requirements Management Plan - will include the following response to significant changes in vegetation health attributable to drought stress:</p> <ul style="list-style-type: none"> investigate current hydrological regime; evaluate whether supplementation or diversion of stormwater feasible/warranted; and rectify/rehabilitate monsoon vine thicket vegetation.
Increase in native species richness and cover and decrease in weeds species richness and cover over time and/or other completion criteria as agreed with DEC and Traditional Owners.	<p>Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance - will include a monitoring program for assessment of the success of rehabilitation, which will include monitoring of species richness, weed species richness, % cover, % weed cover and vegetation health in quadrats in rehabilitation areas as compared to non-rehabilitated areas.</p>	<p>Management and Monitoring Strategy for Vegetation of Medium to High Conservation Significance - to address responses to agreed completion criteria not being met, such as poor native species richness and cover and increases in weed species richness and cover. This will include:</p> <ul style="list-style-type: none"> investigation of possible causes; review of rehabilitation prescription and methodology; rectification of any physical limitations on rehabilitation success where practicable; remedial planting and/or seeding; and additional weed control.
Migratory birds		
No new disturbance in areas of mudflat or mangrove habitat on Dampier Peninsula attributable to Precinct development.	Compliance monitoring of approved projects to ensure no clearing in mudflats or mangrove habitat.	Any disturbance of mudflat or mangrove habitat will not form part of the approved project and therefore will be illegal. Any disturbance will be rehabilitated.
Submission of design rationale to satisfaction of the EPA.	EPA review of design rationale to demonstrate how working widths and infrastructure corridors have been reduced to the narrowest practicable to	Design will be amended if design rationale fails to demonstrate that the corridors have been minimised as far as practicable.

Performance measure/ target	Monitoring	Adaptive management response
	minimise shoreline disturbance.	
Rehabilitation completion criteria to be agreed with DEC in consultation with SEWPAC.	Rehabilitation monitoring program to be detailed in Rehabilitation Plan for assessment against completion criteria agreed with DEC, SEWPAC and Traditional Owners.	If rehabilitation fails to meet completion criteria, the reason for failure will be investigated and then appropriate methods and resources used to improve rehabilitation techniques and ensure completion criteria are met.
Establishment of conservation areas within time period and demonstrated to include areas of high value/use to migratory birds.	Surveys of areas identified for potential conservation will be conducted to confirm high usage by migratory birds prior to designation of conservation areas.	Additional conservation areas to be established that do include areas of high value to migratory birds.
Humpback whales		
No LNG and condensate tankers associated with the BLNG Precinct to enter the Camden Sound/Pender Bay calving and resting area.	Record the movement of LNG and condensate tankers entering and exiting the BLNG Precinct port using AIS transponders or equivalent.	Broome Port Authority to identify reason for diversion and provide information to all shipping companies about the significance of the area and reasons to avoid it.
No significant effect on regional population of humpback whales (including migration behaviour) as a result of pipeline and port construction activities, taking into account natural variability and other influencing factors on population dynamics.	Record numbers of humpback whales using aerial surveys in the migration corridor offshore of James Price Point during pipeline and port construction activities.	Port Facilities Construction Environmental Management Plan - to address responses to significant effects on humpback whale regional population. This will include: <ul style="list-style-type: none"> • investigation of possible causes; • review of construction methods and schedule; • liaise with DEC and SEWPAC regarding appropriate response; and • modify construction methods and/or timing to minimise the effect on humpback whales.
Establishment of marine conservation areas within time period and demonstrated to include known resting and/or calving areas.	Recordings of numbers of humpback whales using aerial surveys.	Additional marine conservation areas to be established that do include known whale resting and/or calving areas.
Dugongs and turtles		
No tankers associated with the BLNG Precinct to enter inshore of the Lacepede Islands (offshore of Beagle Bay) around Carnot Bay and Roebuck Bay Ramsar Wetland.	Survey dugong populations in the vicinity of James Price Point and other areas on the Dampier Peninsula to determine changes over time.	Broome Port Authority to identify reason for diversion and provide information to all shipping companies about the significance of Roebuck Bay Ramsar Wetland, Carnot Bay and inshore of the Lacepede Islands and reasons to avoid these areas.
No dugong-vessel interactions in Carnot Bay, Roebuck Bay Ramsar Wetland, and inshore of the Lacepede Islands during construction as determined by DEC.	Record the movement of LNG and condensate tankers entering and exiting the BLNG Precinct port using AIS transponders or equivalent.	For construction activities, any vessel ignoring the ban on entering these areas will be warned and dealt with in accordance with the measures outlined in the Port Facilities Construction Environmental Management Plan .
No unacceptable number of dugong/vessel interactions in the port area or mortality as agreed with DEC and SEWPAC in Port Facilities Construction Environmental Management Plan .	Record dugong strike and mortality. Record frequency and speed of vessel movements in the port area. Record the numbers of dugongs	Port Facilities Construction Environmental Management Plan - to address responses to dugong/vessel interactions. This will include: <ul style="list-style-type: none"> • review speed limits and actual vessel speeds; • review of construction methods and schedule;

Performance measure/ target	Monitoring	Adaptive management response
	during the observation period and the management response undertaken by the vessel operator.	<ul style="list-style-type: none"> liaise with DEC and SEWPAC regarding appropriate response; and modify construction methods if appropriate.
No injuries or mortality of dugongs during dredging and spoil disposal attributable to these activities.	Observation records to be maintained by Proponent responsible for dredging.	As above.
Extent of direct seagrass disturbance does not exceed that predicted in Strategic Assessment. Criteria and triggers defined in the Dredging and Dredge Spoil Disposal Management Plan prepared to satisfaction of EPA and DEC.	Water quality monitoring program as to be agreed with EPA and DEC in Dredging and Dredge Spoil Disposal Management Plan .	Dredging and Dredge Spoil and Disposal Management Plan - to address responses to exceedance of water quality triggers. This will include: <ul style="list-style-type: none"> review cause of exceedance; review dredging methods and schedule; liaise with DEC and SEWPAC regarding appropriate response; and modify construction methods if appropriate.
Establishment of marine conservation areas within time period and demonstrated to include known dugong aggregation areas.	Extensive baseline information exists on dugong aggregation areas in the Dampier Peninsula. Monitoring as per the proposed Marine Conservation Area Management Plan that will include long term monitoring programs.	Additional marine conservation areas to be established that do include dugong aggregation and calving areas.
Commonwealth marine area		
No breaches of water quality and invasive marine species procedures.	Incident reporting and monitoring for breaches of water quality and invasive marine species procedures.	Port Facilities Construction Environmental Management Plan - to address responses to water quality impacts. Invasive Marine Species Management Plan - to address responses to breaches of invasive marine species management procedures.
Ramsar wetlands		
Establishment of Roebuck Bay Management Plan .	To be described in management plans for Ramsar sites.	To be described in management plans for Ramsar sites.

3.9.1. Reporting

The State Government will monitor the implementation of the Plan by individual proponents, progress on the implementation of State measures and monitor the cumulative impacts of BLNG Precinct activities based on monitoring programs of individual proponents. This information will be collated in an Annual BLNG Precinct Environmental Report prepared by the Precinct Control Group, submitted to SEWPAC and made publicly available.

3.9.2. Compliance and Enforcement

Auditing will be undertaken by the BLNG Precinct Proponent, Foundation Proponent and any other future commercial proponent operators in the Plan Area in accordance with any conditions of approval under the EP Act or the implementation of State Government measures. Compliance and performance reporting conditions will be imposed on proponents of derived proposals in any Statement issued by the Minister for Environment allowing implementation of the proposal. Compliance reporting is normally required annually, whilst performance reporting is generally a five yearly requirement.

Non-compliance with conditions of an Implementation Statement under the EP Act is an offence. Section 48 of the EP Act details the powers that the Western Australian Minister for Environment has in relation to non-compliance.

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