

Priority Port of Abbot Point

Evidence Base Report

2022

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Acknowledgement of Jacobs

This report has been prepared in consultation with Jacobs, South Brisbane. Jacobs provided content material including data, analysis and maps for inclusion.

Acknowledgement of Country

The Department of Transport and Main Roads (TMR) acknowledges the Traditional Owners and Custodians of the land and waters of Queensland. We pay our respects to their ancestors and Elders, past, present and emerging and recognise the strength and resilience of Aboriginal Australia as the oldest living culture worldwide.

TMR respectfully acknowledges the sacred and enduring connection of First Nations people to Country and thanks them for caring and protecting it for thousands of generations.

TMR recognises the diversity of First Nations people throughout Queensland, their rich cultures, history, beliefs and contributions to our society as the first travellers of this land.

TMR actively supports participation of Aboriginal and Torres Strait Islander people across the department and is committed to reconciliation amongst all Australians.

We also acknowledge all Aboriginal and Torres Strait Islander people who call our regions home.

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List of acronyms and abbreviations

Acronym/Abbreviation	Definition
ACH Act	<i>Aboriginal Cultural Heritage Act 2003</i>
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
APSDA	Abbot Point State Development Area
ASS	Acid sulfate soils
AASS	Actual acid sulfate soils
BIA	Biologically Important Area

Acronym/Abbreviation	Definition
BOM	Bureau of Meteorology
CVW	Caley Valley Wetlands
CG	Coordinator-General
CHMP	Cultural Heritage Management Plan
CHL	Commonwealth Heritage List
CLR	Contaminated Land Register
cm	Centimetres
CMD	Coastal Management District
CQC	Central Queensland Coast
DAF	Department of Agriculture and Fisheries
DA Rules	Development Assessment Rules
DAWE	Department of Agriculture, Water and the Environment
DEO	Desired environmental outcome
DES	Department of Environment and Science
DIWA	Directory of Important Wetlands in Australia
DNA	Deoxyribonucleic acid
DOR	Department of Resources
DPA	Dugong Protection Area
DRO	Desired regional outcome
DRS	Delayed Response Scenario
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning
DWT	Deadweight tonnes
EBR	Evidence Base Report
EDQ	Economic Development Queensland
EIS	Environmental Impact Statement
EJ	Exajoules (10 ¹⁸ joules)
EMR	Environment Management Register
EP Act	<i>Environmental Protection Act 1994</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ERA	Environmentally relevant activities
EU	European Union
FHA	Fish habitat area
Fisheries Act	<i>Fisheries Act 1994</i>
GBR	Great Barrier Reef
GBRMP	Great Barrier Reef Marine Park
GBRMP Act	<i>Great Barrier Reef Marine Park Act 1975</i>
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
GIS	Geographic Information System
GVP	Gross value of production
ha	Hectares
HAT	Highest astronomical tide
IAR	Impact Assessment Report
IEA	International Energy Agency
ILUA	Indigenous Land Use Agreement
IUCN	International Union for Conservation of Nature
IPCC	Intergovernmental Panel on Climate Change
km	Kilometres

Acronym/Abbreviation	Definition
km/h	Kilometres per hour
kV	Kilovolts
Land Act	<i>Land Act 1994</i>
LAT	Lowest astronomical tide
LCT	Landscape Character Types
LGA	Local government area
LGIP	Local Government Infrastructure Plan
Local Government Act	<i>Local Government Act 2009</i>
LOA	Length overall (vessel)
m	Metres
MARPOL	<i>International Convention for the Prevention of Pollution from Ships (1973)</i>
MCF	Multi Cargo Facility
MCU	Material change of use
MGR	Minister's Guidelines and Rules
mm	Millimetres
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
MOF	Marine Offloading Facility
MP Act	<i>Marine Parks Act 2004</i>
MSQ	Maritime Safety Queensland
mt	Million tonnes
mtce	Million tonnes of coal equivalent
mtoe	Million tonnes of oil equivalent
mtpa	Million tonnes per annum
NC Act	<i>Nature Conservation Act 1992</i>
NHL	National Heritage List
NQBP	North Queensland Bulk Ports Corporation Limited
NWMP	North West Minerals Province
OUV	Outstanding Universal Value
PASS	Potential acid sulfate soils
PDA	Priority development area
P&E	Planning and Environment Analysis
Planning Act	<i>Planning Act 2016</i>
Planning Regulation	<i>Planning Regulation 2017</i>
WRC Planning Scheme	<i>Whitsunday Regional Council Planning Scheme 2017</i>
PMM	Priority management measure
PMST	Protected Matters Search Tool
Ports Act	<i>Sustainable Ports Development Act 2015</i>
QCWA	Queensland Country Women's Association
QH Act	<i>Queensland Heritage Act 1992</i>
QHR	Queensland Heritage Register
QTRIP	Queensland Transport and Roads Investment Program
NT Act	<i>Native Title (Queensland) Act 1993</i>
RAP	Reconciliation Action Plan
RCP	Representative Concentrations Pathways
RE	Regional Ecosystem
Reef 2050 Plan	<i>Reef 2050 Long-Term Sustainability Plan</i>
MIW	Mackay, Isaac and Whitsunday
MIW Regional Plan	<i>Mackay, Isaac and Whitsunday Regional Plan 2012</i>

Acronym/Abbreviation	Definition
RIDA	Regional interests development approval
RLA	Rural Living Area
RLRPA	Regional Landscape and Rural Production Areas
RNE	Register of the National Estate
RNTBC	Registered Native Title Body Corporate
RPI Act	<i>Regional Planning Interests Act 2014</i>
RPI Regulation	<i>Regional Planning Interests Regulation 2014</i>
SARA	State Assessment and Referral Agency
SA2	Statistical Area Level 2
SCA	Strategic Cropping Area
SCL	Strategic Cropping Land
SDA	State Development Area
SDAP	State Development Assessment Provisions
SDPWO Act	<i>State Development and Public Works Organisation Act 1971</i>
SDS	Sustainable Development Scenario
SEVT	Semi-evergreen Vine Thicket
SLR	Sea level rise
SPL	Strategic Port Land
SPP	<i>State Planning Policy 2017</i>
SPRP	State Planning Regulatory Provisions
STEPS	Stated Policies Scenario
T0 project	North Queensland Export Terminal 0 project
T1	North Queensland Export Terminal 1
T2	North Queensland Export Terminal 2
T3	North Queensland Export Terminal 3
TEC	Threatened Ecological Community
TIA	<i>Transport Infrastructure Act 1994</i>
TMR	Department of Transport and Main Roads
tph	Tonnes per hour
UCH Act	<i>Underwater Cultural Heritage Act 2018</i>
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNCTAD	United Nations Council on Trade and Development
VM Act	<i>Vegetation Management Act 1999</i>
VLOC	Very large ore carrier
VTs	Vessel Traffic Services
Water Act	<i>Water Act 2000</i>
WRC	Whitsundays Regional Council

1. Executive Summary

In accordance with the *Sustainable Ports Development Act 2015* (Ports Act), the Queensland Government has advanced master planning for the priority ports of Gladstone (complete), Townsville (complete), Hay Point/Mackay and Abbot Point.

The priority ports operate adjacent to and within the Great Barrier Reef World Heritage Area (GBRWHA) which extends from the top of Cape York to the north of Bundaberg and was inscribed on the World Heritage List in 1981.

Through port master planning, the Queensland Government seeks to effectively manage the land and marine areas needed for the efficient development and operation of the priority ports, while ensuring that the Outstanding Universal Value (OUV) of the GBRWHA is an intrinsic consideration in priority port development, management and governance.

The evidence base material used to inform and support the development of the master plan and port overlay for the priority Port of Abbot Point comprises two comprehensive reports including this Evidence Base Report (EBR) and the Planning and Environment Analysis (P&E) report.

Applying an evidence-based planning approach is in accordance with an action from the original *Reef 2050 Long-Term Sustainability Plan* (Reef 2050 Plan) to 'Ensure Great Barrier Reef ports planning incorporates evidence-based measures to support protection, restoration and management of coastal ecosystems that contribute to Reef health and resilience (EHA25)'.

The EBR prepared for the priority Port of Abbot Point provides a desktop analysis of the most current information available to present economic, environmental, cultural heritage and social data within a defined study area for the port, including the OUV of the GBRWHA.

The study area covers a large land and marine area to understand all relevant considerations to support the potential growth and operation of the port and related activities. It includes the priority Port of Abbot Point and surrounding land and marine areas to the western boundary, including part of the State Development Area (SDA), all inshore islands, portions of the Great Barrier Reef Marine Park (GBRMP) and extends to the port limits. The area also includes Camp Island Lodge, Flathead Fishing Hole and Southern Upstart Bay in the north and North Head Reef and Stone Island to the south. The western boundary includes infrastructure supply chain corridors beyond the Bruce Highway.

The EBR was developed in consultation with key stakeholders including North Queensland Bulk Ports Corporation Limited (NQBP), Traditional Owners, local government, state agencies and external experts. The Traditional Owners surrounding the priority Port of Abbot Point are the Juru peoples. It identifies the current and proposed infrastructure, supply chain, and port development requirements to sustainably grow the port. It provides an outline of the existing regulatory framework and land use planning tools to inform the P&E report which provides an assessment of how impacts from development can be sustainably managed in the future.

The priority Port of Abbot Point is currently a single commodity coal export port located approximately 25 kilometres (km) north of Bowen between Townsville and Mackay within the Mackay, Isaac and Whitsunday (MIW) region. The offshore port infrastructure is located within the port limits and outside of the GBRMP. The onshore port area is partially within the Abbot Point State Development Area (APSDA).

Bowen is the closest town to the port and has a population of approximately 10,000. It is the business, service and administrative hub for the northern part of the Whitsunday local government area (LGA). It includes Bowen residents and the surrounding rural communities at Mount Curlewis, Merinda, Guthalungra, the Eliot River Hut community and Camp Island. Key local industries include agriculture, horticulture, commercial fishing and aquaculture, and port related industries.

Abbot Point is located within the GBRWHA and contains numerous environmental, cultural and social values. It comprises mainly wide low coastal plains separating the coastline from mountain ranges. Land use on the coastal floodplain and low foothills includes grazing and sugar cane production, with more intensive horticulture occurring around Bowen.

1.1 Environment

Land and marine areas in the study area contain sensitive terrestrial and marine environments of national and international significance. Abbot Point includes foreshores and beach areas stretching from Abbot Point Beach to Euri Creek illustrating a mixture of beach rock, dunes and tidal flats. Although Cape Upstart Marine National Park Zone is outside of the study area, it is an important conservation zone and meeting place for Indigenous people.

Abbot Point Beach and Curlewis Bay are turtle nesting sites with waters hosting whales, dugongs and snub fish. The foredune area at Abbot Point Beach has multiple cultural heritage sites, resource management, fishing, stone tool manufacturing, food production and living. The Juru people also have connection to the Mount Roundback and other nearby sites.

Conservation areas surrounding the port include: Abbot Bay Conservation Park, the GBRMP, Caley Valley Wetlands (CVW), Cape Upstart Marine National Park, Holbourne Island Conservation Park and Edgumbe Heights Recreation Reserve.

The CVW covers 5154 hectares (ha) and contains the Abbot Bay Conservation Park/Resource Reserve. The wetlands are listed on the Directory of Important Wetlands in Australia (DIWA) and provides habitat for a number of threatened waterbirds. It is located within the Don River Basin, which extends from Bowen to the mouth of the Burdekin River north of Cape Upstart National Park. The wetlands experience major seasonal variations in freshwater inputs from local runoff and rainfall.

The wetlands are fed by a complex system of creeks including Plain Creek, Splitters Creek, Spring Creek, Branch Creek, Tabletop Creek, Maria Creek, Six Mile Creek, Goodbye Creek, Euri Creek, Menilden Creek and Saltwater Creek and the hydrology is influenced by runoff from Mount Roundback and Mount Little. Saltwater Creek is the largest creek to flow into the wetlands with a catchment of approximately 83,000ha. Most of the catchments that feed into the study area, flow northwards into the CVW, often through road and railway culverts.

1.2 Outstanding Universal Value

The local expression of OUV for the priority Port of Abbot Point predominantly arises from the significant contribution of species diversity involving both marine and terrestrial species.

Seabirds, migratory shorebirds and marine turtles make a significant contribution to the local expression of OUV. Seabirds and migratory shorebirds are known to forage and roost in intertidal mudflats, sandy beaches, salt pans and rocky intertidal areas and include a significant number of threatened and endangered species.

Loggerhead turtles, green turtles, leatherback turtles, hawksbill turtles, olive-ridley turtles and flatback turtles are present in the area. Green turtles nest at Edgumbe Bay and small populations near the mouths of Saltwater Creek and Euri Creek.

The diversity of mangrove forests located in the CVW covers 673ha, all associated with three tidal channels flowing into Curlewis Bay and Saltwater Creek, the tidal channels of Euri Creek and Menilden Creek and a smaller mangrove present on Cape Upstart Island, North Head Island and Stone Island make a moderate contribution to the local expression of OUV.

The content of the EBR was presented to the P&E report development phase of the evidence base to be interpreted and assessed against the current regulatory framework to determine if any gaps or inconsistencies in the plan making and development assessment processes exist. The P&E report subsequently informed the development of the port master plan and overlay.

2. Introduction

In accordance with the Ports Act, the Queensland Government has advanced master planning for the priority ports of Gladstone (complete), Townsville (complete), Hay Point/Mackay and Abbot Point. TMR is leading this work on behalf of the Queensland Government.

The priority ports operate adjacent to and within the GBRWHA which extends from the top of Cape York to the north of Bundaberg and was inscribed on the World Heritage List in 1981.

Through port master planning, the Queensland Government seeks to effectively manage the land and marine areas needed for the efficient development and operation of the priority ports, while ensuring that the OUV of the GBRWHA is an intrinsic consideration in priority port development, management and governance.

Priority port master planning will assist the Queensland Government to:

- concentrate development in priority ports leading to more effective management of port development in the GBRWHA
- efficiently use existing port and supply chain infrastructure
- identify and protect land and infrastructure critical to the effective operation and future expansion of priority ports
- facilitate economic development and job creation in regional areas.

Through master planning of priority ports, Queensland will deliver on its key port-related actions under Reef 2050 Plan.

In accordance with the Ports Act, master planning will deliver master plans and port overlays for the priority ports. Master plans are strategic documents that outline the long-term outlook for priority ports within the master planned area. Port overlays are the statutory instruments that implement the master plan over the master planned area.

Throughout the master planning process, the Queensland Government has worked closely with port authorities, local governments and other key stakeholders.

The *Priority ports master planning guideline* (2020) has been released by the Queensland Government to help the community and other stakeholders better understand priority port master planning, its process and matters considered when developing a master plan. This report has been prepared in accordance with the priority ports master planning guideline.

The master planning process for the priority Port of Abbot Point is presented in four parts, including:

- evidence base:
 - EBR documents environmental, social and cultural values; economic, infrastructure and supply chain descriptions, regulatory frameworks and land use, and port optimisation characteristics (this report).
 - P&E report analyses the data presented in the EBR to undertake a review and assessment of the scope and application of management measures across the regulatory framework in the context of priority port master planning. The analysis considered the application of the current regulatory framework in managing potential development impacts and the effect of applying proposed management measures in the master plan and port overlay.
- master plan
- port overlay.

2.1 Evidence base

The objectives of the evidence base are to:

- inform the preparation of the master plan by analysing the economic, environmental, and social factors relevant to the priority port, including the OUV of the GBRWHA
- identify long-term infrastructure, supply chain, and port development requirements

- undertake an assessment of the regulatory framework to understand how impacts from development will be sustainably managed.

The evidence base provides the foundation for preparing the master plan and port overlay for the priority Port of Abbot Point in accordance with the Ports Act.

It responds to a key principle in the priority ports master planning guideline, evidence-based planning:

'...master planning should maintain an objective, accountable, and transparent approach with a focus on understanding and applying the best available information relevant for future planning.'

This evidence base also responds to the Reef 2050 Plan's action:

'Ensure Great Barrier Reef ports planning incorporates evidence base measures to support protection, restoration and management of coast ecosystem that contribute to reef health and resilience.'

2.2 Purpose of this report

This report collates, analyses and synthesises information identified through a desktop analysis, relevant to the master planning process for the priority Port of Abbot Point.

2.3 Methodology

This report has been prepared using a desktop analysis and stakeholder engagement through:

- an initial review of background information previously prepared for master planning for the priority Port of Abbot Point
- targeted consultation through meetings and follow up correspondence with key stakeholders including:
 - state agencies
 - NQBP
 - Whitsunday Regional Council (WRC).
- review and analysis of the most recent available data and information including:
 - legislation and policy relating to the Port of Abbot Point
 - planning instruments associated with the port and its precincts
 - existing and proposed land uses
 - existing and proposed infrastructure
 - environmental, social and cultural values.

3. Port of Abbot Point

3.1 Location context and study area

The priority Port of Abbot Point is located within the MIW region and is approximately 25km north of Bowen on the North Queensland coast between the existing industrial centres of Townsville to its north, and Mackay to its south. The local government for the area of Abbot Point is the WRC. Within the region, Bowen is the closest town to the port and has a population of approximately 10,000¹. Abbot Point is located within the GBRWHA and contains numerous environmental, cultural and social values. NQBP is the port authority responsible for the port's administration.

The offshore port infrastructure is located within the port limits and outside of the GBRMP. The onshore port area is partially within the APSDA. The 16,885ha SDA site was declared by the Coordinator-General (CG) in 2008, to facilitate large-scale industrial and port development of regional, and state significance adjacent to the port. The SDA was amended in 2014 to offer a location for related development that requires a large footprint, in close proximity to the port and separation from sensitive receptors. Managed by the CG, the SDA supports enterprise and job creation in a way that considers environmental, cultural, and social issues and existing industry and surrounding infrastructure within the region.

The study area is noted in **Figure 1** and encompasses the priority Port of Abbot Point and the land and marine areas surrounding the port to the western boundary. The study area's eastern boundary extends to include all inshore islands, portions of the GBRMP and extends to the seaward boundary of NQBP port limits. The western boundary extends to include the infrastructure supply chain corridors beyond the Bruce Highway. The northern boundary extends to include Camp Island Lodge and Flathead Fishing Hole and Southern Upstart Bay. The southern boundary includes the township of Bowen, North Head Reef and Stone Island. The study area covers land and water and is deliberately extensive to ensure that sensitive land uses are considered as part of the evidence base.

The rationale for the study area was determined in consultation with NQBP and based on the following:

- port limits and Strategic Port Land (SPL)
- key existing infrastructure and supply chain corridors, including land and marine infrastructure
- key existing sensitive land uses including CVW
- key environmental, social and heritage values within the Abbot Point area including, Southern Upstart Bay, tidal creeks, ephemeral creeks and Lake Caley
- rural land use in proximity to port related activities
- marine areas and urban/rural/tourism/commercial activities.

Key areas of reference include, GBRMP boundary, defined port limits, Bruce Highway, Newlands Rail System, Bowen residential community and environmental areas of CVW, Mount Roundback, Mount Little and Bald Hill. Key water resources include, Saltwater Creek, Euri Creek, Don River, Elliot River.

¹ 2016 Census QuickStats: Bowen (abs.gov.au)



Figure 1: Priority Port of Abbot Point Study Area

3.2 Port overview

The port plays an important role in supporting the region's community given the mining industry is a major employer in the region². It is a dedicated coal port that has been in operation since 1984 and is of significant strategic value as one of the few locations along Queensland's eastern seaboard where deepwater (greater than 15 metres (m)) is so close inshore. It is the most northerly coal port in the Great Barrier Reef (GBR) and well situated for development due to its remote location from urban development and proximity to the resource rich Bowen and Galilee Basins.

Currently the port has a single terminal, North Queensland Export Terminal 1 (T1), with rail in-loading facilities, coal handling and stockpiling areas, a single 2.8km offshore trestle jetty and conveyor connecting to two offshore berths and two ship loaders. The existing terminal is leased by Mundra Ports Pty Ltd under a 99-year lease and operated by Bravus Mining and Resources (previously known as Adani). See **Figure 2**.

² Coal transport infrastructure development (Department of Transport and Main Roads) (tmr.qld.gov.au)



Figure 2: Priority Port of Abbot Point

T1 has a capacity of 50 million tonnes per annum (mtpa)³. The expansion of T1, referred to as the X60 project will provide an additional 10mtpa taking the capacity of T1 to 60mtpa. Bravus Mining and Resources proposes to expand the T1 to support the development of its Carmichael Coal Mine in the Galilee Basin. The project is known as the North Queensland Export Terminal 0 project (T0 project) and a proposed total capacity of up to 120mtpa⁴. Stage 1 of the T0 project will have capacity for 30mtpa. The terminal and associated dredging project have received both Australian and Queensland Government environmental approvals.

The port is serviced by the Newlands Rail System. Bravus Mining and Resources has completed building the 200km Carmichael Rail project. The rail line connects the Carmichael Coal Mine to the Port of Abbot Point in conjunction with existing rail infrastructure.

GVK Limited has Australian Government approvals to develop a separate third terminal, North Queensland Export Terminal 3 (T3) at the Port of Abbot Point. The development is proposed to export 60mtpa of coal with berthing and modern fast loading. It is intended to service up to three mines in the Galilee Basin.

There is a Marine Offloading Facility (MOF), which was restored in 2017. The MOF is used for the import of large infrastructure and equipment for the terminal. NQBP own and operate the MOF and it is located east of the main jetty just south of T1. It is a common-user, multi-functional facility used for offshore construction activities and emergency access at the port. The port also contains mooring capacity at the Bowen Wharves for the two tugboats that provide towage to the port.

3.3 Current port function

The priority Port of Abbot Point is a dedicated coal terminal, exporting both metallurgical and thermal coal. The resource is delivered to the port by rail from mines located in the northern Bowen Basin coalfields. The port

³ Coal transport infrastructure development (Department of Transport and Main Roads) (tmr.qld.gov.au)

⁴ Advisian. (2015). *Abbot Point Growth Gateway Project: Environmental Impact Statement: Volume 1 – Executive Summary*. Advisian - Worley Parsons Group

achieved throughput of 31.9 million tonnes (mt) in 2019–20, demonstrating a 10.3% increase on the previous year's throughput. In total, there were 395 ship visits to this port during 2019–20⁵.

Abbot Point Road is currently the sole link between the Bruce Highway and the port and is a private road on SPL. Abbot Point Road directly intersects with the Bruce Highway and runs north and then northwest from the highway for approximately 10km to T1. T1 is serviced by Aurizon's Collinsville-Newlands Rail Line, a narrow-gauge rail line which is part of the Newlands Rail System and linked to the Goonyella Coal System.

⁵ Throughputs | North Queensland Bulk Ports Corporation Limited (nqbp.com.au)

4. Regulatory frameworks

4.1 Introduction

The regulatory framework provides the federal, state and local management measures for planning and development across the study area and underpins master planning considerations for the priority Port of Abbot Point.

The framework's hierarchy will require more detailed analysis to understand the relevance of measures at the federal, state and local government levels, regulatory controls across land and marine areas, land ownership and administrative powers. This will help identify the extent and level of risk and potential gaps in the regulatory framework, in the study area.

The current framework manages a range of values and impacts related to social values, transport and economic infrastructure, land use and development, areas of ecological significance, resource management, Indigenous and other cultural heritage values and port operations. Balancing social, environmental and economic considerations is an important element of the master planning process.

This chapter provides an overview of the existing regulatory framework affecting the study area, including the scope of the legislation, relevant subordinate legislation and the nature of applicable management measures.

The threats, impacts and risks managed by regulatory frameworks is explored in more detail throughout the report.

- This chapter provides the following sections:
- Commonwealth legislation – **Section – 4.2**
- State legislation (Queensland) – **Section 4.3**
- Local government – **Section 4.4**
- Management measures overview – **Section 4.5**
- Summary – **Section 4.6.6.**

4.2 Commonwealth legislation

Information on the Commonwealth regulatory framework has been sourced using the Federal Register of Legislation and Administrative Arrangements Order – C2021Q00014 (amended 2 July 2021). In this context, management measures in the study area are applied either directly through Commonwealth legislation or on a lower order instrument that implements the Commonwealth law or its intent at the state or local level.

The Commonwealth legislation considered relevant to the study area and the master planning process is summarised below and listed in **Appendix A**.

4.2.1 *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*

The Act provides for declarations to preserve and protect places, areas and objects of particular significance to Aboriginal and Torres Strait Islander people in accordance with Aboriginal tradition. Aboriginal tradition is taken to include traditions, observances, customs or beliefs relating to certain people, areas, objects or relationships.

4.2.2 *Biosecurity Act 2015*

The Act seeks to manage diseases and pests that may cause harm to human, animal or plant health or the environment within Australia and up to 12 nautical miles from the coastline including the airspace over, and coastal seas of these areas. The scope of the Act includes risks related to biosecurity, contagions, human disease, ballast water and sediment.

The Act gives effect to Australia's international rights and obligations, including under the *International Health Regulations 2005*, the World Trade Organization Agreement on the *Application of Sanitary and Phytosanitary Measures* and the *Convention on Biological Diversity 1992*.

4.2.3 Coastal Trading (Revitalising Australian Shipping) Act 2012

The Act seeks to promote a viable shipping industry that contributes to the broader Australian economy, facilitate the long-term growth of the Australian shipping industry, enhance the efficiency and reliability of Australian shipping as part of the national transport system, and ensure efficient movement of passengers and cargo between Australian ports.

4.2.4 Environment Protection (Sea Dumping) Act 1981

The Act protects the environment by regulating dumping into the sea, incineration at sea and artificial reef placements. The scope of the Act includes permits to dump material and other objects at sea including dredged material, excavated material, artificial reefs, platforms, controlled materials and people for burial purposes.

4.2.5 Environment Protection and Biodiversity Conservation Act 1999

The Act seeks to protect nationally and internationally important flora, fauna, ecological communities and heritage places, defined in the Act as Matters of National Environmental Significance (MNES).

The scope of the Act includes promoting environmental protection and biodiversity conservation informed by Indigenous peoples' knowledge of biodiversity and engagement with the community. The Act promotes ecologically sustainable development and provides for controlled actions, biodiversity plans, assessment pathways and bilateral agreements.

Development proposals having a significant impact on MNES are assessed through the controlled actions process in addition to any state and local development approvals. Examples of MNES that the Act applies to include national heritage places, wetlands of international importance, nationally threatened species and ecological communities, migratory species, Commonwealth marine areas and the GBRMP.

4.2.6 Great Barrier Reef Marine Park Act 1975

The Act manages the long-term protection and conservation of the environment, biodiversity and heritage values of the GBR region. The Act seeks the ecologically sustainable use of the GBR region for uses including recreational, economic and cultural activities, encourages collaboration and engagement with the community and industry, and facilitates Australia to meet its international responsibilities in relation to the environment and protection of world heritage.

The Act establishes the Great Barrier Reef Marine Park Authority (GBRMPA) and provides for marine plans, plans of management and regulation of the GBRMP. The *Great Barrier Reef Marine Park ZONING PLAN 2003* is the primary planning instrument for the conservation and management of the GBRMP. Regulating activities in the GBRMP is explored in more detail in Chapter 5: Land Use Planning.

4.2.7 Marine Safety (Domestic Commercial Vessel) National Law Act 2012

The Act seeks to manage marine incidents, and standards relating to the operation, design, construction and equipping of domestic commercial vessels. A domestic commercial vessel is taken to be a vessel that is for use in connection with a commercial, governmental or research activity.

4.2.8 Native Title Act 1993

The Act recognises and protects native title, provides a process for claims to native title in relation to land or waters, and provides for or permits the validation of past acts and intermediate period acts that were invalidated because of the existence of native title.

4.2.9 Navigation Act 2012

The Act manages Maritime safety including to promote the safety of life at sea and safe navigation, and the prevention of pollution of the marine environment. The scope of the Act includes the health and welfare of seafarers, aids to navigation, vessel safety, tonnage certificates and wrecks including their salvage.

4.2.10 *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*

The Act prohibits the carriage, transfer or discharge of certain oils, noxious substances, packaged harmful substances, sewage, garbage and air pollution. The scope of the Act includes the development of emergency plans, a duty to report incidents, record keeping and cleaning.

4.2.11 *Sea Installations Act 1987*

The Act manages the operation of sea installations and the safety of the people using them and of the people, ships and aircraft near them. Sea installations are taken to be man-made structures used for an environment related activity such as business, tourism or recreation uses.

4.2.12 *Underwater Cultural Heritage Act 2018*

The Act provides for the identification, protection and conservation of Australia's underwater cultural heritage that is recorded as being 75 years or older. This includes submerged Aboriginal and Torres Strait Islander heritage from three nautical miles out to the continental shelf. Different kinds of articles of underwater cultural heritage are, or can be, protected, depending on the kinds of articles, their heritage significance and their location. Some articles are, or can be, protected even if they have already been removed from those water. The scope of the Act includes declaration of articles, ownerships or areas, making the Underwater Cultural Heritage Rules, permit requirements, and prohibited and notifiable activities.

4.2.13 *Work Health and Safety Act 2011*

Protection of people's health, safety and welfare. The scope of the Act includes health and safety duties, incident notification and consultation.

4.3 State legislation (Queensland)

Information on the state regulatory framework has been sourced using the Queensland legislation website and the Administrative Arrangements Order (No. 2) 2021, which was current at the time of writing. The head of power for most state interests is provided by this level of the legislative hierarchy and related instruments.

A summary of state legislation considered relevant to the study area and the master planning process is provided below and listed in **Appendix A**.

4.3.1 *Aboriginal Cultural Heritage Act 2003*

The Act's focus is the recognition, protection and conservation of Aboriginal cultural heritage. The scope of the Act includes management of activities that may harm Aboriginal cultural heritage and ensuring Aboriginal people are involved in processes for managing the recognition, protection and conservation of Aboriginal cultural heritage including the development of Cultural Heritage Management Plans (CHMPs), cultural heritage studies and stop orders.

4.3.2 *Aboriginal Land Act 1991*

The Act promotes the recognition of the interests and responsibilities of Aboriginal people in relation to land and thereby to foster the capacity for self-development, and the self-reliance and cultural integrity, of the Aboriginal people of Queensland.

The Act provides for the process of applying for, and granting, the land in fee simple under the *Land Act 1994* (Cth) (Land Act), claims for claimable land and making, amending or repealing freehold instruments. The scope of the Act includes appointing grantees of land, provision for leasing, transferring, selling or mortgaging land, and special provisions about prescribed a Deed of Grant in Trust land and prescribed reserve land.

4.3.3 *Biosecurity Act 2014*

The Act encompasses animal and plant diseases and pests, animal feed, fertilisers and other agricultural inputs. The Act establishes a framework to minimise biosecurity risk and help manage biosecurity issues or events.

The scope of the Act includes alignment with relevant national and international obligations and managing risks from pests and diseases on the natural and built environment, industry (including agriculture, tourism, service) and infrastructure sectors.

4.3.4 *Building Act 1975*

The Act includes building work, classifications and certifiers, fire safety, pool safety and sustainable housing. The Act provides for building development applications, building assessment provisions, and matters that a local government may designate for the Building Code of Australia or Queensland Development Code.

4.3.5 *Coastal Protection and Management Act 1995*

The Act seeks the protection and management of the coast through coordinated and integrated planning and decision-making. The Act provides for the protection, conservation, rehabilitation and management of the coastal zone, including its resources and biological diversity, and ensure decisions about land use and development safeguard life and property from the threat of coastal hazards.

4.3.6 *Economic Development Act 2012*

The purpose of the Act is to facilitate economic development, and development for community purposes, in the state. The Act establishes the coordination of economic development and development for community purposes, and a development framework for priority development areas (PDAs). More specifically, the Act provides for the designation of PDAs and preparation of PDA development schemes. These mechanisms are discussed in more detail in Chapter 5: Land Use Planning.

4.3.7 *Environmental Offsets Act 2014*

The purpose of the Act is to counterbalance the significant residual impacts of particular activities on prescribed environmental matters through the use of environmental offsets. The Act seeks to manage significant residual impacts of activities on matters of national, state or local environmental significance and to establish an environmental offsets framework. The Act includes provisions for offset conditions, environmental offsets policies, agreed delivery arrangements and environmental offset agreements. The Act cannot impose an offset condition on matters already assessed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act).

4.3.8 *Environmental Protection Act 1994*

The Act seeks to protect the environment and manage ecologically sustainable development. The scope of the Act includes promoting environmental responsibility and involvement within the community, integrating environmental values into land use planning and management of natural resources, and ensuring all reasonable and practicable measures are taken to protect environmental values from all sources of environmental harm.

The Act provides for:

- the OUV of the GBR
- environmental offsets
- notifiable activities
- best practice environmental management
- environmental protection policies
- Environmental Impact Statements (EIS)
- environmental authorities and environmentally relevant activities.

Environment includes ecosystems; natural and physical resources; qualities and characteristics that contribute to biological diversity, scientific value or interest, and amenity; and any related social, economic, aesthetic and cultural conditions.

4.3.9 Fisheries Act 1994

The purpose of the Act includes to provide for the use, conservation and enhancement of the community's fisheries resources and fish habitats in a way that seeks to apply and balance the principles of ecologically sustainable development. The Act seeks to promote ecologically sustainable development and access to fisheries resources in a way that maximises the potential economic, social and cultural benefits to the community.

The Act provides for the management, use, development and protection of fisheries resources and fish habitats, the management of aquaculture activities and helping to prevent shark attacks on humans in coastal waters of the state adjacent to coastal beaches used for bathing.

4.3.10 Forestry Act 1959

The Act's focus is to manage forest reservations, state forests, forest products and quarry material, and the property of the Crown on state forests, timber reserves and on other lands.

4.3.11 Land Act 1994

The scope of the Act is the administration and management of land (generally non-freehold land) including land that may become covered by water subject to tidal influence. The Act provides for allocating land for development in the context of the state's planning framework and balancing the economic, environmental, cultural and social opportunities and values of land, and Indigenous access and use agreements.

4.3.12 Marine Parks Act 2004

The purpose of the Act is to provide for conservation of the marine environment including marine parks. This is achieved by a comprehensive and integrated strategy that includes:

- the cooperative involvement of public authorities and other interested groups and persons, including members of Aboriginal and Torres Strait Islander communities
- the cooperative implementation of Australia's international responsibilities, and intergovernmental agreements and instruments
- a coordinated and integrated approach with other environment conservation legislation
- recognition of the cultural, economic, environmental and social relationships between marine parks and other areas, whether of water or land
- the provision of opportunities for public appreciation, understanding and enjoyment of the marine environment.

The Act provides for the application of zones and designation of areas, marine permits, access, and use requirements. The *Marine Parks (Great Barrier Reef Coast) Zoning Plan 2004* is made under the authority of this Act. Regulating activities in the GBRMP is explored in more detail in Chapter 5: Land Use Planning.

4.3.13 Native Title (Queensland) Act 1993

The Act provides for a national scheme for the recognition and protection of native title and for its coexistence with the existing land management systems. This Act seeks to ensure that Queensland law is consistent with standards set by the *Native (Queensland) Title Act 1993* (NT Act) for future dealings affecting native title.

The Act includes provisions to validate past acts, and intermediate period acts, invalidated because of the existence of native title and to confirm certain rights including the ownership of natural resources and certain water and fishing access rights, and public access to and enjoyment of beaches and certain other places.

4.3.14 Nature Conservation Act 1992

The purpose of the Act is the conservation of nature. It encompasses the protection and management of native wildlife and its habitat, ecologically sustainability and recognition of the interest and involvement of Aborigines and Torres Strait Islanders in nature and its conservation. The scope of the Act includes ecosystems, natural and physical resources, natural processes, biological diversity and integrity, and the intrinsic or scientific value of places.

4.3.15 Planning Act 2016

The purpose of the Act is to establish an efficient, effective, transparent, integrated, coordinated, and accountable system of land use planning, development assessment and related matters that facilitates the achievement of ecological sustainability.

The scope of the Act includes the:

- sustainable use of renewable and non-renewable natural resources
- Aboriginal and Torres Strait Islander knowledge, culture and tradition
- cultural heritage
- housing choice, diversity and affordability
- economic resilience and diversity
- coordinated infrastructure delivery
- built environment design, conservation and amenity
- minimising adverse environmental effects of development.

The Act establishes Queensland's plan making, development assessment and dispute resolution systems. The Act provides for:

- protecting or giving effect to state interests
- a hierarchy of planning instruments
- processes for plan making, development assessment and designations
- Ministerial powers to protect, or give effect to, relevant state interests
- designation of premises for development of infrastructure
- accepted, assessable and prohibited development
- development exempt from assessment and development that cannot be made assessable.

Queensland's planning system is explored in more detail in Chapter 5: Land Use Planning.

4.3.16 Queensland Heritage Act 1992

The object of the Act is the conservation of Queensland's cultural heritage for the benefit of the community and future generations. The Act seeks to retain the cultural heritage significance of places and artefacts and provide the greatest sustainable benefit to the community consistent with the conservation of their cultural heritage significance. The scope of the Act includes local and state heritage places and state protected areas, archaeological artefacts, and underwater cultural heritage artefacts that are recorded as being 75 years or older and includes protection for submerged archaeology in internal waters.

4.3.17 Regional Planning Interests Act 2014

The Act's focus is to regulate activities on areas of the state that contribute, or are likely to contribute, to Queensland's economic, social and environmental prosperity. The Act seeks to manage the impact of resource activities and other regulated activities on areas of regional interest, and a process to assess and manage impacts. The Act provides for regional interest development approvals, exempt resource activities and exempt regulated activities.

Regional interest areas are defined in the Act as priority agricultural areas, priority living areas, Strategic Cropping Areas (SCAs) and strategic environmental areas. The Department of Resources (DOR) certifies the 'Trigger Map for Strategic Cropping Land (SCL)' for use under the Act.

The applicability of the Act is discussed further in Chapter 5: Land Use Planning.

4.3.18 *State Development and Public Works Organisation Act 1971*

The Act provides for state planning and development through a coordinated system of public works organisation and for environmental coordination. Under the Act, the CG may declare a project to be a coordinated project for which an EIS or an Impact Assessment Report (IAR) is required.

The Act provides for SDAs, approved development schemes, and assessment and approval of particular coordinated projects under a Bilateral Agreement made under the EPBC Act. These mechanisms are discussed in more detail in Chapter 5: Land Use Planning.

4.3.19 *Sustainable Ports Development Act 2015*

The purpose of this Act is to provide for the protection of the GBRWHA through managing port-related development in and adjacent to the area. The purpose of the Act is achieved through prohibiting certain development and providing for master planning of the priority ports. To do this, the Act seeks to concentrate port development in the priority ports, recognise the diversity of the port network, and plan for the expansion of the port network and related supply chain and infrastructure capacity.

The Ports Act designates the following priority ports: Port of Abbot Point, Port of Gladstone, the ports of Hay Point/Mackay, and the Port of Townsville. The effect of the Act on regulating activities on land and in marine areas is explored further in Chapter 5: Land Use Planning.

4.3.20 *Transport Infrastructure Act 1994*

The Act seeks to facilitate effective integrated planning and efficient management of a system of transport infrastructure. For ports, the Act's focus is to establish a regime under which ports can be managed within an overall strategic framework. Similarly, to establish a regime under which waterways and public marine facilities can be effectively and efficiently managed. The Act provides for port land use plans, SPL and enforcement of activities on port land. These mechanisms are discussed in more detail in Chapter 5: Land Use Planning.

4.3.21 *Transport Operations (Marine Pollution) Act 1995*

The purpose of the Act is to protect Queensland's marine and coastal environment by minimising deliberate and negligent discharges of ship-sourced pollutants into coastal water. The Act achieves this primarily by giving effect to annexes of the *International Convention for the Prevention of Pollution from Ships 1973* (MARPOL) that address pollution by oil, noxious liquid substances in bulk, harmful substances in packaged form, sewage and garbage.

4.3.22 *Transport Operations (Marine Safety) Act 1994*

The Act provides for marine safety and related marine operational issues and the operation and activities of ships. The Act seeks to balance its objectives with effectiveness and efficiency on the Queensland maritime industry.

Some Queensland waters need to be controlled to ensure safety. The Act allows areas of Queensland waters to be declared as pilotage areas and compulsory pilotage areas. Controls applied under the Act include requiring the use of a pilot by certain ships on entering, leaving or navigating within a compulsory pilotage area, and the appointment of harbour masters and providing powers to give directions about ships and their navigation. Harbour masters may, for example, direct ships to enter, leave or navigate in pilotage areas or anchor, berth or moor a ship in a pilotage area.

The Act does not generally overlap with the national law that applies to domestic commercial vessel safety and does not generally apply to a ship belonging to the Australian Defence Force or the naval, military or air forces of a foreign country.

4.3.23 *Transport Operations (Marine Safety–Domestic Commercial Vessel National Law Application) Act 2016*

The purpose of this Act is to apply the Commonwealth domestic commercial vessel national law as a law of the state.

4.3.24 *Transport Operations (Road Use Management) Act 1995*

This Act's objectives provide for the effective and efficient management of road use including vehicle use in public places and provides a scheme for managing the use of roads. The Act seeks to achieve an appropriate balance between safety, and the costs that regulation imposes on road users and the community.

The scope of the Act includes road use management strategies, road rules, performance standards for road users, access management and transportation of dangerous goods. In relation to dangerous goods, the Act provides for the classification of dangerous goods, determination of routes suitable for the transportation of dangerous goods, the licensing of vehicles and drivers transporting dangerous goods, and accreditation of people involved in transporting dangerous goods.

4.3.25 *Transport Planning and Coordination Act 1994*

The Act's objectives provide for the improvement of Queensland's economic, trade and regional development performance by achieving overall transport effectiveness and efficiency through strategic planning and management of transport resources.

The purpose of the Act is to provide guidance in respect of transport coordination plans, preparation and funding, including the coordination of strategic planning and operation of integrated transport systems in the state, and managing fund allocations relevant to transport coordination plans such as Regional Transport Plans.

4.3.26 *Vegetation Management Act 1999*

The Act's purpose is to regulate vegetation clearing in a way that includes the conservation of remnant vegetation, avoids land degradations and loss of biodiversity, maintains ecological processes, reduces greenhouse gases and allows for sustainable land use. Vegetation is taken to be a native tree or plant, other than grass or non-woody herbage, a plant within a grassland Regional Ecosystem (RE) prescribed under a regulation, or a mangrove. The scope of the Act defines development that is for a relevant purpose and classes of REs.

The Act provides for the development of a state policy for vegetation management, vegetation management maps and accepted development vegetation clearing code.

4.3.27 *Water Act 2000*

The Act's focus is the sustainable management of Queensland's water resources and quarry material, including water supply and demand management. The scope of the Act includes the planning, allocation and use of water, and the allocation of quarry material and riverine protection. The Act provides for the making of activity guidelines, designation of water regions, and establishment of water authorities.

Development applications made under the *Planning Act 2016* (Planning Act) involving levees, taking or interfering with water, or the removal of quarry material may be required to meet criteria set out in the Act or benefit from additional development rights under the Act.

4.3.28 *Work Health and Safety Act 2011*

The Act provides for a nationally consistent framework that protects the health and safety of workers and workplaces. The Act relies on the principle that people should be protected from harm to their health, safety and welfare from hazards and risks arising from work, substances or plants.

The Act provides for the definition of hazardous chemicals and sets out the requirements for safe handling and storage. A facility that stores chemicals may be determined a major hazard facility and require a licence to operate under this legislation. The requirements for safe handling and storage of chemicals are outlined in Worksafe Queensland's, *Managing risks of hazardous chemicals in the workplace: Code of Practice 2021*.

Managing hazardous activities at the port is discussed in more detail in Chapter 8.

4.4 Local government

4.4.1 *Whitsunday Regional Council Planning Scheme 2017*

The *Whitsunday Regional Council Planning Scheme 2017* (WRC Planning Scheme) sets out WRC's intention for the future development in the planning scheme area over the next 20 years. The scheme seeks to advance state and regional strategies, including state planning policies and the *Mackay, Isaac and Whitsunday Regional Plan 2012* (MIW Regional Plan), through more detailed local responses, taking into account the local context.

The WRC Planning Scheme provides for what development should occur, where, when and how development should occur, and what assessment process is required. The management measures provided by the WRC Planning Scheme are described in more detail in Chapter 5: Land Use Planning.

4.5 Management measures – overview

An overview of the legislative instruments above is given in **Appendix L**. The table includes subordinate legislation relevant to the master plan process, the administering authority, an outline of management measures, and why this instrument is included in the evidence base.

4.6 Summary

This chapter has provided an overview of the regulatory context for the priority Port of Abbot Point and identifies the mechanisms at the federal, state and local government levels that represent the management measures for activities and impacts in and around the port.

This overview together with the topic-based chapters in this report will support the planning and environment analysis of the regulatory framework. This analysis will lead to a better understanding of regulatory gaps or outdated policy direction that could compromise the long-term objectives for the priority Port of Abbot Point and contribute to the development of a master plan and port overlay.

5. Land use planning

5.1 Introduction

The federal, state and local regulatory framework manage a range of values and impacts affecting, and affected by, land use planning assessment and decision-making within the study area. Balancing social, environmental and economic considerations in relation to planning and development is an important element of the master planning process.

This chapter provides a high-level overview of the land use planning management tools affecting plan making and development assessment within the priority Port of Abbot Point study area.

Land use planning is managed through a suite of statutory instruments, policies and rules. Within this framework, and under the Ports Act, a master plan at the priority Port of Abbot Point may influence decision making across plan making and development assessment processes.

The Ports Act is underpinned by the Queensland planning system which is established through the Planning Act, *Planning and Environment Court Act 2016* and *Regional Planning Interests Act 2014* (RPI Act). The Planning Act and RPI Act encompass state interests relevant to the study area and master planning process.

The *Transport Infrastructure Act 1994* (TIA), *State Development and Public Works Organisation Act 1971* (SDPWO Act) and *Economic Development Act 2012* also play an important role in land use planning in the study area and require plan making and development assessment under their own frameworks.

These legislative frameworks all have a potential role in the future planning and development of the priority Port of Abbot Point and wider study area. Some of these frameworks work closely with one another and others are more discrete, but all are affected by the instruments implemented under the Ports Act. **Figure 3** illustrates the legislation and key tools discussed further in this chapter.



Figure 3: Land use planning frameworks

This chapter provides the following sections:

- Ports Act – **Section 5.2**
- Queensland's Planning Framework – an overview – **Section 5.3**
- Planning Act – **Section 5.4**
- RPI Act – **Section 5.5**
- TIA – **Section 5.6**
- SDPWO Act – **Section 5.7**
- Economic Development Act 2012 – **Section 5.8**
- Land use management measures – **Section 5.9**
- Regulating activity in marine areas – **Section 5.10**
- Summary – **Section 5.11.**

5.2 Sustainable Ports Development Act 2015

The purpose of the Ports Act is to provide for the protection of the GBRWHA through managing port-related development in and adjacent to the area.

The purpose of the Ports Act is achieved by:

- prohibiting particular future development in the GBRWHA
- providing for the development of master plans that establish a long-term vision for the future development of priority ports consistent with the principles of ecologically sustainable development
- implementing master plans through port overlays that regulate development in and surrounding priority ports.

The purpose is to be achieved in a way that includes:

- long-term planning for priority ports to provide a strategic and coordinated approach to managing economic, environmental, cultural and social values in the GBRWHA
- concentrating port development in priority ports
- recognising the diverse functions of the port network, including trade, tourism and defence operations
- efficiently using port and supply chain infrastructure
- expanding port and supply chain capacity in a staged and incremental way to meet emerging demand for imports and exports
- identifying and protecting land and infrastructure critical to the effective operation of the port network.

The Ports Act identifies the priority Port of Abbot Point as one of four priority ports in Queensland.

5.2.1 Master planning

Under the Ports Act, a master plan is to be developed that sets out the long-term planning strategy for the priority Port of Abbot Point. The master plan must consider the principles of ecologically sustainable development and must include:

- the strategic vision, objectives and desired outcomes for the master planned area
- state interests affected, or likely to be affected, by current and future uses at the port
- an Environmental Management Framework
- any other matter prescribed by regulation.

The master plan will identify the priority port master planned area. A master planned area can extend beyond SPL but cannot include an area within a marine park or an area covered by tidal water that is outside port limits.

Figure 4 shows the priority port master planning process, consultation requirements, and port overlay process under the Ports Act.



Figure 4: Master planning process

5.2.2 Port overlay

The master plan will be implemented through the port overlay. The port overlay must:

- state the purpose of the overlay
- state how the priority management measures (PMM) in the master plan are to be achieved
- include any other matter prescribed by regulation.

The port overlay prevails to the extent of an inconsistency between a port overlay and a:

- planning instrument under the Planning Act
- land use plan made under the TIA.

The port overlay is a statutory instrument and applies to the whole master planned area. However, it cannot regulate development that is:

- assessable development and accepted development for a PDA under the *Economic Development Act 2012*
- regulated development for SDAs under the SDPWO Act.

The study area includes the APSDA but there are no PDAs. The Ports Act requires that consideration must be given to the requirements of the port overlay when making or amending a development scheme for the SDA or PDA.

The relationship between a potential port overlay and other land use planning instruments within the study area is summarised in **Table 1**.

Figure 5 outlines the function and implementation of the port overlay.

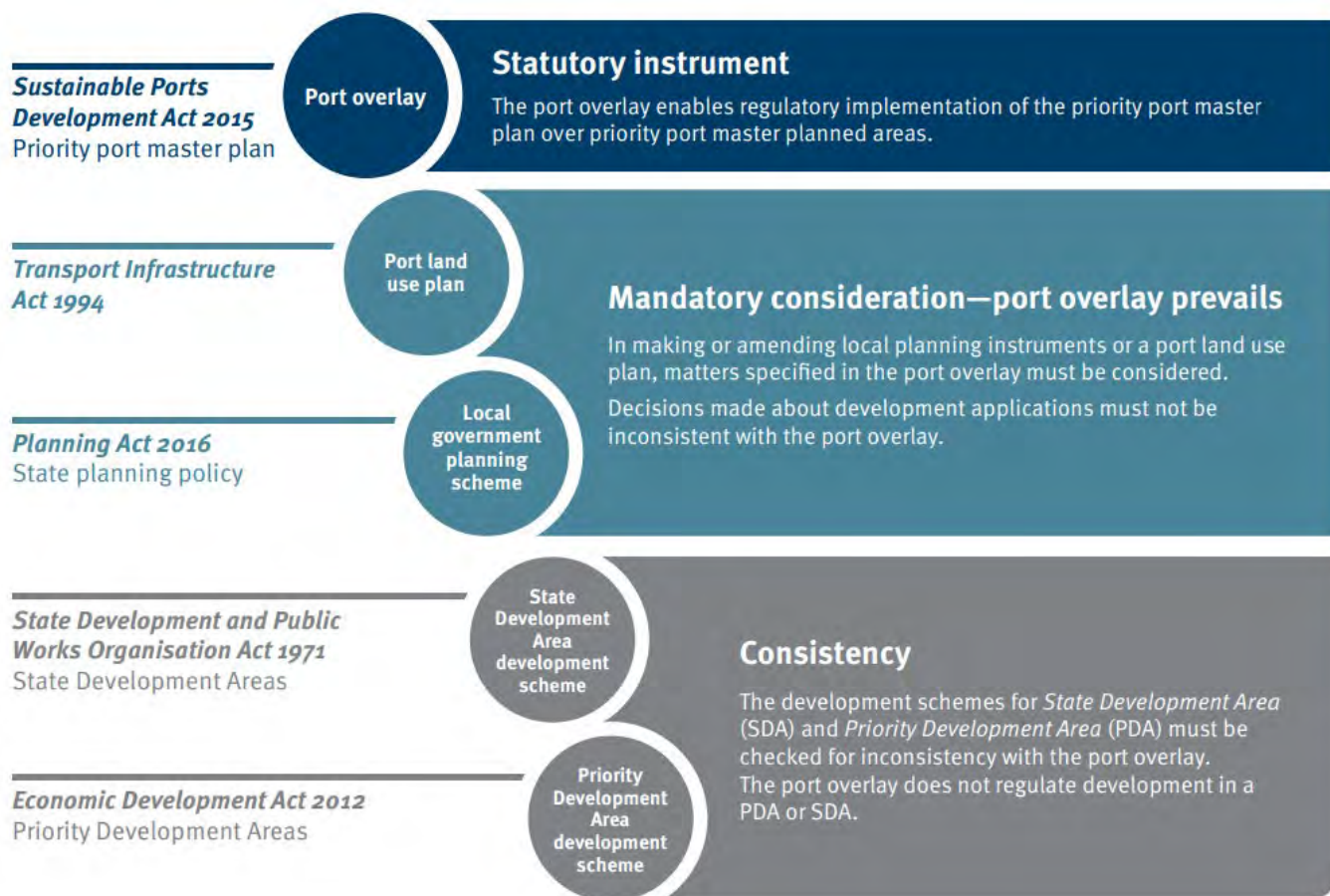


Figure 5: Implementation of the port overlay

5.2.2.1 Plan making

Under the Ports Act, the port overlay for the priority Port of Abbot Point may state matters to be considered by:

- NQBP in making or amending their land use plans
- WRC in making or amending their local planning scheme
- if the master planned area includes a PDA, the Minister for the Department of State Development, Infrastructure, Local Government and Planning (DSDILGP)
- in making or amending the development scheme for the PDA
- if the master planned area includes a SDA, the CG in making or amending the development scheme for the SDA.

5.2.2.2 Development assessment

The port overlay may include:

- categories of development (accepted development, assessable development requiring code or impact assessment, or prohibited development)
- assessment benchmarks
- matters an assessment manager must have regard to.

For development made assessable by the port overlay, a decision maker for an application under the Planning Act must:

- where stated in the overlay:
 - assess the development against applicable assessment benchmarks
 - have regard to other relevant assessment matters.
- not make a decision that is inconsistent with the port overlay.

5.2.2.3 Marine parks and capital dredging

The study area includes a marine park which is affected by multiple definitions under the Ports Act:

- 'restricted area' means an area that is within the GBRWHA but outside the Australian marine park
- 'Australian marine park' means the GBRMP established under the *Great Barrier Reef Marine Park Act 1975* (Cth) (GBRMP Act)
- 'state marine park' means the GBR Coast Marine Park continued in existence under the *Marine Parks Act 2004* (MP Act)

The Ports Act provides that a master planned area cannot include a marine park. It also states that an assessment manager must refuse a port-related development application if the development is in:

- the state marine park
- a restricted area that is outside a port's existing port limits.

However, this does not apply for development that is or involves:

- dredging
- disposing or depositing of material generated from dredging activities.

An approving authority must not approve capital dredging related to a new or existing port facility if the dredging will be carried out within a restricted area unless the development is in a priority port's master planned area.

Table 1: Relationship between land use planning instruments and a port overlay

Legislation	Regulatory instrument within master planned area	Relationship to the port overlay	Action for development assessment	Action for plan making
Planning Act	WRC Planning Scheme or other local planning instruments.	The planning scheme and the port overlay apply. The port overlay prevails to the extent of any inconsistency.	Where the port overlay makes development assessable and prescribes assessment benchmarks, the assessment manager must: <ul style="list-style-type: none"> • assess the development against the assessment benchmarks • have regard to matters specified. The assessment manager's decision must not be inconsistent with the port overlay.	WRC must consider the content of the port overlay when making or amending the planning scheme or other local planning instruments under the Planning Act.
	Port of Abbot Point Land Use Plan	The land use plan and the port overlay apply. The port overlay prevails to the extent of any inconsistency.	Where the port overlay makes development assessable and prescribes assessment benchmarks, the assessment manager must: <ul style="list-style-type: none"> • assess the development against the assessment benchmarks • have regard to matters specified. The assessment manager's decision must not be inconsistent with the port overlay.	Not applicable.
	Planning Regulation 2017 (Planning Regulation)	The State Development Assessment Provisions (SDAP) and the port overlay apply.	Where the port overlay makes development assessable and prescribes assessment benchmarks, the assessment manager must: <ul style="list-style-type: none"> • assess the development against the assessment benchmarks • have regard to matters specified. The assessment manager's decision must not be inconsistent with the port overlay.	Not applicable.
TIA	Port of Abbot Point Land Use Plan	The port overlay prevails to the extent of any inconsistency.	Not applicable.	NQBP must consider the content of the port overlay when making or amending the land use plan under the TIA.

Legislation	Regulatory instrument within master planned area	Relationship to the port overlay	Action for development assessment	Action for plan making
SDPWO Act	APSDA Development Scheme	The CG must consider but is not bound by a requirement under the port overlay.	The port overlay does not regulate development that is regulated by the development scheme.	<p>The CG must consider whether the development scheme is inconsistent with the port overlay.</p> <p>Where there is an inconsistency, the CG must decide whether to amend the development scheme to remove the inconsistency.</p> <p>The CG must consider the content of the port overlay when making or amending the development scheme.</p>

5.3 Queensland's planning framework – an overview

The Planning Act establishes Queensland's planning system and provides the framework for the state's plan making, development assessment and dispute resolution systems. Under the Planning Act, the DSDILGP Minister is given powers that can be enacted in response to matters relating to state interests.

The relationship between the various components of the planning system covered in this chapter are illustrated in **Appendix B**. For the purpose of land use planning in the study area, local planning schemes and development applications are considered the primary tools under the planning framework delivering planning and development outcomes.

5.3.1 Legislative framework

The Planning Act seeks to establish an efficient and accountable system of land-use planning and development assessment to lead to ecological sustainability which balances:

- the protection of ecological processes and natural systems at local, regional, state and national levels
- economic development
- the cultural, economic, physical and social wellbeing of Queenslanders.

The *Planning Regulation 2017* (Planning Regulation) prescribes matters dealt with, and instruments made, under the Planning Act.

5.3.2 State planning instruments

The state's interests are set out in the *State Planning Policy 2017* (SPP) and regional plans. These interests are delivered through local planning schemes.

The SPP is the primary state planning instrument in Queensland. It provides clear and comprehensive details of the policies needed to ensure that plan making and development assessment in Queensland is outcome focused, efficient, and accountable.

Seventeen state interests ensure that state interests are protected and delivered through local government processes (see **Table 2**). These state interests, interpreted and applied according to the guiding principles outlined in the SPP, describe the planning matters the state has decided must be properly considered and integrated into local plan making and development assessment decisions. The five guiding principles in the SPP seek to ensure a system that is:

- **outcome focused** – clearly focusing on the delivery of outcomes
- **integrated** – reinforcing the role of local planning schemes as the integrated, comprehensive statement of land use policy and development intentions for a local area
- **efficient** – supporting the efficient determination of appropriate development
- **positive** – enabling positive responses to change, challenges and opportunities
- **accountable** – promoting confidence in the planning system through plans and decisions that are transparent and accountable.

The SPP sits above regional plans and planning schemes in the hierarchy of planning instruments under the Planning Act. The SPP applies (to the extent relevant) to the following:

- making or amending a local planning instrument or regional plan
- designating premises for infrastructure
- local government assessment of a development application, if its planning scheme has not yet appropriately integrated the relevant SPP state interest policies
- an assessment manager or referral agency other than local government when assessing a development application.

Table 2: State Policy Planning themes and state interests

SPP theme	State interest	Statement
1. Planning for liveable communities and housing	1. Housing supply and diversity	Diverse, accessible and well-serviced housing, and land for housing, is provided and supports affordable housing outcomes.
	2. Liveable communities	Liveable, well-designed and serviced communities are delivered to support wellbeing and enhance quality of life.
2. Planning for economic growth	3. Agriculture	The resources that agriculture depends on are protected to support the long-term viability and growth of the agricultural sector.
	4. Development and construction	Employment needs, economic growth, and a strong development and construction sector are supported by facilitating a range of residential, commercial, retail, industrial and mixed-use development opportunities.
	5. Mining and extractive resources	Extractive resources are protected and mineral, coal, petroleum and gas resources are appropriately considered to support the productive use of resources, a strong mining and resource industry, economical supply of construction materials, and avoid land use conflicts where possible.
	6. Tourism	Tourism planning and development opportunities that are appropriate and sustainable are supported, and the social, cultural and natural values underpinning tourism developments are protected.
3. Planning for the environment and heritage	7. Biodiversity	Matters of environmental significance are valued and protected, and the health and resilience of biodiversity is maintained or enhanced to support ecological processes.
	8. Coastal environment	The coastal environment is protected and enhanced, while supporting opportunities for coastal-dependent development, compatible urban form, and maintaining appropriate public use of and access to, and along, state coastal land.
	9. Cultural heritage	The cultural heritage significance of heritage places and heritage areas, including places of Aboriginal and Torres Strait Islander cultural heritage, is conserved for the benefit of the community and future generations.
	10. Water quality	The environmental values and quality of Queensland waters are protected and enhanced.
4. Planning for safety and resilience to hazards	11. Emissions and hazardous activities	Community health and safety, and the natural and built environment, are protected from potential adverse impacts of emissions and hazardous activities. The operation of appropriately established industrial development, major infrastructure, and sport and recreation activities is ensured.

SPP theme	State interest	Statement
5. Planning for infrastructure	12. Natural hazards, risk and resilience	The risks associated with natural hazards, including the projected impacts of climate change, are avoided or mitigated to protect people and property and enhance the community's resilience to natural hazards.
	13. Energy and water supply	The timely, safe, affordable and reliable provision and operation of electricity and water supply infrastructure is supported, and renewable energy development is enabled.
	14. Infrastructure integration	The benefits of past and ongoing investment in infrastructure and facilities are maximised through integrated land use planning.
	15. Transport infrastructure	The safe and efficient movement of people and goods is enabled, and land use patterns that encourage sustainable transport are supported.
	16. Strategic airports and aviation facilities	The operation of strategic airports and aviation facilities is protected, and the growth and development of Queensland's aviation industry is supported.
	17. Strategic ports	The operation of strategic ports and priority ports is protected and their growth and development are supported.

The online SPP Interactive Mapping System supports the application of the SPP state interests. The SPP Interactive Mapping System represents the spatial representation of the state's interests expressed in the SPP. A suite of SPP guidance material, including *Integrating state interests in a planning scheme: Guidance for local governments, November 2021 – VS 1.2*, aims to give a greater emphasis on providing up front certainty through planning schemes and reducing conflict during the development assessment process. The guidance material supports local government in its interpretation, integration and advancement of the strategic ports state interest when making or amending their planning scheme.

At the regional level, the state prepares regional plans to support economic growth, development and liveable communities while protecting natural resources and balancing state interests outlined in the SPP.

Regional plans set out integrated planning and development assessment policies about matters of state interest for particular regions. Regional plans form part of Queensland's regional planning framework, which is managed through the Planning Act, Planning Regulation, RPI Act and *Regional Planning Interests Regulation 2014* (RPI Regulation). The MIW Regional Plan applies in the study area.

5.3.2.1 Other statutory instruments

The Queensland Government is also responsible for statutory instruments that ensure the plan making and development assessment systems are consistent across Queensland. These are:

- **Minister's Guidelines and Rules (MGR)** – a statutory instrument that establishes how local planning instruments are to be made or amended.
- **Development Assessment Rules (DA Rules)** – a standard assessment process to make sure development applications are assessed equitably. The DA Rules apply to all parties involved in the assessment process including the applicants, assessment managers and referral agencies.
- **SDAP** – set out the state's interest in development assessment and include assessment benchmarks and other assessment matters. SDAP also provides the state's Fast Track 5 framework, which is a streamlined assessment pathway for particular development proposals.

5.3.3 Local planning instruments

Local government prepares local planning instruments that guide growth and development in their LGA. Local planning instruments include:

- local planning schemes
- planning scheme policies
- Local Government Infrastructure Plans (LGIP)
- temporary local planning instruments.

Figure 6 illustrates the WRC Planning Scheme zoning.

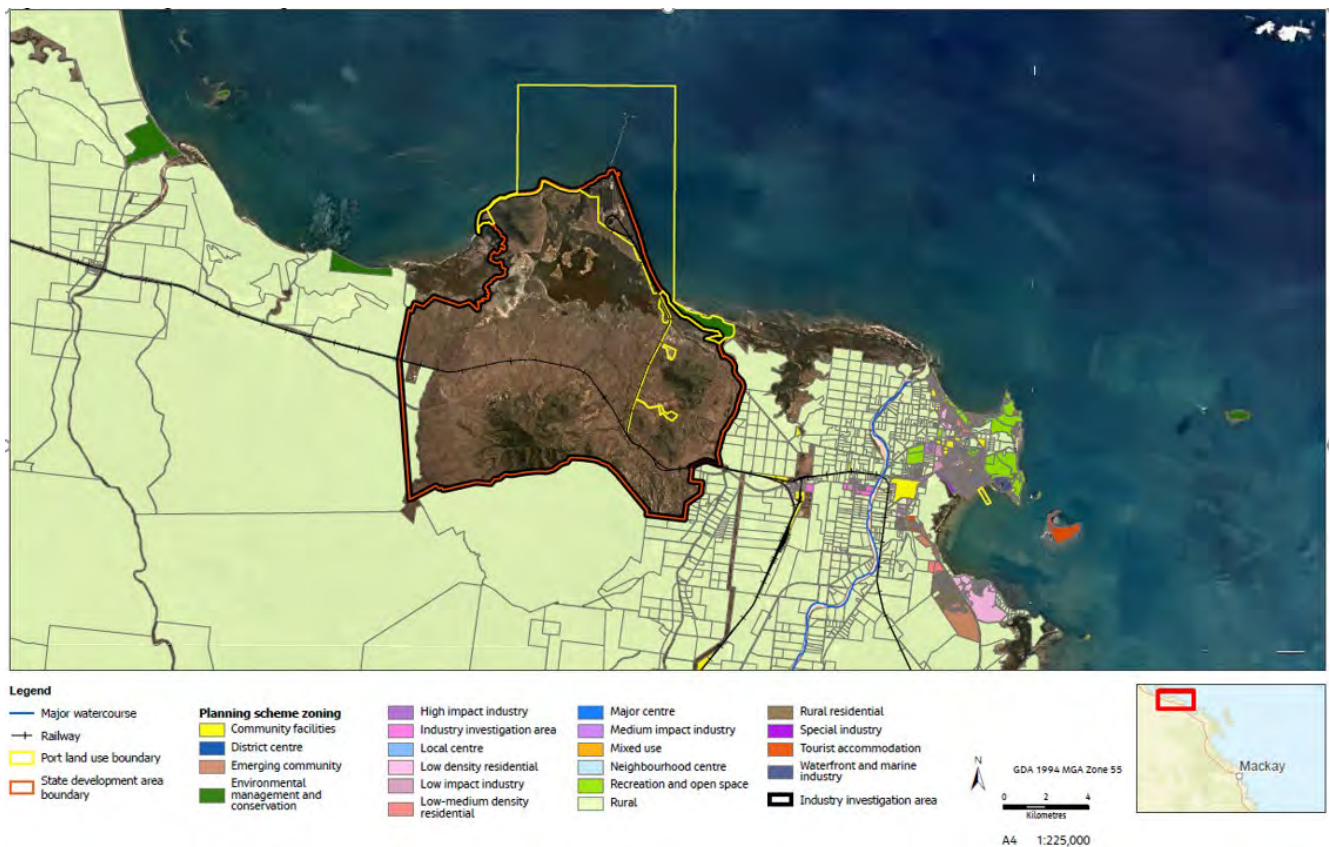


Figure 6: Whitsunday Regional Council Planning Scheme zoning

5.4 Planning Act 2016

The hierarchy of decision-making established under the planning framework seeks to ensure that local planning and development outcomes appropriately reflect with matters of state and regional interest.

5.4.1 Plan making

Queensland's performance-based planning system encourages and responds to change by allowing for innovation and flexibility in plan making.

A local planning scheme is the primary local planning instrument for regulating what, where and how new development should occur at the local level. It outlines planning and development aspirations and infrastructure needs.

The Planning Act requires that all local governments review their planning schemes within ten years of the current one being made or last reviewed. The MGR sets out the process for making or amending local planning instruments.

Local governments are required to address state and regional policy matters outlined in the SPP and relevant regional plan.

The Queensland Government carries out a state interest review of certain proposed planning schemes or planning scheme amendments to determine whether they appropriately integrate state planning instruments. The DSDILGP Minister must approve a new local planning scheme and certain proposed planning scheme amendments before they can commence.

5.4.2 Development assessment

The Planning Act defines three categories of development: prohibited, acceptable and assessable. Assessable development is required to have a development approval (in the form of a development permit) before the development can occur.

The Planning Regulation, local planning scheme, temporary local planning instruments or variation approval identify which types of development require a development approval and which category of assessment will apply (either code or impact assessment).

The DA Rules set out the standard process for making, assessing and deciding development applications. The Planning Regulation identifies which entity is the assessment manager, and where relevant, referral agency for all applications. Local governments are the assessment manager for a large proportion of development applications in Queensland. Local government in its capacity as assessment manager or referral agency will assess development applications against its local planning scheme. It will also refer to the SPP on certain matters where their local planning scheme does not appropriately integrate the SPP.

Where a development proposal may affect a state interest, the Planning Regulation may identify the state as the assessment manager or referral agency. The State Assessment and Referral Agency (SARA) provides a coordinated, whole-of-government approach to the state's assessment of development applications. SARA assesses development applications against SDAP where the Planning Regulation identifies SDAP as the assessment benchmarks.

The current SDAP is prescribed by the Planning Regulation. SDAP defines the state's interests in development assessment across 25 state codes (see **Table 3**) and includes the assessment benchmarks or matters SARA will assess a development application against. Guidance material and supporting information to help applicants address each of the state codes is listed in the reference section after each state code. The state interests managed under SARA are administered by the following state agencies:

- Department of Agriculture and Fisheries (DAF)
- Department of Education
- Department of Environment and Science (DES)
- Department of Housing and Public Works
- Department of Manufacturing, Regional Development and Water
- DOR
- DSDILGP.

SARA has not issued any development permits for a material change of use (MCU) relating to industrial or sensitive uses within the study area since commencement of the Ports Act.

For a small number of development applications, the Planning Regulation identifies entities other than the local government or SARA as an assessment manager or referral agency (for example, a private certifier or port authority), assessment benchmarks or other assessment criteria other than the local planning scheme or SDAP (for example, the building assessment provisions or a port land use plan).

Table 3: State Development Assessment Provisions – State codes

State Code	State interest
State code 1	Development in a state-controlled road environment
State code 2	Development in a railway environment
State code 3	Development in a busway environment
State code 4	Development in a light rail environment
State code 5	Development in a state-controlled transport tunnel environment
State code 6	Protection of state transport networks
State code 7	Maritime safety
State code 8	Coastal development and tidal works
State code 9	GBR wetland protection areas
State code 10	Taking or interfering with water
State code 11	Removal, destruction or damage of marine plants
State code 12	Development in a declared fish habitat area (FHA)
State code 13	Unexploded ordnance
State code 14	Queensland heritage
State code 15	Removal of quarry material from a watercourse or lake
State code 16	Native vegetation clearing

State Code	State interest
State code 17	Aquaculture
State code 18	Constructing or raising waterway barrier works in fish habitats
State code 19	Category 3 levees
State code 20	Referable dams
State code 21	Hazardous chemical facilities
State code 22	Environmentally relevant activities
State code 23	Wind farm development
State code 24	Urban design outcomes for significant projects (advice only)
State code 25	Development in South East Queensland koala habitat areas.

5.4.3 State requirements under the *Planning Act 2016*

5.4.3.1 State Planning Policy

The SPP outlines the guiding principles and state interests that underpin the delivery of local and regional plans and development that advance the social, economic and environmental needs of all Queenslanders. The SPP is a statutory instrument and must be appropriately integrated or considered when undertaking the activities to which the SPP applies.

The SPP identifies policy and planning outcomes for matters of state interest through a state interest statement, state interest policies and, where applicable, benchmarks for development assessment. The SPP does not include assessment benchmarks for development related to strategic ports or priority ports.

The SPP cites the ecological, economic, social and cultural value of the GBRWHA as being a key part of why the coastal environment is a matter of state interest. The SPP states that, '*Planning and development in the GBR catchments should support the commitments made by all levels of government to protect the OUV of the GBR from the impacts of development and climate change*'. The SPP specifically seeks to protect and enhance the coastal environment, while supporting opportunities for coastal-dependent development, compatible urban form, and maintaining appropriate public use of and access to, and along, state coastal land.

However, all state interests in the SPP are relevant to the values and potential development impacts across the study area. Of particular relevance is state interest 17 'strategic ports'. As the priority Port of Abbot Point is located in the WRC, the strategic ports state interest will be relevant to council when it makes or amends its WRC Planning Scheme. The SPP recognises Queensland's ports as a major component of both the national and state supply chain due to their ability to provide critical connections with global markets and facilitate the import and export of goods and materials. The SPP aims to ensure development does not impact on the safe and efficient operation of the ports to support continued growth of the state's economy and Australia's national defence system. Through the policies included in state interest 17, the SPP also seeks to ensure that port operations do not result in unintended social and environmental impacts on communities close to ports (see **Table 4**).

A summary of key matters addressed by the other state interest policies relevant to the master planning process at the priority Port of Abbot Point is provided in **Appendix C**.

Table 4: State interest 17: Strategic ports

Policy number	State interest policies
1	Strategic ports, associated SPL and core port land, are identified.
2	Development complements the role of a strategic port as an economic, freight and logistics hub, and enhances the economic opportunities that are available in proximity to a strategic port.
3	Strategic ports are protected from development that may adversely affect the safety, viability or efficiency of existing and future port operations.
4	Development is located and designed to mitigate adverse impacts on the development from environmental emissions generated by port operations.
5	Key transport corridors (including freight corridors) linking strategic ports to the broader transport network are identified and protected.

Policy number	State interest policies
6	Statutory land use plans for strategic ports and the findings of planning and environmental investigations undertaken in relation to strategic ports are considered.
7	For priority ports, development is also consistent with the requirements of priority port master plans and priority port overlays as these are approved under the Ports Act.

5.4.3.2 State Development Assessment Provisions

SDAP is a statutory instrument and identifies 25 state interests for development assessment purposes where the state is required to assess an application. SDAP is structured in a performance-based code format where applicants address performance criteria to demonstrate the extent to which their proposal appropriately manages any impacts on a matter of state interest, and/or protects a development from impacts of matters of state interest.

State codes that provide assessment criteria include a purpose statement and performance outcomes. Acceptable outcomes are given for some performance outcomes. A purpose statement defines the intent of each state code and is the highest order test of a state code that a development application will be assessed against. Development that is demonstrated to meet the purpose statement of a state code is taken to comply with that state code.

The Planning Regulation determines whether new development proposals are assessable by SARA against SDAP. Where assessment against SDAP is required, one or more state codes may apply. State codes are applied on the basis either of a development's location or the type of use being proposed. The following assumptions are made about the state codes that are most likely to be relevant for future development within the study area.

Some locational state codes are not applicable in the study area because the state interest is either not mapped or otherwise not applicable. These are state codes three (busways), four (light rail), five (transport tunnels), 12 (FHAs), 13 (unexploded ordnance) and 25 (South East Queensland koala habitats). Queensland heritage places are mapped within the study area. However, these are over 20km away from the port facility and state code 14 (heritage) is therefore unlikely to be relevant in the assessment of port-related development.

Similarly, some use-based codes are unlikely to be called up for development in or around the priority Port of Abbot Point. These are state codes 19 (levees) and 20 (referable dams). State code 24 (urban design) provides 'advice only' and is not considered further in this chapter.

The remaining 15 state codes could be required in the assessment of development proposals in the study area. These are highlighted below, and their purpose statements are provided in **Appendix D**.

5.4.3.2.1 Key locational state codes

Coastal protection and maritime safety state interests are mapped within the study area and therefore, particularly for proposals closer to the coast, the following codes may apply to future development applications: state code seven (maritime safety), eight (coastal development and tidal works), nine (wetlands), 10 (taking or interfering with water) and 11 (marine plants).

Current and future road and rail state-controlled transport corridors are also mapped within the study area and therefore state codes one (roads), two (railways) and six (transport networks) may apply to certain development proposals depending on their location or scale.

5.4.3.2.2 Key use-based state codes

Port or port-related development proposals are often industrial in nature meaning that state codes 21 (hazardous chemicals) and 22 (environmentally relevant activities (ERA)) may be relevant.

Proposed new land uses may trigger assessment against state codes 15 (removing quarry material), 16 (vegetation clearing), 17 (aquaculture), 18 (waterway barrier works) or 23 (wind farms).

5.4.4 Mackay, Isaac and Whitsunday Regional Plan 2012

The MIW Regional Plan provides the strategic framework for managing growth, change, land use and development in the region to 2031. It seeks to balance the recognised lifestyle values of the region with the establishment of a strong and diversified economy, while recognising that long-term regional prosperity is

reliant on sound management of natural resources, the natural environment and the ongoing viability of the agricultural sector.

The MIW Regional Plan was published in 2012 under a previous planning framework. Some of the policy directions in the MIW Regional Plan and its constituent parts for example, parts D and E, are significantly outdated. There are currently no assessment benchmarks provided by the MIW Regional Plan. A commitment in the plan for a five to 10 yearly review indicates it will be reviewed in the near future.

5.4.4.1 Regional framework

The regional framework comprises a regional vision, strategic directions and regional narratives.

There are 10 strategic directions which outline the broad policy framework for the region and identify important aspects involved in planning for the region's long-term development. The strategic directions are to be achieved through management of the region's natural resources and environmental assets, and mechanisms that support a strong economy. The strategic directions support the regional vision and inform the principles and policies identified in the desired regional outcomes (DROs). The regional narrative reflects the existing settlement pattern.

5.4.4.2 Desired regional outcomes

The DROs are framed around the regional plan's 10 strategic directions. The DROs articulate the preferred direction for development and land use outcomes in the region. Each DRO is supported by a set of principles, policies and programs that are intended to manage the region's growth to 2031. The DRO principles are provided in **Appendix E**. The principles and policies guide state and local governments in the formulation of policies and planning documents, such as planning schemes.

The MIW Regional Plan was prepared prior to the release of the SPP in July 2017. The relationship between some of the MIW Regional Plan land use policies (DROs, principles and policies) and the state interest policies in the SPP is therefore outdated. The SPP guidance material 'integrating state interests in planning schemes – guidance for local government' supports local governments in their plan-making role by providing a table (see **Appendix G**) listing the:

- regional plan land use planning policies to be given effect through the local planning scheme
- primary state interest supported by the regional plan land use planning policies.

5.4.4.3 Regional land-use categories

The State Planning Regulatory Provisions (SPRP) are included in the MIW Regional Plan. The SPRP includes a regional land-use map that indicates areas which are to be protected as Regional Landscape and Rural Production Areas (RLRPA) or Rural Living Areas (RLA), and areas which are designated as Urban Footprint. These allocations have informed the current settlement pattern.

The RLRPA identifies land with regional landscape, rural production or other non-urban values. The RLA generally comprises rural residential locations under local planning instruments or other similar areas.

The Urban Footprint identifies land that is expected to meet the region's projected urban development needs to 2031. The Urban Footprint is a representation of:

- large urban communities, other communities recognised as being affected by growth pressures, and other areas recognised as the preferred locations for future growth
- lands surrounded by existing or proposed urban development, but which may not be an appropriate location for development (for example, floodplains and conservation parks).

The SPRP is used to provide assessment benchmarks for certain development proposals in the region, however these have been superseded and are no longer given effect under the Planning Regulation.

5.4.5 Local planning

5.4.5.1 Plan making

The WRC Planning Scheme commenced on 3 July 2017. The scheme appropriately integrates all aspects of the SPP. The scheme, specifically the strategic framework, appropriately advances the MIW Regional Plan.

The planning scheme includes:

- the strategic framework
- the LGIP
- tables of assessment
- zones
- local plans
- overlays
- development codes
- other plans
- schedules and appendices (including definitions, mapping, notations, designations and planning scheme policies).

5.4.5.1.1 Strategic framework

The strategic intent for the region is to guide growth while maintaining a high quality of life for Whitsunday residents.

The strategic framework sets out the policy intent for the planning scheme and comprises a strategic intent and five key policy themes (each with outcomes, elements and land use strategies).

The strategic intent states:

'The major townships of the region operate as a network of centres, each maintaining relatively strong levels of growth supported by the ongoing strengthening and development of the key economic sectors of agriculture, mining and tourism and associated development and construction activities. The strength of these industry sectors will continue to be supported by maintaining and protecting the resources and values upon which these sectors rely, promoting business innovation and increasing accessibility to robust road, rail, port and aviation facilities.'

The strategic vision focuses upon capitalising upon the region's opportunities in a sustainable manner using the following guiding principles identified within the strategic framework:

- liveable communities and housing
- economic growth
- environment and heritage
- safety and resilience to hazards
- infrastructure

A summary of these five themes is given in **Appendix G**.

5.4.5.1.2 Zone and overlay codes

SPL is not subject to a local planning instrument under the Planning Act. The WRC Planning Scheme currently identifies SPL within the industry investigation zone.

The detailed planning requirements set out in the planning scheme further protect and support the priority port and surrounding areas. The scheme includes management measures for environmental impacts from port-related development and encroachment on or by port-related development.

Four zones are applicable within the study area:

- 6.2.1 Community facilities zone code
- 6.2.4 Environmental management and conservation zone code
- 6.2.6 Industry investigation area zone code (port land)
- 6.2.16 Rural zone code.

There are 12 overlay codes that provide an additional layer of assessment to manage specific risks across the study area. These relate to natural hazards, agricultural land, coastal environments and area of environmental significance, extractive resources and infrastructure.

Further details of these zones and overlays are presented in **Appendix H** and **Appendix I** and are summarised.

5.4.5.1.3 Planning scheme policies

There are currently seven planning scheme policies:

- environmental features
- heritage
- landscaping
- natural hazards
- thirds party advice or comment
- growth management
- WRC development manual.

5.4.5.1.4 Local government infrastructure plans

LGIPs form part of a local government's planning scheme and identifies the local shared infrastructure needed to support planned urban development in the local community. The LGIP must be prepared in accordance with the Planning Act and the MGR.

LGIPs are required if a local government intends to levy infrastructure charges or impose development conditions for trunk infrastructure on development approvals.

Under the Planning Act, a local government may impose conditions about the provision of necessary trunk infrastructure. Where a development is out-of-sequence or inconsistent with the planning assumptions of the LGIP, or where a development is located outside the local government's priority infrastructure area, an applicant may be liable for extra costs imposed through an extra payment condition.

The WRC LGIP is incorporated into the current planning scheme and comprises:

- planning assumptions about future growth and urban development including the assumptions of demand for each trunk infrastructure network
- priority infrastructure area to accommodate growth to 2031
- desired standards of service for trunk infrastructure networks (water supply, sewerage, stormwater, transport, parks and land for community facilities)
- plans for existing and future trunk infrastructure.

Development for urban purposes is expected to align with the planning assumptions of the LGIP and should be appropriately sequenced.

If a local government has an LGIP in place, the local government is required to adopt an infrastructure charges resolution to levy infrastructure charges. *Whitsunday Regional Council's Adopted Charge Resolution 2020*⁶ took effect on 26 November 2020 and applies to the entire WRC area.

Future trunk infrastructure identified by the LGIP (**Figure 7**) as outlined within the planning scheme, including the estimated timing for delivery is listed in **Appendix J**.

⁶ Whitsunday Regional Council. (2020). *Whitsunday Regional Council's Adopted Charge Resolution (No. 1) 2022*.



Figure 7: Planned Trunk Infrastructure – Local Government Infrastructure Plan

5.4.5.2 Planning scheme amendment package

WRC is proposing changes to a broad range of planning scheme provisions, to ensure the region continues to prosper and the WRC Planning Scheme remains effective and contemporary. Amendments to the planning scheme will ensure planning decisions continue to reflect principles and standards developed with community input.

The proposed amendment is following the major amendment process required in the MGR. WRC endorsed the amendment package to progress to State Interest Review 2021 and the package is currently with the Queensland Government for Ministerial approval prior to the commencement of public consultation.

The amendment package addresses:

- issues raised in the rounds of stakeholder consultation for the formation of the planning scheme (2015 – 2017)
- numerous minor workability problems identified by internal and external stakeholders during the past few years
- updating of the different sections of the scheme as required by SPP Guidance Materials
- zoning amendment requests (in and outside of the official consultation periods).

5.4.5.3 Development assessment

The WRC Planning Scheme, and therefore the LGIP, does not have a role in development assessment within the APSDA. However, it is applicable over adjoining land within the land use planning jurisdiction of WRC.

There have been no recent development approvals for sensitive uses within a 5km proximity to industrial activities near the port. The only significant applications have been for planned hazard activities as detailed within **Section 8.3.4**.

5.5 Regional Planning Interests Act 2014

The RPI Act and RPI Regulation work alongside the Planning Act and Planning Regulation to strike an appropriate balance between protecting priority land uses and delivering a diverse and prosperous economic

future for our regions. The RPI Act also gives effect to the policies about matters of state interest in regional plans.

The RPI Act identifies and protects areas of regional interest throughout Queensland. Its aim is to:

- manage the impact of resource and regulated activities on areas of regional interest
- support these activities with other activities, such as highly productive agricultural activities
- assist in resolving land use conflict between activities which contribute to the state's economy.

There are four areas of regional interest identified for their contribution to Queensland's economic, social and environmental prosperity:

- priority living areas
- priority agricultural areas
- SCAs
- strategic environmental areas.

SCA is an area of regional interest because it includes land that is, or likely to be, highly suitable for cropping due to a combination of the land's soil, climate and landscape features.

The SCA consists of areas shown on the SCL trigger map as SCL. SCL is land that may be suitable for cropping because of a combination of the land's soil, climate and landscape features. There are areas of SCL mapped within the study area.

5.5.1 Development assessment

Under the RPI Act, a Regional Interests Development Approval (RIDA) is required to carry out a resource activity or regulated activity in a SCA (mapped as SCL). Resource activities relate to resource authorities defined under the RPI Act such as certain petroleum authorities under the *Petroleum and Gas (Production and Safety) Act 2004* or a licence, permit, pipeline licence, primary licence, secondary licence or special prospecting authority granted under the *Petroleum (Submerged Lands) Act 1982*. There are currently no regulated activities defined in relation to SCA in the study area.

DOR makes and certifies the SCL trigger map. Amendments can be made to the SCL trigger map because of a RIDA, or because a SCL map amendment application successfully demonstrates that a SCL area needs correcting.

5.6 Transport Infrastructure Act 1994

The TIA seeks to achieve the effective delivery of transport infrastructure. The scope of TIA's objectives include integrated planning and efficient management of public marine transport infrastructure and transport infrastructure relating to ports.

TIA provides for the establishment of port authorities to manage and operate port facilities and services and make land purposes consistent with the operation of its port. The *Transport Infrastructure (Ports) Regulation 2016* prescribes NQBP as the port authority for the priority Port of Abbot Point.

In relation to port development, the TIA sets out the process for the preparation and approval of land use plans. A land use plan is a statutory instrument and relates to port authority land that is on or near the interface between the land and the waters within the limits of the port.

5.6.1 Plan making

TIA requires a port authority to review its land use plan at least every eight years. A land use plan must specify details of:

- the port authority's SPL
- land the port authority proposes to become SPL
- current and proposed uses of the land

- coordinate and integrate the core matters, which under TIA are defined as land use and development, port facilities and valuable features
- identify desired environmental outcomes (DEOs) for the land
- include measures that will help achieve the DEOs.

Under the TIA, the Transport Minister may approve a land use plan if satisfied it meets a range of requirements set out in the TIA, including that the draft plan will not adversely affect state interests (as defined under the Planning Act, Schedule 2) and that if the port is in a master planned area, that it is consistent with the port overlay.

5.6.1.1 Land use plan

The land use plan provides details of SPL for the priority Port of Abbot Point, and development on SPL must comply with the requirements of the land use plan. A set of development guidelines for the land use plan support NQBP in its role as assessment manager for development applications.

The land use plan sets out DEOs that provide the overall vision for the priority Port of Abbot Point. The DEOs address economic development, community wellbeing and ecological processes (see **Table 5**). All aspects of the land use plan are based on these DEOs and contribute to their achievement.

Table 5: Port of Abbot Point Land Use Plan – Desired environmental outcomes

Component	Desired environmental outcomes
Economic development	<ul style="list-style-type: none"> • the port will be a world class facility to support imports and exports for the region • the port will provide critical infrastructure to support the establishment of large-scale industrial development of regional, state and national significance in the APSDA • the port will positively contribute to the town of Bowen and provide regional employment opportunities in its ongoing operations and management, and during development and construction periods • the development of port related industries and activities in appropriate locations on SPL will be facilitated • land will be retained and acquired that is strategic to the future operations and development of the port • port uses will be consolidated to provide cost effective infrastructure • NQBP will actively liaise with infrastructure providers and planners, including DSDILGP, WRC, TMR, rail providers and energy providers, regarding the provision of services and infrastructure to the port for all possible exports and imports • sustainable technologies will be incorporated into port development to decrease long-term operating costs and reduce the environmental footprint and off-site impacts • opportunities will be explored to secure improved road and rail access to the port to facilitate the efficient movement of coal and other products associated with planned port expansions that are consistent with the wider strategic development of the state's coal export capability.

Component	Desired environmental outcomes
Ecological processes	<ul style="list-style-type: none"> • protection and enhancement of the natural port environment will be achieved through pursuing high standards of environmental performance and incorporating sustainable environmental management into all aspects of port planning, development and operations at the port • development on port land will not adversely affect the values of identified areas with high conservation significance, including the GBRMP and adjacent Caley (Kaili) Valley Wetlands • climate change assessment will form part of the design of projects SPL, as appropriate • development of port land will comply with air, water, waste and noise policies administered under the <i>Environmental Protection Act 1994</i> (EP Act).
Community wellbeing	<ul style="list-style-type: none"> • port operations prioritise the safety and security of all visitors and employees accessing port land • the scenic and environmental values of the Bowen foreshore will be maintained • NQBP will work with the WRC to ensure port operations remain separated from sensitive receiving environments (such as residential) • NQBP will continue to manage and protect Indigenous cultural heritage values on port land through involvement with Traditional Owners • NQBP will continue to maintain and enhance its relationship with the community and WRC, to provide transparency for planning and development at the port.

The land use plan includes a designation map for its SPL.

The land use precincts establish the intent and preferred uses across the port's SPL. These five-land use planning designates the diversity of the port's operations and support its future growth:

- **Port Handling Activities** – onshore SPL that has a direct nexus with the waterfront for the handling of commodities for export
- **Offshore Port Infrastructure** – areas for offshore infrastructure, predominately used for the berthing of port vessels and transfer of materials for shipment
- **Port Related and Support** – areas of SPL integral to and supporting the key functions/interests of the port
- **Special Management Area** – areas of SPL with special locational or physical attributes
- **Environmental Protection** – broadly the areas of SPL identified with high conservation significance.

The details of each designation are presented in **Appendix K**. The designations respond to the intent of the local government planning scheme, NQBP objectives and the operational needs of the port.

The indicative uses described for each designation is indicative and not intended as an exhaustive list. Specific development proposals are assessed on a case-by-case basis in accordance with the intent of the land use plan, its precincts, development guidelines and any applicable memorandum of understanding protocols, for example, for land where NQBP does not manage planning and development.

Figure 8 illustrates the land use designations in the Port of Abbot Point Land Use Plan.

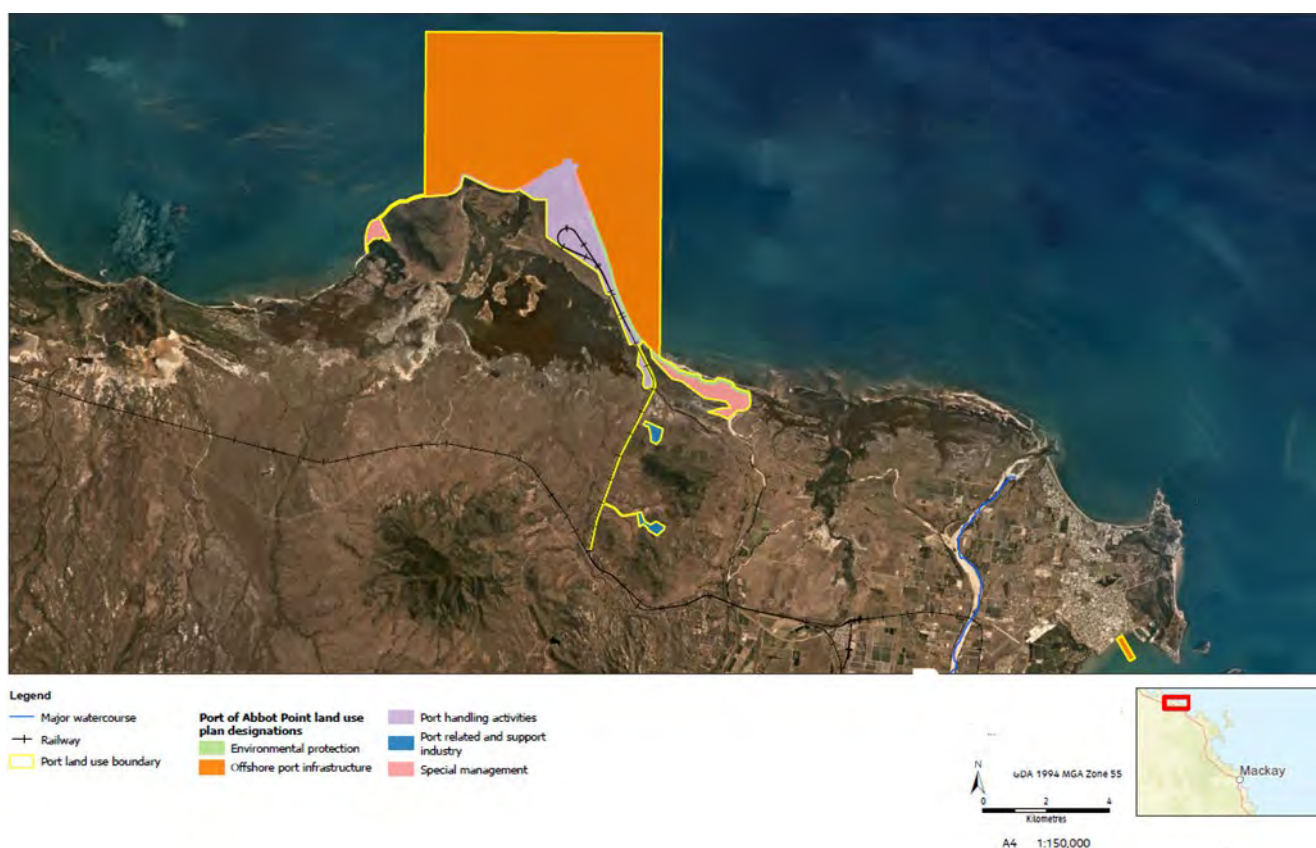


Figure 8: Port of Abbot Point land use plan designations

5.6.1.2 Sustainable port development guidelines

The development guidelines⁷ are a non-statutory component of the land use plan that provide a set of development codes and criteria for assessing development proposals on SPL. The development guidelines set out NQBP's port development approval process, objectives and requirements for:

- building design and visual amenity
- site layout, traffic management and parking
- sustainable design
- landscaping
- signage, lighting, fencing and security
- infrastructure and services
- environmental management
- heritage protection
- marine infrastructure and tidal works.

The development guidelines also identify works that are exempt from certain NQBP approvals.

5.6.2 Development assessment

Under the TIA, SPL is not subject to a local planning instrument the under the Planning Act, for example, the WRC Planning Scheme. However, the Planning Regulation may require a development proposal on SPL or in SPL tidal waters to be assessed against a land use plan prepared under the TIA.

⁷ Revision 3, March 2018 Doc Ref: E18/05266 source https://nqbp.com.au/_data/assets/pdf_file/0016/2680/Revision-3-Sustainable-Port-Development-Guidelines-20180312.pdf

Development made assessable by the land use plan, or development that is a MCU inconsistent with the land use plan (and a priority port overlay does not state that the development is accepted development or prohibited development), is assessable development and must be made to the port authority as assessment manager.

A development application for prescribed assessable development within port limits on land below high-water mark, is required by the Planning Regulation to be made to WRC as assessment manager and referred to the chief executive of the port authority as a referral agency. The chief executive's assessment must be against the functions of a port authority set out in the TIA.

5.6.2.1 Port notices and port development approvals

Under the TIA, a port authority may display or publish a port notice with the effect of controlling activities or conduct in its port area if it considers the port's operation may be affected, or damage may be caused to SPL or the environment. Purposes for controlling activities or conduct include to:

- maintain or improve the safe, secure or efficient operation of its port
- maintain fair or reasonable access to port facilities for users of its port
- move or moor ships within its port area
- manage controlled activities
- prevent damage to SPL
- prevent damage to the environment.

For the above list, the TIA defines controlled activities as being activities in relation to tug services, refuelling operations or certain works on ships.

If the port authority decides to regulate a controlled activity by issuing a port notice, TIA provides the mechanism for the activity to require approval by the port authority. For the priority Port of Abbot Point, NQBP requires all works in the port area be approved through this port notice process. NQBP refers to this process as their port development approval process.

Where NQBP requires works to be assessed through the port development approval process and the development assessment process under the Planning Act, it will issue two approval documents. This is because the Planning Act requires conditions of a development approval to meet certain requirements that are different to the requirements NQBP may wish to apply under a port development approval in its capacity both as landowner and port authority, for example, commercial, operational or security requirements. The NQBP port development approval process is described in more detail in their *Sustainable Port Development Guidelines*⁸.

5.7 State Development and Public Works Organisation Act 1971

Under the SDPWO Act, the CG has wide-ranging powers to plan, deliver and coordinate large-scale projects, while ensuring their environmental impacts are properly managed. These powers include:

- declaring a project to be a coordinated project and coordinate the IAR for the project
- recommending the declaration of a project as a prescribed project
- recommending the declaration of the SDA and managing land use within the SDA
- acquisition of land or easements
- other measures the CG thinks are necessary.

5.7.1 Coordinated projects

Proponents of a project may apply to have it declared a coordinated project by the CG. Coordinated projects are generally large scale and may involve:

⁸ North Queensland Bulk Ports Corporation. (2018). *Sustainable Port Development Guidelines*.

- complex approval requirements
- involving federal, state and local governments
- significant environmental effects, strategic significance to the locality, region or state, including for the infrastructure, economic and social benefits, capital investment or employment opportunities it may provide
- significant infrastructure requirements.

A declaration does not exempt the project proponent from requiring appropriate development approvals or from compliance with relevant planning and environment laws and planning instruments.

Coordinated projects require either an EIS or an IAR. An EIS is a rigorous and comprehensive IAR, involving whole-of-government coordination and public consultation. The IAR process is a more focused form of environmental assessment. The IAR can be used when the environmental effects of a project do not require assessment through the EIS process.

5.7.2 Prescribed projects

A prescribed project is one that is generally of economic and social significance to the state or part of the state. Public interest and potential environmental effects may be key factors in the decision to make a declaration.

If a prescribed project is considered to be 'critical or essential' for economic, social or environmental reasons to Queensland, it may be declared a 'critical infrastructure project'.

The purpose of declaring a prescribed project is to overcome any unreasonable delays in obtaining project approvals. The declaration enables the CG to intervene in the approvals process to ensure timely decision making for the prescribed project.

Declared prescribed projects may include:

- works a person is directed to undertake under the SDPWO Act
- a project in the SDA
- an infrastructure facility (as defined in the SDPWO Act)
- a coordinated project
- another project the DSDILGP Minister considers is economically or socially significant to Queensland or the region in which the project is to be undertaken or affects an environmental interest of Queensland or a region.

5.7.3 State Development Areas

SDAs are clearly defined areas of land established by the Governor-in-Council to promote economic development in Queensland. Each SDA is subject to a development scheme which is a regulatory document that controls land use and infrastructure planning and development in the SDA. The priority Port of Abbot Point is included in the APSDA.

5.7.3.1 Abbot Point State Development Area

The APSDA, declared in 2008, is 16,885ha of defined land area dedicated for both industrial and port-related development of regional, state and national significance. The SDA encompasses the priority Port of Abbot Point.

Facilities located within the APSDA include rail in-loading infrastructure, coal handling and stockpiling areas, a single trestle jetty and conveyor connecting to two offshore berths and two ship-loaders which are located 2.8km offshore.

The APSDA supports the region's existing and emerging industry, enterprises and surrounding infrastructure in a way that considers environmental, cultural, and social issues.

The APSDA development scheme contains a development assessment framework for making, assessing and deciding applications and requests relating to development within the APSDA, predominately land use, operational work and reconfiguring a lot. The APSDA includes six precincts including:

- Industry Precinct
- Infrastructure and Corridors Precinct
- Restricted Development Precinct
- Environmental Management/Materials Transportation Precinct
- Port Facilities Precinct
- Port Expansion Precinct.

A varied development scheme for APSDA came into effect November 2014 by regulation.

Figure 9 illustrates the APSDA precincts.

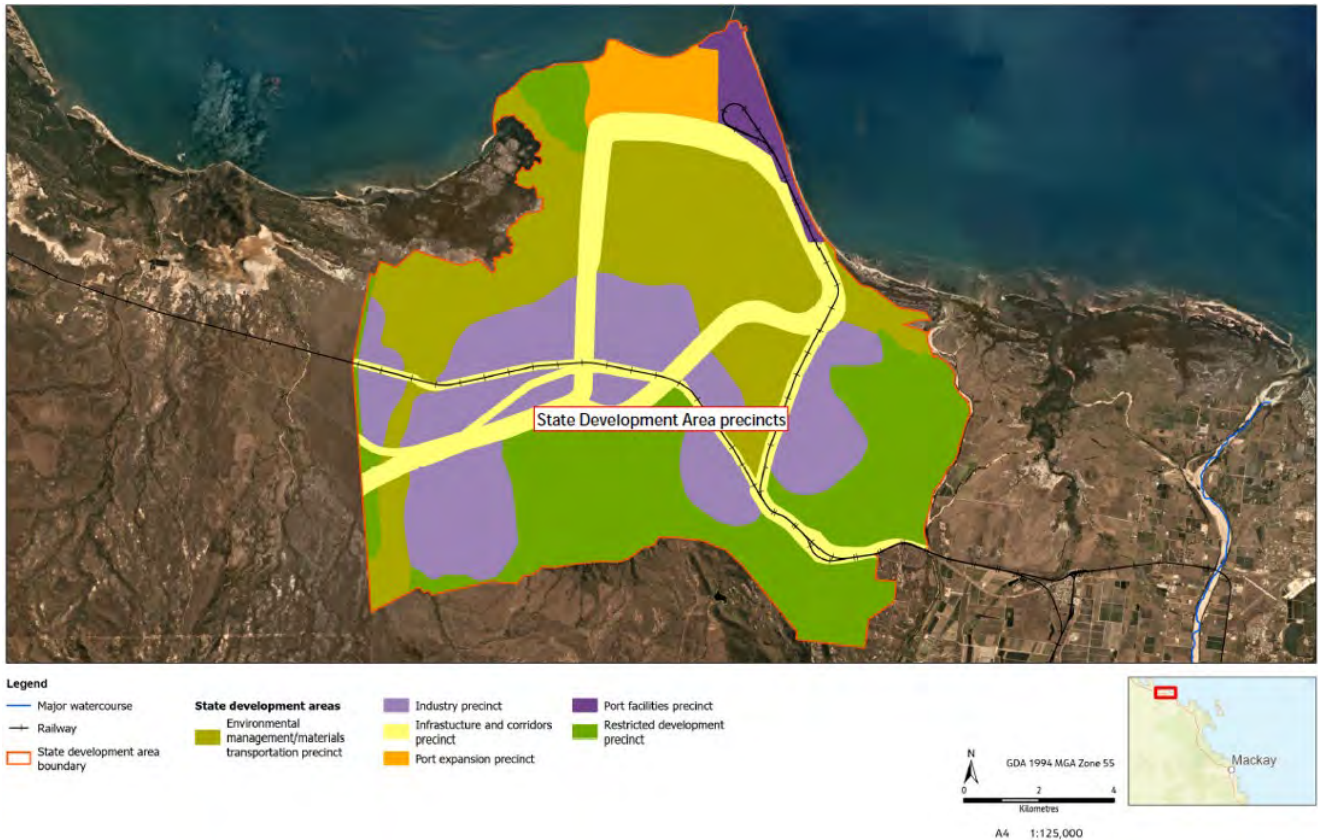


Figure 9: Abbot Point State Development Area precincts

5.7.4 Coordinator-General powers: *State Development and Public Works Organisation Act 1971*

The CG may acquire land or easements for:

- authorised works
- works included in a program of works or approved development scheme
- works to be undertaken by a local body or a department of the Queensland Government
- purposes including establishment of industry, essential services or infrastructure corridors in SDAs
- a private infrastructure facility (such as a road, railway, bridge or other transport facility, electricity generation, transmission or distribution facilities, oil or gas storage, transmission or distribution facilities).

Other powers of the CG make provision for:

- authorisation to raise or lower the level of water in any body of water or take, divert or use the water in any body of water
- powers for works on foreshores and under waters.

5.8 *Economic Development Act 2012*

EDQ leads and delivers infrastructure and property projects for Queensland's economic benefit, and also drives a range of development projects. EDQ operates under the *Economic Development Act 2012*.

EDQ works to identify specific areas of land for development called PDAs. PDAs are parcels of land within Queensland identified for development to deliver significant benefits to the community. The DSDILGP Minister may declare a PDA under the *Economic Development Act 2012*. Once a PDA is declared, EDQ may undertake the assessment of development applications within the PDA. There are no PDAs in the study area.

5.9 Land use management measures

Regulatory instruments provide measures that manage potential impacts or values. This report has been based on a defined study area. For the purposes of this section, a more refined study area has been used to focus on potential impacts, threats and pressures more relevant in the context of port development.

A summary of the management measures relevant to land use planning is given in **Appendix L**.

5.10 Regulating activity in marine areas

5.10.1 Master planning in marine areas

The study area includes marine areas within port limits and a World Heritage Area protected by marine parks. Under the Ports Act, a master planned area for a priority port cannot include:

- an area covered by tidal water that is outside port limits
- an area within a marine park, even if the area is within port limits.

Only marine areas within port limits (or immediately adjoining port limits where the context is useful) are addressed below. Port limits are defined as part of the port area under the TIA. Managing activities within marine parks are discussed.

5.10.2 Marine areas

5.10.2.1 Port limits

Port limits are defined under the TIA. Port limits exclude land above the high-water mark but include navigable rivers or creeks flowing into the sea waters that are within the defined area of port limits. The Abbot Point port area comprises SPL, port facilities and port limits.

5.10.2.2 Great Barrier Reef World Heritage Area

The GBR is the largest coral reef system in the world, extending over approximately 2300km from Cape York to just north of Bundaberg and includes area from the low water mark on the Queensland coast to beyond the edge of the continental shelf. It comprises deltaic reefs, ribbon reefs, lagoonal reefs, fringing reefs and planar reefs. It was declared a World Heritage Area in 1981 because of its OUV. This recognised the reef as being one of the most remarkable places on earth, its global importance and its natural worth.

The GBRWHA is managed as a multiple-use area and uses include a range of commercial and recreational activities. The area is managed jointly by the Australian and Queensland Governments under the GBR Intergovernmental Agreement 2015 and complementary legislation.

5.10.2.3 Marine parks

The *Great Barrier Reef Marine Park ZONING PLAN 2003* and the *Marine Parks (Great Barrier Reef Coast) Zoning Plan 2004* provide for ecologically sustainable recreational, commercial and research opportunities and continuation of traditional activities in the land and waters within the GBRMP and the GBR Coast Marine Park. **Figure 10** illustrates GBRMP zoning.



Figure 10: the *Great Barrier Reef Marine Park ZONING PLAN 2003*

5.10.2.4 Outlook of the Great Barrier Reef

The delivery of the *Great Barrier Reef Outlook Report 2019* is required under the GBRMP Act and aims to provide a regular and reliable means of assessing reef health and management in an accountable and transparent way. The report is produced by the GBRMPA and updated every five years.

The first GBR Outlook report in 2009 identified the long-term challenges facing the reef, dominated by climate change over the next few decades. Emerging issues since the 2009 GBR Outlook report include proposed port expansions, increases in shipping activity, coastal development and intensification and changes in land use within the GBR catchment, population growth, the impacts from marine debris, illegal activities, and extreme weather events including floods and cyclones.

Key management actions being taken to reduce threats to the reef are outlined in the Reef 2050 Plan first published in 2015, and the *Great Barrier Reef Blueprint for Resilience* (2017).

The Reef 2050 Plan is Australia's overarching long-term strategy for protecting and managing the GBR to support its health and resilience. The plan is a key component of the Australian Government's response to the recommendations of the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Committee. The committee regularly reviews the state of conservation of all properties inscribed on the World Heritage List.

The 2019 GBR Outlook report is the third comprehensive report in the series and identifies that the GBR region still faces significant pressures ranging in scale from local to global. The 2019 GBR Outlook report found that planning systems for ports had been subject to major reforms under the Reef 2050 Plan and shipping was one of the strongest areas of management effectiveness.

5.10.2.5 Reef 2050 Long-Term Sustainability Plan

The Reef 2050 Plan is implemented jointly by the Australian Government, GBRMPA and the Queensland Government. It builds upon, but does not replace, the existing statutory and management arrangements for the GBRWHA. The Reef 2050 Plan's new vision for the reef in 2050 is that the GBR is sustained as a living natural and cultural wonder of the world.

The Reef 2050 Plan was updated in 2021 and responds to the threats identified in the 2019 GBR Outlook report. The updated plan provides a greater focus on the importance of climate change action, water quality, fostering increased collaboration with Traditional Owners and continuing to ensure that effort and investment

targets the right priorities and actions to support the health and resilience of the reef. It also focusses on addressing local and regional pressures over which people in Australia and Queensland have direct control such as land-based run-off, coastal development and direct human use of the reef. The updated plan is the result of the first five-yearly comprehensive review of the Reef 2050 Plan, carried out in close collaboration with stakeholders and the community.

The Reef 2050 Plan includes five work areas that seek to address key threats to the reef, reduce cumulative impacts and protect and conserve the reef goals, and achieve the objectives and longer term 2050 outcomes and vision of the plan.

5.10.2.5.1 Reef 2050 Plan Work Area 3: Reduce impacts from water-based activities

Work area three focuses on reducing direct impacts to the reef from water-based and island activities that occur in and adjacent to the GBRWHA. It seeks to protect the reef's OUV and ensure uses are ecologically sustainable while providing social, cultural and economic benefits.

This work area focuses on partnerships and collaboration with reef-dependent industries, working in partnership with Traditional Owners to manage Sea Country, sustainable management of commercial and recreational fisheries and prevention of new pest and disease incursions.

The updated plan continues the integrated approach to ports management and shipping. Existing measures include restricting new port activities and development in and adjacent to the GBRWHA to within established ports and prohibiting transshipment of bulk materials outside port extents. Capital dredging is restricted to four priority ports in Queensland and disposal of capital dredge material is prohibited in the GBRWHA and marine parks. The plan seeks to maintain these commitments and avoid, reduce and mitigate remaining impacts.

5.10.2.6 Shipping and port operations

Shipping activity throughout the GBR is a vital link in the production chain for many industries and services regional centres. Ports are important infrastructure for this shipping industry.

The *Navigation Act 2012* (Cth) requires all foreign vessels trading interstate on the Australian coast to be licensed or have a permit. The Australian Maritime Safety Authority conducts inspections to ensure that foreign vessels visiting Australian ports comply with the relevant international regulations, are seaworthy, do not pose a risk of pollution and provide a safe working environment.

Maritime Safety Queensland (MSQ) is responsible for monitoring and managing the safe movement of ships in Queensland Waters including minimising vessel sourced waste and providing response to marine pollution. Under the *Transport Operations (Marine Pollution) Act 1995*, MSQ is both the statutory and combat agency for response to all ship sourced oil spills.

Under the TIA, pilotage areas have been gazetted around designated ports and maritime areas to ensure the safe and efficient movement of shipping. These areas encompass the approaches, main shipping channel and waters of the port.

The harbour master and the port authority have joint responsibility for managing the safe and efficient operation of the port including controlling traffic movement in the port, maintaining on-water safety distances and responding to any emergency situation.

Within port limits, some activities may require permits or other permission from the port authority or harbour master. For example, NQBP as the port authority is responsible for the management of dangerous goods in port, including the loading and unloading of ships alongside and movement across the wharf. Under the TIA, a port authority may for example impose a charge for the use of its port area including for goods or passengers loaded, unloaded or transhipped to or from a ship using port facilities in its port.

5.11 Summary

This chapter has provided an overview of the land use planning assessment and decision making within the study area. An overview of the statutory framework, policies and rules has also been summarised which will lead to a better understanding of the role legislative frameworks play in the future planning and development of the priority Port of Abbot Point and the wider study area.

6. Social

6.1 Introduction

The priority Port of Abbot Point is located in a region that is rich with cultural history, significant natural resources and a thriving agricultural and mining economy that support the surrounding communities. Consideration of social and community factors in the development of the priority port master plan is critical to ensuring social and cultural values are appropriately protected from future port development and activities.

The closest significant residential population to the port is the town of Bowen, 25km south of the port. Bowen is the administrative centre for northern part of the Whitsunday region. The next closest significant population hub is Proserpine, the administrative centre of the region, 65km south of Bowen. The social impact assessment of the future development of the port focuses on the town of Bowen and its surrounding area.

This chapter identifies and describes the social and socio-economic characteristics and values of the port and surrounding area. It provides an overview of policies and strategies relevant to the socio-economic environment of the study area, existing communities and social values, and potential impacts, threats and pressures from development and activities in the ports and surrounding area.

The analysis of social values in the study area involved consideration of both quantitative and qualitative data and information. It involved:

- review of relevant strategies, statutory instruments and policies to identify regional and social objectives for communities in the study area and issues of community significance relevant to the ports and surrounding areas
- analysis of existing population and demographic data for local and regional communities, including data on cultural diversity, housing, employment and income, and relative socio-economic disadvantage, from the Australian Bureau of Statistics (ABS), the Queensland Government and WRC
- identifying and mapping social infrastructure in the study area, including education, health and medical services, community and cultural facilities, sport and recreation uses
- describing and mapping areas valued by local and regional communities and that contribute to the amenity of the study area
- identifying and describing potential impacts, threats and pressures from development and activities relating to the port.

The study area for the review of social values is shown in **Figure 11** and includes the Bowen and Collinsville Statistical Area Level 2 (SA2). However, given that the Collinsville SA2 community is located well outside the study area, the statistics used in this chapter relate exclusively to the Bowen SA2 as the study area as it was considered a more accurate representation of the social profile of the area. The Bowen SA2 includes the township of Bowen which is within the study area.

The port is located within the WRC LGA. Population and demographic data for the LGA is presented to inform the identification of social values in the wider region.

The analysis of existing social values principally draws on information presented in the Queensland regional profiles available from the Queensland Government Statistician's Office website. The regional profiles present data and information from a range of sources including the ABS *2016 Census of Population and Housing* and other ABS datasets, and various Queensland Government and Australian Government departments.

The 2021 Census of Australia's population was conducted on 10 August 2021. Data from the 2021 Census is due to be released from June 2022. While data from the 2016 Census is about five years old, this is the most comprehensive information currently available for Australia's population and demography.

Queensland Statistical Area, Level 2 (SA2), 2021 – Bowen



Figure 11: Study area boundary for social values

This chapter provides an overview of the following:

- Social policy and strategic context – **Section 6.2**
- Existing communities and social values – **Section 6.3**
- Socio-economic profile – **Section 6.4**
- Potential impacts, threats and pressures – **Section 6.5**
- Summary – **Section 6.6.**

6.2 Social policy and strategic context

6.2.1 Queensland policies, strategies and legislation

Master planning for the priority Port of Abbot Port considers state, regional and local government policies, strategies and legislation.

6.2.1.1 Mackay, Isaac, and Whitsunday Regional Plan 2012

The MIW Regional Plan establishes a vision and direction for the MIW region to 2031. The plan also identifies the regional framework and DROs for the region.

As the pre-eminent plan for the region and a statutory instrument under the *Statutory Instruments Act 1992*, the MIW Regional Plan takes precedence over all local government land use planning instruments within the region.

The regional vision states that:

'The Mackay, Isaac and Whitsunday region is a vibrant, progressive region where the values of the community and industry are respected and in balance with the natural environment. The region's natural assets and abundant resources will be responsibly managed for the benefit of residents, visitors and future generations. It achieves its potential with a range of industries, employment and learning opportunities for everyone. The region has a resilient and inclusive community that respects and offers diversity and choice, and where residents and visitors enjoy a healthy, active and safe lifestyle' (Queensland Government 2012).

The MIW Regional Plan provides strategies to inform future decision making which aim to:

- address regional economic, social and environmental issues
- identify strategic infrastructure and service needs and priorities
- support economic prosperity and employment values
- highlight and respond to climate change
- recognise environmental values
- support consolidated growth within established regional centres and townships
- focus on public, private and community sector responses to key regional issues
- align efforts across agencies and all levels of government.

The master planning process will enable several of the above strategies to be achieved at a more local scale within the MIW region. The master plan will promote economic prosperity for the master planned area which will have flow-on effects to the wider MIW region. Strategic infrastructure and supply chain corridors to support the priority Port of Abbot Point will be identified to achieve the economic growth.

A PMM may be adopted where necessary to manage potential impacts on environmental values. Under the Ports Act, master plans must include an Environmental Management Framework which provides for the identification and management of development impacts on environmental values. To achieve this a PMM is established to identify objectives and measures to manage potential impacts on environmental values.

Engagement with key stakeholders and the wider community will ensure that regional issues are addressed where relevant to the priority Port of Abbot Point.

6.2.2 Local government policies and strategies

6.2.2.1 Local Government Act 2009

The purpose of the *Local Government Act 2009* (Local Government Act) is to provide for the way in which local government is constituted and the nature and extent of its responsibilities and powers.⁹ It also provides for a system of local government that is accountable, effective, efficient and sustainable. The Local Government Act stipulates that councillors must deliver outcomes to the community that are in the public interest.

6.2.2.2 Whitsunday Regional Council Planning Scheme 2017

The WRC Planning Scheme was prepared to facilitate development that is environmentally sustainable, boosts industry and supports the lifestyle enjoyed by the community.¹⁰

The zone codes applicable in the surrounding areas of the port include: Rural; Industry investigation area, Recreation and open space, Environmental management and conservation, and Special industry. *Whitsunday Regional Council Community Plan 2011–2021*.

The Local Government Act commits all councils to develop a long-term plan for their region. In response, the WRC formulated a *Whitsunday Regional Council Community Plan 2011–2021*. The shared vision of the community is for a region that is economically, environmentally and socially sustainable, promotes and preserves the culture and heritage, and is accessible, active and inviting.

The *Whitsunday Regional Council Community Plan 2011–2021* lists the port and the APSDA, which was declared in 2008, as a highlight in the region. The plan discusses the potential to develop the port and the Queensland Government's commitment to develop mining, mineral processing and industrial development in

⁹ Queensland Government. (2021). Local Government Act 2009 (Qld)

¹⁰ Whitsunday Regional Council. (2017). Whitsunday Planning Scheme 2017. Whitsunday Regional Council.

this area over the next 50 years while recognising and protecting environmental, community and cultural values.

6.3 Existing communities and social values

This section provides an overview of existing communities and social values, conditions and characteristics within the study area. It presents information and data relating to population and demography, education and employment, housing, community facilities and services, valued by local and regional communities. Information is presented for the study area Bowen SA2 and the Whitsunday LGA, in comparison with the state average.

6.3.1 Social profile

6.3.1.1 Social context

Abbot Point is isolated from residential communities. The surrounding towns to the port include:

- **Bowen** is located about 25km south of the port and is the largest town in the study area. Bowen is the business, service and administrative hub for the northern part of the Whitsunday LGA. It offers a range of services and facilities for local residents and surrounding rural communities including a public hospital, aged care, primary and secondary schools, tertiary education facilities, and sport and recreation facilities. Key local industries include agriculture, horticulture, commercial fishing and aquaculture, and port related industries.¹¹
- **Mount Curlewis**, which is located about 13km southwest of the port and has about 20 houses.
- **Merinda**, which is located about 16km south of the port and had a resident population of 198 people in 2016.
- **Guthalungra**, which is located about 21km west of the port next to the Elliot River, which had a population of about 112 people at the 2016 Census in a small group of about 10 to 15 houses near the Bruce Highway and on horticultural properties along the Elliot River.¹²
- **The Eliot River Hut** community is located near the mouth of the Elliot River and comprises of approximately 130 fishing shacks used by families for weekend and holiday camping and day trippers.¹³ The Juru people are the Traditional Owners and native title holders of the land accommodating the fishing shacks.
- **Camp Island** is located about 15km west of the port and is the closest offshore area frequented by residents and tourists. It comprises a privately owned lodge that accommodates up to eight guests in four villas; kitchen, dining and living areas in the main lodge, and recreation facilities.¹⁴

6.3.2 Population and age

Table 6 presents information on the estimated resident population in the Bowen SA2 on 30 June 2020. The Bowen SA2 had an estimated resident population of 9488 representing approximately 26.4% of the Whitsunday LGA (35,927).

The population of the Bowen SA2 is projected to grow to approximately 11,812 by 2041, representing an average, annual increase of 1.0% since 2016. The population of the Whitsunday LGA is projected to grow to 46,194 by 2041, representing a similar growth rate for the 10-year period to 2020.

¹¹ Department of Local Government and Planning. (2012). Mackay, Isaac and Whitsundays Regional Plan 2012 (Qld)

¹² Australian Bureau of Statistics. (2020). 2016 Census Quick Stats. Retrieved 10 August 2021 from https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/036

¹³ Townsville Bulletin. (2016). Premier in talks with Elliot River hut owners. Retrieved from: <https://www.townsvillebulletin.com.au/news/townsville/regional/premier-in-talks-with-elliott-river-hut-owners/news-story/524f847a0bc520f394b8daf09456e212>

¹⁴ Camp Island Lodge. (n.d). About Us. Retrieved from: <https://campisland.com.au/about/>

Table 6: Population and growth

Indicator	Bowen SA2	Whitsunday LGA	Queensland
Estimated resident population			
Estimated resident population (2020)	9,488	35,927	5,176,186
Average annual growth rate (2010–2020)	0.5%	1.1%	1.6%
Average annual growth rate (2015–2020)	0.2%	0.8%	1.6%
Population projections			
Projected population (2041)	11,812	46,194	7,161,661
Average annual growth rate (2016–41)	1.0%	1.2%	1.6%

The Bowen SA2 generally had a slightly older population when compared to Queensland, with higher median ages, lower proportions of children and youth, and higher proportions of older people. This is summarised below and presented in **Table 7**.

In the Bowen SA2, the median age was 40.2 years on 30 June 2019 representing 2.8 years above the median age for Queensland. For the same period, the Bowen SA2 had lower proportions of children (14 years or under) and youth (15 to 24 years) than the Queensland average. The proportion of working aged residents (15 to 64 years) was marginally higher than the Queensland average of 52.3% in 2019. Residents aged 65 years or older was 19% of the Bowen SA2 population in 2019, just over 3% higher than the Queensland average.

Table 7: Age profile

Indicator	Bowen SA2	Whitsunday LGA	Queensland
Estimated resident population			
Median age	40.2 years	38.7 years	37.4 years
Change in median age (2009–2019)	1.2 years	1.4 years	1.2 years
0–14 years	18.0%	17.9%	19.4%
15–24 years	10.9%	10.8%	13.0%
25–44 years	25.7%	29.0%	27.3%
45–64 years	26.6%	26.5%	24.6%
65 years or over	18.9%	15.7%	15.7%
Population projections			
Median age (2041)	43.7 years	40.3 years	40.7 years
Change (2021–41)	2.7 years	1.7 years	2.8 years

Source: Australian Bureau of Statistics. (2019)

6.3.3 Families

The 2016 Census noted a total of approximately 2201 families in the Bowen SA2, as shown in **Table 8**.

Couple only families were the predominant family type, comprising of 46% of families in the Bowen SA2, more than the Queensland average of 39%. The proportion of couple families with children was below the Queensland average, while the proportion of one parent families was similar to the Queensland average.

Table 8: Family composition(a), 2016

Statistical area	Couple family with no children	Couple family with children	One-parent family	Total(b)
Bowen SA2	45.9%	36.3%	16.4%	2201
Whitsunday LGA	45.5%	38.7%	14.6%	7798
Queensland	39.4%	42.5%	16.5%	1,221,148

(a) Includes same-sex couple families. (b) Includes other families

Source: Australian Bureau of Statistics. (2016)

6.3.4 Indigenous population

The 2016 Census identified 850 Aboriginal or Torres Strait Islander people in Bowen SA2 representing approximately 9.3% of Bowen's population, more than double the Queensland average, summarised in **Table 9**.

Table 9: Indigenous status, 2016

Locality	Number of people	Proportion of population
Bowen SA2	850	9.3%
Whitsunday LGA	1638	4.8%
Queensland	186,482	4.0%

6.3.5 Disadvantage

The socio-economic indexes for areas (produced by the ABS provide an indication of relative levels of socio-economic disadvantage. The index for relative socio-economic disadvantage is derived from variables such as income, educational attainment, unemployment and vehicle ownership. Lower quintile values generally represent areas of disadvantage while higher quintile values indicate areas of least disadvantage.

Table 10 shows the level of socio-economic disadvantage relative to Queensland as a whole. In 2016, 92.7% of residents in the Bowen SA2 were in the bottom two quintiles compared to 40% of Queensland residents in the same quintiles.

Table 10: Index of relative socio-economic disadvantage quintiles(a), 2016

Locality	Quintile 1 (most disadvantaged)	Quintile 2	Quintile 3	Quintile 4	Quintile 5 (least disadvantaged)
Bowen SA2	46.7%	46.0%	7.3%	0.0%	0.0%
Whitsunday LGA	24.2%	36.8%	19.7%	15.7%	3.6%
Queensland	20.0%	20.0%	20.0%	20.0%	20.0%

(a) The quintiles are population based and derived at the Queensland level (state-based quintiles and not national based quintiles).

Source: Australian Bureau of Statistics. (2016b)

6.4 Socio-economic profile

6.4.1 Income and employment

Table 11 provides a summary of income and employment indicators for the Bowen SA2 and Whitsunday LGA. These communities generally had lower personal and household incomes when compared to the Queensland average.

The 2016 Census noted the Bowen SA2 median weekly personal and household incomes to be below the Queensland median values, as did individuals and families within lower and higher income categories, and lower income individuals.

There were 5052 people in the Bowen SA2 who were either working or looking for work in the March quarter 2021. The corresponding unemployment rate of 8.2% was higher than the state average.

Table 11: Income

Indicator	Bowen SA2	Whitsunday LGA	Queensland
Income (2016)			
Median weekly personal income	\$586	\$685	\$660
Median weekly household income	\$1,071	\$1,228	\$1,402
Personal income (less than \$20,800 per year)	27.8%	23.6%	28.4%
Personal income (\$104,000 or more per year)	5.8%	5.9%	7.1%
Family income (less than \$33,800 per year)	12.0%	10.7%	9.4%
Family income (\$156,000 or more per year)	10.4%	10.8%	15.3%
Employment			
Total labour force	5,052	21,366	2,714,310
Unemployment	8.2%	6.7%	7.3%

Source: Australian Bureau of Statistics. (2016c).

Unemployment fluctuated over the last five years to 2021 as shown in **Figure 12**. It remained above the Queensland average over the period with the exception of 2018. Overall, the level of unemployment in the Bowen SA2 reduced steadily from a high of 12.8% in the March quarter 2016, to a low of 5.4% in September 2018, before rising again to 10.9% in the December quarter 2019. Since December 2019, unemployment rates have generally declined or remained stable.

At the wider Whitsunday LGA level, unemployment remained below the Queensland average between 2016 and 2021.

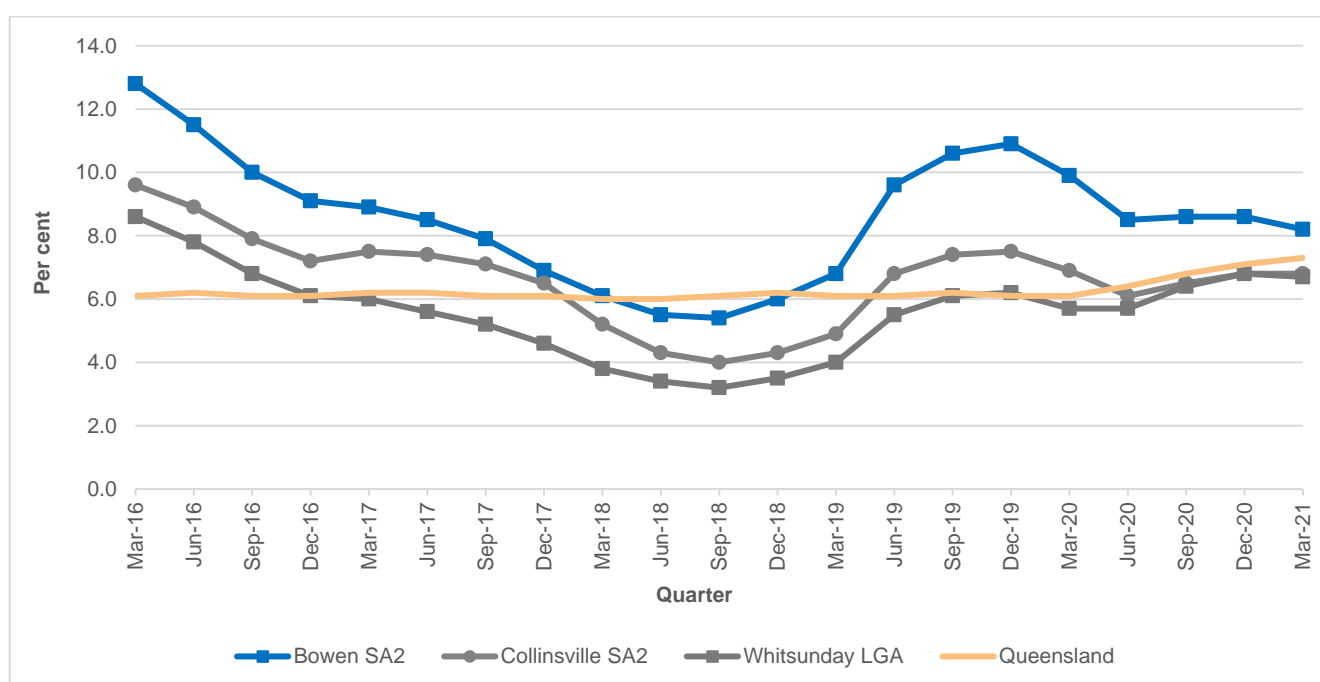


Figure 12: Unemployment, 2016–21

The main industries of employment for residents in the study area recorded in the 2016 Census are shown in **Table 12**. Agriculture was the dominant industry of employment in Bowen, employing employed 14.1% of

persons aged 15 years and above. Coal mining employed a further 4.0%. Other key industries included education, food and beverage services, both within the top five industries of employment for Bowen SA2 and this is consistent with the state average.

The Whitsunday LGA was also similar however, accommodation was a key industry representing the highest employer in the LGA aged 15 years or above, reflecting the role of the Whitsundays as a major tourism destination.

Table 12: Main industries of employment¹⁵

Statistical area	Top five industries of employment (2016 Census)
Bowen SA2	Agriculture (14.1%) Preschool and school education (6.2%) Food and beverage services (4.5%) Coal mining (4.0%) Rail transport (3.9%)
Whitsunday LGA	Accommodation (9.7%) Agriculture (8.0%) Food and beverage services (6.1%) Coal mining (5.5%) Preschool and school education (5.3%)
Queensland	Preschool and school education (6.1%) Food and beverage services (5.9%) Construction services (5.2%) Professional, scientific and technical services (except computer system design and related services) (5.1%) Other store-based retailing (5.1%).

6.4.2 Education and training (highest level of schooling and non-school qualifications)

The communities listed in **Table 13** reported lower levels of education attainment for those 15 years and over in comparison to the state average. The Bowen SA2 reported relatively low levels of secondary schooling compared to the state average, with 7.9% aged 15 years and over did not go to school or achieve Year 8 or below, and 42.5% of those who achieved Year 11 or Year 12 (or equivalent).

In relation to higher education, the Bowen SA2s reported people with certificate level qualifications the same or above the Queensland average. In contrast, the reported proportion of people with a bachelor degree or higher was less than half that of the Queensland average.

Table 13: Education attainment, 2016¹⁶

Locality	Did not go to school, or Year 8 or below	Year 11 or 12 or equivalent	Bachelor degree or higher	Certificate
Collinsville SA2	10.2%	34.2%	5.9%	21.3%
Bowen SA2	7.9%	42.5%	7.8%	23.3%
Whitsunday LGA	5.4%	47.2%	9.3%	25.1%
Queensland	5.4%	58.9%	18.3%	21.3%

¹⁵ Australian Government. (2021). National Skills Commission, Small Area Labour Markets Australia, various editions; Australian Bureau of Statistics. (2016). Census of Population and Housing, General Community Profile - G51 and unpublished data, taken from Queensland Regional Profile 2 June 2021.

¹⁶ Ibid 15

6.4.3 Rental market and sale trends

The 2016 Census reported a total of 3322 occupied private dwellings in the Bowen SA2. Separate houses were the predominant dwelling type, comprising 82.2% of dwellings being well above the Queensland average (76.6%).¹⁷

Bowen SA2 had a relatively high proportion of medium density housing such as semi-detached houses and apartments (10.5%). The Bowen SA2 recorded 2.9% of dwellings as caravans and cabins being well above the state average (0.8%), reflecting Bowen's role as a tourist destination within the region.

Rented privately owned dwellings in the study area were recorded at 1371. These included dwellings being privately rented through a real estate agent, or from a person not in the same household, and dwellings rented through a state housing authority, housing co-op, church, or other entity.¹⁸

Median rents in the Bowen SA for the 12 months to 31 March 2021 were below the median rents for the state (**Table 14**). Median weekly rents in the Bowen SA2 ranged from \$184 for a one-bedroom flat/unit to \$390 for a four-bedroom house. Median weekly rents in the Bowen SA2 were generally lower than both the Whitsunday LGA and the state averages.

Median house sales in the study area for the 12 months ending 31 December 2020 were below the Queensland median. The median sale prices for detached dwellings were \$275,000 in the Bowen SA2, compared to \$500,000 for the state. The median price for sales of attached dwellings in the Bowen SA2 was \$263,675 compared to \$415,000 for the state. The general median sale prices for all dwellings within the Bowen SA2 were below both the Whitsunday LGA and the state averages.

Table 14: Median rent by residential dwelling sales

Dwelling type	Bowen SA2	Whitsunday LGA	Queensland
Median rent (12 months ending 31 March 2021)			
1 bedroom flat/unit	\$184	\$200	\$325
2-bedroom flat/unit	\$260	\$300	\$390
3-bedroom house	\$310	\$370	\$380
4-bedroom house	\$390	\$425	\$450
Median sale price (12 months ending 31 December 2020)			
Detached dwellings	\$275,000	\$375,000	\$500,000
Attached dwellings	\$263,675	\$268,375	\$415,000
Total	\$275,000	\$345,250	\$470,000

Source: Queensland Government Statistician's Office. (2021)

6.4.4 Social infrastructure

Social infrastructure includes community facilities, places, services and networks that contribute to community wellbeing and quality of life. **Table 15** and **Figure 13** highlight the local and district-level services, facilities and networks. The concentration of social infrastructure is in Bowen, however higher order services are sourced from Townsville and Mackay such as medical, tertiary education and hospitals.

¹⁷ Australian Bureau of Statistics. (2016). Census of Population and Housing, General Community Profile – G32, taken from Queensland Regional Profile 2 June 2021.

¹⁸ Australian Bureau of Statistics. (2016). Census of Population and Housing, General Community Profile – G33, taken from Queensland Regional Profile 2 June 2021.



Figure 13: Local and district-level services, facilities and networks

6.4.5 Education

Education facilities in the study area include:

- four primary schools, including three state primary schools (Queens Beach State School, Bowen State School and Merinda State School) and one private primary school (St Marys Catholic Primary School) that provides primary education for students in Prep to Year 6
- one secondary school (Bowen State High School), that provides secondary education for students in Year 7 to Year 12
- one tertiary education facility, TAFE Queensland GBR International Marine College, Bowen Campus, which offer courses in study areas such as aged care, automotive, community services, early childhood education and care, engineering, and general education and training
- there are numerous facilities offering childcare and early education services, including:
 - five preschool, early childhood education, and childcare facilities
 - one family day care service
 - three facilities offering out of school hours and vacation care.

6.4.6 Health and emergency services

Mackay Hospital and Health Service area provides health services to a population of approximately 180,000 people. Bowen Hospital is the main health care facility in the study area. The hospital has capacity for 27 beds and provides general medical services, 24-hour emergency care, oncology and palliative care. The hospital also offers a range of allied health services, clinics, visiting specialist services and community health services. Patients requiring health and medical services not provided by Bowen Hospital are treated through the Mackay Base Hospital, which is the major hospital in the Mackay Hospital and Health Service area, or Townsville University Hospital as the major tertiary hospital in North Queensland. Telehealth is also used to provide patient access to various specialist services not offered at the hospital, reducing the requirement for

patients to travel to tertiary level hospitals. At the end of June 2020, the hospital had nine doctors, 46 nurses and eight health practitioners, professional and technical staff.¹⁹

A range of other medical and health care services are located in Bowen including general practice medical services, dental services, mental health services, chiropractic, podiatry and dermatology services.²⁰ Community aged care is provided through Home and Community Care services such as Home Help and nursing.

Emergency services are mainly located in Bowen and include Bowen Ambulance Station, Bowen Fire Station, Queensland Police Services Bowen Station, the Volunteer Marine Rescue Bowen and Bowen State Emergency Services.

6.4.7 Recreation

There are a range of facilities provide for formal and informal recreational activities, including sporting grounds, open space areas, skate parks, national parks and reserves, concentrated mainly in Bowen. These facilities mainly service the local communities and residents from surrounding areas.

There are a number of facilities that offer a range of nature-based recreational activities for local and regional communities such as camping, four-wheel driving, bushwalking, nature watching and fishing. Other facilities include beaches, camping areas and boat ramps used for recreational fishing. Fishing is considered one of Bowen's biggest attractions due to the numerous creek systems, coral studded islands, nearby reefs and abundant fish life.

The Elliot River is a popular area for boating, fishing and nature watching. Two boat ramps are located in Bowen, including at the Boat Harbour and Grays Bay, approximately 20km south of Abbot Point.

6.4.8 Other social infrastructure

A study on the accommodation and infrastructure needs undertaken in 2010 for the WRC and DSDILGP identifies a range of other services and facilities in Bowen that service the needs of local communities and surrounding residents. These include:

- arts and cultural facilities and services, including nine churches of various denominations and a museum
- community meeting places such as cafes, boat club and hotels
- three charitable organisations, tenancy support services, and employment services
- youth focused groups
- six aged care services and facilities, including at home support services, and independent and supported living accommodation.²¹

6.4.9 Future social infrastructure needs

The SGS Economics and Planning study also identify a range of future local and district level social infrastructure needs, including:

- health care services, such as aged care, and local and district health services
- family support services
- services and facilities that cater for groups such as youth and Indigenous people
- employment and training programs that up-skill local people
- cultural and tourism infrastructure, including upgraded library services

¹⁹ State of Queensland. (n.d). Queensland Health Hospital Performance, Bowen Hospital. Retrieved from: <http://www.performance.health.qld.gov.au/Hospital/Index/192>

²⁰ Health Direct. (n.d). find a service. Retrieved from: <https://www.healthdirect.gov.au/australian-health-services>

²¹ SGS Economics and Planning. (2010). *Bowen Abbot Point Accommodation and Community Infrastructure Study: Final Report*.

- services that cater for non-resident worker populations, such as mining, industrial, infrastructure development, seasonal workers and tourists.²²

The Queensland *State Budget 2021–22*²³ and *Mackay-Whitsunday Regional Recovery Action Plan*²⁴ also identify action plans for social infrastructure upgrades or new infrastructure in Bowen including:

- Indigenous Bush Tucker Trail and Paddock to Plate Venue
- Flagstaff Hill Conference and Cultural Centre
- Bowen Hospital upgrades, including refurbishment of medical imaging facility and scanners
- Bowen State High school upgrades
- Agricultural Centre of Excellence new centre at the Bowen TAFE
- Bowen Neighbourhood Centre, to design and construct a neighbourhood centre to support the community.

Table 15: Social infrastructure

Facility Type	Facilities	
Education	Bowen State High School Bowen State School Merinda State School Queens Beach State School	Saint Marys Catholic Primary School – Bowen Campus TAFE Queensland.
Childcare	Beach Hut Queens Beach Outside of School Hours Care Bowen Childcare and Early Education Bowen Collinsville Family Daycare Bowen Out of Hours Care.	Bowen Preschool C&K Queens Beach Community Kindergarten Cooinda Family Centre Playgroup Goodstart Early Learning Bowen Kidz At the Beach Saint Mary's Outside School Hours Care.
Health, medical and emergency services	Bowen Hospital Bowen Medical Centre Bowen State Emergency Services Centacare North Queensland - Bowen Herbert Street Family Medical Centre Queens Beach Medical Centre.	Queensland Ambulance Service – Bowen Ambulance Queensland Fire and Emergency Service – Bowen Fire Station Queensland Police Services – Bowen Station Relationships Australia Volunteer Marine Rescue Bowen.
Community facilities	Bowen Child Safety Services Bowen Community Centre Bowen Courthouse.	Bowen Neighbourhood Centre Cooinda Family Centre Flemington Road Cemetery.

²² Queensland Government. (2021). Mackay-Whitsunday. Retrieved from <https://budget.qld.gov.au/regional-action-plans/mackay-whitsunday/>

²³ *Ibid* 22

²⁴ State of Queensland. (2020). *Mackay-Whitsunday Regional Recovery Action Plan*. Retrieved from <http://covid19.qld.gov.au/>

Facility Type	Facilities	
Sport and recreation facilities	Ben Bolt Park	Mother Beddock
	Bowen Golf Club	Mount Devlin
	Bowen showground	Queens Beach
	Coastal path	Rose Bay
	Col Leather Sporting Complex	Rotary Lookout
	Denison Park	Scottville Reservoir hill
	Edgecumbe Heights Recreation Reserve	Town Reservoir Hill
	Ethel Barker Park	Watertank lookout point
	Hansen Park	Wreck of the Gothenburg on Old Reef
	Horseshoe Bay Road boat ramp	WWII Radar Lookout
	Horseshoe Bay Beach	Yasso Point boat ramp
	Kings Beach	Yasso Point boat ramp.
	Lions Park.	
Cultural facilities and places of worship	Bowen Baptist Church	Collinsville Coalface Museum
	Bowen Christian Outreach Centre	Coral Sea and Catalina Memorial Museum
	Bowen Historical Museum	Holy Trinity Anglican Church
	Bowen Uniting Church.	Saint Mary's Catholic Church.

6.4.10 Community values

Community values represent both physical and intangible features of a region that are important to the community's quality of life and wellbeing such as open space, connectivity, services, sense of place and cohesion. The social infrastructure represents community value by aiding in social cohesion, identity and quality of life.

This section highlights and maps community values centred around visual amenity within the study area, as shown in **Figure 14**.

At a regional level, the key community values of the study area are sustainability and liveability. The character and amenity of the Whitsundays region reflects its rich natural environment harbouring a unique array of topographic features such as ranges, national parks, ridges, capes and islands. The coastline of the port has beaches (sandy and boulder), low rocky platforms and mangroves. As stated in the MIW Regional Plan, 'The natural environment provides the foundation for the regional economy and lifestyle enjoyed by its residents'.²⁵

The study area is rich in cultural heritage sites and landscapes that are significant to both Indigenous and non-Indigenous communities due to activity in the area both pre and post European settlement. Given the port's isolated location, it does not have many viewpoints, with topography and vegetation screening operations from Bowen.

NQBP have developed a number of community grants under its EcoPorts grants program. This program provides \$1000 grants to schools in the Abbot Point area and Bowen community to assist local students to develop grassroots sustainability projects. Eco Talks are held in local schools to showcase NQBP's international environmental story and the work undertaken in the GBRWHA.

The North Queensland Cowboys and NQBP launched in 2016 a blitz program involving school visits, port site visits and networking with community and business leaders. The partnership enables Cowboys players and ambassadors, such as club legend and life member Matthew Bowen, to connect with school children in outdoor activities and through the delivery of important messages on positive life choices.

NQBP joined traditional owners to provide students a full day of cultural experiences during the recent National Aborigines and Islanders Day Observance Committee celebrations at Bowen High School. Students learned how to grow native plants and experienced cultural traditions. NQBP has also launched its first

²⁵ Department of Local Government and Planning. (2012). *Mackay, Issac and Whitsundays Regional Plan 2012*, p.12

Reconciliation Action Plan (RAP) 2020 to 2022, building on relationships with Traditional Owners in their port communities.

NQBP also offer sponsorships to partner with organisations that help NQBP meet its business objectives and deliver long-term benefits to port communities. The criteria developed to assess applications are designed to establish relationships that will mutually benefit NQBP and the receiving organisation. The proposals are evaluated according to:

- tangible benefits associated with the partnership
- opportunity to create long-term value
- ability to reach targeted audiences and build relationships
- positive exposure for the NQBP brand
- potential to be leveraged with additional investment from other business
- potential for long-term sustainable partnership or relationship.

6.4.11 Conservation areas

The conservation areas surrounding the port include Abbot Bay Conservation Park, the GBRMP, CVW, Cape Upstart Marine National Park, Holbourne Island Conservation Park and Edgecumbe Heights Recreation Reserve. Each provide their own value to the community and have been identified in previous port projects as key areas of focus. Much of the natural environment in the region is protected under conservation and provides protection for Queensland tidal lands and tidal waters.^{26 27}

The CVW cover 5154ha and is listed on the DIWA. These nationally important wetlands are located south and along the coastline of the port providing habitat for a number of threatened waterbirds. The wetlands also include the Abbot Bay Conservation Park/Resource Reserve. The wetlands are listed as a Matters of State Environmental Significance (MSES) and hold an 'existence' value to the Bowen community.

The development of the Social Impact Assessment for the Abbot Point Growth Gateway project in 2015, highlighted the communities concern over mining activities and the associated risk it poses for the GBRMP and CVW. With appropriate strategies the projects were able to address the community concerns and retain the quality of the natural environment.²⁸

Cape Upstart Marine National Park Zone is outside of the study area (approximately 15km from the port), however, it is an important conservation zone and meeting place for Indigenous people. Protection of the community value is pertinent for the Traditional Owners, evident through a recent advancement in the National Park First Nations Naming project, which had nominated Cape Upstart National Park to be renamed to Budgenerra to acknowledge the culture and ancestors of the Juru people.²⁹ Cape Upstart and Holbourne Island Conservation Park are located approximately 30km away from the port and provide bushwalking, nature, bird spotting and education for the region.

6.4.12 Beach areas/Landscaped foreshores

Abbot Point is flanked on either side by foreshores and beach areas. To the south of the port, Abbot Point Beach stretches 8.5km to Euri Creek in a mixture of beach rock, dunes and tidal flats. The Abbot Point Beach and Curlewis Bay are turtle nesting sites with waters hosting whales, dugongs and snub fish.

Due to restricted access to the port, there are no recreational opportunities on port land. Public access to the northern beaches of the port is not permitted. Many beaches around Bowen are popular with locals and tourists alike, including Horseshoe Bay, Rose Bay, Murrays Bay, Kings Beach, Queens Beach and Grays Bay.

Archaeological evidence illustrates the connection of the foredune at Abbot Point Beach to the Juru people, with multiple sites of cultural heritage, resource management, fishing, stone tool manufacturing, food

²⁶ Department of Local Government and Planning. (2012). *Mackay, Issac and Whitsundays Regional Plan 2012*, p.54

²⁷ Queensland Government. (2018). Great Barrier Reef Marine Park. Retrieved from: <https://www.qld.gov.au/environment/coasts-waterways/marine-parks/about/gbrmp>

²⁸ WorleyParsons Consulting. (2015). *Social Impact Assessment- Abbot Point Growth Gateway Project*. Retrieved from https://www.statedevelopment.qld.gov.au/__data/assets/pdf_file/0021/14844/abbot-pt-eis-appendix-r-social-impact-assessment.pdf

²⁹ Enoch, L. (2020). First Nations language to be acknowledged in naming of national parks. Retrieved from <https://statements.qld.gov.au/statements/90294>

production and living. The Juru people also have connection to the Mount Roundback and other nearby sites.

6.4.13 Recreation

The waters surrounding the port provide opportunities for recreation that add to the coastal lifestyles of Bowen residents. Due to the restriction in public access to port land, the recreational values for Abbot Point are fishing and environmental values that can be accessed from the sea. The deep sea and coastal fishing opportunities are accessed primarily from Bowen.

Sailing is also a valued recreational sport around the Abbot Point area especially in the waters of the GBR and nearby Bowen. There are multiple community yachting groups that support the pursuit of this community value.

6.4.14 Vistas/Viewpoints

The port is set amongst mountains and ranges including Cape Upstart National Park, Mount Roundback, Mount Bruce, Luce and Curlewis. Within Bowen, there are several lookout points that provide cultural and tourist attractions. The lookout points include Flagstaff Hill, Mount Nutt Lookout, Reservoir Hill, Horseshoe Bay lookout, World War II Radar Station Lookout and Mother Beddock.

The only viewpoint to the port is from Cape Upstart National Park, located west of Abbot Point. The port may be viewed from Mount Luce, Mount Little and Mount Roundback however, public access is not permitted as these locations are within SPL.



Figure 14: Community value in study area

6.5 Potential impacts, threats, and pressures

Potential impacts, threats and pressures on social values from development and activities in the port and surrounding area are summarised in **Table 16**. This identifies whether these impacts, threats and pressures are direct or indirect, and 'one off' or 'on-going'.

Table 16: Potential impacts, threats and pressures on social values

Social value	Potential impact/threat/pressure	Direct/indirect	One-off/on-going
Population and demography	Influx of workers to support construction activities within the port, resulting in an increase in the non-resident population and subsequent changes to the age profile and ratio of males and females (due to typical construction workforce demographics).	Direct	One-off
	Increase in resident population due to people moving to Bowen and surrounding communities to take up employment opportunities in ongoing port-related activities.	Indirect	Ongoing
	Population retention in the study area, including younger people due to increased opportunities for local employment and training during port construction and operation activities.	Indirect	On-going
Employment and training	Employment generation associated with construction of future development and ongoing operation of port-related activities, supporting increased local employment opportunities and diversity, and associated social and economic outcomes (for example, increased personal and household incomes, upskilling of local workforce).	Direct/ indirect	One-off/ on-going
	Increased employment and training opportunities during construction of future development and ongoing operation of port-related activities for groups such as youth and Indigenous, supporting lower youth and Indigenous unemployment rates and increased economic and social outcomes.	Direct/ indirect	One-off/ on-going
	Employment opportunities within local and regional businesses that provide goods and services to support construction and port-related activities.	Indirect	On-going
	Demand for local workers during construction and ongoing port operations has potential to result in labour shortages in lower paid employment sectors.	Direct	On going
Housing	Increased demand for housing by construction workers potentially resulting in higher rent prices and impacts on rental housing affordability and levels of housing stress for households on low and fixed income.	Direct	One-off
	Increased demand for housing by workers of ongoing port-related activities potentially resulting in higher housing prices and impacts on housing affordability and housing stress for households on low and fixed income.	Indirect	On-going
	Increased demand for temporary accommodation options potentially impacting on the availability of short-term visitor accommodation for tourists.	Direct	One-off

Social value	Potential impact/threat/pressure	Direct/indirect	One-off/on-going
	Increased rental income for owners of investment properties due to increased demand for housing by construction workers and workers involved with on-going port-related activities.	Direct	On-going
	Economic benefits for owners of temporary accommodation options due to increased use by construction workers.	Direct	One-off
	Potential demand for new housing development to support the housing needs of future port-related workers.	Indirect	On-going
Social infrastructure	Influx of non-resident workers to support construction activities and on-going operational port-related activities may increase demand for critical community services and facilities, impacting access to these services for local residents.	Indirect	On-going
	Increase in workers and their families moving to Bowen and surrounding communities in response to port related employment opportunities increasing demand on services and facilities such as education, childcare facilities, family support services, and sporting facilities.	Indirect	On-going
	Increase in resident population due to people moving to Bowen and surrounding communities to take up employment opportunities in ongoing port-related activities.	Indirect	On-going
	Improvements in community services and facilities due to an increase in people moving to Bowen and surrounding communities in response to port-related employment opportunities (for example, increased demand for education facilities may support improvements in education facilities, classes available to students, etc).	Indirect	On-going
Community values	Changes to community identity and social cohesion due to an influx of non-resident workers to support future construction activities and ongoing operational activities for the port.	Indirect	On-going
	Potential conflict between residents and non-resident workforce due to possible incidences of anti-social behaviour of non-resident workforce.	Indirect	On-going
	Potential for conflict and division between community members due to differences in opinion about perceived adverse impacts on environmental values relating to the GBR and project benefits.	Indirect	On-going
	Potential impacts on community values relating to environmental features such as the GBR, waters, national parks and conservation areas.	Indirect	On-going

Social value	Potential impact/threat/pressure	Direct/indirect	One-off/on-going
	Potential impacts on recreational fishing areas within coastal and deep-sea waters surrounding the port due to changes in on-going port operations and activities.	Indirect	On-going
	Increase in road safety risks due to increased construction traffic and port-related traffic (for example, workers commuting to the port, delivery of construction materials, plant and equipment, increased heavy vehicle activities).	Direct	On-going
	Increased economic opportunities for local and regional communities, business and industry due to construction activities, port-related operations, and increase in local population (for example, increased spending on local supplies, goods and services by construction contractors, port-related businesses, and workers).	Direct/ indirect	On going
	Introduction of new development and port-related infrastructure, impacting on the visual environment and views towards the port from surrounding land and waters.	Direct	On-going

6.6 Summary

The priority Port of Abbot Point is situated in an isolated location on the coast of North Queensland. Despite its location, the area is rich with cultural history, significant natural resources and a thriving agricultural and mining economy that supports the surrounding communities. This section of the report identifies and describes the social and socio-economic characteristics of the port and surrounding areas. This information will inform the master planning process in accordance with the Ports Act requirements.

The master planning process considers the existing policy framework at a local, state and federal level stipulating the regional and social objectives, and issues of community significance to the port and surrounding areas. The importance of community cohesion, Indigenous heritage, economic growth, recreational, environmental preservation and sustainability values is central to the master planning process.

The social profile of the port presents the historical and current demographic characteristics of Abbot Point which are derived from the communities of Bowen and Collinsville. The study area has a relatively small estimated residential population of 12,783 people (30 June 2020) of which 9488 people reside in Bowen SA2. There is an older-than-average population that is expected to keep increasing to 2041. There is strong Indigenous and Torres-Strait Islander representation, high levels of socio-economic disadvantage and a higher unemployment rate in Bowen coupled with lower levels of education when compared with the Queensland average. Agriculture is the main industry with coal mining, education and food and beverage services in the top five industries.

The communities are supported by a range of social infrastructure that contribute to wellbeing and quality of life. The concentration of social infrastructure is in Bowen including education, health and emergency services, recreation and community facilities. Community values are centred around conservation, recreation, visual amenity and the natural environment which all add to the lifestyles enjoyed by residents and tourists alike.

7. Cultural heritage

7.1 Introduction

Legislation in Queensland protects all known heritage places and requires that proponents undertake detailed due diligence assessment prior to development in undisturbed land. Native title has been determined to exist over part of the study area.

A search of the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register identified eight known Aboriginal places within the study area. No heritage places were identified in other searches.

This chapter provides the following sections:

- Aboriginal cultural heritage – **Section 7.2**
- Historical cultural heritage – **Section 7.3**
- Summary – **Section 7.4.**

7.2 Aboriginal cultural heritage

7.2.1 Commonwealth Legislation and Policy

7.2.1.1 *Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth)*

The purpose of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) is to ensure the preservation and protection of areas and objects in Australia and in Australian waters that are of particular significance to Aboriginal tradition.

It contains provisions for an Indigenous person or group to submit an application to the Australian Government seeking a declaration to protect an area or object of particular Indigenous significance, from specific threats of injury or desecration. The Australian Government would only seek to exercise its power after the relevant Indigenous party has exhausted all opportunities to preserve and protect the area or object through the relevant state or territory legislation.

7.2.1.2 *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*

The EPBC Act includes 'national heritage' as a MNES and protects listed places to the fullest extent under the Constitution. It also establishes the National Heritage List (NHL) and the Commonwealth Heritage List (CHL).

The only area of National or Commonwealth heritage existing within the study area is the GBRMP.

7.2.1.3 *Native Title Act 1993 (Cth)*

The *Native Title Act 1993* (Cth) recognises and protects native title and provides that native title cannot be extinguished contrary to the Act. Aboriginal claimants may lodge an application for native title determination over an area of land and sea. The determination then details whether native title rights have been extinguished or are retained as either exclusive or non-exclusive right for the claimant party.

The *Native Title Act 1993* (Cth) also establishes processes for the negotiation of agreements between a Registered Native Title Body Corporate (RNTBC) and development proponents. These agreements are generally project specific.

7.2.2 Queensland Legislation and Policy

7.2.2.1 *Aboriginal Cultural Heritage Act 2003*

All Aboriginal cultural heritage in Queensland is protected under the *Aboriginal Cultural Heritage Act 2003* (ACH Act) and penalty provisions apply for any unauthorised harm. Compliance with the act can be achieved through application of the Duty of Care Guidelines or implementation of a CHMP.

Under Part 3, Division 1, Section 23(1) of the Act, a person carrying out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage (the cultural heritage duty of care). This applies whether places are recorded in an official register or not and whether or not they are located in, on or under private land.

A person who carries out an activity is taken to have complied with the cultural heritage duty of care in relation to Aboriginal cultural heritage, if the person is acting in compliance with the guidelines.

The Act provides for development of CHMPs to address matters of cultural for proposed development. CHMP are generally project specific documents developed between Aboriginal Parties and a development proponent.

7.2.2.1.1 Duty of Care Guidelines

The *Duty of Care Guidelines, 2004* are gazetted in accordance with Section 28 of the ACH Act and allow for the protection and preservation of Aboriginal cultural heritage, it sets out a prescribed process to ensure that a person has exercised an appropriate level of due diligence prior to commencing an activity that may harm Aboriginal cultural heritage.

The guidelines recognise that it is unlikely that Aboriginal cultural heritage will be harmed where:

'The current or proposed activity is on an area previously subject to significant ground disturbance and the activity will impact only on the area subject to the previous disturbance; or

The impact of the current or proposed activity is unlikely to cause any additional harm to Aboriginal cultural heritage that that which has already occurred.'

This is not to say that a particular area may not continue to have importance under Aboriginal tradition or history, even though it has been subject to prior significant ground disturbance.

A person who carries out an activity is taken to have complied with the cultural heritage duty of care in relation to Aboriginal cultural heritage if the person is acting in compliance with the guidelines.

In accordance with the ACH Act, a person undertaking an activity must take all reasonable and practicable measures to avoid harming Aboriginal cultural heritage. The following criteria must be considered for a person to have undertaken appropriate due diligence:

- the nature of the activity, and the likelihood of its causing harm to Aboriginal cultural heritage
- the nature of the Aboriginal cultural heritage likely to be harmed by the activity
- the extent to which the person consulted with Aboriginal parties about the carrying out of the activity, and the results of the consultation
- whether the person carried out a study or survey, of any type, of the area affected by the activity to find out the location and extent of the Aboriginal cultural heritage, and the extent of the study or survey
- whether the person searched the database and register for information about the area affected by the activity
- the extent to which the person complied with cultural heritage duty of care guidelines
- the nature and extent of past uses in the area affected by the activity.

The Duty of Care Guidelines identifies five activities:

- activities involving No Surface Disturbance (Category 1)
- activities causing No Additional Surface Disturbance (Category 2)
- developed Areas (Category 3)
- areas previously subject to Significant Ground Disturbance (Category 4)
- activities causing additional surface disturbance (Category 5).

Where proposed project activities may excavate, relocate, remove or harm Aboriginal cultural heritage entered on the Aboriginal Cultural Heritage Register or Database in any of the above activities, there is generally a high risk that Aboriginal cultural heritage could be harmed. In these circumstances, the activity

should not proceed without further cultural heritage assessment, including consultation with the Aboriginal Party for the area.

7.2.2.2 *Native Title (Queensland) Act 1993*

The NT Act ensures that Queensland legislation is consistent with the *Native Title Act 1993* (Cth) and to validate past acts under Queensland law that may have been invalidated because of the existence of native title. The NT Act also serves to confirm existing rights that are not native title rights, such as land access and natural resource ownership.

7.2.3 Relevant Database and Register Searches

7.2.3.1 Aboriginal and Torres Strait Islander Cultural Heritage Database and Register Search

A search of the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register undertaken on 10 August 2021, identified 299 known Aboriginal sites within the study area, a summary of these sites is presented below in **Table 17**. Some of these records may be multiple recordings of the same place or recordings of different parts of the same place. Please note that the locations on the map are not precise locations, but an indication of the area in which places were found. Precise locations are not supplied for cultural heritage confidentiality reasons.

Table 17: Aboriginal places in the study area

Site type	Number
Aboriginal Intangible Place	1
Artefact Scatter	107
Burial(s)	5
Cultural Site	6
Engraving(s)	2
Hearth/Oven(s)	31
Isolated Find	6
Landscape Feature	20
Painting(s)	4
Resource Area	11
Scarred Tree	3
Shell Midden	3
Shell Midden(s)	72
Story Place	3
Weir/Fish Trap	25
Total	299

7.2.3.2 National Native Title Register

A search of the National Native Title Tribunal's Native Title Vision tool undertaken on 31 May 2021, indicated that there is a native title consent determination in place for the land at Abbot Point illustrated in **Figure 15**. The Traditional Owners of the land are the Juru people and they are represented by the Kyburra Munda Yalga Aboriginal Corporation RNTBC.

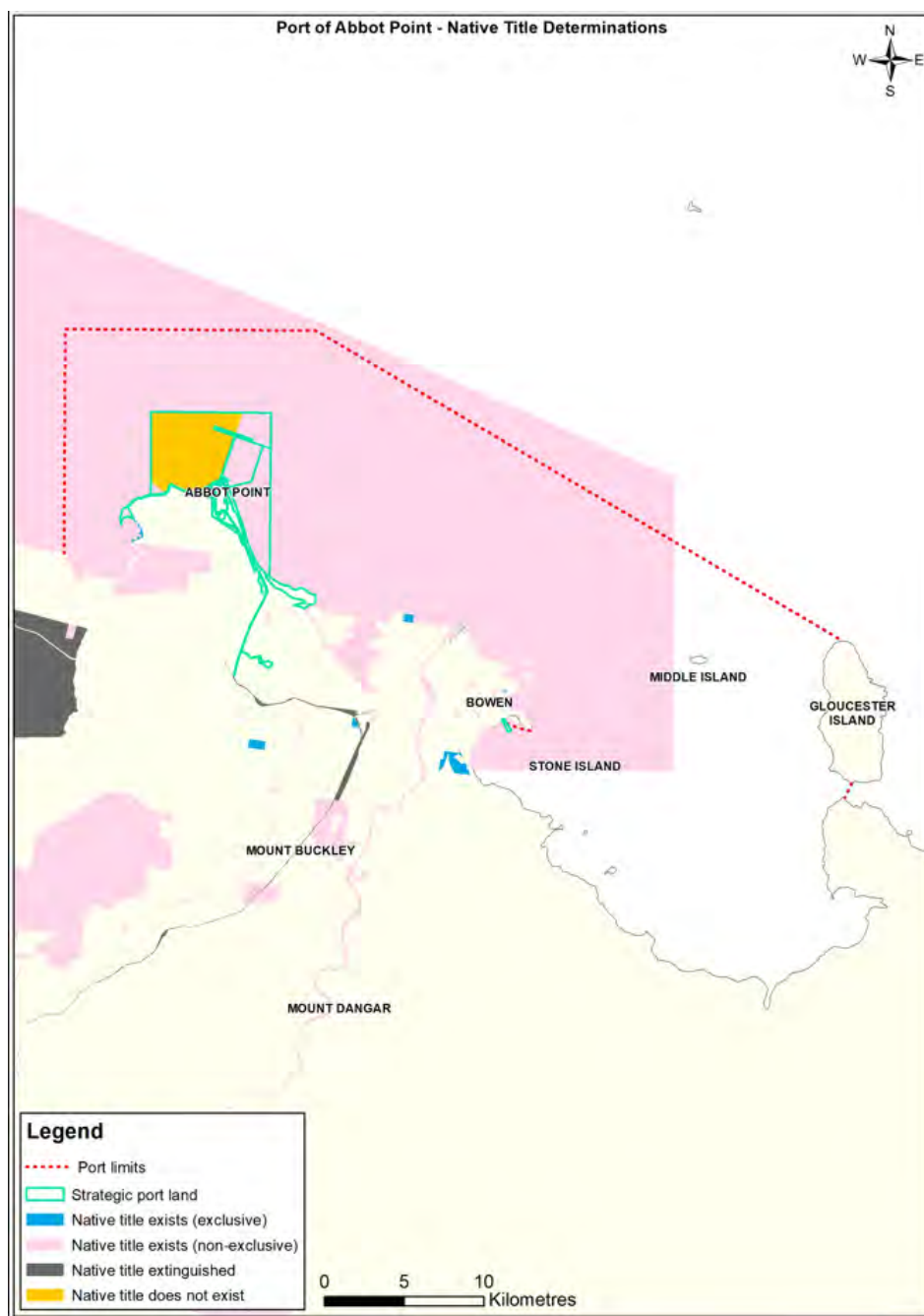


Figure 15: Consent Determination of Native Title for the Juru people

7.2.4 Non-statutory databases

7.2.4.1 National and Commonwealth Heritage Lists

A search of the study area was undertaken on 31 May 2021. There are no registered Aboriginal cultural heritage sites listed on the NHL and CHL, within the study area.

One natural heritage site is listed on the NHL being the GBR.

7.2.4.2 Register of the National Estate

A search of the study area was undertaken on 31 May 2021. There are no registered Aboriginal cultural heritage sites listed on the Register of the National Estate (RNE) within the study area.

7.2.4.3 Places classified by the National Trust

A search of the study area was undertaken on 31 May 2021. There are no Aboriginal places currently classified by the National Trust within the study area.

7.2.4.4 Relevant Council Local Heritage Lists

A search of the study area was undertaken on 31 May 2021. There are no Aboriginal places currently on the WRCs Local Heritage Register within the study area.

7.2.5 Traditional Owner groups, ethnographic history and Aboriginal Land Use history

The earliest land use was by the local Aboriginal population. The descendants of these people are known as the Juru people. The Kyburra Munda Yalga Aboriginal Corporation are the RNTBC for the study area. This includes areas where native title has been extinguished and where exclusive and non-exclusive native title exists.

The activities undertaken by the Traditional Owners within the vicinity of the study area have contributed to the nature and character of the current landscape. The Juru people utilised the land and coastal waters across the Abbot Point area and the surrounding landscape. Indigenous land use practices would have included food gathering, hunting and farming practices such as use of fish traps.

7.2.6 Previous studies and known heritage values

A number of previous Indigenous cultural heritage surveys and studies have been conducted in and around the port. Many of these are unpublished or not available in full. There is also significant potential for heritage sites to exist that have not yet been investigated, especially in areas overlooking fresh water and at resource procurement sites. It should be noted that specific details of locations of significant Indigenous cultural heritage sites are not published or made publicly available.

Of note, these sites include:

- fish traps³⁰
- middens comprising of shellfish remains, turtle bone and bird bone³¹
- discrete intra-site activity areas for food processing, food procurement, and artefact manufacture³²
- scattered artefacts such as grindstones, hammer stones, backed blades and implements such as knives, edge ground axes.³³

7.2.7 Current plans and agreements

7.2.7.1 North Queensland Bulk Ports Reconciliation Action Plan

NQBP has in place a RAP. A RAP is designed to encourage reconciliation between a corporation and the Aboriginal and Torres Strait Islander Peoples of Australia through the implementation of specific, timely, and measurable actions. The RAP requires NQBP to engage with the Traditional Owners in a meaningful way when planning future development. This includes extensive consultation regarding the cultural heritage values of the area.

7.2.7.2 Indigenous Land Use Agreements

An Indigenous Land Use Agreement (ILUA) is a voluntary agreement between a native title group and other people or bodies about the use and management of land and waters. An ILUA can be made in areas where native title has been determined to exist over part of the area, a claim to native title has been made, or where no native title claim has been made. When registered, all parties are bound to the terms of the agreement, and the ILUA operates as a contract between the parties.

³⁰ Rowland, M.J. and S. Ulm. (2011). *Indigenous Fish Traps and Weirs of Queensland*. Queensland Archaeological Research 14.

³¹ Barker, B. (1999). *A Cultural Heritage Assessment of Ports Corporation (Queensland) Holdings at Abbot Point/Bowen Region (Bowen Shire)*. Ports Corporation.

³² Ibid

³³ Ibid

The Juru people are party to six ILUAs with various parties regarding access to and management of the Abbot Point area in accordance with the NT Act. The Juru people are party to six ILUAs with various parties regarding access to and management in accordance with the NT Act.

7.2.7.3 Sustainable Port Development Guidelines

NQBP established *Sustainable Port Development Guidelines*³⁴, 2018 (development guidelines) to provide standards and guidelines for sustainable development for the ports of Hay Point, Mackay, Abbot Point and Weipa. The development guidelines are intended to ensure that future development at the ports occurs in a controlled and sustainable manner and encourages the use of sustainable development principles and innovative design.

In relation to Indigenous cultural heritage, the development guidelines require that proponents undertake due diligence assessments of previously undeveloped areas and prepare a management plan if there are any identified significant or listed areas on the site, in order to protect those places. Further, if archaeological material is identified during site preparation work, the works must cease until the artefacts have been appropriately managed in accordance with the ACH Act.

7.2.7.4 Traditional Owners of the Great Barrier Reef: The Next Generation of Reef 2050 Actions

This report was produced by a consortium, led by the Reef and Rainforest Research Centre to provide advice, based on extensive engagement with Traditional Owners, to support the commitments of the Reef 2050 Plan.

The report produced 10 statement/recommendations:

Statement/Recommendation 1:

Resolve Sea Country Claims: those responsible for the management of the reef ensure, through collaboration between relevant federal and state agencies, that adequate resources are available to support the longer term, fair and efficient resolution of Sea Country Native Title claims across the GBR estate over the coming decade.

Statement/Recommendation 2:

Get the Foundations Right: formalising and supporting the foundational rights and responsibilities of Traditional Owners in Sea Country by enhancing the governance capacities of families, clans, tribes, sub-regions and regions.

Statement/Recommendation 3:

Normalise Rights-Based Agreement Making: embed policy, procedures and ongoing participation and support to mobilise long term approaches for co-governance and co-management through agreement making, implementation and monitoring across the GBR at regional, sub-regional, and local scales.

Statement/Recommendation 4:

Establish a GBR Traditional Owner Sea Country Alliance: resource and support Traditional Owners to establish a GBR-wide Sea Country Alliance and engagement framework as a basis for negotiating and implementing a Tripartite Agreement.

Statement/Recommendation 5:

Negotiate a GBR-Wide Tripartite Agreement: Australian and Queensland Governments through Intergovernmental Agreement to meet obligations for free, prior and informed consent in accordance with the United Nations Declaration on the Rights of Indigenous Peoples through the negotiation of a whole of GBR Tripartite Agreement with Traditional Owners.

³⁴ Ibid 8

Statement/Recommendation 6:

Establish a GBR Traditional Owner's Funding Facility: to underpin long term and sustainable support for achieving Traditional Owner aspirations from local to regional scales, establish a GBR funding facility and support partnership arrangements to enable program delivery and investment leverage.

Statement/Recommendation 7:

Immediate Traditional Owner Co-design in Programs and Procurement: urgent interim action is required to ensure equitable and effective Traditional Owner involvement and influence in the co-design, procurement and delivery of all current programs and tenders of relevance to their reef-related aspirations (for example, GBR Foundation, Indigenous Advancement Strategy, Closing the Gap, etc.).

Statement/Recommendation 8:

Ensure Fit-For-Purpose Delivery Programs: through leveraging the Traditional Owner Funding Facility, establish stable delivery programs that particularly support social, cultural, environmental and economic aspirations (for example, country-based planning, meaningful jobs, infrastructure, and business development).

Statement/Recommendation 9:

Towards Research Partnerships: The GBR's leading research institutions jointly collaborate with Traditional Owners to plan and negotiate a long-term strategy for supporting their knowledge and research needs (for example, data sharing agreements, etc.).

Statement/Recommendation 10:

Traditional Owners Embedded in GBR Monitoring: embed Traditional Owners and cultural heritage in all aspects (for example, turtles and dugongs) and scales (from GBR-wide to local) of GBR monitoring and evaluation, using culturally appropriate approaches (for example, Strong Country – Strong People Framework).

7.2.8 Summary of Aboriginal heritage values

Legislation in Queensland protects all known heritage places and requires that proponents undertake detailed due diligence assessment prior to development in undisturbed land.

Native title has been determined to exist across the study area.

A search of the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register identified 299 known Aboriginal sites within the study area. No heritage places were identified in other searches.

Numerous studies and plans note the high heritage value of Abbot Point and recommend that cultural heritage assessment take place prior to any development works in previously undeveloped areas. The NQBP RAP requires consultation with Traditional Owners in the development of future plans. This approach is in alignment with the recommendations of the *Traditional Owners of the GBR: The Next Generation of Reef 2050 Actions*. The Duty of Care Guidelines also require cultural heritage assessments over much of the study area.

Previous studies indicate that it is rich with Aboriginal cultural heritage values. Several heritage studies have identified a complex of sites within the sand dunes and mangrove stands that indicate long-term complex occupation of the site. This area, within 3.5km of the beach, is considered to be high value for scientific and social/cultural values.

Less cultural heritage work has been undertaken in the inland portion of the study area.

7.2.9 Impacts, threats and pressures

Visitors, development and natural processes may present impacts, threats and pressures to Aboriginal cultural heritage. As there is no public access to the port, the risk of visitor impacts is low.

All development works in previously undeveloped or lightly developed areas have the potential to damage and destroy Aboriginal cultural heritage. It is possible some of these sites could have been impacted during the initial construction of the port and its associated infrastructure. Future works can minimise damage to these places thorough the planning process.

The natural action of wind, surf and storms can have a severe negative effect on coastal cultural heritage places, especially when those places are located in high energy environments such as tidal mudflats, mangrove stands and sand dunes.

7.3 Historical cultural heritage

Historical cultural heritage values express the important elements of value systems and lifestyles that communities want to preserve for future generations. The *Queensland Heritage Act 1992* (QH Act) is the principal legislation in Queensland established to provide for the protection and conservation of historical cultural heritage by protecting all places, items and areas entered in the Queensland Heritage Register (QHR). Historical cultural heritage under the QH Act includes buildings, structures, cemeteries, archaeological sites, gardens, urban precincts and natural and landscape features relating to the occupation of the state by groups such as Europeans, Chinese, South Sea Islander and other peoples. Under the Act, historical cultural heritage may also include places such as missions and other institutions, which have a heritage shared between these groups and Aboriginal or Torres Strait Islander peoples. In these instances, a place may be recognised as both historical and Aboriginal cultural heritage.

7.3.1 Commonwealth Legislation and Policy

7.3.1.1 *Environment Protection and Biodiversity Conservation Act 1999* (Cth)

The EPBC Act includes 'national heritage' as a MNES and protects listed places to the fullest extent under the Australian Constitution. It also establishes the NHL and the CHL. The following is a description of each of the heritage lists and the protection afforded places listed on them.

7.3.1.1.1 Commonwealth Heritage List

The CHL is a list of properties owned by the Australian Government that have been assessed as having significant heritage value. Any proposed actions on CHL places must be assessed for their impact on the heritage values of the place in accordance with actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies, noted in the Significant Impact Guidelines 1.2³⁵. The guidelines require the proponent to undertake a self-assessment process to decide whether or not the action is likely to have a significant impact on the environment, including the heritage value of places. If an action is likely to have a significant impact an EPBC Act referral must be prepared and submitted to the responsible Federal Minister for approval.

7.3.1.1.2 National Heritage List

The NHL is a list of places with outstanding heritage value to Australia, including places overseas. Any proposed actions on NHL places must be assessed for their impact on the heritage values of the place in accordance with MNES (Significant Impact Guidelines 1.1). The guidelines require the proponent to undertake a self-assessment process to decide whether or not the action is likely to have a significant impact on a MNES including the national heritage value of places. If an action is likely to have a significant impact an EPBC Act referral must be prepared and submitted to the responsible Federal Minister for approval.

7.3.1.1.3 Register of the National Estate

The RNE was formerly compiled as a record of Australia's natural, cultural and Aboriginal heritage places worth keeping for the future. The RNE was frozen on 19 February 2007, which means that no new places have been added or removed since that time. From February 2012 all references to the RNE were removed from the EPBC Act. The RNE is maintained on a non-statutory basis as a publicly available archive. **Figure 16** illustrates the locations of historical heritage sites.

³⁵ Department of Sustainability, Environment, Water, Population and Communities. (2013). *Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies: Significant impact guidelines 1.2: Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth of Australia.



Figure 16: Historical Heritage in the study area

7.3.1.1.4 Underwater Cultural Heritage Act 2018 (Cth)

The *Underwater Cultural Heritage Act 2018* (Cth) (UCH Act) replaces the *Historic Shipwrecks Act 1976* (Cth). The Act protects all shipwrecks and associated relics that are at least 75 years old, regardless of whether their physical location is known, and broadens that protection to include sunken aircraft and other types of underwater cultural heritage. The Act aims to provide clarity to present and ongoing jurisdictional arrangements for protecting and managing Australia's underwater cultural heritage.

The UCH Act:

- recognises that human remains found within shipwrecks or sunken aircraft must be treated with respect and not as artefacts
- enables protection of Australia's underwater cultural heritage in waters outside of Australia from actions by Australians
- broadens protection to sunken aircraft and other underwater cultural heritage sites
- elevates the role of the public by recognising their role in promoting awareness, understanding, appreciation and appropriate use of Australia's underwater cultural heritage, modernises and strengthens the range of compliance and investigation powers, while adopting a graduated approach to enforcement
- continues the highly successful delegated framework for day-to-day management in collaboration with the Australian states and Northern Territory.

The Act brings Australian law into alignment with the UNESCO 2001 Convention on the Protection of the Underwater Cultural Heritage.

Figure 17 illustrates the underwater heritage sites in the study area.



Figure 17: Underwater Heritage in the study area

7.3.1.2 The Burra Charter

The Burra Charter (The Australian National Committee of International Council on Monuments and Sites Charter for Places of Cultural Significance) was adopted by the Australian International Council on Monuments and Sites in 1979. It is a set of principles that provide a nationally accepted standard for heritage conservation practice in Australia. Initially, the charter was designed for conservation and management of historic heritage. However, after the addition of further guidelines in 1988, the Burra Charter is now applied to all types of places of cultural significance, including natural, Indigenous and non-Indigenous places with cultural values.

Under the Burra Charter 'conservation' it is defined as 'all of the processes of looking after a place so as to retain its cultural significance'. A 'place' is considered significant if it 'possesses aesthetic, historic, scientific, social or spiritual value for past, present or future generations. These values are reflected in the criteria used to determine the cultural heritage significance under the QH Act. The charter is updated periodically to reflect new understandings of theory and practice relating to cultural heritage management and conservation.

7.3.2 State Legislation and Policy

7.3.2.1 Queensland Heritage Act 1992

The QH Act provides for the protection and conservation of Queensland's non-Indigenous historical cultural heritage and is administered by DES. The QH Act establishes a framework for identifying and protecting heritage places by:

- establishing the Queensland Heritage Council as an independent statutory authority
- maintaining the QHR including State Heritage Places and Archaeological Places
- keeping local heritage registers including a process for local government to determine local heritage places
- regulating development of heritage places through the Planning Act.

7.3.2.1.1 Discovery of Archaeological Artefacts

Under Part 9 of the QH Act, a person must report to DES if they discover an archaeological artefact that is an important source of information about an aspect of Queensland's history. Archaeological artefacts include any relic or other remains located above, on or below the present land surface, or found in state waters, that relate to past human behaviour. Once a report has been made, the discovery cannot be disturbed for 20 working days, unless permission is given by DES. DES assesses the discovery to determine if it is an important source of information about Queensland's history.

7.3.2.2 Queensland Heritage Register

The QHR is a list of places of cultural heritage significance to Queensland to be protected for present and future generations. There are three categories of Queensland Heritage Place in the QHR, including:

- State Heritage Place
- Archaeological Place
- Protected Area.

Under Part 6 of the QH Act, approval is required from DES for any proposed work or changes within the boundary of a place entered on the QHR. Depending upon the type of changes proposed, approval can be granted by one of the following:

- **A General Exemption Certificate** - where no application is required. Most minor work and maintenance needed to keep a place in operational condition is approved under the General Exemption Certificate which applies to all places entered on the QHR
- **An Exemption Certificate** - upon application direct to DES. Exemption Certificates are mostly used to approve simple projects or work that does not have a detrimental impact on the cultural heritage significance of a Queensland Heritage Place not covered by General Exemption
- **A Development Application** - for works proposed to be undertaken by TMR that are not covered by the General Exemption Certificate or able to be covered by an Exemption Certificate, a Development by the State Application must be made. Development applications should include a Heritage Impact Statement prepared in accordance with Section 4.0 of the Guidelines - SDAP, State Code 14: Queensland Heritage (DES 2017). Development proposals by the Queensland Government that involve a place on the QHR are reviewed by the Queensland Heritage Council.

Additionally, for a Protected Area, permits are required from DES in order to enter or undertake any activity within a Protected Area.

7.3.3 Relevant database and register searches

7.3.3.1 Queensland Heritage Register

A search of the study area was undertaken on 10 August 2021. There are four historical heritage places listed on the QHR within the study area. All are associated with the Town of Bowen, around 30km from Abbot Point.

7.3.3.2 The National and Commonwealth Heritage Lists

A search of the study area was undertaken on 10 August 2021. There is one registered historical heritage site listed on the CHL within the study area. It is associated with the town of Bowen.

There are no cultural heritage sites on the NHL. One natural heritage site is listed on the NHL being the GBR.

7.3.3.3 Relevant Council Local Heritage Lists

A search of the study area was undertaken on 10 August 2021. There are 15 registered historical heritage sites listed on the WRC Heritage List within the study area. All are associated with the town of Bowen or small islands near Bowen.

7.3.3.4 Australasian Underwater Cultural Heritage Database

A search of the study area was undertaken on the 10 August 2021. There are six registered historical heritage sites listed on the Australasian Underwater Cultural Heritage Database within the study area. These include the *Julia Percy*, *Ronson*, *Queen of the Colonies*, *Wentworth*, *Day Dawn* and *Iona*.

7.3.4 Known places and previous studies

There are no publicly available historical heritage surveys or archaeological investigations specific to the study area. There are, however, several regional studies which illustrate the type of historical heritage that may be present. Key themes of these studies include:

- The significant military activity in the Bowen region around the World War II period. This includes the Military Training Camp at Miowera, that was established south of Bowen in 1940. In 1942 the Royal Australian Air Force Nos.11 and 20 Squadrons were quartered at Bowen and commandeered much of the main street for supply stores and accommodation. There is a Royal Australian Air Force Radar Station Site at Queens Beach in Bowen, and the Bowen Airfield has two extant concrete igloo bomb stores. There is also the Bowen Flying Boat Base on Quay Street, and numerous buildings that were requisitioned for military purposes.³⁶
- The historical importance of Bowen as a central port township and entry point to opening up pastoral activity in the northern and central parts of Queensland. Bowen was the main administrative centre for this part of Queensland until the 1880s.³⁷
- The development of sugarcane as a cash crop in the coastal areas from the 1860s, and the forced transportation of South Sea Islander workers for the industry, which has led to their significant contribution to the social and cultural life of the region.³⁸
- The expansion of mining activities in the Bowen Basin, which led to the creation of the Port of Abbot Point.³⁹

There are numerous historical heritage places in the study area, associated with the settlement and expansion of Bowen through to World War II. All known historical heritage places in the study area are close to, and associated with the development of, the town of Bowen. These places illustrate the growth and changing nature of the town, through decades of sugar, pastoralism and boom and bust cycles, through to its use as an important armed forces base in World War II, to its current use as a regional centre and its key role of supporting the port. It is possible previously unidentified heritage places and historical archaeological sites are present in the study area, especially given the local history of pastoralism and military activity associated with World War II.

³⁶ Pearce, H. 2009 WWII NQ: A cultural heritage overview of significant places in the defence of north Queensland during World War II, Environmental Protection Agency, Brisbane.

³⁷ Blake, T. 2005 Queensland Cultural Heritage Places Context Study. Report to the Queensland Government.

³⁸ Ibid

³⁹ Ibid

Table 18: Historical heritage places in the study area

Register	Register Number	Name of Place	Level of Significance	Reason for listing	Statutory Protection
QHR ⁴⁰	600044	Bowen Court House	State	Law/order, immigration, customs, quarantine: Courthouse—magistrates/court of petty sessions Theme 7.1 Maintaining order: Policing and maintaining law and order.	Yes
QHR	600041	Bowen Harbour Board Building (former)	State	Marine and maritime industry: Shipping agent's offices Themes 5.4 Moving goods, people and information: Using shipping 7.2 Maintaining order: Government and public administration.	Yes
QHR	602817	Bowen State School	State	Education, research, scientific facility: School—state Theme 9.1 Educating Queenslanders: Providing primary schooling.	Yes
QHR	601487	Flemington Road Cemetery	State	Burial ground: Cemetery—public Theme 1.4 Peopling places: Family and marking the phases of life.	Yes
CHL ⁴¹	106124	Bowen Post Office	N/A	Bowen Post Office, constructed in 1936, is noted for its comparatively rare Art Deco styling to an existing post office. While the application of Art Deco detail is concentrated along the Herbert Street parapeted frontage, is restrained to three-dimensional massing and symmetry with stylised low-relief decoration, and is conservative in design terms, the application is comparatively rare in terms of the post offices surveyed. The stylistic treatment includes the moulded columns, capitals, keystones and string lines in low relief on smooth rendered walls. The curtilage includes the title block/allotment of the property. The significant components of Bowen Post Office include the main postal building constructed in 1936.	Yes

⁴⁰ Queensland Government. (2017). Queensland Heritage Register. Retrieved from <http://apps.des.qld.gov.au/heritage-register/>

⁴¹ Australian Government. (n.d.) Australia's Commonwealth Heritage List. Retrieved from <http://www.dcceew.gov.au/parks-heritage/heritage/places/commonwealth-heritage-list>

Register	Register Number	Name of Place	Level of Significance	Reason for listing	Statutory Protection
Australasian Underwater Cultural Heritage Database ⁴²	2694	<i>Julia Percy</i>	N/A	The <i>Julia Percy</i> was bound from Maryborough for timber when the vessel was wrecked near Port Denison in March 1867. No lives were lost.	Yes
Australasian Underwater Cultural Heritage Database	3069	<i>Ronson</i>	N/A	Unknown.	Yes
Australasian Underwater Cultural Heritage Database	3032	<i>Queen of the Colonies</i>	N/A	The <i>Queen of the Colonies</i> was driven ashore on Bowen Beach during a gale and broke up.	Yes
Australasian Underwater Cultural Heritage Database	3321	<i>Wentworth</i>	N/A	The <i>Wentworth</i> left Townsville for Bowen, on 16 June 1887. On the morning of 17 June 1887, the vessel had just passed the North Head Lighthouse when the <i>Wentworth</i> struck and was stranded at the entrance to Port Denison. The vessel stranded 195 feet from the low-water mark. The <i>Wentworth</i> sustained substantial damage. However, up to 15 July 1887, all attempts to re-float the vessel had failed. The Marine Board found the captain to blame for the wreck, due to careless navigation.	Yes
Australasian Underwater Cultural Heritage Database	2380	<i>Day Dawn</i>	N/A	The <i>Day Dawn</i> was lost off Bowen on 30 January 1884.	Yes
Australasian Underwater Cultural Heritage Database	2633	<i>Iona</i>	N/A	The <i>Iona</i> , with a cargo of timber, was burnt to the water's edge at Bowen on the morning of 3 September 1888. It was believed the timber was for the railway works. The Queensland Museum lists the vessel as burnt on 2 September 1888.	Yes

⁴² Australian Government. (n.d.). Australasian Underwater Cultural Heritage Database. Retrieved from <http://www.environment.gov.au/shipwreck/public/wreck/>

Register	Register Number	Name of Place	Level of Significance	Reason for listing	Statutory Protection
WRC Heritage List ⁴³	N/A	Bowen Catalina Slipway and Hardstand	Local	Constructed in 1942–1943, Bowen Catalina Slipway and Hardstand are important in demonstrating Bowen's role as a base for amphibious aircraft during World War II. The concrete slipway and expansive hardstand area remain intact as evidence of the important wartime role played by Bowen as a major flying boat repair depot. Bowen's Catalina Slipway and Hardstand are significant as the only example of World War II flying boat base infrastructure in the region. As one of only four flying boat bases across Queensland, it is also significant as an uncommon example of its type.	Yes
WRC Heritage List	N/A	Bowen Cemetery	Local	Bowen General Cemetery demonstrates the early phase of settlement in Bowen. The gravestones of various early settlers provide an accurate representation of the notable residents in the district and demonstrate the families who have made a major contribution to the district. The cemetery is significant for its spiritual and symbolic value to the Bowen community and because of its continuity of use as a burial place for the region.	Yes
WRC Heritage List	N/A	Bowen Council Offices	Local	The Bowen Shire Council Offices is a substantial building for a small administrative centre and is important in demonstrating the evolution of Bowen's history, and the broader Queensland Government initiatives during the Depression era under the Intermittent Relief Work Scheme. Constructed in 1937, and used continuously as government offices since that time, the building reflects the growth and development of Bowen during the 1930s and is an expression of confidence in the district's future. The Bowen Shire Council Offices is a good representative example of a regional civic complex designed for government and commercial uses. It remains substantially intact and is important in illustrating the principal characteristics of a 1930s civic building located in the centre of town. It comprises intact council chambers and original council furniture (table and chairs), offices and purpose-built commercial shops. The building is also significant as an example of the work of architect CD Lynch, who made a substantial contribution to North Queensland architecture in the early 20th century. The Bowen Shire Council Offices is prominently sited on the corner of the main street (Herbert Street) and Powell Street and its distinctive compositional qualities contribute to its aesthetic significance. The building's overall symmetry and unity of scale, form and materials make it an important part of a municipal precinct between Powell and William Street (along Herbert Street).	Yes

⁴³ Whitsunday Regional Council. (2014). Whitsunday Regional Council: Local Heritage Register. Retrieved from <http://whitsundayrc.qld.gov.au/community-and-environment/our-community/history-and-heritage>

Register	Register Number	Name of Place	Level of Significance	Reason for listing	Statutory Protection
WRC Heritage List	N/A	Bowen Court House	Local	<p>The Bowen Court House is a substantial masonry building in classical revival style, built in 1880 to house the Northern Supreme Court, the Bowen Post Office and government offices. Since 1899, it has functioned as a District and Magistrates Court. A Police Magistrate was appointed to serve Bowen in late-1860 and a temporary courthouse was constructed. In November 1865, Bowen became a District Court area. Judge Long Innes, later to become Attorney General and Judge of the Supreme Court of New South Wales, was appointed as Bowen's first District Court Judge. He arrived in early 1866 and held court in the Municipal Chambers. Because of the financial crisis taking place in Queensland in 1866, the planned courthouse did not go forward until early-1867. In 1874, recognising the rapid development of North Queensland, due largely to the discovery of gold, the <i>Supreme Court Act 1991</i> increased the number of judges in Queensland to four, of which one was to reside in Bowen as 'the Northern Judge'. The Bowen Supreme Court formally opened before His Honour Mr Justice Sheppard on 21 October 1874. The Supreme Court first sat in Bowen on 26 February 1875. By May 1877, all the government buildings in Bowen had become dilapidated and it was recommended to construct new buildings in masonry. The site selected for the new court was considered the best in town and plans were completed by July 1879. The building was designed in the Colonial Architect's office during the time when Francis Drummond Greville Stanley was the Colonial Architect. The building has remained substantially unchanged since construction and has continued in use as a courthouse. A veranda was added to the north-west elevation in 1913, and the balustrades and posts have been altered, however, the building is generally very intact and still has the main components of its early furniture.</p>	Yes

Register	Register Number	Name of Place	Level of Significance	Reason for listing	Statutory Protection
WRC Heritage List	N/A	Bowen Harbour Board Building	Local	<p>The former Bowen Harbour Board building was constructed in 1921 for Bowen shipping agents McDonald Hamilton and Company. One contributing factor to the town's success was the management of its harbour, and therefore the efforts of its harbour board. The prospect of an official harbour board was first considered in 1913, when dissatisfaction among the Bowen Chamber of Commerce led to an inquiry into the financial arrangements of the port. The <i>Bowen Harbour Board Act of 1914</i> was gazetted on 1 September 1914. The board's by-laws were gazetted on 15 July 1915 seeing changes to the system of revenue collection, such as charging for berthage, and changes to the haulage system. The Harbour Board's revenue substantially increased, allowing port expansion through the construction of new cargo sheds and facilities to accommodate the expanding range of export materials. As the port developed so did the role of the Harbour Board. By 1933 the board was seeking a new location for its offices. The building selected by the board was constructed in 1921 for ship owners/agents. MacDonald Hamilton and Company, who occupied the site until closing their business in Bowen in 1930. The Harbour Board occupied the first floor up until 30 March 1985, at which time the Harbour Board was officially abolished as the port had been superseded by ports such as Townsville and was now obsolete as a commercial port. At this time the building was taken over by the Harbours and Marine Department. In 1988 the building was restored to house the Department of Harbours and Marine and was further renovated in 1994 by Q-Build in conjunction with Project Services in order to add air conditioning and internal fit out. In February 1998 the Queensland Heritage Council gave approval for the renovation of the ground floor.</p>	Yes
WRC Heritage List	N/A	Bowen Jetty	Local	<p>The Bowen Jetty, originally completed in 1867, rebuilt and extended between the 1880s and 1950s, provides evidence of the early importance of the Port of Bowen in north Queensland. The concrete head (1911–1915) at the end of the main jetty stem demonstrates the changes in port facilities necessitated by the evolution of ship design from the second half of the 19th century and is a rare early example of the use of reinforced concrete in a marine application. The coal pier (completed 1926) is important for its association with the first phase of coal mining in the Bowen Basin, the state's largest and most productive coal field. The pier was built as an export coal terminal for Collinsville State Colliery and Bowen Consolidated Colliery, two of the earliest mines in the Bowen Basin. The submerged remains of the earlier timber jetty head (c1880–1884) are important as remnants of one of North Queensland's oldest commercial port structures and contribute to our understanding of the port's evolution.</p>	Yes

Register	Register Number	Name of Place	Level of Significance	Reason for listing	Statutory Protection
WRC Heritage List	N/A	Bowen Post Office	Local	The site selected for the new Bowen Court House and was considered the best in town and plans were completed by July 1879. Presumably for reasons of economy, the new building was to house several different functions in different parts of the building. A large court room occupied the centre of the building, rising to its full height. The south wing was occupied by the Post Master, the ground floor containing the office, kitchen and servant's room, and the upper floor sitting and bedrooms.	Yes
WRC Heritage List	N/A	Bowen State School	Local	Bowen State School (established in 1865 as Bowen National School) is important in demonstrating the evolution of state education in Queensland and the associated evolution of government education architecture. One of the oldest public schools established in Queensland, Bowen State School retains a significant complex of buildings and landscape elements that illustrate the development of government education philosophies from the 1880s to the 1950s.	Yes
WRC Heritage List	N/A	Bowen War Memorial	Local	Dedicated in 1926, the Bowen War Memorial is important in for its symbolic meaning, and as an enduring local record of a major historical event. It survives as evidence of an era of widespread nationalism represented at the local level, commemorating a major historical event and representing great human sacrifice. The Bowen War Memorial demonstrates the principal characteristics of a commemorative structure. As a digger statue, the Bowen War Memorial is representative of the most popular form of war memorial in post-WWI Queensland. The Bowen War Memorial has a strong association with the former Bowen Shire community as evidence of the impact of participation in two world wars and in the Vietnam War.	Yes
WRC Heritage List	N/A	Concrete WWII Igloos	Local	The two concrete igloos located to the south of Bowen Airfield demonstrate the use of Bowen as an airfield during World War II and as a munition and bomb storage facility. Further, they are important surviving evidence of facilities used to store materials for the 1st Australian Field Experimental Station based at Gun Yarra railway siding near Proserpine which conducted chemical weapons testing during 1944. The two concrete igloos located to the south of Bowen Airfield demonstrate the principal characteristics of World War II Igloo buildings, facilities that were purpose built to house munitions and other materials during the war.	Yes
WRC Heritage List	N/A	Flemington Road Cemetery	Local	The settlement of Port Denison (Bowen) being the first town in North Queensland, is of special significance as it represents the earliest period of the settlement of the Kennedy region. As such, the Flemington Road Cemetery is important in demonstrating the evolution and pattern of Queensland's history in being tangible evidence of the settlement.	Yes

Register	Register Number	Name of Place	Level of Significance	Reason for listing	Statutory Protection
WRC Heritage List	N/A	Former Burns Philp Building	Local	The Burns Philp Building in Bowen demonstrates the important role of shipping and merchandising in Bowen during the first half of the twentieth century in association with a major North Queensland company, Burns Philp and Company Limited. Further, it's construction in reinforced concrete in 1917–1918 is an early example of the use of this material in north Queensland. The Burns Philp and Company Limited Building is a good example of the work of architect CD Lynch and Walter Hunt, Townsville-based architects who made a substantial contribution to North Queensland architecture in the early 20th century. The Burns Philp Building in Bowen has strong association with the important mercantile entity of Burns Philp and Company Limited as a purpose-built branch in an important regional centre.	Yes
WRC Heritage List	N/A	North Head Lighthouse Complex	Local	The North Head Lighthouse Complex is important in demonstrating the evolution of the region's history, particularly the establishment of port facilities to serve the region's hinterland in an early period of its history. It also continues to reinforce that Bowen was a port since the 1860s. The North Head Lighthouse Complex has the potential to yield information that will contribute to an understanding of the region's history, particularly the design, methods of construction, layout and use of the lighthouse complex and North Head Island more generally (including archaeological potential) over a period of over 150 years. The North Head Lighthouse Complex is important to the region because of its aesthetic significance. The lighthouse is clearly visible from various vantage points in Bowen and the characteristic white and red-domed structure reflects an earlier, more romantic period of shipping and its associated dangers.	Yes
WRC Heritage List	N/A	Queensland Country Women's Association (QCWA) Cottage - Queens Beach	Local	The Queens Beach QCWA Seaside Cottage is an important early example of the QCWA's aim to provide affordable seaside accommodation for rural women and their families. Its development in Queens Beach in 1925, shortly after the formation of the QCWA, demonstrates the northern district's organisational ability to deliver facilities and services which helped alleviate the hardships experienced by families from rural Queensland. The 1925 Queens Beach QCWA Seaside Cottage is a rare surviving example of the cottage-style of holiday accommodation that was developed and operated by the QCWA. The cottage is the oldest extant QCWA Seaside Cottage in the region. Although the cottage has been moved from its original location, it has been continuously used as holiday and/or emergency accommodation since officially being opened in 1925.	Yes

Register	Register Number	Name of Place	Level of Significance	Reason for listing	Statutory Protection
WRC Heritage List	N/A	Summervale Theatre	Local	The Summervale Theatre at Queens Beach is important in demonstrating the evolution of picture theatres in the region, and of independent picture theatres in regional Queensland. Although modified over time, it remains an important example of entertainment facilities developed in the region before the advent of television that remains in use. The Summervale Theatre is important in illustrating the principal characteristics of a small, independent, single auditorium picture theatre of the mid-20th century. These include: the prominent façade and entry, foyer with ticket window and confectionary counter, projection box, and relatively intact large main auditorium. The Summervale Theatre has a strong association, extending from the late 1940s until the present, with the communities of the districts of Bowen, Whitsunday, Proserpine and Collinsville as a focal point of social life. The theatre functions not only as a cinema, but also as a venue for other forms of popular entertainment and important social occasions for which the place is a focus for memories.	Yes
RNE ⁴⁴	8902 (Indicative Place)	Mossvale Station Old Homestead	Not applicable	Not Available.	No
RNE	8922	Seaward House	Not applicable	The house is one of the earliest surviving buildings in the region constructed only three years after the founding of the settlement at Bowen. Its association with William Seaward, early merchant of North Queensland and Francis Clarke, a former colonial architect of New South Wales, adds to its historic significance. On 3 December 1864, tenders were called in the Port Denison times for the erection of a dwelling for Mr W Seaward. The architect was Francis Clarke. Clarke and Seaward had been two of Bowen's settlers. Seaward had apparently come from Sydney and with William Marsh had founded the firm Seaward Marsh and Company, said to have been the first firm of merchants founded in north Queensland. By 1864 Seaward Marsh and Company were prospering. Francis Clarke had been colonial architect for New South Wales and by 1864 had been elected as Bowen's first Mayor.	No
RNE	8924	Bowen Court House	Not applicable	Most important element of Bowen townscape. Well-conceived and executed architectural design and detail. First Supreme Court building in northern Queensland. Suggested curtilage includes Williams and Herbert Streets. Frontages to adjoining building boundary on north east frontage.	No

⁴⁴ Australian Government. (n.d.). The Register of the National Estate. Retrieved from <http://www.dcceew.gov.au/parks-heritage/heritage/publications/about/national-estate>

Register	Register Number	Name of Place	Level of Significance	Reason for listing	Statutory Protection
RNE	14255 (Indicative Place) Bowen Harbour Board Building	Bowen Harbour Board Building	Not applicable	A late example of the two-storey veranda style of commercial premises. Its execution in concrete is particularly notable. For its important contribution to the streetscape punctuating the end of the main shopping section on the corner of the street. For its association with the Bowen Harbour and the controlling Harbour Board.	No
National Trust ⁴⁵	BOW 2/7	Bowen Court House	Not Applicable	Not Available.	No
National Trust	BOW 2/12	Seaward House	Not Applicable	Not Available.	No
National Trust	BOW 2/10	Bowen Harbour Board Building	Not Applicable	Not Available.	No

⁴⁵ National Trust. (n.d.). *About us*. Retrieved from <https://www.nationaltrust.org.au/about-us/>

7.3.5 Historical land use history

There was extensive and large-scale historic Aboriginal activity in the Abbot Point and Bowen areas prior to European discovery and settlement in the 1840s and 1850s. Bowen was proclaimed a town in 1861 and European pastoralists settled in the area during the early 1860s for the production of beef cattle. Pastoral development required the native vegetation to be cleared and large stations relied heavily on Aboriginal labour.

Prior to the establishment of Bowen, there had been sporadic contact between the Indigenous peoples of the area and Europeans. After European settlement and pastoral exploitation of the region, tensions between pastoralists and Aboriginal people rose and frontier violence intensified during the 1860s. There were dramatic reductions in the number of Indigenous people in the area and, by the end of the 1860s, the first Aboriginal 'reserve' had been established.

Bowen became the base for the pastoral occupation of North Queensland and the port was established to tranship supplies to new outback stations and serve ships passing through the Torres Strait sea route from Asia.⁴⁶ By 1865, Bowen's European population exceeded 1000 people and the port was busy transporting material to pastoralists inland.

In the broader region, gold was discovered near Townsville in 1865 and at Mount Wyatt, to the south west, in 1867, which brought waves of immigrants to North Queensland. In 1866, an immigration port was established in Bowen to facilitate the provision of Pacific Islander labour for the Queensland sugar plantations. Many people from the Pacific Islands who married Indigenous people remained in Bowen following the introduction of the *White Australia Policy* and its repatriation legislation in 1901.

Various enterprises were attempted to support Bowen in the later 1800s, including meatworks and rail and tramway links to capitalise on sugar and coal in the region. Not all these ventures were successful and Bowen's population in the early 1900s remained not much over 1000. Despite this, Bowen had a school of arts, a hospital, and the harbour was rated as one of the best on the east coast.

The first large-scale government removal of Indigenous people from the area occurred in 1915 and further removals took place in the first half of the 20th century, however the number of people removed is difficult to ascertain.

As rail extended to North Queensland in the early 1900s, coal was in short supply. Coal deposits near Bowen led to the promise of collieries, iron and steel works but these did not eventuate. The coal field south of Bowen, known as the Bowen Basin, was first investigated during the 1870s, but detailed exploration of the field did not occur until the 1920s with funding from the Queensland Government. The coal deposits led to the foundation of Collinsville, 90km south west of Bowen, which was connected to Bowen by rail in 1922. In Bowen, commercial fishing was successful and an evaporative saltworks was established in 1925. Plans to upgrade the harbour and pier facilities were made based on the possibility of exporting coal to China. When these plans fell through, the Bowen Harbour Board was left in debt. The pier was the centre of the coal trade until the purpose-built port was opened at Abbot Point in the mid-1980s. The original port continues to cater for fishing boats.

Abbot Point was substantially a pastoral area until it was developed into a port in the 1980s with funding from the Queensland to construct a new deepwater port to serve the expanding coal industry. The port began operation in 1984 and had an initial coal handling capacity of 6.5mtpa. Abbot Point has expanded considerably since then.

7.3.6 Summary of historical heritage values

There are numerous historical heritage places in the study area, associated with the settlement and expansion of Bowen through to World War II. All known historical heritage places in the study area are close to and associated with the development of the town of Bowen. These places illustrate the growth and changing nature of the town, through decades of sugar, pastoralism and boom and bust cycles, through to its use as an important armed forces base in World War II, and its current use as an important regional centre and its key role in supporting the port. It is possible that previously unidentified heritage places and historical archaeological sites are present in the study area, especially considering the local history of pastoralism and military activity associated with World War II.

⁴⁶ Stanley, J. (1984). *The Foundation of a North Queensland Port Settlement 1861-1880*. Department of History, University of Queensland, Brisbane.

7.3.7 Impacts, threats and pressures

Many historical heritage places in Bowen see continuing use by the present-day community for a variety of purposes. This use is important as it keeps the community connected to these places, but care must be taken to ensure that modern use does not erase evidence of the heritage values. Many of these impacts can be mitigated through planning and engagement with building owners.

The Town of Bowen is one of the regional centres in the MIW region. The pressures from ongoing development and modernisation on historic heritage places can be intense as existing buildings are replaced with new ones or utilised for new purposes. Since 2012, no Queensland Heritage Places have been substantially destroyed or demolished through development.⁴⁷ However, it is likely that some of places have already been impacted through development activities over the last century.

The natural action of wind, surf and storms can have a negative effect on heritage places, even when those places comprise built heritage. Since 2012, five Queensland heritage places have been destroyed by cyclones, fire and hailstorms.⁴⁸ Without ongoing maintenance and protection, it is likely heritage places would suffer damage from the effects of time and weather. It is highly likely that weather and other natural factors have already impacted sites.

7.4 Summary

Legislation in Queensland protects all known heritage places and requires that proponents undertake detailed due diligence assessment prior to development in undisturbed land.

The previous limited work in the study area indicates that it is potentially rich with Indigenous cultural heritage values areas along the coastline and near fresh and estuarine waterbodies. These areas should be considered especially sensitive.

A search of the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register identified 299 known Aboriginal places within the study area. There were no registered Aboriginal cultural heritage sites listed on the NHL and CHL, within the study area.

There are four historical heritage places listed on the QHR and one listed the CHL, all located within the Town of Bowen. There are no cultural heritage sites on the NHL.

Fifteen registered historical heritage sites are listed on the WRC Heritage List, all associated with the Town of Bowen or small islands near Bowen.

Six registered historical heritage sites listed on the *Australasian Underwater Cultural Heritage Database* were identified in the study area.

It is possible there are previously unidentified historical heritage places within the study area relating to the history of pastoralism or mining.

⁴⁷ Department of Environment and Science Queensland. (2020) Queensland heritage places destroyed. Retrieved 29.06.2021 from <https://www.stateoftheenvironment.des.qld.gov.au/heritage/historic/queensland-heritage-places-destroyed>.

⁴⁸ Ibid

8. Environmental values

8.1 Introduction

A desktop assessment was undertaken to identify and collate existing information on the known ecological values of the environment within the project area and surrounding landscape. The Australian and Queensland Government environmental mapping, legislation, associated triggers and databases were reviewed as part of the ecological values assessment and are listed in **Table 19**. Where applicable, copies of these searches are provided in **Appendix M**.

This assessment was undertaken to identify key environmental values relevant to master planning. This included the review of existing available data, studies, and reporting:

- Australian and Queensland Government databases searches and relevant publications
- data and reporting associated with existing environmental studies and environmental values monitoring programs for the project area
- previous Port of Abbot Point-specific reporting, including EIS level studies for project proposed for the port.

A large number of environmental studies, targeted research and monitoring investigations have been conducted to investigate the terrestrial aquatic and marine environment within and surrounding the port. Most of the more recent investigations relate to individual proposed developments within the port, ports master planning and strategic or future planning initiatives. These include studies that relate to a specific environmental aspect such as sediment, water quality, ecology or coastal processes. This information has been verified with current database searches and statutory requirements to ensure its validity to inform port master planning. Most recent studies relate to proposed dredging programs and potential for disposal of dredged material.

The project WebMap prepared for this project was used to view and query a range of spatial resources and create the relevant maps within this report. Desktop searches used to inform the environmental layers of the WebMap are provided in **Table 20**.

Potential species, communities and protected areas within or adjacent to the study area were identified using the Commonwealth Protected Matters Search Tool (PMST) as noted under the EPBC Act. Those species or communities with a conservation status are identified using the following key legend:

- CR – Critically endangered
- E – Endangered
- V – Vulnerable.

The WildNet Records Species List database was used to identify those species, communities or protected areas within or nearby the study area. The generated report is derived from a spatial layer generated from the WildNet database, which is managed by DES. Those species or communities with a conservation status are identified using the following key legend:

- CR – Critically endangered
- E – Endangered
- V – Vulnerable
- SL – Special Least Concern.

The RE within the study area as defined under the *Vegetation Management Act 1999* (VM Act) were identified noting the conservation status by the following key legend:

- E – Endangered
- OC – Of Concern
- LC – Least Concern.

Table 19: Desktop searches undertaken for the study area

Search Tool	Administrative body	Search details
EPBC Act PMST	Australian Department of Agriculture, Water and Energy	Accessed 09/06/2021 Search of project site using a polygon with the following coordinates. A multi-coordinate grid search was used to accommodate the entire project site and buffer area. -21.1655 149.1154, -21.1601 149.5038, -21.3873 149.5077, -21.3927 149.1187.
Queensland Wildlife Online database search (WildNet)	DES	Accessed June 2021.
Atlas of Living Australia	Commonwealth Scientific and Industrial Research Organisation	Spatial search of study area and surrounds.
Regulated Vegetation Map, v4.12	Queensland DOR	Accessed 29/04/2021.
Queensland Wetlands – Ecological Significance Mapping, v2	DES	Accessed May 2021.
Flora Survey Trigger Area, v7.1	DOR	Accessed 26/06/2021.
Essential Habitat, v9.12	DOR	Accessed 21/04/2021.
Vegetation management RE mapping, v11.0	DOR	Accessed 01/04/2021.
Vegetation management wetlands mapping, v6.12	DOR	Accessed 29/04/2021.
Protected areas map, version 7.1	DES	Accessed 22/03/2021.

This chapter outlines the existing environment values within and surrounding the Port of Abbot Point study area, relevant to the master planning process. As part of this analysis, a review of existing environmental values and monitoring programs was undertaken.

This chapter provides an overview of the following sections:

- Landscape and visual amenity – **Section 8.2**
- Topography, soils and geology – **Section 8.3**
- Climatic Conditions – **Section 8.4**
- Terrestrial Environment – **Section 8.5**
- Wetlands – **Section 8.6**
- Aquatic ecosystems – Freshwater – **Section 8.7**
- Aquatic Ecosystems – Estuarine and Marine – **Section 8.8**
- Biosecurity – **Section 8.9**
- Air quality – **Section 8.10**
- Noise emissions – **Section 8.11**
- Existing monitoring programs – **Section 8.12**
- Summary – **Section 8.13.**

8.2 Landscape and visual amenity

8.2.1 Existing environment

Scenic amenity is defined as 'a measure of the relative contribution of each place in the landscape to the collective appreciation of open space as viewed from places that are important to the public'.⁴⁹ Scenic amenity is a combination of two independent factors:

- scenic preference – a measure of the relative contribution of community preference for different landscapes
- visual exposure – a measure of relative visibility of different parts of the landscape.⁵⁰

The landform of the study area comprises mainly wide low coastal plains separating the coastline from mountain ranges. Land use on the coastal floodplain and low foothills includes grazing and sugar cane production, with more intensive horticulture occurring around Bowen. Low-lying wetlands remain in either natural condition or modified as ponded pastures. The steeper mountains, hills and headlands generally support natural forest.⁵¹

Figure 18 illustrates the distinctive landscape of the cane fields in the study area⁵².



Figure 18: Cane fields are a distinctive landscape in the study area

The Bruce Highway and North Coast Railway runs parallel to the coastline at approximately 5km to 10km inland and traverse mainly rural landscapes with few opportunities for viewing the coast or ocean.⁵³ The Scenic Amenity Study identified the section of Bruce Highway in the study area between Mount Pring, Mount Roundback and Sprole Castle (Bowen) as a road that offered scenic driving experiences and lookouts.⁵⁴

Tourist resorts and visitor use occurs mainly around the northern beach suburbs of Bowen. The native vegetation reflects the dry tropics, where open eucalypt woodland has a different character to that of wetter parts of the Queensland tropical coastline to the north and south, and many of the smaller creeks and watercourses on the coastal plain are seasonal. Abbot Point also includes Abbot Hill, One tree Hill and Mount Luce. **Figure 19** below illustrates the rural coastal plain of Euri Creek valley north of Bowen.

⁴⁹ Cardno. (2017). *Scenic Amenity Study*, Whitsunday Region Scenic Amenity Study, WE15037.

⁵⁰ Ibid

⁵¹ Cardno. (2012). *Chenoweth ELA, Abbot Point Cumulative Impact Assessment, Visual Impact Assessment*.

⁵² Ibid

⁵³ Ibid

⁵⁴ Ibid 49



Figure 19: Rural coastal plain of Euri Creek valley north of Bowen

The topography of the study area is dominated by Mount Roundback and associated ranges that are relatively prominent in relation to the adjacent flat coastal plain. Other more prominent headlands and mountains such as Cape Upstart to the north-west, and Cape Gloucester and Gloucester Island to the south-east provide distant topographic 'book-end' frames to the coastline.

Between the base of Cape Upstart and Bowen, the coastline is oriented mainly east-west, divided into two broad bays by Abbot Point. On the eastern side of Abbot Point (south as far as Mount Little), the coastline is relatively straight strip of dunes and wetlands. The coastline curves south and east around the Port of Bowen.

Abbot Point defines the eastern edge of Abbot Bay but is a minor landscape feature relative to Mount Luce and the extensive wetland. The wetland has scenic amenity value with many of their ecological features such as aggregations of birds adding to the appreciation of the area. The Bruce Highway and railway pass between the foothills of Mount Roundback and the wetland.

Camp Island is located within Abbot Bay and comprises a small tourist resort (Silver Shoal Lodge) on its southern side. There are no elevated lookouts on the island but views towards the mainland from the resort and beach include Mount Luce and the existing T1 jetty.

The Landscape Character Types (LCTs) identified in Cardno Chenoweth Eco Logical Australia, (2012) include:

- forested mountains
- cleared/semi-cleared areas with scattered trees
- farmlands and horticulture
- coastal mangroves and wetland
- urban and boat harbour (Bowen)
- industrial (T1)
- rivers and creeks
- main transport routes.

Marine areas include open oceans, bays and non-mangrove coastal foreshores including sandy beaches are distinct features although not identified in the **Figure 20** below, due to the scale of mapping.⁵⁵

One north-south shipping channel traverses the study area, running parallel to the Queensland coast. The shipping channel is the main route used by bulk carriers travelling to and from the priority Port of Abbot Point. This channel passes approximately 32km to the north-east of Abbot Point and 36km north-east of Bowen. The

⁵⁵ Ibid 51

shipping channel is currently used by a number of ships transiting through the inner passage of the GBRWHA, providing access to and from other Queensland ports to the north and south of Abbot Point. Abbot Point is relatively low with only one small hill being Bald Hill at its seaward extremity. It is a comparatively small coastal headland with few distinguishing natural features.⁵⁶



Figure 20: View of Abbot Point and Bald Hill

Coarse sandy beaches, low rocky outcrops, rocky beaches and vegetation at the base of Mount Luce, all form the main interface with the Coral Sea around much of the Abbot Point coastline. The rest of the surrounding vegetation consists of a mix of dense and scattered vegetation including mangroves, small tidal creeks and the CVW. Abbot Bay and the waters surrounding Abbot Point are wholly within the GBRWHA. The reefs are located approximately 44km offshore.

The LCT of Abbot Point is predominantly rural but mixed with four contrasting character types:

- forested mountains (Mount Luce)
- grazed pasture, partly cleared with scattered trees (base of Mount Roundback)
- coastal wetland (including Lake Caley)
- industrial (T1).⁵⁷

⁵⁶ Ibid 51

⁵⁷ Ibid 51



Figure 21: Grazing landscape at foothills of Mount Roundback



Figure 22: Caley Valley Wetlands and open lowland plains

Scenic integrity refers the extent to which the landscape appears to be in its natural or long-established form and character. The scenic integrity of Abbot Point varies considerably. The forested mountains and rural grazing areas illustrated in **Figures 21**⁵⁸ and **Figure 22**⁵⁹ are 'intact'. The wetland area, although modified several decades ago by bunding, now has the appearance of a 'natural' system. The existing T1 including stockpiles, large scale machinery, rail movements, long jetty and ships at berth, are not natural and does detract from the area's scenic integrity.

The existing T1 defines much of the identity and distinctive character of the area since its construction in 1984. The area is characterised and visually dominated by the existing industrial and shipping infrastructure. It is large scale development that contrasts visually with its rural, natural and coastline setting. It is usually seen at a distance and is now an established and accepted part of North Queensland coastline. See **Figure 23**.⁶⁰

⁵⁸ Ibid 51

⁵⁹ Ibid 51

⁶⁰ Ibid 51



Figure 23: Port of Abbot Point



Figure 24: Existing development

Although the existing development is extensive and visually dominant illustrated in **Figure 24**⁶¹, it is less prominent when seen from sea level. When observed from offshore, for example by boat-based viewers, the existing jetty, berths, ship-loaders and ships are clearly visible at close range or in the middle distance. When seen in close view, Abbot Point is dominated visually by existing infrastructure, although the development is still relatively low (less than 20m above ground) compared to the landform of Bald Hill (59m) and Mount Luce (283m).⁶² Abbot Point is located on a largely flat landscape that is partly screened for the most part from the Town of Bowen by the coastal range culminating in Mount Little.

The nearest town (Bowen) is mainly screened from views northwards towards Abbot Point, apart from Greys Bay Beach, Mount Nutt reservoir lookout and the elevated residential areas off Gregory Street, which offer views north west to Abbot Point, see **Figure 25**⁶³. Daytime views from these viewpoints show the distant jetty, with stockpiles and stacker reclaimers. These are barely discernible at more than 20km in distance. However, the existing T1 lighting is more obvious at night. Bowen is a town set in an urban area framed by a skyline of forested ranges with a main street that boasts a distinctly historic character with many of its original buildings.



Figure 25: Greys Beach (arrow) Mount Roundback, Mount Little, Mount Luce and Cape Upstart

⁶¹ Ibid 51

⁶² Ibid 51

⁶³ Ibid 51



Figure 26: Abbot Point from Bowen Reservoir - Mount Roundback and Mount Luce

The Bruce Highway travels close to the coastline near to Abbot Point but there are no views of reefs or coral cays from Abbot Point. The highway and North Coast Rail Line curve around the base of Mount Roundback. Highway motorists will be able to see coal trains on the existing rail lines, however existing vegetation screens the view of existing coal port operations, jetty and berthed ships, see **Figure 26**.

Few, if any visitors to the islands and reefs of the GBRWHA are within view of the Abbot Point coastline or T1. Recreational fishers and boat users are known to make use of the immediate area and within view of T1. Occasional cruise ships will use the channels offshore from Abbot Point; however, any views of Abbot Point will be distant.⁶⁴

8.2.2 Potential impacts and/or opportunities

Potential impacts on landscape and visual amenity in the study area from the port, other coastal industrial development, and coastal residential development are presented in **Appendix N** and summarised below:

- larger footprint increasing visual impact on nearby sensitive receptors
- clearing of vegetation that screens existing port operations
- increase in shipping activities in the GBRWHA impacting scenic experience of visitors.

8.3 Topography, soils and geology

8.3.1 Topography

The regional topography of Abbot Point is characterised by tidal flats and flood plains with undulating hills to the west, south and south-west. Mount Luce (286m high) is located to the west of Abbot Point, Mount Roundback (728m high) is located south of Abbot Point and the Bruce Highway, Mount Little (314m high) is south-west of Abbot Point and north of the Bruce Highway. Bald Hill (57m high) is at the tip of Abbot Point adjacent to the existing coal facility. A large area of Abbot Point is swamp, water holes and Caley Lake, which drains to ocean.⁶⁵

⁶⁴ Ibid 51

⁶⁵ State of Queensland Department of Natural Resources. (2020). Mines and Energy 2020, QTopo, Abbot Point 8558-3 (1:10,000). <https://qtopo.information.qld.gov.au/>.

The study area is gently undulating, ranging from approximately 4m Australian Height Datum (AHD) in the south and south-west to 5m AHD in the north-east corner. Topography within the existing coal facility has been changed through filling activities during construction.⁶⁶

8.3.2 Soils

Soil mapping (Digital Atlas of Australian Soils, 2019)⁶⁷ identifies the predominant soils in the study area as including:

- dermosoldermosols and hydrosols within the existing port area and along the coastline
- chromosols in the southern and western extents of the study area
- sodosols across a large extent of inland parts of the study area, including at Bowen
- small patches of tenosols and vertosols in the central portion of the study area, concentrated around the Bruce Highway⁶⁸ (refer to **Figure 27**).

Tenosols generally have a low fertility and low water-holding capacity, while vertosols are brown, grey, or black soils which crack open when dry and have high soil fertility and high-water holding capacity. Chromosols have sandy or loamy surface soils overlying a yellow, brown, red-brown, or sometimes black clay subsoil, which is generally neutral to alkaline. Dermosols are red, brown, yellow, grey or black and have loam to clay textures. Hydrosols are typically saturated with water for long periods of time and are generally grey or greenish grey in colour and located in patches along the coastline.⁶⁹

The desktop assessment has shown the regions of Roundback Mountain, Luce Mountain, Mackenzie Mountain, Little Mountain and Sproule Castle have slopes greater than 15%, as noted in the WRC Planning Scheme. No areas have been shown to be high landslip zones based on desktop assessments.

High and moderate landslips were noted outside of the study area, in Hydeaway Bay⁷⁰ and Dryander National Park. An online search of Queensland Globe has shown the study area contains several quarry areas, with Abbot Point Road Quarry, Silica Sand Quarry on Mellons Road and the Gordon Quarry located on Peter Delemothe Road (located outside of the study area) providing significant resources to the local area. The state-owned land quarries are managed under the *Forestry Act 1959*, whereas mines and quarries for construction purposes (Don River operating mine for gravel) are managed under the Planning Act. The regulatory framework is further discussed in **Section 11**.

⁶⁶ Ibid 65

⁶⁷ Bureau of Rural Sciences. (2019). Digital Atlas of Australian Soils. Bioregional Assessment Source Dataset.

⁶⁸ Ibid

⁶⁹ Geoscience Australia. (2021). Geoscience Australia Portal. <https://portal.ga.gov.au/restore/38ed09a9-9e23-45eb-9016-dbe1dc92531d>.

⁷⁰ Cardno (2019) *Whitsunday Landslide Study, Landslide Susceptibility Investigation and Mapping*. Whitsunday Regional Council.



Figure 27: Soil types in the study area

8.3.3 Acid sulphate soils

Acid sulfate soils (ASS) are a generally present in low-lying areas of both coastal and inland landscapes across Australia. These soils contain iron pyrites formed under specific conditions, (the presence of iron, sulphur and organic matter). The pyrites oxidise when exposed to air, and when combined with water, create sulphuric acid. The creation and leaching of sulphuric acid from the soil profile into the landscape may cause serious impacts to nearby watercourses and its ecosystem.⁷¹

The oxidation of potential acid sulfate soils (PASS) can result in several negative outcomes and has the potential to cause significant environmental and economic impacts such as fish kills, loss of biodiversity in wetlands and waterways, contamination of groundwater resources, loss of agricultural productivity, and corrosion of concrete and steel infrastructure.

Both actual ASS, and PASS have the potential to cause environmental harm if not correctly identified prior to development and construction activities. Legislation and policies that apply to ASS in Queensland include the EP Act and SPP.

ASS is managed in Queensland under the SPP⁷², emissions and hazardous facilities, with requirements for ASS to be reflected in local planning instruments. Key considerations in assessing development in ASS affected areas include:

- identifying areas with high probability of containing ASS
- providing preference to land uses that will avoid, or where avoidance is not practicable, minimise the disturbance of ASS
- including requirements for managing the disturbance of ASS to avoid or minimise the mobilisation and release of acid, iron or other contaminants.

A review was undertaken of the WRC Planning Scheme ASS overlay. For this assessment, areas have been classified as:

- high-risk mapped as land at or below 5m AHD

⁷¹ Waratah Coal (2011) *China First- Acid Sulphate Soils Assessment Vol 5- Appendices | Appendix 9- Acid Sulphate Soils Assessment E3 Consult.*

⁷² Department of Infrastructure, Local Government and Planning. (2017). *State Planning Policy*. Queensland Government.

- medium-risk mapped as land above 5m AHD and below 20m AHD
- low risk if they have been mapped as others.

The review identified that majority of the port owned lots occur within the area with a high risk of ASS occurrence. These areas broadly correlate with lower lying areas that fringe water courses and water bodies that would have been susceptible to inundation and sulfide formation during the last glacial maximum in the Holocene epoch.

As shown in **Figure 28**, the high-risk ASS (land at or below 5m AHD) are located along the coastline from Cape Upstart to the northern side of the Don River. There are small, isolated areas along the coast that have been identified as medium-risk ASS, such as Abbot Bay Conservation Park. Further inland from the coast, medium-risk areas and then low-risk areas have been noted. The southern side of the Don River, in areas identified as coastal flats and residential areas using the WebMap data shows high-risk ASS. The Bowen Salt works site is also mapped as high-risk ASS.

Impacts due to the disturbance of ASS will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment. Potential impacts attributable to project construction might include:

- excavation of significant volumes (greater than 1000m³) of ASS and use for 'cut and fill' activities on site or off-site (within the project alignment) where they are prone to ready leaching releasing metals and acidity into the surrounding environment
- exposing actual acid sulfate soils (AASS) during excavation or drilling causing acid to leach into the surrounding environment
- Exposing PASS during excavation allowing oxidation to create AASS
- surface runoff entering areas of exposed ASS, causing acid release into the surrounding environment
- acid leachate of ASS treatment sites released to the surrounding environment
- long-term open excavations and stockpiling of the ASS without any treatment where it is exposed to rainfall, causing acidic run-off to leach into the surrounding environment
- seepage of acidic soil pore water during loading activities and subsequent drainage into the surrounding environment.

Importantly, these impacts have the potential to cause significant environmental and economic impacts such as fish kills, loss of biodiversity in wetlands and waterways, contamination of groundwater resources, loss of agricultural productivity, and corrosion of concrete and steel infrastructure. This is not uncommon in coastal environments and environmental risks associated with these soils are commonly mitigated via appropriate management for this type of project.

To reduce the potential impacts to the surrounding environment, ASS investigations should be undertaken for any project within the study area, in accordance with the *National Acid Sulfate Soil Guidelines* (2018), and a detailed ASS Management Plan should be developed, where required, to manage the existing and potential acidity for any associated waters (perched, seepage, stormwater etc) during construction.

In general, medium-risk area located approximately 2km away from the coast associated with a higher elevation (land above 5m AHD and below 20m AHD).

Under the WRC Planning Scheme, where ASS is identified, development shall ensure ASS are avoided or managed in accordance with the Queensland ASS Technical manual. This may be demonstrated by undertaking an ASS assessment.

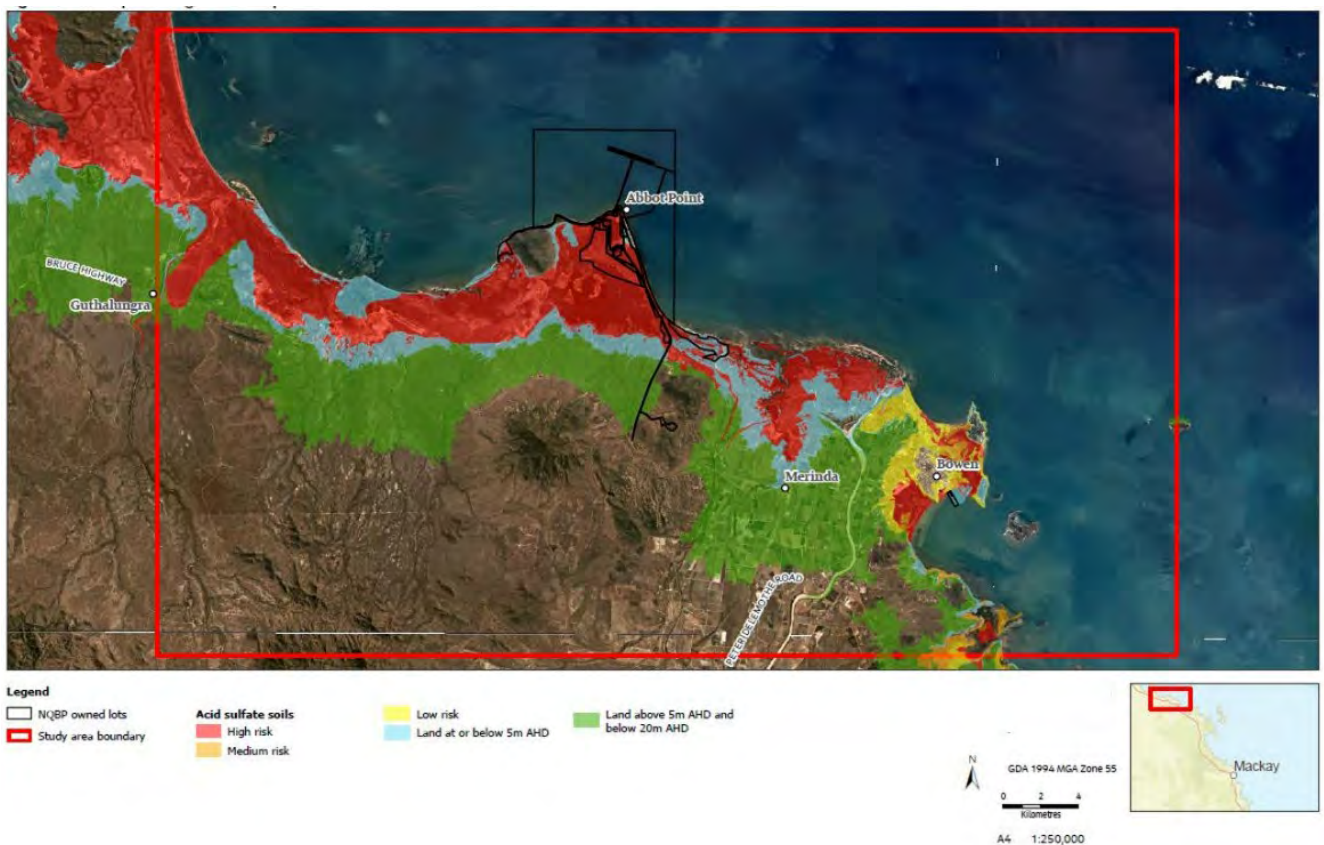


Figure 28: Acid sulfate soils in the study area

8.3.3.1 Contaminated land

Contaminated land in Queensland is administered under the EP Act on a lot and plan basis. Individual lots are assessed on a case-by-case basis, due to the potential for contamination to be highly site-specific based upon individual site activities (for example, service station, heavy industry etc). Land contamination can occur because of poor environmental management and waste disposal practices or accidental spills in industrial, agricultural, or mining activities. In some cases, land was contaminated in the past by activities now known to be hazardous.

In accordance with the EP Act, the Environment Management Register (EMR) and Contaminated Land Register (CLR) are the principal sources of land use planning data for contaminated land in Queensland. The EMR and CLR are administered by DES.

The EMR provides information on historic and current land uses, including whether the land has been, or is currently used for, a 'notifiable activity', or has been contaminated by a hazardous material. Notifiable activities are set out in Schedule 3 of the EP Act. Examples of notifiable activities include landfills, service stations, and petroleum or oil storages.

The CLR includes land which is proven (through investigation) to be contaminated land which is causing or has the potential to cause serious environmental harm. Land is recorded on the CLR when an investigation shows it is contaminated and action needs to be taken to remediate or manage the land.

Based on the above desktop assessment, an EMR/CLR search was undertaken for lot/plans located within high-risk areas.

To assess contaminated land, the following areas have been classified as:

- high risk if they have been:
 - mapped as special purpose zone
 - mapped as high impact industry zone
 - mapped as industry investigation zone
 - existing petrol stations
 - existing or historical environmental authority locations

- existing or historical enforcement register locations
- existing key resources areas
- identified notifiable activities from aerial images.
- medium risk if they have been:
 - mapped as mixed-use zone
 - mapped as district centre zone
 - mapped as low impact industry zone
 - mapped as major centre zone
 - mapped as district centre zone
 - mapped as local centre zone.
- low risk if they have been mapped as all other zones.

The EP Act is a key element of Queensland's environmental legal system. Its objective is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains ecological sustainability.

ERA that are prescribed activities are generally industrial or intensive animal industries with the potential to release emissions which impact on the environment and surrounding land uses.

Under the EP Act, ERA require an environmental authority to be issued before any activity begins. An environmental authority imposes conditions to reduce or avoid potential environmental impact and is administered by DES.

There are 83 environmental authority permits located within the port land use area, and another 115 environmental authority permits located outside of the port land use area. A full list of the prescribed ERA can be found in Schedule 2 of the Queensland *Environmental Protection Regulation 2019*.

A summary of the key legislation and policies relevant to hazardous facilities and activities at the port are shown in **Table 20**.

Table 20: Summary of key legislation and policies

Legislation	Application
EP Act	A key element of Queensland's environmental legal system. It provides a range of tools to ensure protecting Queensland's environment while allowing for development. Further discussion on the EP Act is provided in Section 11.1.2.4.
<i>Environmental Protection Regulation 2019</i>	Prescribes the detail for processes contained in the EP Act.
<i>Petroleum and Gas (Production and Safety) Act 2004</i>	Regulates the technical and safety aspects of gas production, transmission, distribution and use and deals with licensing of gas transmission pipelines.
<i>Explosives Act 1999</i>	Regulates the handling of, and access, explosives to protect public health and safety, property and the environment.
<i>Mining and Quarrying Safety and Health Act 1999</i>	Protects the safety and health of persons at mines and persons who may be affected by operations, and to require that the risk of injury or illness to any person resulting from operations is at an acceptable level.
<i>Coal Mining Safety and Health Act 1999</i>	Standards state ways of achieving an acceptable level of risk for people working in coal mines.
<i>Work Health and Safety Act 2011</i>	Sets out requirements and standards for building healthy and safe workplaces.
Planning Act	Establishes an efficient, effective, transparent, integrated, coordinated, and accountable system of land use planning, development assessment and related matters that facilitates the achievement of ecological sustainability.
SPP	Expresses the state's interests in land use planning and development. Includes emissions and hazardous activities.

The initial desktop assessment identified various hazardous facilities and activities in the study area that may pose a potential risk to human health and the environment and should be assessed prior to any proposed development. Under the various planning and development policies and regulation, these sites and activities

(including the presence of ASS) are managed and catered for when protecting the interests of the environment and other land users.

Sites that undertake ERA's or notifiable activities are administered, managed and monitored such that there should be no impediment to development or land use outside of those sites or activities.

Where a lot is transferred to a new owner for land use of the same type, however (for example, industrial to industrial or commercial to commercial), there is no current process for triggering an investigation for the assessment of contamination, that is, there is no 'MCU'. In these instances, standard due diligence and 'buyer beware' processes apply to the vendor and buyer.

8.3.3.2 Key resources area

There is one key resources area (a quarry) within the study areas. The quarry is located west of Euri Creek, approximately 15km south of the port. The footprint of this key resources area covers the following 33 land lots:

Table 21: Summary of lot plan in key resources area

Lot Plan	Tenure	Parcel type
8RP733945	Freehold	Lot Type Parcel
9RP733945	Freehold	Lot Type Parcel
35H124127	Freehold	Lot Type Parcel
26USL44981	State Land	Lot Type Parcel
9SP239788	Freehold	Lot Type Parcel
9SP239788	Freehold	Lot Type Parcel
154SP239787	Freehold	Lot Type Parcel
101SP256315	Freehold	Lot Type Parcel
102SP256315	Freehold	Lot Type Parcel
11HR1950	Freehold	Lot Type Parcel
5RP742851	Freehold	Lot Type Parcel
2RP737967	Freehold	Lot Type Parcel
42RP746944	Freehold	Lot Type Parcel
4RP742851	Freehold	Lot Type Parcel
2RP724490	Freehold	Lot Type Parcel
26SP220411	Lands Lease	Lot Type Parcel
2RP725413	Freehold	Lot Type Parcel
1RP736787	Freehold	Lot Type Parcel
2RP736787	Freehold	Lot Type Parcel
7RP732784	Freehold	Lot Type Parcel
1RP732784	Freehold	Lot Type Parcel
2RP732784	Freehold	Lot Type Parcel
3RP732784	Freehold	Lot Type Parcel
4RP732784	Freehold	Lot Type Parcel
5RP732784	Freehold	Lot Type Parcel
2RP740254	Freehold	Lot Type Parcel
1RP740254	Freehold	Lot Type Parcel
2RP731500	Freehold	Lot Type Parcel
1RP731500	Freehold	Lot Type Parcel
2K103501	Lands Lease	Lot Type Parcel

Lot Plan	Tenure	Parcel type
27SP225044	Freehold	Lot Type Parcel
27SP225044	Freehold	Lot Type Parcel
6SP225044	Lands Lease	Lot Type Parcel

8.3.3.3 Fuel stations

There are nine fuel stations located within the study area and listed in **Table 22**.

Table 22: Summary of fuel stations in study area

Lot Plan	Site name	Address	Fuel type
111SP265792	Coles Express Delta Bruce Highway	19081 Bruce Hwy (Corner, Collinsville Road)	Unleaded, Diesel, Premium Unleaded 95, Premium Unleaded 98.
4SP160994	Liberty Bowen	4 Lauriston Street	Not applicable.
1RP734740	Pacific Petroleum Bowen	2 Betzels Lane	Diesel.
36RP726004	Puma Bowen	19038 Bruce Highway	Unleaded, Diesel, Premium Unleaded 95, Premium Unleaded 98, Premium Diesel.
1SP135868	Caltex Bowen	Bruce Highway	Unleaded, Diesel, Premium Unleaded 98, E10.
2G4198	Choice Guthalunga	4 Coventry Road.	Unleaded, Diesel, E10.
21SP225387	Caltex/Woolworths Bowen	24 Richmond Road	Unleaded, Premium Unleaded 95, E10, Premium Diesel.
2RP712944	Metro Petroleum Bowen	1 Tracey Street	Unleaded, Diesel, Premium Unleaded 98.
10RP724068	BP Merinda	19350 Bruce Highway	Unleaded, Diesel.

8.3.3.4 Environmental Management Register and Contaminated Land Register

In accordance with the EP Act, the EMR and CLR are the principal source of land use planning data for contaminated land in Queensland. The EMR and CLR are administered by DES.

The EMR provides information on historic and current land uses, including whether the land has been, or is currently used for, a 'notifiable activity', or has been contaminated by a hazardous material. Notifiable activities are set out in Schedule 3 of the EP Act. Examples of notifiable activities include landfills, service stations, and petroleum or oil storages.

The CLR includes land which is proven (through investigation) to be contaminated land which is causing or has the potential to cause serious environmental harm. Land is recorded on the CLR when investigation shows it is contaminated and action needs to be taken to remediate or manage the land.

Based on the above desktop assessment, EMR/CLR searches were undertaken for land parcels located within high-risk areas.

There are 62 environmental authority permits located within the port land use area, and another 52 environmental authority permits located outside of the port land use area. A full list of the prescribed ERA can be found in Schedule 2 of the Queensland *Environmental Protection Regulation 2019*.

A list of EMR-listed land parcels within the study area and within the port land use area are located in **Appendices E and F**.

8.3.4 Planned hazardous activities

The tables below list the potential planned hazardous facilities and activities within 5km of the port.

Table 23: Coordinator General's development approvals within five kilometres of the port

Application number	Type	Decision date	Currency period	Proponent	Details
APC2017/007	Change application to an SDA approval.	2/10/2018	2/10/2022	Adani Australia Coal Terminal Pty Ltd	Change to an SDA approval for port facilities (T0 project).
AP2017/011	SDA application: MCU.	2/10/2018	2/10/2022	Adani Mining Pty Ltd	Port facilities (T1).
ECP2019/007	Request to extend a currency period.	28/11/2019	8/02/2024	NQBP	Abbot Point Growth Gateway project.
AP2020/004	SDA application: MCU.	22/10/2020	22/10/2024	Hillery Group	Medium impact industry (mobile concrete batching plant within existing quarry site).
AP2020/007	SDA application: MCU.	12/03/2021	12/03/2025	Bowen Rail Company	Rail infrastructure.
AP2020/008	SDA application: reconfiguring a lot.	12/03/2021	12/03/2025	Bowen Rail Company	Application to reconfigure a lot.

Table 24: Whitsunday Regional Council approvals within five kilometres of the port

Authority	Application number	Details	Decision date	Proponent	Property description	Address
WRC	DA05382	Application to a MCU for an extension to existing quarry and caretakers dwelling, ERA and operational works for vegetation clearing.	4/06/2018	BQC Quarries	101SP256315	500-586 West Euri Road, Bowen.
WRC	DA09479	Preliminary approval overriding the planning scheme for a staged industrial estate: MCU, reconfiguring a lot, operational works, building works.	28/08/2018	Bill and Lyne Dobe	1SP285375, 2SP285375	Bruce Highway, Merinda.

A preliminary desktop study segregates the study area into three risk categories for hazardous facilities and activities based on the land use zoning by WRC Planning Scheme:

- High probabilities of hazardous facilities and activities occurrence:
 - mapped as special industry zone
 - mapped as high impact industry zone
 - mapped as medium impact industry zone
 - mapped as industry investigation area
 - mapped as waterfront and marine industry
 - EMR/CLR listed lots.
- Medium probabilities of hazardous facilities and activities occurrence:
 - mapped as low impact industry zone
 - mapped as local centre

- mapped as mixed use.
- Low probabilities of hazardous facilities and activities occurrence are mapped as other land use.

Figure 29 shows the locations of potential hazardous facilities in the study area.

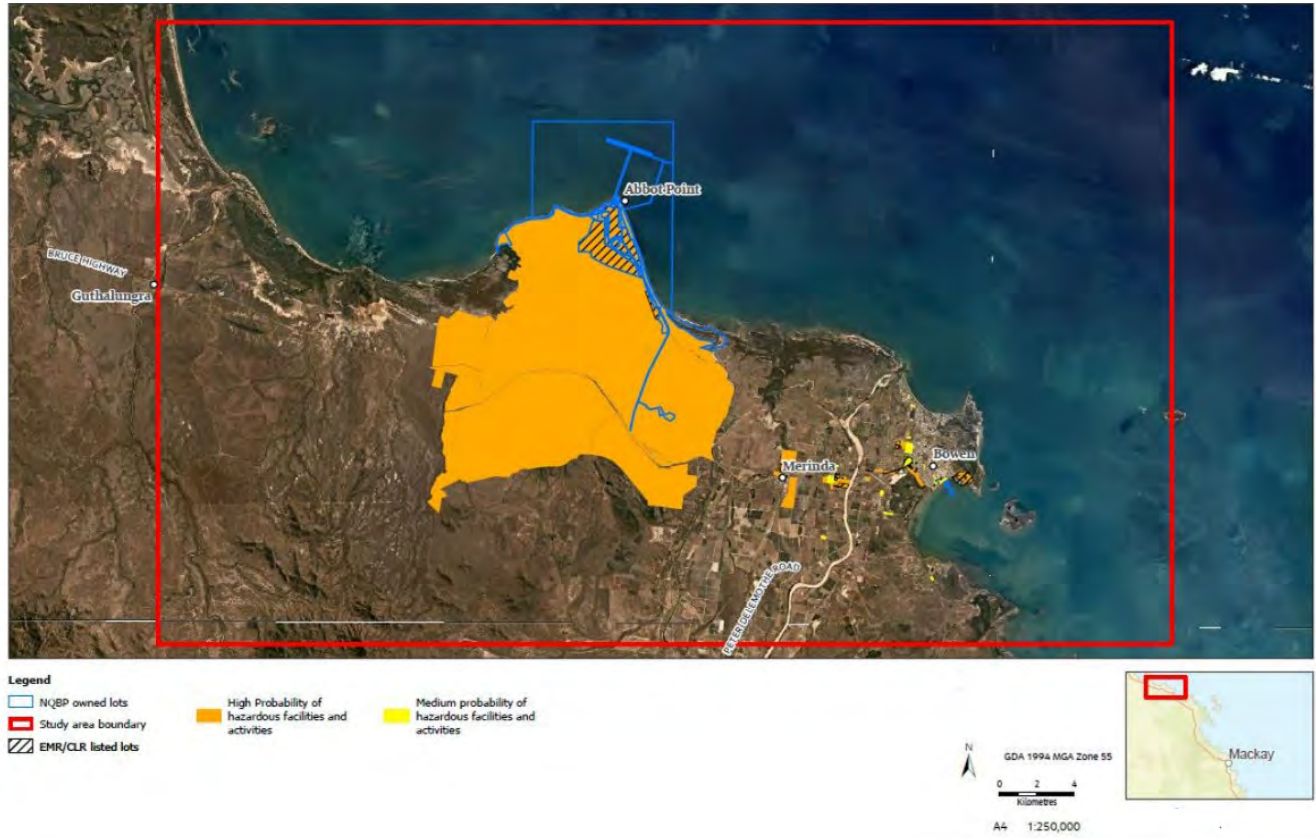


Figure 29: Probabilities of hazardous facilities and activities map of the study area

8.3.5 Geology

An updated search of the geoscience database identified that the surface geology at Abbot Point consists of quaternary and cenozoic sediments with some carboniferous deposits along the northern coastline and Mount Luce (refer to Figure 30).

The quaternary sediments are predominantly sand dunes with some interbedded silt. Most of the area mapped as quaternary is a sand plain that is located 3m to 4m above the CVW to the south. This sand plain has poorly sorted sands and was likely formed as a series of beach ridges and aeolian activity.⁷³ Other quaternary sediments underlying the study area include coastal mud flats comprising clays, silts and sands and colluvium along the east side of Mount Luce. Alluvial sediments and residual soils have also been mapped south of the wetlands and on terraces above the coastal mudflats. These areas consist of a mix of sands, gravels, clays, silts and peats, with some colluvium and rock debris.⁷⁴

A groundwater study conducted in 2014, identified the bedrock in the study area as a mixture of granodiorites, adamellites, granites, diorites and gabbro. Mount Luce, Bald Hill, Mount Little and Mount Roundback have formed where this bedrock is resistant to erosion. The beach immediately west of Abbot Point consists of granodiorite boulders or conglomerate that may have been deposited by storms, with fine silt and sand interspersed throughout. Headlands in the study area, including Abbot Point contain granodiorite boulders.⁷⁵

⁷³ Advisian. (2015). *Abbot Point Growth Gateway Project Environmental Impact Statement Volume 2*. Queensland Government.

⁷⁴ Australasian Groundwater and Environmental Consultants Pty Ltd (AGE). (2014). *Report on the Port of Abbot Point Expansion Groundwater Studies*. Worley Parsons, Project No. G1702A November 2014.

⁷⁵ GHD. (2012). *Abbot Point Cumulative Impact Assessment: Coastal processes and Hydrodynamics Technical Report, August 2012*. Abbot Point Working Group.

Offshore sediments consist largely of dark grey-green fine sand with shell fragments. Underlying this sand is up to 8m of very loose silty sand. A high strength cemented clay was discovered at 10m to 12m below the seabed during geotechnical investigations carried out in 2010.⁷⁶

The geology of the Whitsunday Coast is diverse and has undergone periods of intense tectonic activity, faulting, which has influenced the shape of the current landscape.⁷⁷ A broad assessment shows that in late Tertiary times, large areas of intrusive rock underwent erosion and planation, the coarser outwash products forming broad alluvial-colluvial aprons. During the Pleistocene, episodes of erosion under varying climatic controls began the incision of drainage and erosional encroachment upon this landscape. In the early Pleistocene, broad colluvial-alluvial plains formed around areas of major relief, and extensive floodplains were deposited, in response to wet and humid climates. The modern colluvial slopes and floodplains are much smaller, probably due to an overall humid to arid climatic shift.⁷⁸

More recently, changes in the coastal zone have occurred. With continued influx of fluvial sediment and the inundation of marine coastal landforms, a slow progradation seawards has occurred. For example, former islands such as Mount Luce have been approached, and ultimately connected to the mainland.

8.3.6 Potential impacts/threats

Potential impacts on topography, soils and geology from the port, coastal industrial development and residential development are presented in **Appendix P** and summarised below:

- soil erosion from vegetation clearing, earthworks, and stockpiling
- stormwater runoff
- disturbance of PASS during construction and or operational activities.

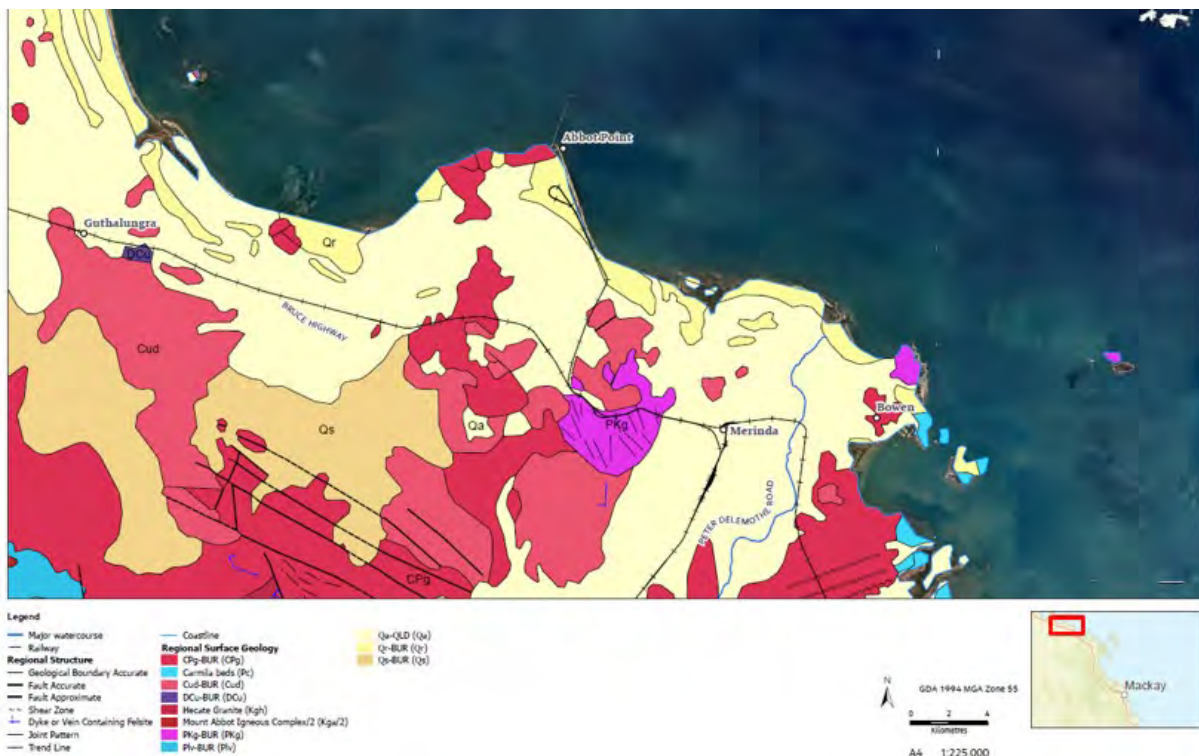


Figure 30: Geology in the study area

⁷⁶ Ibid

⁷⁷ Whitsunday Shire Council (2003). *Soils and land suitability of the Whitsunday Coast Area, Central Queensland*.

⁷⁸ Aldrick, J.M. (1988). *Soils of the Elliot River- Bowen Area, North Queensland*.

8.4 Climatic Conditions

8.4.1 Climate

Relevant meteorological data has been sourced from the Bureau of Meteorology (BOM) weather monitoring station located at Bowen Airport (Station ID# 033257). The BOM station (latitude: 20.02°S, longitude: 148.22°E) is located less than 2km to the west of the Town of Bowen and approximately 20km south-east of Abbot Point and provides representative meteorological data for the study area. The port area has a dry tropical climate.

Table 25 summarises the major climate statistics recorded at this location.

Table 25: Monthly climate statistics at Bowen Airport (2021)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual average
Mean Maximum temperature (°C)	31.5	31.3	30.8	29.3	27.1	24.9	24.5	25.4	27.4	29.2	30.4	31.3	28.6
Mean minimum temperature (°C)	23.8	23.8	22.8	20.8	17.8	15.0	13.4	14.2	16.5	19.8	22.1	23.4	19.4
Mean rainfall - millimetres (mm)	179.0	221.1	118.5	62.2	1.1	23.3	19.6	23.0	10.6	12.1	52.0	141.4	892.7
Mean 9am wind speed -kilometres per hour (km/h)	18.3	17.6	20.7	21.1	19.8	19.1	17.6	17.8	17.4	18.0	18.2	18.3	18.7
Mean 3pm wind speed (km/h)	24.7	22.9	25.3	24.5	23.2	22.3	21.4	22.2	23.1	25.0	24.9	24.9	23.7

Source: BOM, 2021⁷⁹

8.4.2 Temperature

As illustrated in **Table 25**, average annual temperatures at Abbot Point range from a low of 19.4°C to a high of 28.6°C. Average maximum temperatures range from 25°C in the dry season (June to August) to 31°C in the wet season (November to March). The lowest mean average minimum temperature was 13.4°C, recorded in July.⁸⁰

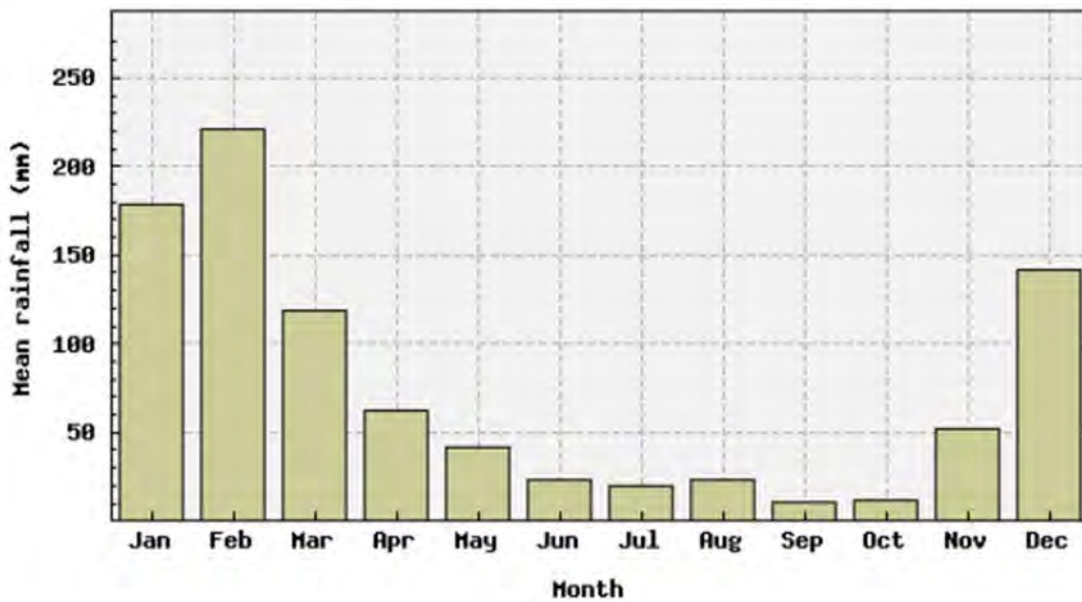
Relative humidity reaches an average of 74% in the summer months and 71% in the winter.

8.4.3 Rainfall

Abbot Point experiences rainfall patterns typical of monsoonal areas, with heavy rainfall occurring in the summer months, and low rainfall totals in the dry winter months (**Figure 31**). The wet season receives 62% of the total annual rainfall, and the dry season receives an average of 7% of annual rainfall. Total rainfall varies from 1000mm to 1500mm, with an average of 82.2 days of rain each year. Mean annual rainfall at the port is approximately 892.7mm per year.

⁷⁹ Bureau of Meteorology. (2021). Climate statistics for Australian locations: Monthly climate statistics. http://www.bom.gov.au/climate/averages/tables/cw_033257.shtml.

⁸⁰ Adaptive Strategies and Open Lines Environmental Consulting. (2015). *Abbot Point Master Planning: Supporting report - environmental, social and cultural heritage values version 3 (Final)* October 2015.



Australian Government
Bureau of Meteorology

033257 Mean rainfall (mm)

Created on Mon 7 Jun 2021 10:36 AM AEST

Figure 31: Annual average rainfall data for Bowen Airport (Bureau of Meteorology Climate Statistics, 2021)

8.4.4 Wind

Winds around Abbot Point tend to be strong throughout most of the year due to the exposed location of the port. The annual distribution of wind speed and direction at Abbot Point indicates that there are dominant east-south-easterly winds that typically build through the day to more intense speeds in the afternoon. The wind direction is also influenced by the seasons, with winds being predominantly south-easterly in winter and tend to east-south-easterly over summer and spring. The wind roses derived from the BOM climate statistics for the Bowen Airport weather station (see **Figure 32** and **Figure 33**) indicate that moderate south-easterly winds are dominant in the morning than by the afternoon the wind direction varies from the east and south-east while wind speeds increase to between 20km/h to 30km/h.

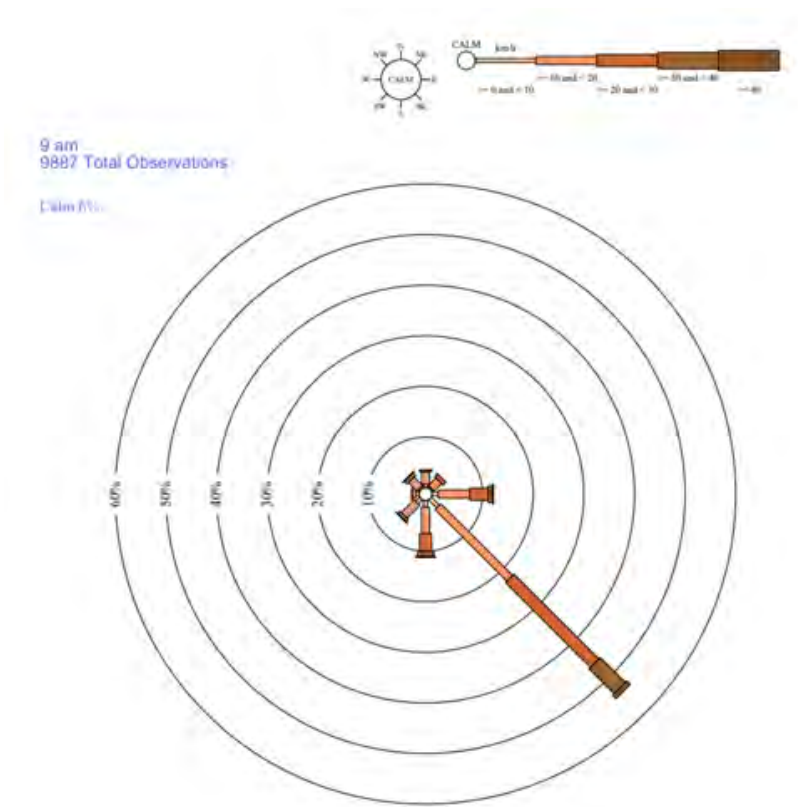


Figure 32: Wind rose for 9am at the Bowen Airport weather station (Bureau of Meteorology Climate Statistics, 2021)

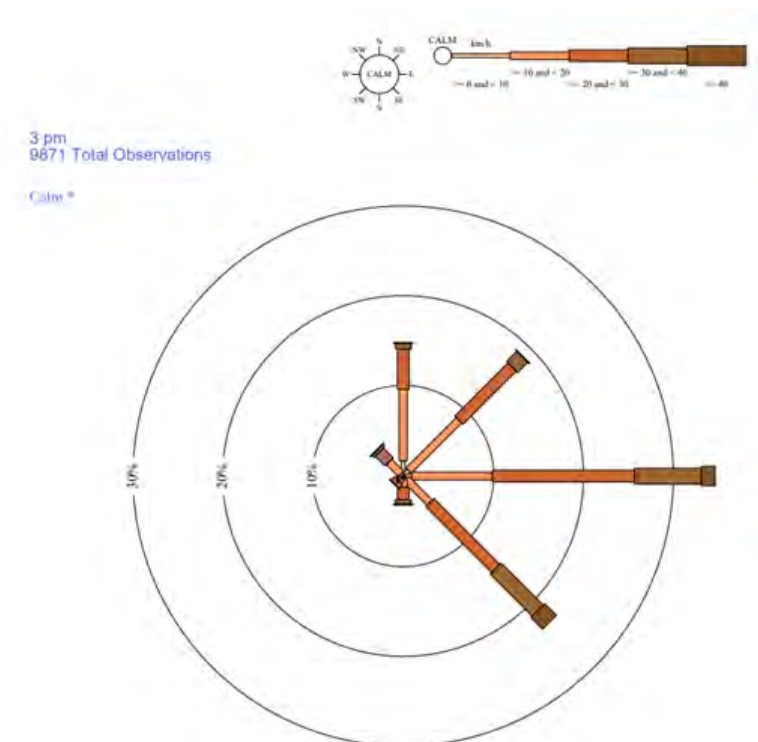


Figure 33: Wind rose for 3pm at the Bowen Airport weather station (Bureau of Meteorology Climate Statistics, 2021)

8.4.5 Extreme events

The regional climate and landform make the port and study area susceptible to natural hazards such as floods and cyclones. Significant weather events in recent years have had a prominent effect on Abbot Point and has relevance to water quality and benthic habitats.⁸¹

Tropical Cyclone Ita and Tropical Cyclone Dylan, which occurred in January 2014 and April 2014 respectively, generated winds exceeding 50km/h.⁸² Tropical Cyclone Debbie, a Category 4 storm, made landfall at Airlie Beach (50km southeast of Bowen) in 2017 and generated maximum wind speeds of 195km/h with gusts up to 263km/h. Storm surges of 2.6m were recorded within the surrounding area, causing significant damage to property and coastlines.⁸³

8.5 Terrestrial environment

8.5.1 General ecological description

The study area provides potential habitat for a variety of listed terrestrial and freshwater flora and fauna species and ecological communities. As indicated in previous sections, the area is within and adjacent to the GBRWHA and GBRMP. It includes the CVW, a largely ephemeral wetland system, which is important to numerous bird species.

The area supports a diverse range of terrestrial ecological values, located predominately within the Brigalow Belt North bioregion.⁸⁴ The study area is also located within the Central Queensland Coast (CQC) with nearby islands including Holbourne Island (outside of the study area) and Camp Island containing stands of vegetation typically found in the CQC bioregion. The CQC bioregion only occurs on two offshore islands in very small areas. These bioregions are characterised by savannah woodlands and semi-deciduous rainforests.

The study area has a wide variety of vegetation types with varying ecological condition. Of special interest is the EPBC Act-listed endangered Semi-evergreen Vine Thicket (SEVT) and the Poplar Box Grassy Woodland which consists of Eucalypt woodland where Poplar/Bimble Box is the main tree canopy species present. Other tree species may occasionally occur depending on the characteristics of the site, these include *Callitris glaucophylla* (white cypress pine), *Casuarina cristata* (belah), *Eucalyptus coolabah* (coolibah), *Eucalyptus largiflorens* (black box), *Eucalyptus melanophloia* (silver-leaved ironbark), *Eucalyptus microcarpa* (inland grey box) and *Eucalyptus pilligaensis* (narrow-leaved grey box). The RE 12.3.10 (*Eucalyptus populnea* woodland on alluvial plains - endangered) was not identified as present within the study area from desktop assessments.

The endangered SEVT within the study area is located from Cape Upstart south to Bowen. The occurrence of SEVT corresponds to only one of the REs identified from previous studies; RE 11.2.3 Microphyll vine forest (beach scrub) on sandy beach ridges. No other REs identified as an EPBC Act-listed SEVT occur within this region. It is estimated that approximately 984ha of SEVT remain in the study area with the majority located along the eastern coastline to the south of Cape Upstart.⁸⁵

In the past, the area has been extensively used for farming with some areas cleared for industrial uses. The current state of the environmental values at Abbot Point reflects both its proximity to ecologically important areas, its use as an existing industrial port, and previous use as an agricultural area.⁸⁶

8.5.2 Matters of National Environmental Significance

The EPBC Act is the Australian Government's environmental legislation that protects Australia's MNES. The PMST was accessed on 9 June 2021 to generate a report for the study site to identify any MNES within the study area. The results of the PMST report are presented in Sections 8.6, 8.7, 8.8 and 8.9, with the results discussed within the relevant terrestrial or aquatic ecosystem context.

⁸¹ North Queensland Bulk Ports Corporation Limited. (2011). *Land Use Plan Port of Abbot Point*.

⁸² Ibid 71

⁸³ Bureau of Meteorology. (2021). Tropical Cyclone Debbie 25-29 March 2017 Summary. <http://www.bom.gov.au/cyclone/history/debbie17.shtml>.

⁸⁴ Department of Environment and Science. (2018). *A Biodiversity Planning Assessment for the Brigalow Belt Bioregion*. Queensland Government.

⁸⁵ GHD. (2012). *Abbot Point Cumulative Impact Assessment: Part C Chapter 8 Semi-evergreen Vine Thicket*. Abbot Point Working Group.

⁸⁶ WorleyParsons. (2015). *Abbot Point Growth Gateway Project Terrestrial Ecology Report: Matters of National Environmental Significance: Appendix 13*.

Key MNES and other matters identified in the PMST are summarised as follows:

- **Areas and places:** The study site is located wholly within a World Heritage Area and National Heritage Place; the GBR. The GBRMP within the study area includes regions zoned as marine park, habitat protection and general use. The areas zoned as marine park are noted under the International Union for Conservation of Nature (IUCN) as Category II, with the areas zoned as habitat protection zones being IUCN Category VI.
- **Wetlands of international and national importance:** There are no Wetlands of International Importance within the study area, however there are three listed nationally important wetlands including the CVW, the GBRMP, and Southern Upstart Bay.
- **Reserves:** There are three state reserves within the study area; the Abbot Bay, the Cape Upstart and Gloucester Island.
- **Threatened Ecological Communities (TEC) and species:** Two Threatened Ecological Species, 38 listed threatened species and 62 migratory species are listed as MNES that occur or may occur within the study area. The TECs are presented in **Table 26**.

Table 26: Threatened Ecological Communities of conservation significance (2021)

TEC	Conservation status	Type of presence
Poplar Box Grassy Woodland on Alluvial Plains.	Endangered.	Community may occur within area.
SEVTs of the Brigalow Belt (north and south) and Nandewar bioregions.	Endangered.	Community likely to occur within area.

While these two TECs have been shown to be present on the desktop search, there is no recorded presence of Poplar Box Grassy Woodland on alluvial plains within the study area. This was verified in RE desktop searches and a review of past ecological studies for the Abbot Point study area.

One TEC has been recorded within the study area, the SEVTs of the Brigalow Belt (north and south) and Nandewar bioregions (SEVT TEC).⁸⁷ This TEC is listed under the EPBC Act as endangered and the *Nature Conservation Act 1992* Queensland (NC Act) as 'Of Concern'.

Under the VM Act, the SEVT TEC is represented by 10 REs. Only one of these REs has been recorded within the study area - RE 11.2.3. This RE is listed as 'of concern' under the VM Act. The total area of known SEVT TEC within the study area is 915.64ha. Refer to **Figure 34** illustrating SEVT within the study area.

The SEVT TEC is described as dry seasonal subtropical rainforest, characterised by a prominence of trees with microphyll sized leaves (2.5 centimetres (cm) to 7.5cm long) and *Brachychiton australis* and *Brachychiton rupestris*.

The SEVT TEC can be found from Townsville to northern New South Wales and is typically highly fragmented, with 87% of recorded occurrences less than 50ha in size.⁸⁸ Records of this TEC within the study area to date are similarly fragmented and vary in size from 2ha to 24ha.⁸⁹ Existing surveys have noted that the condition of the SEVT TEC within the study area has been impacted by the invasive presence of rubber vine (*Cryptostegia grandiflora*).⁹⁰

⁸⁷ Ecological Australia. (2013). Abbot Point Cumulative Impact Assessment. Part C Chapter 8 Semi-evergreen Vine Thicket.

⁸⁸ Department of Natural Resources and Mines. (2010). National recovery plan for the "Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions" ecological community. Queensland Government.

⁸⁹ Ibid 87

⁹⁰ Open Lines and Adaptive Strategies. (2016). Abbot Point Strategic Planning Project: Abbot Point environmental Values Input.



Figure 34: Semi-evergreen Vine Thicket in the study area

8.5.3 Listed threatened terrestrial flora

The PMST search (9 June 2021) identified four EPBC Act listed flora species as potentially occurring within the study area. These are presented in **Table 27**. Croton magnetica is included as it was listed as potentially occurring within the study area by the Wildlife Online database search. This species was recorded within the study area during the EIS for the proposed Abbot Point Multi Cargo Facility (MCF).⁹¹ The assessment located a single plant at One Tree Hill within a patch of vine thicket.⁹² Other potential habitat for this species in the study area includes beach scrub on rocky headlands.

Table 27: Listed threatened terrestrial flora species potentially occurring in the study area (2021)

Species	Common Name	EPBC Act Listing	NC Act Listing
<i>Aristida granitica</i>	-	Endangered	Endangered
<i>Dicanthium setosum</i>	Bluegrass	Vulnerable	Least Concern
<i>Eucalyptus raveretiana</i>	Black ironbox	Vulnerable	Least Concern
<i>Omphalea celata</i>	-	Vulnerable	Vulnerable
<i>Croton magnetica</i>	-	-	Vulnerable

Ozothamnus eriocephalus is listed as vulnerable under the EPBC Act and was noted during the EIS assessment work in 2010 as having potential to occur in the study area due to the presence of suitable habitat (specifically rocky outcrops, vine thickets and eucalypt woodlands). The species has not been recorded in the study area to date and was not listed in the PMST report. **Table 28** presents the threatened flora species that have been identified in the study area or suitable habitat is present.

⁹¹ GHD. (2010). *Proposed Abbot Point Multi Cargo Facility Environmental Impact Statement*. North Queensland Bulk Ports Corporation Limited.

⁹² Ibid

Table 28: Listed threatened flora known to be present, or habitat present in the study area (2021)

EPBC Act			NC Act		
E – Endangered V – Vulnerable			E – Endangered LC – Least concern V – Vulnerable		
Species	Common name	EPBC Act	NC Act	Habitat	Species or species habitat present
<i>Dichanthium setosum</i>	Bluegrass	V	LC	Heavy soils (predominantly cracking clays or alluvium) in woodland or open woodland usually dominated by <i>Acacia</i> (brigalow) and/or <i>Eucalyptus</i> species.	Present
<i>Eucalyptus raveretiana</i>	Black Ironbox	V	LC	Along watercourses and occasionally on river flats. In open forest or woodland communities. Preferred alluvial soils include sands, loams, light clays or cracking clays.	Present
<i>Omphalea celata</i>	-	V	V	Fragmented semi evergreen vine thicket or <i>araucarian microphyll</i> vine forest. Along watercourses in steep sided gorges and gullies. Frequently associated with <i>Eucalyptus raveretiana</i> .	Present
<i>Phaius australis</i>	Lesser Swamp-orchid	E	E	Areas where soils are almost always damp, but not flooded for lengthy periods. Usually found in coastal habitats between swamps and forests.	Present

8.5.4 Listed threatened terrestrial fauna

There is a broad diversity of terrestrial fauna species and supporting habitat in the study area and surrounds including many conservation significant species listed under the EPBC Act and the NC Act. Fauna surveys conducted during a previous EIS⁹³ within the area identified 212 terrestrial wildlife species, including 152 birds, 29 mammals, 24 reptiles and seven amphibians.

Additional species have also been observed in the other relevant studies. Several EPBC Act listed threatened terrestrial species and ecological communities are among those known to occur within the Abbot Point study area. The 12 terrestrial habitat types identified include:

- beach and beach scrub
- rocky shore
- vine thicket on rocky substrate
- grassland
- saltwater and freshwater wetland
- melaleuca

⁹³ Ibid 91

- ephemeral and pandanus creek
- open woodland with grassy understory
- rocky hillside.⁹⁴

8.5.4.1 Avifauna

The CVW⁹⁵ is an important waterbird habitat. It is one of the most important sites for waterfowl in Northern Queensland, containing intertidal areas for shorebirds.⁹⁶ A large number of water birds use the CVW for breeding purposes. This area is also relevant for colonial breeding species under the NC Act. See **Figure 35** below for migratory species at the priority Port of Abbot Point. Data for **Figure 35** was provided by the Queensland Wader Study Group being a special interest group of the Queensland Ornithological Society Incorporated.

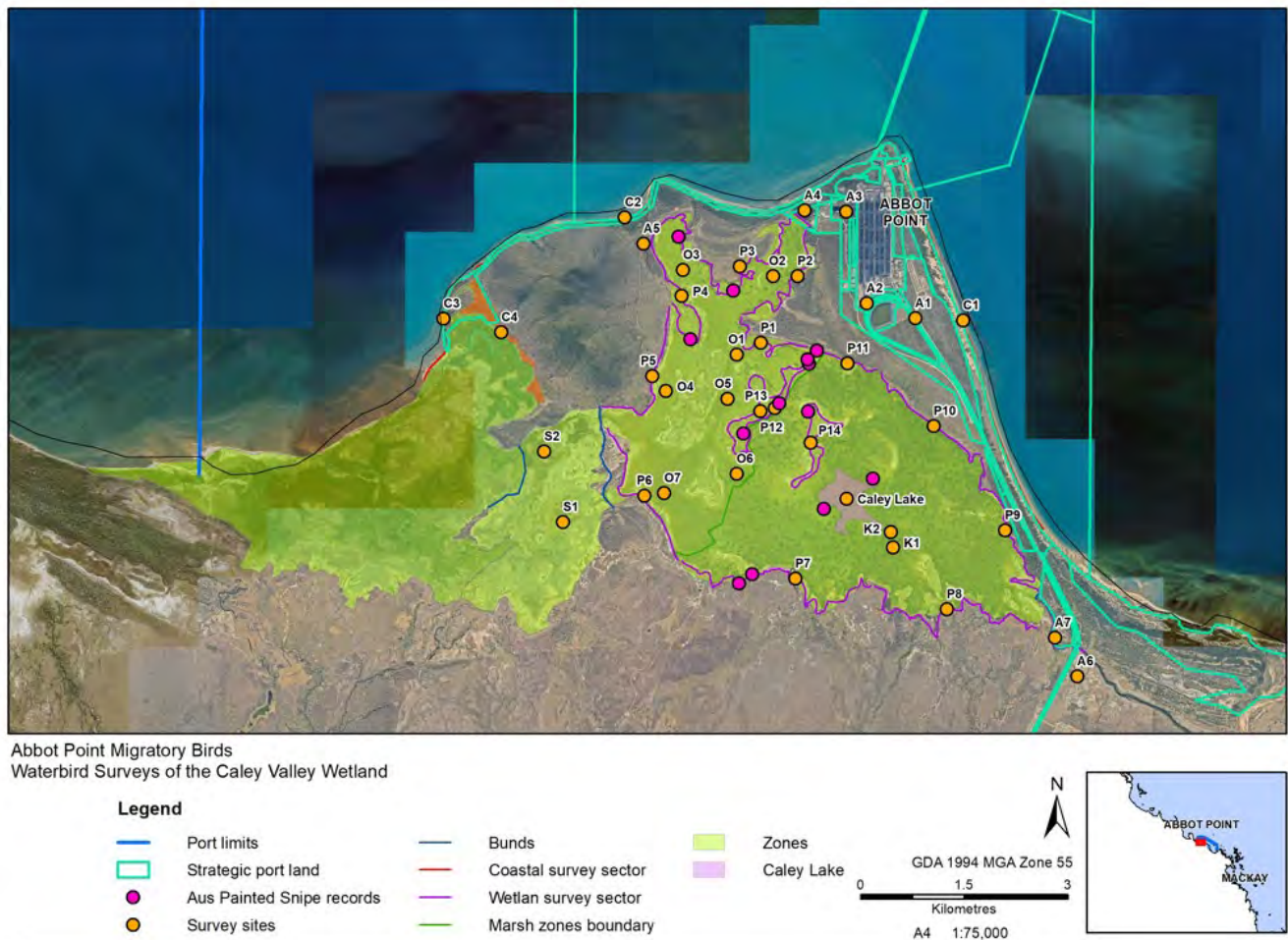


Figure 35: Migratory birds at Abbot Point

Migratory shorebirds are considered under international and bilateral agreements and listed under the EPBC Act with industry guidelines for mitigating impacts with reference to important habitats.

A PMST search undertaken in May 2021 identified 19 EPBC Act-listed bird species as potentially occurring in the study area. Of these, seven species, their habitat or roosting areas are known to be present in the study area.

Three species are classified as critically endangered under the EPBC Act, while a further seven species are listed as endangered. The Red Knot (*Calidris canutus*) is a species of endangered conservation significance under both the EPBC Act and the NC Act is known to occur in the study area. **Table 29** presents the conservation listed species including their conservation status and potential for presence.

⁹⁴ Ibid 91

⁹⁵ WetlandMaps, online data search 6th September 2021.

⁹⁶ Lloyd, P., Sanderson, C. and Popple, L. (2020). Waterbird surveys of the Caley Valley Wetland in wet and dry seasons, Abbot Point, Queensland. *Stilt*: 73 – 74: 6:17

Table 29: Avifauna species of conservation significance present or habitat present in study area (2021)

EPBC Act	NC Act
E – Endangered CE – Critically endangered V – Vulnerable	E – Endangered CR – Critically endangered LC – Least concern V – Vulnerable

Species	Common name	EPBC Act	NC Act	Presence with study area
<i>Calidris canutus</i>	Red Knot, Knot	E	E	Species or species habitat known to occur within area.
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE	CR	Species or species habitat known to occur within area.
<i>Calidris tenuirostris</i>	Great Knot	CE	CR	Roosting known to occur.
<i>Charadrius leschenaultii</i>	Greater Sand Plover	V	V	Roosting known to occur.
<i>Charadrius mongolus</i>	Lesser Sand Plover	E	E	Roosting known to occur.
<i>Erythrotriorchis radiatus</i>	Red Goshawk	V	E	Species or species habitat likely to occur within area.
<i>Falco hypoleucos</i>	Grey Falcon	V	V	Species or species habitat likely to occur within area.
<i>Fregetta grallaria grallaria</i>	White-Bellied Storm-Petrel (Tasman Sea)	V	LC	Species or species habitat likely to occur within area.
<i>Geophaps scripta scripta</i>	Squatter Pigeon (Southern)	V	V	Species or species habitat likely to occur within area.
<i>Hirundapus caudacutus</i>	White-Throated Needletail	V	V	Species or species habitat likely to occur within area.
<i>Limosa lapponica baueri</i>	Bar-Tailed Godwit	V	V	Species or species habitat known to occur within area.
<i>Macronektes giganteus</i>	Southern Giant-Petrel, Southern Giant Petrel	E	V	Species or species habitat may occur within area.
<i>Neochmia ruficauda ruficauda</i>	Star Finch (Eastern), Star Finch (Southern)	E	E	Species or species habitat likely to occur within area.
<i>Numenius madagascariensis</i>	Eastern Curlew, Far Eastern Curlew	CE	E	Species or species habitat known to occur within area.
<i>Poephila cincta cincta</i>	Southern Black Throated Finch	E	E	Species or species habitat likely to occur within area.
<i>Pterodroma neglecta neglecta</i>	Kermadec Petrel (Western)	V	LC	Foraging, feeding or related behaviour.
<i>Rostratula australis</i>	Australian Painted Snipe	E	E	Species or species habitat known to occur within area.
<i>Turnix olivii</i>	Buff-Breasted Button-Quail	E	E	Species or species habitat may occur within area.
<i>Tyto novaehollandiae kimberli</i>	Eastern Curlew, Far Eastern Curlew	V	V	Species or species habitat likely to occur within area.

Figure 36 below illustrates the incidence of migrating breeding and non-breeding bird species at Abbot Point

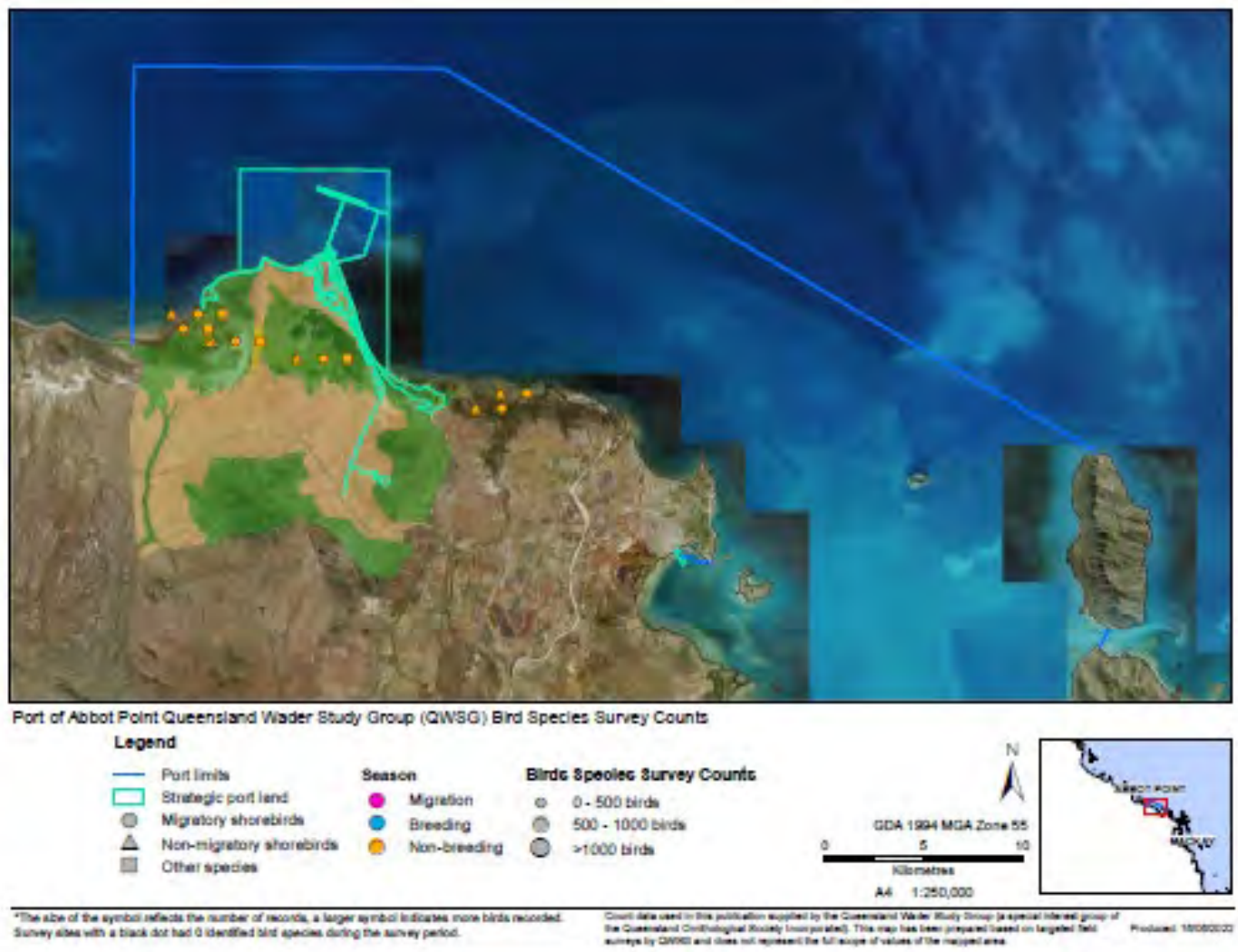


Figure 36: Abbot Point bird species survey counts

8.5.4.2 Mammals

The PMST identified six terrestrial mammals with a conservation listing under the EPBC Act as occurring or potentially occurring in the study area. These are listed in **Table 30**. Of these, one species is classified as endangered while the remainder are classified as vulnerable. Five of these species were also listed under the NC Act.

Table 30: Mammal species of conservation significance present or habitat present in study area (2021)

EPBC Act	NC Act
E – Endangered V – Vulnerable	E – Endangered LC – Least concern V – Vulnerable

Species	Common name	EPBC Act	NC Act	Presence in study area
<i>Dasyurus hallucatus</i>	Northern Quoll	E	LC	Species or species habitat likely to occur within area.
<i>Macroderma gigas</i>	Ghost Bat	V	E	Species or species habitat likely to occur within area.
<i>Petauroides volans</i>	Greater Glider	V	V	Species or species habitat may occur within area.
<i>Phascolarctos cinereus</i>	Koala	V	V	Species or species habitat known to occur within area.
<i>Pteropus poliocephalus</i>	Grey-headed Flying Fox	V	LC	Foraging, feeding or related behaviour may occur within area.
<i>Xeromys myoides</i>	Water Mouse	V	V	Species or species habitat known to occur within area.

8.5.4.3 Terrestrial reptiles

One terrestrial reptile species, the Yakka Skink (*Egernia rugosa*) is listed as occurring or potentially occurring within the study area. It is classified as vulnerable under both the EPBC Act and the NC Act.

8.5.5 Listed migratory terrestrial species

A PMST search was performed on 9 June 2021 and identified seven migratory terrestrial species, shown in **Table 31**, as potentially occurring within the study area. Several previous studies and reports were also reviewed and references for possible presence within the study area have been included in this review.

Australia is visited by migratory shorebirds that exhibit a wide array of habitat requirements and spatial distributions. Migratory shorebird habitat in Australia provides:

- Feeding areas with abundant food resources. Physical characteristics of feeding areas primarily consist of intertidal mudflats, sandy beaches, salt pans and rocky intertidal areas. The characteristics of high value feeding areas include large populations of invertebrates, low disturbance, and un-degraded soils.⁹⁷
- Roosting areas where migratory shorebirds can sleep and preen during non-feeding times. Roosting areas in proximity to feeding areas reduce energetic costs and maintain positive energy flow.

As previously noted, the CVW is an important habitat for listed birds and overall species diversity in the area. It is not only the presence of species that is relevant within the CVW it has suitable migratory shorebird habitat. Migratory shorebirds are considered under international and bilateral agreements and specifically listed under the EPBC Act. Those species present or potentially present within the study area have been noted in **Appendix O**. The importance of the CVW to waterbird populations other than shorebirds should be noted as several species of waterbirds use the area for breeding. It is also important to species listed under the NC Act as relevant for colonial breeding.

⁹⁷ Ibid 91

There are migratory species known to be present within the study area; the migratory, red-necked stint, sharp-tailed sandpiper, latham's snipe, great egret, caspian tern and the endangered Australian painted snipe. These species all have population numbers of volume.^{98 99}

Table 31: Listed migratory terrestrial species of conservation significance present or habitat in study area (2021)

Species	Common name	EPBC Act	NC Act	Presence within study area
<i>Cuculus optatus</i>	Oriental Cuckoo	-	-	Species or species habitat known to occur within area.
<i>Hirundapus caudacutus</i>	White-Throated Needletail	Vulnerable	-	Species or species habitat likely to occur within area.
<i>Monarcha melanopsis</i>	Black-Faced Monarch	-	-	Species or species habitat known to occur within area.
<i>Monarcha trivirgatus</i>	Spectacled Monarch	-	-	Species or species habitat known to occur.
<i>Motacilla flava</i>	Yellow Wagtail	-	-	Species or species habitat may occur within area.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	-	-	Species or species habitat known to occur within area.
<i>Rhipidura rufifrons</i>	Rufous Fantail	-	-	Species or species habitat known to occur within area.

8.5.6 Matters of State Environmental Significance

MSES are natural values and areas protected under Queensland legislation, and include:

- protected areas, including all classes of protected area except nature refuges and coordinated conservation areas, under the NC Act
- marine parks including marine national parks, marine conservation park, scientific research, preservation, and buffer zones under the MP Act
- areas within declared FHAs under the *Fisheries Act 1994* (Fisheries Act)
- high conservation value wetlands under the EP Act, including wetlands assessed as containing 'high or 'very high' values via a conservation assessment, or where a conservation assessment has not yet been completed, wetlands that intersect with areas shown in DIWA and high ecological value waters (wetlands and waterways) declared under the *Environment Protection (Water) Policy 2009*
- legally secured offset areas as defined under the *Environmental Offsets Act 2014*

⁹⁸ BMT WBM. (2014). *Abbot Point Port and Wetland Project Preliminary Documentation for Wetland Hydrology, Water Quality and Aquatic Ecology Component. Volume 1: Executive Summary.*

⁹⁹ Adaptive Strategies and Open Lines Environmental Consulting. (2015). *Abbot Point Master Planning: Supporting report - environmental, social and cultural heritage values version 3 (Final).*

- threatened wildlife under the NC Act and special least concern animals under the *Nature Conservation (Wildlife) Regulation 2006*
- marine plants (growing on or adjacent to tidal land, defined by Highest Astronomical Tide (HAT)) providing for fish passage under the Fisheries Act
- waterways that provide for fish passage under the Fisheries Act
- high risk areas on the flora survey trigger mapping under the NC Act
- regulated vegetation under the VM Act including REREs identified as 'Endangered', 'Of Concern', areas of essential habitat, and areas of REs associated with a wetland or watercourse.

The desktop assessment determined that no legally secured offset areas were identified as occurring within the study area. Key MSES within the study area and surrounds include the GBRMP, the Southern Upstart Bay, CVW area, and a number of REs which are listed as 'Of Concern' or 'Endangered'.

Wetlands have high conservation value under the *Environment Protection Act 1994*. Conservation areas in the study area are illustrated in **Figure 37** below.



Figure 37: Conservation areas in study area

8.5.6.1 Flora survey trigger maps

Flora survey trigger maps, showing protected plant trigger areas, are prepared by the DES and nominate high-risk areas where plants listed as endangered, vulnerable or near threatened under the NC Act are known to or considered likely to exist. Several areas within the study area have been mapped as high-risk and are shown on **Figure 38**.



Figure 38: Flora trigger areas

8.5.6.2 Regulated vegetation in Queensland

A review of the Regulated Vegetation Management Map indicates the presence in the study area of a complex mosaic of vegetation including Category B remnant vegetation classified as 'Endangered' or 'Of Concern', Category C high value regrowth vegetation classified as 'Endangered' or 'Of Concern' Category R (GBR Riverine) and Essential Habitat for protected wildlife (refer **Figure 40**).

Mapping available for the study area indicates that Category A, B and C classified vegetation is present and comprises 179 'Of Concern' and 'Least Concern' RE communities. Of these, 61 are 'Of Concern' or have an 'Of Concern' RE as the dominant community. **Figure 39** shows the extent of mapped regulated vegetation and associated REs for the project site. The conservation status of these REs as referenced by the VM Act and a short RE description is presented in **Appendix N**.

There are twelve REs that cover over 1% of the study area each. These are listed, along with a short description of their species composition, conservation status and extent of coverage in **Table 32**.

8.5.6.3 Threatened terrestrial vegetation communities and flora species

The study area comprises a broad range of vegetation types, including *eucalyptus corymbia* and *eucalyptus casuarina* dominated forests and woodlands, mangroves forests, open shrublands, saltmarshes, forblands, saline grasslands, sedgeland, vegetated swamps and wetlands, coastal vine thickets, rainforest and tussock grasslands.²³

An assessment of the RE mapping for the terrestrial areas within the study area indicates there are approximately 55% remnant vegetation communities remaining and 4% high value regrowth.

These communities are interspersed in a mosaic of patches remaining after substantial land clearance has occurred to facilitate residential, agricultural, industrial, and commercial developments. Additionally, clearance for corridor developments or widening of existing linear infrastructure has also occurred, including for the coal terminal rail line and loop. Within the port footprint further expansion has also necessitated vegetation clearance.

Terrestrial vegetation, particularly remnant vegetation, is critical for the provision of habitat for native fauna and flora species, and in particular species of conservation significance with limited remaining distribution or very specific types of habitat. Remnant vegetation also provides value in terms of the provision of corridors for movement of wildlife between refuges, roosting, breeding, and feeding areas and areas for temporary refuge for

migratory species. These communities also provide more broader values to the environment such as regulating air quality, carbon sequestration and water and nutrient cycling.

REs are defined as vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil and are used to define vegetation listed under the NC Act. A review of REs within the study area using BioMap indicated that the REs listed in NC Act are present. These are listed in **Appendix N** of this report.



Figure 39: Regulated vegetation in the study area

Table 32: Regulated Vegetation mapped by Queensland Department of Natural Resources Mines and Energy in the study area

VM Act
L – Least Concern

Regulated vegetation	VM Act Status	Percentage of Total land Area	Vegetation Category	RE Description
11.12.4	L	2% or 1343ha	Category C	SEVT and microphyll vine forest on igneous rocks
11.2.5	L	2% or 1305ha	Category C	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales
11.12.9	L	2% or 1429ha	Category A, B	<i>Eucalyptus platyphylla</i> woodland on igneous rocks
11.3.7	L	2% or 1533ha	Category C	<i>Corymbia</i> spp. open woodland on alluvial plains
11.3.10	L	2% or 1993ha	Category A, B	<i>Eucalyptus brownii</i> woodland on alluvial plains

Regulated vegetation	VM Act Status	Percentage of Total land Area	Vegetation Category	RE Description
11.12.13	L	3% or 2684ha	Category A, B	<i>Corymbia clarksoniana</i> woodland on igneous rocks
11.1.2	L	4% or 3354ha	Category A, B	Samphire forbland on marine clay plains ^a
11.1.4	L	4% or 2985ha	Category A, B	Mangrove low open forest and/or woodland on marine clay plains ^a
11.12.1	L	5% or 4190ha	Category C	<i>Eucalyptus crebra</i> woodland on igneous rocks
11.12.7	L	5% or 4240ha	Category A, B	<i>Eucalyptus crebra</i> woodland with patches of SEVT on igneous rocks (boulder-strewn hillsides)
11.3.30	L	5% or 4601ha	Category C	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains
11.3.32	L	11% or 9035ha	Category A, B	<i>Allocasuarina luehmannii</i> low open woodland on alluvial plains

a) Marine plants, including mangroves and samphire's are protected under the Fisheries Act and the VM Act status does not prevail over their protection under the Fisheries Act and as MSES Mangroves are specifically excluded as vegetation from the VM Act in Section 8(c) because these communities are protected under other state legislation.

The presence of 45 listed vegetation communities within the Abbot Point study area is important as:

- 12 of the communities are listed as 'Of Concern' under the NC Act
- the communities provide a diversity of habitat types that allows for a diversity of fauna and flora including threatened species
- they provide connectivity between terrestrial areas to large coastal wetland and riparian areas.¹⁰⁰

¹⁰⁰ Abbot Point Strategic Planning Project. (2016). Abbot Point Environmental Values Input.



Figure 40: Regional ecosystems in the study area

8.5.7 Threatened terrestrial fauna and fauna habitat

The study area includes areas of elevation such as Mount Roundback, Mount Luce and Mount Little however, the landscape is primarily low-lying coastal lands. The CVW and surrounding wetland areas and water courses also feature within the study area. As the quality of habitats within the study area has been significantly impacted by agricultural activities, soil erosion, compaction and prevalence of weeds are some of the impacts from overgrazing by cattle.

The study area and surrounds include national parks, conservation parks, and reserves, which are protected under the provisions of the NC Act. Such designated areas provide protection to areas of habitat for local terrestrial fauna assemblages, including potential habitat for conservation significant species (for example, Koala, (*Phascolarctos cinereus*), Yakka skink (*Egernia rugosa*), and the Coastal Sheath-tail Bat (*Taphozous australis*), which have all been previously recorded - or heard - in the study area in historical field surveys.

Fauna habitats within the Abbot Point area include sclerophyll woodland, open forest, vine thicket on rocky headlands, melaleuca regrowth, Eucalyptus crebra woodlands, pasture grasslands, beach scrub, saline and freshwater wetlands and ephemeral creeks.¹⁰¹

Essential habitat has been mapped for several threatened and endangered species within the study area and surrounds, however the Geographic Information System (GIS) layer that is currently publicly accessible does not identify the species for which the habitat was recorded. Refer to **Figure 41**.

Terrestrial fauna of conservation significance, as discussed in Section 5.6.4, includes avifauna, mammals, and reptiles.

¹⁰¹ Advisian Worley Parsons Group. (2015). *Abbot Point Growth Gateway Project: Environmental Impact Statement, Volume 2*.



Figure 41: Essential habitat in the study area

8.5.7.1 Islands

The study area includes several islands, as shown in **Table 33** these have been included below to demonstrate the wide-ranging REs present that provide habitat to both terrestrial and marine species.

Table 33: Islands located within the study area

Islands	RE	Ecological habitat description
Camp Island	11.1.1 11.2.3	Camp Island consists of coral shores, a sandy beach and 15ha of national park with Samphire forbland on marine clay plains and mangrove communities. It has a private ecotourist resort located on the island, with vegetation in this area being modified.
Stone Island	11.1.4 8.2.9/11.2.3/11.1.1 11.12.16 8.12.11a	The island is 2km offshore from Bowen, approximately 6ha in size, the area is predominately made up of Tussock grassland on coastal dunes.
Middle Island	8.12.13 8.1.1	Middle Island is 11km east of Rosslyn Bay Harbour, is within a marine park 'green zone' that prohibits fishing and collecting, hence the area's abundance of marine life. The dominant vegetation is Tussock grassland, or shrubland.
North Head Island	11.12.16	A small island located offshore from Bowen, a lighthouse was erected in 1866, with the island consisting of mixed low woodland to shrubland on igneous rocks. The vegetation communities have a low diversity of mangrove/saltmarsh communities.
Gloucester Island (located approx. 10km from Bowen, outside of the study area)	8.12.12d 8.12.29b 11.12.16 8.12.14c 8.3.5	The endangered Proserpine rock-wallaby (<i>Petrogale persephone</i>) confined to the island favours rocky outcrops and rock piles covered with dry vine scrub, usually associated with beach scrub being the only naturally occurring island population.

Islands	RE	Ecological habitat description
Holbourne Island ¹⁰² (located approx. 30km offshore from Bowen, outside the study area)	3.2.29 8.2.9 8.2.2 8.2.1 8.12.13a 8.12.12	<p>The island's broad vegetation types range from undulating grassland, such as blady grass, stunted shrubs, low trees, thickets of stunted rock fig and a scattering of woody weeds on hillsides and lowlands. Due to its isolation, limited interference and extreme conditions, the island provides an example of vegetation diversity, with over 90 species of plants.</p> <p>The most significant vegetation is the small band of open <i>pisonia</i> forest (approximately 2 to 5.5m high) that extends as a 0.5ha narrow strand of open forest behind the western beach and also scattered elsewhere on calcareous lowlands. The occurrence of this vegetation community is unusual on a continental island. It is most commonly featured as part of coral cays.</p> <p>The island is a site for breeding seabirds and it's an important Green, Flatback and Marine Turtle nesting site.</p>

8.5.8 Potential impacts/threats

Potential impacts on the terrestrial flora and fauna from the port, coastal industrial development and residential development are presented in **Appendix O** and summarised below.

Terrestrial vegetation communities include:

- reduction in extent and condition of remnant vegetation due to clearing and stormwater runoff
- increased pressures such as weeds and pests on remnant vegetation from new road construction, pedestrian and tracks and increased visitations from the local community and tourists outside the APSDA
- threatened flora and fauna
- clearing of fauna habitat for residential development and/or industrial use leading to reduced species habitat and loss of species
- increased noise, light and human activity from residential development resulting in displacement of fauna species or whole populations
- direct mortality and/or injury to fauna from increased vehicle movements
- increased stormwater resulting in dieback or death of vegetation communities and therefore reduction of habitat for inhabiting fauna species.

8.6 Wetlands

The Queensland Wetlands Program defines wetlands as 'wetlands are areas of permanent or periodic/intermittent inundation, with water that is static or flowing fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed 6m'. To be a wetland the area must have one or more of the following attributes:

- at least periodically the land supports plants or animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle, or
- the substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers, or
- the substratum is not soil and is saturated with water or covered by water at some time¹⁰³

¹⁰² Department of Environment and Resource Management. (2011). Holbourne Island National Park and adjoining State Waters Central Queensland Coast Bioregion.

¹⁰³ Environmental Protection Agency (1999) Strategy for the Conservation and management of Queensland's wetlands.

- The GBRMP is identified in the DIWA. Wetlands in the surrounding catchment and estuarine marine receiving waters contribute to the ecological health of the GBR in many ways.

The CVW, shown in **Figure 42** is located within the Don River Basin, which extends from Bowen in the south, to the mouth of the Burdekin River north of Cape Upstart National Park. The wetlands experience major seasonal variations in freshwater inputs from local runoff and rainfall.

The wetlands are fed by a complex system of creeks including Plain Creek, Splitters Creek, Spring Creek, Branch Creek, Tabletop Creek, Maria Creek, Six Mile Creek, Goodbye Creek and Saltwater Creek. The hydrology is influenced by runoff from Mount Roundback and Mount Little to the south and south east of the wetlands respectively. Saltwater Creek is the largest creek to flow into the wetlands with a catchment of approximately 83,000ha. Most of the catchments that feed into the study area, flow northwards into the CVW, often through road and railway culverts.

The CVW are nationally significant wetlands, have high ecological significance and are listed on the DIWA. They are a modified natural system that consist of:

- estuarine (brackish waters approximately 66.5% of the wetlands) – tidal flats at the western extent of the wetlands
- lacustrine (lakes and dams) for example, Lake Caley in the south-eastern part of the wetland basin. Lake Caley is a permanent body of water through the dry season
- palustrine (marsh or swamp – approximately 32.6 % of the wetlands) – mostly eastern extent
- riverine (rivers or deep-water habitats in a channel – approximately 0.3% of the wetlands).

The wetlands experience some tidal influence from west to east and there are three distinct hydrological zones that have been identified:¹⁰⁴

- Tidally influenced western extent of the wetlands, which falls within the coastal water zone and estuarine zone. Saline water enters the system from Curlewis Bay directly west of the wetlands. This zone contains beaches, mangroves, saltmarsh, coastal dune vegetation and seagrass beds.
- Wetland basin zone where freshwater runoff from the local catchment occurs in a seasonal pattern (significant rainfall and runoff during the summer months, and less during the winter months). During the wet season, the wetlands can fill with freshwater, but in the dry season, saline waters dominate in the western extent. The natural and artificial topography of the wetlands means that freshwater ponds in the basins such as Lake Caley, and then either evaporates during drier periods, or is transferred into groundwater reserves.
- Saltwater Creek and the non-tidal zone in the eastern extent of the wetlands, which includes the terrestrial zone. This zone provides fauna habitat and permanent water during the dry season, contains a network of ephemeral creeks and provides fauna movement corridor despite the riparian vegetation being fragmented.

Groundwater plays an important role in maintaining freshwater inputs to the wetlands during the dry season. There is little information available on the groundwater levels below the wetlands which are suspected to be shallow and generally within 5m of the surface.

In 1956, four bund walls were constructed in the wetlands to enhance duck shooting opportunities. These walls impound freshwater in the east creating a large fresh and brackish water wetland and shortly after the walls were constructed the abundance and diversity of wetland birds increased. The bund wall in the western extent south of Mount Luce, partially constrains tidal flushing and excessive ponding around this bund has resulted in some mangrove dieback and root anoxia.

The wetlands vary in response to broader climatic trends. During dry periods and drought, they can be almost completely empty and dry for nine months of the year, during typical rainfall years they hold water for about nine months and during wet periods they can support standing water for the entire year. This seasonal variation influences the presence of wetland flora and fauna, and response to threats and pressures at different times of the year.

¹⁰⁴ BMT WBM. (2014). Abbot Point Port and Wetland Project Preliminary Documentation for Wetland Hydrology, Water Quality and Aquatic Ecology Component.

Previous work done identified¹⁰⁵ the key water resources in the Abbot Point study area as:

- Saltwater Creek, Euri Creek, Don River and Elliot River
- tidal creeks including Splitters Creek, Branch Creek and Mount Stuart Creek
- ephemeral creeks including Six Mile Creek and Goodbye Creek
- CVW and Lake Caley.

Key environmental receptors within the freshwater environment of the study area include:

- migratory birds
- fauna habitats including wetland.

A search of the PMST in June 2021 revealed that 27 species of conservation significance are either known to inhabit or visit these wetlands or have habitat or roosting sites suitable for their visitation within the study area. These are listed in **Table 34**.

Table 34: Migratory shorebird species of conservation significance present or habitat, roosting sites in study area

EPBC Act			NC Act	
E – Endangered CE – Critically endangered V – Vulnerable			CR – Critically endangered E – Endangered SL – Special least concern V – Vulnerable LC – Least concern	

Species	Common name	EPBC Act	NC Act	Presence within study area
<i>Actitis hypoleucos</i>	Common Sandpiper	-	SL	Species or species habitat known to occur within area.
<i>Arenaria interpres</i>	Ruddy Turnstone	-	SL	Roosting known to occur within area.
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	-	SL	Roosting known to occur within area.
<i>Calidris alba</i>	Sanderling	-	SL	Roosting known to occur within area.
<i>Calidris canutus</i>	Red Knot	E	E	Roosting known to occur within area.
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE	CR	Species or species habitat known to occur within area.
<i>Calidris melanotos</i>	Pectoral Sandpiper	-	SL	Species or species habitat may occur within area.
<i>Calidris ruficollis</i>	Red-necked Stint	-	SL	Roosting known to occur within area.
<i>Calidris tenuirostris</i>	Great Knot	CE	CR	Roosting known to occur within area.
<i>Charadrius leschenaultii</i>	Greater Sand Plover	V	V	Roosting known to occur within area.
<i>Charadrius mongolus</i>	Lesser Sand Plover	E	E	Roosting known to occur within area.
<i>Gallinago hardwickii</i>	Latham's Snipe	-	SL	Species or species habitat known to occur within area.
<i>Gallinago megala</i>	Swinhoe's Snipe	-	SL	Roosting likely to occur within area.
<i>Gallinago stenura</i>	Pin-tailed Snipe	-	SL	Roosting likely to occur within area.
<i>Limosa lapponica</i>	Bar-tailed Godwit	V	V	Species or species habitat known to occur within area.
<i>Limosa limosa</i>	Black-tailed Godwit	-	SL	Roosting known to occur within area.
<i>Numenius madagascariensis</i>	Eastern Curlew	CE	E	Species or species habitat known to occur within area.
<i>Numenius minutus</i>	Little Curlew	-	SL	Roosting known to occur within area.

¹⁰⁵ Adaptive Strategies and Open Lines Environmental Consulting. (2015). Abbot Point Master Planning: Supporting report - environmental, social and cultural heritage values version 3 (Final) October 2015.

Species	Common name	EPBC Act	NC Act	Presence within study area
<i>Numenius phaeopus</i>	Whimbrel	-	SL	Roosting known to occur within area.
<i>Pandion haliaetus</i>	Osprey	-	SL	Breeding known to occur within area.
<i>Pluvialis fulva</i>	Pacific Golden Plover	-	SL	Roosting known to occur within area.
<i>Pluvialis squatarola</i>	Grey Plover	-	SL	Roosting known to occur within area.
<i>Tringa brevipes</i>	Grey-tailed Tattler	-	SL	Roosting known to occur within area.
<i>Tringa incana</i>	Wandering Tattler	-	SL	Roosting known to occur within area.
<i>Tringa nebularia</i>	Common Greenshank	-	SL	Species or species habitat known to occur within area.
<i>Tringa stagnatilis</i>	Marsh Sandpiper	-	SL	Roosting known to occur within area.
<i>Xenus cinereus</i>	Terek Sandpiper	-	SL	Roosting known to occur within area.



Figure 42: Mapped wetlands in the study area

8.7 Aquatic ecosystems – freshwater

8.7.1 General ecological description

The CVW is one of the largest intact wetland systems between Townsville and Bowen¹⁰⁶ and is listed under the DIWA as a palustrine system that has been modified from an original brackish wetland since the 1940s. The CVW, located in the Don River Basin, provides a range of wetland ecosystems services and comprises a diversity of complex and dynamic habitat types. The wetland comprises of three distinct wetland types or functional zones:

- coastal water and estuarine (intertidal) zone

¹⁰⁶ BMT WBM. (2015). *Abbot Point Growth Gateway Project: Technical Report for Wetland Hydrology, Water Quality and Aquatic Ecology Components (MNES)*.

- hypersaline or open pan zone
- wetland basin zone (comprising the open marsh zone and closed marsh zone).

These wetland types are characterised by a mosaic of flora and invertebrate habitats with differences in the predominately ephemeral flora between the wet and dry seasons.¹⁰⁷

It is believed that groundwater flowing northward from the higher topographies to the east and west discharge into the CVW. Groundwater forms an important source to the wetlands during the dry season when freshwater inputs are minimal.

This is inferred due to the deep pools of water maintained in some areas during the dry season, for example a central pool in the wetland basin zone that experiences semi-permanent inundation and is referred to as Lake Caley. Groundwater may also interact with the CVW surface water within the hyporheic zone beneath ephemeral waterways, indicated by the shallow depth to groundwater suggested below Branch Creek, Goodbye Creek, Maria Creek, Kangaroo Creek, Saltwater Creek, Plain Creek, Split Creek, Splitters Creek, Tabletop Creek and Mount Stuart Creek.

8.7.2 Surface Water

Previous work done¹⁰⁸ identified the key water resources in the study area as:

- Saltwater Creek, Euri Creek, Don River and Elliot River
- tidal creeks including Splitters Creek, Branch Creek and Mount Stuart Creek
- ephemeral creeks including Six Mile Creek and Goodbye Creek
- CVW and Lake Caley.

Most waterways in the study area drain northwards towards Abbot Bay and the Coral sea.

An assessment of the waterway barrier works stream classification within the study area highlights the presence of a number of streams at risk of adverse impact of fish movement as a result of barrier works. The study area includes a number of waterways that are likely to provide fish passage and require assessment where proposed development includes waterway barrier works. Under the *Water Act 2000* (Water Act), a watercourse is a reference to anywhere that is upstream of the downstream limit of the watercourse. **Figure 43** shows the waterways under the Fisheries Act in the study area and **Figure 44** shows the watercourses defined under the Water Act.

¹⁰⁷ *Abbot Point Cumulative Impact Assessment*. (2014). Part C Chapter 14: Natural Environment.

¹⁰⁸ Adaptive Strategies and Open Lines Environmental Consulting. (2015). *Abbot Point Master Planning: Supporting report - environmental, social and cultural heritage values version 3 (Final) October 2015*.

Table 35: Waterways in the study area (2015)

Waterway name	Risk rating under the Fisheries Act	Downstream limits defined by the Water Act	Notes on condition of waterway ¹⁰⁹
Saltwater Creek	4 - Purple (Major)	No – unmapped watercourse.	Saltwater Creek is a permanent watercourse located to the south-east of the existing port terminal (T1) and it flows into the eastern end of the CVW. Typically, Saltwater Creek holds water for most of the year and despite its name, it is a freshwater system. Most of the land around Saltwater Creek has been cleared and the riparian banks have been invaded by weeds. Despite this, the creek has high habitat value for waterbirds and fish and offers important refuge to a range of wetland fauna.
Euri Creek	4 - Purple (Major)	Yes – located west of Merinda and east of Abbot Point Road.	Saltwater intrusion and sand chokes are major issues for Euri Creek. Limited water monitoring has occurred, but pesticide concentrations have been identified in 2007 as being below Australian and New Zealand Environment and Conservation Council (ANZECC) guidelines.
Don River	4 - Purple (Major)	Yes – located west of the Town of Bowen.	Saltwater intrusion and sand chokes are major issues for the Don River. Limited water monitoring has occurred, but pesticide concentrations have been identified in 2007 as being below ANZECC guidelines.
Elliot River	4 - Purple (Major)	Yes – far west of study area.	Sand chokes are an issue for Elliot River, impeding flow in some areas, likely because of soil loss and erosion.
Splitters Creek	4 - Purple (Major)	No – unmapped watercourse.	In good condition except for some upstream areas adjacent to grazing lands which have increased sediment loads.
Branch Creek	-	No – unmapped watercourse.	-
Six Mile Creek	3 – Red (High)	No – unmapped watercourse.	-
Goodbye Creek	-	No – unmapped watercourse.	-
Plain Creek	3 – Red (High)	No – unmapped watercourse.	-
Caley Valley Waterhole	2 – Amber (moderate)	No – unmapped watercourse.	-
Breakfast Creek	2 – Amber (moderate)	No – unmapped watercourse.	-
Maiden Creek	2 – Amber (moderate)	No – unmapped watercourse.	-
Sandy Creek	2 – Amber (moderate)	No – unmapped watercourse.	-

¹⁰⁹ Great Barrier Reef Marine Park Authority. (2013). *Don basin assessment: Burdekin dry tropics natural resource management region*. GBRMPA, Townsville.



Figure 43: Waterways in the study area (*Fisheries Act 1994*)



Figure 44: Watercourses in the study area (*Water Act 2000*)

8.7.3 Groundwater

Most of the study area is within zone 14 of the Bowen Groundwater Management area and is managed groundwater sharing rules under the *Water Regulation 2016*. The study area is not within a water plan area. The Splitters Creek borefield is the main water source within the study area, located approximately 14km west of the port. The existing T1 draws its water from this aquifer which provides an allocation of 250 millilitres per annum.¹¹⁰

Previous groundwater assessments assessed the existing groundwater conditions in the study area.¹¹¹ The 2014 study focused on the CVW and in 2015, the study focused on the existing terminal area which includes North Queensland Export Terminal 2 (T2) and adjoining industrial land. The results of these investigations were:

- pH of groundwater varied between 6.4 and 8.1 (slightly acidic to slightly alkaline)
- sodium and chloride were the dominant salts in the groundwater
- total dissolved solids (salinity) range from 800 milligrams per litre to 105,000 milligrams per litre (brackish to hypersaline brine).

Groundwater movement within the study area is generally towards the CVW and the coast, with rainfall recharge occurring in the higher terrain (refer to **Figure 45**¹¹²). Groundwater levels fluctuate seasonally with the wet and dry season and sustained pools of water in some waterways and Lake Caley during the dry season, indicates that there is evidence of hydraulic connection with groundwater.¹¹³

In addition to supporting diversity of flora and fauna in the study area, groundwater levels are also important in suppressing the activation of ASS. Groundwater is integral to wetland components and processes. Most wetlands are groundwater dependent ecosystems and to manage groundwater dependent ecosystems it is essential to know where they are, and the extent and nature of their dependence on groundwater.

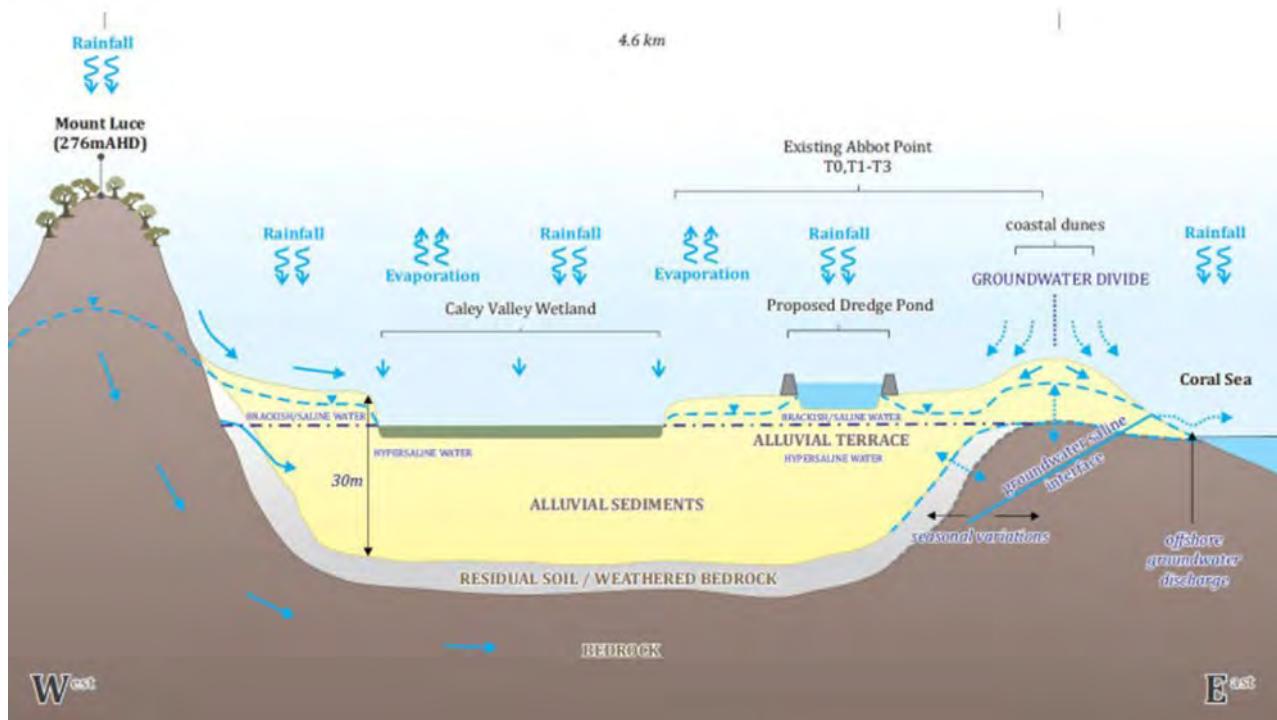


Figure 45: Conceptual hydrogeological model (Source: Advisian, 2015)

¹¹⁰ Ibid 105

¹¹¹ Ibid 101

¹¹² Ibid 101

¹¹³ GHD. (2012). *Abbot Point Cumulative Impact Assessment: Technical Report – Groundwater Assessment, Version 1 Revision E*.

8.7.4 Potential impacts/threats

The potential impacts on freshwater aquatic ecosystems in the study area from the port, other coastal industrial development and coastal residential development are presented in **Appendix P** and summarised below:

Water quality

- degraded surface water quality due to increased turbidity, sedimentation, increased salinity, increased nutrient levels, pesticides and chemicals
- PASS
- changes in groundwater levels exposing PASS
- environmental harm from PASS in dredge spoil.

Groundwater

- impacts to groundwater from significant earthworks, contamination or overuse during dry periods
- disruption of hydraulic connection between surface and groundwater and changes in groundwater levels.

Wetlands

- extensive clearing for cultivation and development and construction of waterway barriers resulting in a changed hydrological regime and declining health/dieback of wetland communities
- temporary displacement of migratory birds during reclamation activities at the port
- ongoing operational impacts including noise, light, dust resulting in displacement of shorebirds from habitat
- encroachment of residential development and increased cultivation resulting in displacement of shorebirds from habitat.

8.8 Aquatic ecosystems – estuarine and marine

8.8.1 General ecological description

The marine component of the study area lies completely within the GBRWHA. Coastal marine areas within the study area extend from Cape Upstart National Park to south of Bowen at Edgumbe Bay. The marine areas located near Cape Upstart are designated as a marine national park zone. The zoning changes north of the Elliot River to a Habitat Protection Zone which extends to the Abbot Bay Resource Reserve. The General Use Zone continues to just south of Bowen, excluding the area that is designated as port land. A second Habitat Protection Zone is located off Bowen, with a second General Use Zone extending approximately 5.5km around Middle Island.

8.8.2 Marine water quality

Marine water quality in the study area is driven by coastal and fluvial processes, which influences the diversity and abundance of marine fauna and flora. Seasonal variations in rainfall, wind, tides, and currents, freshwater runoff, increases sediment transport in the nearshore, with increases in turbidity and nutrient levels in the coastal marine environment.

Changes in marine water quality include the generation of turbid plumes, the release and migration of contaminants and a change to the flushing regime. Contaminants from the study area such as coal dust, shipping activities, activated ASS, disturbances of the seabed and run off also affect marine water quality.

Marine water quality is also influenced and adversely impacted by cyclone activity, through high intensity rainfall and strong winds which can stir up and transport sediment from the sea floor.

A baseline marine water quality monitoring program was implemented at Abbot Point in 2015–16 and an ambient water quality monitoring program surrounding the priority Port of Abbot Point commenced in 2017. There are five monitoring sites that align with key sensitive receptors (for example, seagrass and coral), along with key features in the study region (for example, river flow points). There is a strong seasonal pattern for water

temperature which was highest during the summer months.^{114 115} In some instances, conductivity also exhibited seasonality, with significantly lower conductivity during the wet season, which is most likely a result of rainfall events including cyclones and freshwater inputs from creeks.^{116 117}

Turbidity across the monitoring sites is significantly higher during the wet season than during the dry season¹¹⁸ and while turbidity is generally well mixed throughout the water column, it was generally highest near the seafloor which has implications for the protection of benthic habitats such as coral and seagrass.¹¹⁹ Turbidity at Abbot Point is likely wind and wave driven. All other physicochemical parameters including dissolved oxygen, temperature, electrical conductivity, pH and turbidity are well mixed throughout the water column.¹²⁰

While some herbicides were detected during the 2018–19 sampling period, their concentrations did not exceed relevant guideline values and all other herbicides and pesticides were below the laboratory limits of detection.¹²¹

While phosphorus and nitrogen are essential for the growth of organisms, excess nutrients (eutrophication) can stimulate the growth of macrophytes and algae, which can result in an increase in chlorophyll, in the water column. During the 2017–18 monitoring period, nutrients including particulate nitrogen, particulate phosphorus and chlorophyll exceeded the local relevant guideline values at some sites.¹²²

Between 2015 and 2019, dissolved metals and organics (hydrocarbons and Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene) concentrations were mostly below laboratory reporting limits or were low where recorded and were well below guideline values.¹²³

8.8.3 Coastal processes

8.8.3.1 Bathymetry

The existing Wharf 1 is located approximately 2.8km offshore in water depths of 17m, below Lowest Astronomical Tide (LAT) and the nearshore bathymetry to the east and north-east slopes down gradually. Clark Shoal is located approximately 1.7km west of the existing berth and is comprised of a relatively shallow (2m to 4m deep) sandy platform. Offshore of the shoal, the seabed rapidly decreases to approximately -17m LAT.

8.8.3.2 Tides

Tides at Abbot Point are semi-diurnal (two high tides and two low tides occur each day). These tides have a spring/neap cycle of approximately seven days, with a maximum tidal range of 2.4m. Tidal planes for Abbot Point, as published by MSQ, are presented in **Table 36**¹²⁴. The tidal elevation records for 2020 are presented in **Figure 46**¹²⁵.

Table 36: Tidal planes at Abbot Point (Maritime Safety Queensland 2021)

Tidal Plane	Tidal Level (mean LAT)
HAT	3.6
Mean High Water Springs	2.7
Mean High Water Neaps	2.07
AHD	1.63
Mean Low Water Neaps	1.3
Mean Low Water Springs	0.67
LAT	0.00

¹¹⁴ Vision Environment (2016). *Abbot Point Ambient Water Quality Monitoring: October 2015 to October 2016*. North Queensland Bulk Ports. Vision Environment, Gladstone Australia

¹¹⁵ Vision Environment (2017). *Abbot Point Ambient Water Quality Monitoring: July 2016 to June 2017*. North Queensland Bulk Ports. Vision Environment, Gladstone Australia

¹¹⁶ Ibid 119

¹¹⁷ Ibid 120

¹¹⁸ Ibid 119

¹¹⁹ Ibid 119 and 120

¹²⁰ Ibid 124

¹²¹ Ibid 124

¹²² Ibid 124

¹²³ Ibid 124

¹²⁴ Maritime Safety Queensland (2021) Semidiurnal Tidal Planes 2021. <https://www.msq.qld.gov.au/Tides/Tidal-planes-Accessed:20/07/2021>

¹²⁵ Ibid

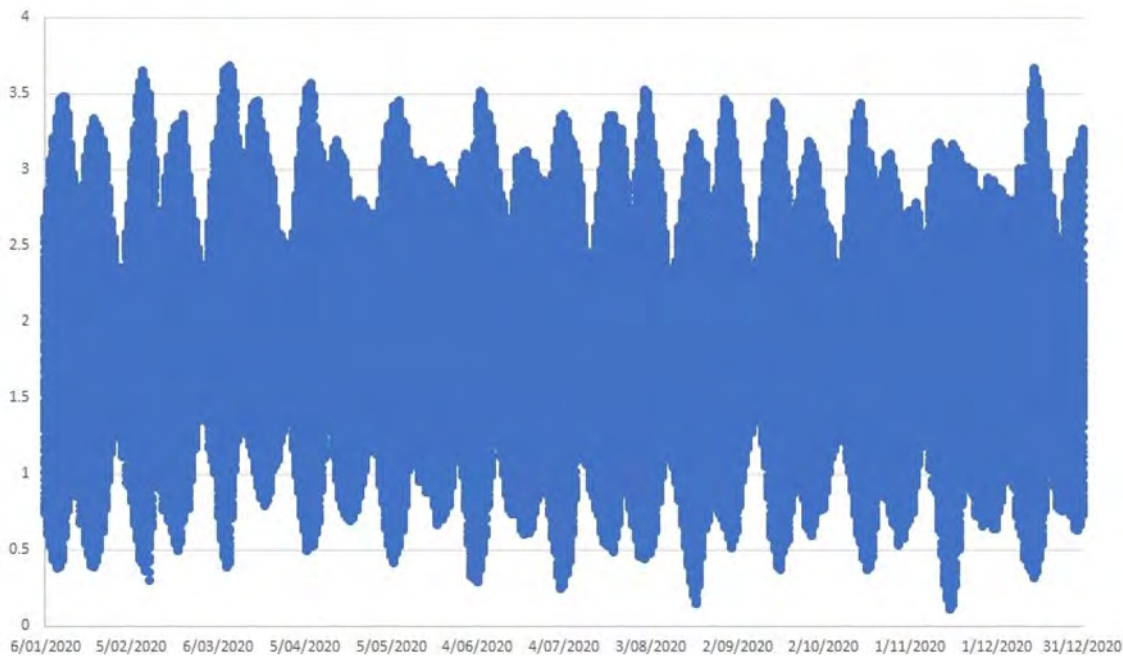


Figure 46: Tidal elevation recorded at Bowen (Maritime Safety Queensland 2021)

8.8.3.3 Currents

Current speeds have been measured to the west and east of the existing wharf. Currents are strongest to the east with a peak of 0.3m per second during the spring tide and 0.1m per second during the neap tide. Current measurements to the west were consistently less than 0.1m per second.¹²⁶ These measurements indicated that the peak flood currents occur just before high water and flow to the east-south-east and peak ebb currents occur just before low water and flow to the west-north-west.

Current measurements at locations approximately 20km offshore from the Wharf 1 have shown that currents in the GBR lagoon are influenced by astronomical tides and local winds.¹²⁷

8.8.3.4 Waves

Abbot Point is protected from most long period oceanic swells by the GBR which is located offshore. Tropical cyclones, however, do occasionally generate large waves inshore of the reef that impact this area.

A wave rider buoy is located approximately 2km from the priority Port of Abbot Point in 14m of water. This instrument provides a continuous measurement of parameters including significant wave height, maximum wave height, wave energy, wave direction and sea surface temperature. Measurements at this site indicate that wave heights exceed 0.5m approximately 50% of the time with relatively frequent significant wave heights of 1.0m.¹²⁸

8.8.3.5 Sediment Transport

Multiple studies of the sediment properties at Abbot Point have been undertaken since 2004 in relation to maintenance and capital dredging projects at the port. These studies indicated that the sediments were composed of silty sands with underlying clays¹²⁹, medium to coarse-grained sands and fine gravels.^{130 131} The most recent study indicated that the sediments were composed of 60% very fine sand and 40% silts and clays.¹³²

¹²⁶ WorleyParsons. (2015). *Abbot Point Growth Gateway Project Dredging and Onshore Placement of Material Numerical Modelling Report*.

¹²⁷ Ibid

¹²⁸ GHD Pty Ltd. (2012). *Abbot Point, T0, Terminal 2 and Terminal 3 Capital Dredging Public Environment Report* (EPBC 2011/6213/GBRMPA G34897.1)

¹²⁹ WBM Oceanics Australia (WBM). (2005). *Sampling and Analysis Plan for Capital Dredging Material – Port of Abbot Point*. Ports Corporation of Queensland.

¹³⁰ GHD Pty Ltd. (2009). *Report for Proposed Multi Cargo Facility, Abbot Point: Preliminary Sediment Quality Assessment*. Ports Corporation of Queensland

¹³¹ GHD Pty Ltd. (2010). *Proposed Abbot Point Multi Cargo Facility Environmental Impact Statement*. North Queensland Bulk Ports Corporation, May 2010

¹³² GHD Pty Ltd. (2012) *Abbot Point, Terminals 0, 2 and 3 Capital Dredging Sediment Sampling and Analysis Plan Implementation Report*. Mackay: North Queensland Bulk Ports Corporation Limited.

As the port is located offshore in relatively deepwater, the natural sediment transport rates in the area are relatively low.¹³³ In deep areas like this, sediment movements are predominantly due to tidal currents rather than wave action.¹³⁴ In the coastal area at Abbot Point, the large spring tides create tidal currents, that along with a mild wave climate, stir up sediments in the shallow areas at low tides. There is also a northerly longshore transport of sand along the beaches driven by south-easterly waves and westerly longshore transport of sand along the beaches to the west of Abbot Point driven by south-easterly waves refracted around Abbot Point.⁸⁴

8.8.4 Marine plants

Marine plants include mangroves, seagrass, salt couch, samphire (succulent) vegetation and adjacent plants such as melaleuca and casuarina. All marine plants are protected under the Fisheries Act as these habitats provide shelter, food and nursery areas for fish, especially estuarine dependent species. They are considered a vital natural resource that helps sustain fish numbers in the future for commercial, traditional and recreational fishing.

8.8.4.1 Mangroves and saltmarsh

Mangroves are an integral part of the GBR ecosystem as these habitats support ecologically diverse communities of plants and animals that include fish, crustaceans, molluscs, insects, mammals and reptiles.¹³⁵ Saltmarshes generally occupy the hyper-saline soils of the upper inter-tidal zone and are generally found growing on the landward side of mangroves. They are made up of salt tolerant plants including sedges, rushes, reeds, grasses, succulent herbs and shrubs.¹³⁶ The areas of bare ground in and around saltmarsh habitats are known as saltflats and are covered in mats of algae during the wet season.¹³⁷ See **Figure 47** below illustrating the saltmarsh and mangroves areas within and adjacent to the study area

Mangroves and saltmarshes are particularly important as they form ecosystems that link the marine and terrestrial environments and provide habitat for both marine and terrestrial organisms. Many mangrove and saltmarsh dependent organisms also depend on other adjacent habitats during the low tide. As the high tide retreats, these organisms leave mangroves and saltmarshes to shelter in nearby seagrass beds and mudflats located in deeper water,¹³⁸ highlighting the importance of the connection between these habitats for species diversity and abundance.¹³⁹

Mangroves are also ecologically important as they act as a filter for nutrients and sediments, reduce erosion, maintain water quality, provide protection from storms and cyclones and act as a carbon sink.

Approximately 673ha of mangrove forests occur within the western estuarine zone of the CVW and are associated with three tidal channels flowing into Curlewis Bay and Saltwater Creek.¹⁴⁰ Saltwater Creek to the east of the study area also supports mangroves.¹⁴¹ Some areas have experienced excessive ponding of water, around the western bund, which has led to root anoxia and localised mangrove dieback.⁶⁸

Milky Mangrove (*Excoecaria agallocha*) is the dominant mangrove species in the Saltwater Creek area in the CVW. While the Red Mangrove (*Rhizophora stylosa*) and Yellow Mangrove (*Ceriops tagal*) dominate in the western estuarine zone of CVW.¹⁴²

There are small areas of mangroves present on Cape Upstart Island, North Head Island and Stone Island.

¹³³ BMT WBM. (2018). *GBR Quantitative Sediment Budget Assessment*. Queensland Ports Association.

¹³⁴ GHD Pty Ltd. (2012). *Abbot Point, Terminals 0, 2 and 3 Capital Dredging Sediment Sampling and Analysis Plan Implementation Report*. Mackay: North Queensland Bulk Ports Corporation Limited.

¹³⁵ Lovelock, C. (1993). *Field Guide to the Mangroves of Queensland*, Australian Institute of Marine Science, Townsville. p72. <http://www.aims.gov.au/pages/reflib/fgmangroves/pages/fgm-qld-index.html>

¹³⁶ Department of Environment and Energy. (2016). *Coastal wetlands – Mangroves and saltmarshes*.

¹³⁷ Goudkamp, K. and Chin, A. June. (2006). 'Mangroves and Saltmarshes' in Chin, A. (ed) *The State of the Great Barrier Reef On-line*, Great Barrier Reef Marine Park Authority, Townsville. Viewed on 7/09/2021, http://www.gbrmpa.gov.au/publications/sort/mangroves_saltmarshes.

¹³⁸ Skilleter, G.A. and Loneragan, N.R. (2002). 'Assessing the Importance of Coastal Habitats for Fisheries, Biodiversity and Marine Reserves: A New Approach Taking into Account "Habitat Mosaic"', in *Aquatic Protected Areas. What works best and how do we know?* Proceedings of the World Congress on Aquatic Protected Areas, eds J. Beumer, A. Grant and D.C. Smith, Cairns, Australia, 240-249pp.

¹³⁹ Mumby, P.J. (2006). 'Connectivity of reef fish between mangroves and coral reefs: Algorithms for the design of marine reserves at seascape scales', *Biological Conservation* 128: 215-222.

¹⁴⁰ BMT WBM. (2012). *Kaili (Caley) Valley Wetlands Baseline Report*.

¹⁴¹ Abbot Point Master Planning Supporting - environmental, social and cultural heritage values. (2015).

¹⁴² Ibid 140



Figure 47: Area of saltmarsh and mangroves within and adjacent to the study area

8.8.4.2 Seagrass and macroalgae

Seagrasses are extremely important to ecosystem function with a variety of food webs dependent upon decaying seagrass leaves and other components.¹⁴³ They are primary producers, and act to stabilise bottom sediments and are an effective store for carbon.¹⁴⁴ Accordingly, seagrass meadows area could play a role in mitigating climate change given seagrass habitats are thought to be efficient in carbon sequestration.

Since 2008 there have been three-yearly broad scale surveys of the marine habitat within the priority Port of Abbot Point port limits and regular surveys of inshore and offshore seagrass meadows along with areas outside the zone of influence of the port activity and development.¹⁴⁵ As seagrass distribution and condition depend on light availability and temperature, these parameters are part of the monitoring program.

During the 2019 survey, five seagrass species were observed. Offshore from deepwater assemblages were dominated by *Halophila spinulosa* with *Halophila decipiens* and *Halophila ovalis* also present. The inshore meadows were dominated by *Halophila ovalis* with *Zostera muelleri* occurring near the mouth of Euri creek. Other species present during previous surveys but not observed during the 2019 survey include *Cymodocea rotundata*, *Cymodocea serrulata*, *Syringodium isoetifolium* and *Halophila tricostata*.¹⁴⁶

During the 2019 survey, the condition of inshore seagrass habitat was classified as satisfactory and offshore seagrass habitat was classified as good. The broadscale survey in 2019 found a slightly lower coverage of seagrass compared to previous surveys and seagrass biomass across the region was lower than the 2016 survey, but greater than 2008 and 2013.¹⁴⁷

The seagrasses in the priority Port of Abbot Point monitoring meadow were classified as in satisfactory condition overall in 2019 and remain in recovery phase after cumulative years of impacts from tropical cyclones. Seagrass meadows are highly dynamic and their coverage and density tend to decrease during the wet season and recover during the dry season. This is likely a response to increased sediment from higher rainfall and terrestrial runoff, resulting in higher turbidity and reduced benthic light availability. Seagrass distribution and

¹⁴³ Papenmeier, S et al. (2020). *Seafloor Geomorphology as Benthic Habitat (Second Edition)* GeoHab Atlas of Seafloor Geomorphic Features and Benthic Habitats. PP 451-460. <https://www.sciencedirect.com/science/article/pii/B9780128149607000257>.

¹⁴⁴ Australian Institute of Marine Science. (2021). *A vulnerability assessment for the Great Barrier Reef*. https://www.gbrmpa.gov.au/_data/assets/pdf_file/0017/21743/VA-Seagrass-31-7-12.pdf. Accessed July 2021.

¹⁴⁵ Van De Wetering, C et al. (2020). *Port of Abbot Point Long-Term Seagrass Monitoring Program – 2019. Report No. 20/12. A Report for the North Queensland Bulk Ports Corporation Limited (NQBPC). Centre for Tropical Water & Aquatic Ecosystem Research (TropWater). James Cook University*

¹⁴⁶ GHD (2010). *Proposed Abbot Point Multi Cargo Facility Environmental Impact Statement*. Prepared for North Queensland Bulk Ports Corporation, May 2010

¹⁴⁷ Ibid

density at the site is naturally variable due to seasonal changes and environmental factors including rainfall, cyclones and flooding.¹⁴⁸

Seagrass is an important environmental value in the study area due to it being the primary food source for dugongs in the area and a major food source for marine turtles. It also provides important foraging grounds for certain species of dolphin and cetaceans. Seagrass is an important habitat for many fish species and marine invertebrates, providing shelter, food and nursery areas that support the future for commercial, traditional and recreational fishing. Some species of sharks on the GBR move between different habitats at various stages of their life cycle, using seagrass beds as nurseries or foraging grounds.¹⁴⁹

None of the algae or seagrass species identified in the study area are listed under the EPBC Act, however, seagrass and macroalgae communities are protected under the Fisheries Act and are matters of environmental significance as inherent marine plants.

Macroalgae play an important role as shelter, food and nursery areas for fish species and marine invertebrates. Low density algal communities have been identified across the study area. These algal communities have included nine green algae (*phylum Chlorophyta*) species, four brown algae (*phylum Phaeophyta*) species and seven red algae (*phylum Rhodophyta*) species.¹⁵⁰

Macroalgae has been monitored as part of the Abbot Point ambient coral monitoring program since 2016 at Camp Island and Holbourne Island. As Holbourne Island has a more mid-shelf location than Camp Island, there is a lower macroalgae coverage, as is normally the case on inshore fringing reefs. During the 2019–20 survey at Holbourne Island, there was a temporary peak in *Padina* cover of 12.3% before it returned to previous levels. During this same period, macroalgae cover at the Camp Island location fluctuated between 33% and 40% cover for *Sargassum*. There have been fluctuations in macroalgae cover at these sites over the past three surveys which is likely due to normal seasonal nutrient fluctuations with higher cover prior to the wet season and lower cover post wet season.¹⁵¹

8.8.5 Coral Reefs

Coral reefs exist in the Abbot Point region and consist of near-shore and mid-shelf reefs. Reef communities comprising hard and soft corals exist at Camp Reef, Middle Island Reef, Holbourne Island, Stone Reef, North Head Reef and Thomas Reef (**Figure 48**).

Coral reef monitoring has been undertaken at two islands in the Abbot Point region since 2016. Camp Island is a small near-shore island located 2.5km from the mouth of the Elliot River, south of Cape Upstart and 17km north of Abbot Point. The island is surrounded by water less than 10m deep and the surrounding fringing reefs are shallow in less than 3m of water. Holbourne Island is a small mid shelf reef surrounded by a fringing reef located 32km north north-east of Abbot Point, where the reef extends down to over 20m depth.

¹⁴⁸ McKenna, S. A., Sozoy, A. M., Scott, E. L. and Rasheed, M. A. (2016). *Port of Abbot Point Long-Term Seagrass Monitoring Annual Report 2014 – 2015*. Report No. 16/21. May 2016

¹⁴⁹ Great Barrier Reef Marine Park Authority. (2011). *A vulnerability assessment for the Great Barrier Reef: Sharks and Rays*.

¹⁵⁰ Advisian. (2015). *Abbot Point Growth Gateway Project Environmental Impact Statement Volume 2 - Environmental Impact Statement 17* August 2015 and Ecological Australia and Open Lines. (2012). *Abbot Point Cumulative Impact Assessment: Part C – Impact Assessment, Chapter 12 – World and National Heritage*, prepared for North Queensland Bulk Ports Corporation Limited.

¹⁵¹ Ayling, T et al. (2020). *Port of Abbot Point Ambient Coral Monitoring Surveys: 2019 – 2020*. Centre for Tropical Water and Aquatic Ecosystem Research (TropWater) Publication 20/45, James Cook University, Cairns.



Figure 48: Reefs and shoals in the Abbot Point study area

The hard coral communities at Camp Island are dominated by the fast-growing *Acropora* and *Montipora* species. At Harbourne Island, the shallow sites were dominated by *Montipora* and *Faviid* corals and the deep sites were dominated by *Acropora*, *Montipora*, *Faviid* and *Poritid* corals.¹⁵²

The Holbourne Island shallow and deep monitoring sites were severely impacted by Cyclone Debbie in March 2017 and the severe coral bleaching episode in early 2020 that affected much of the greater central and southern GBR. Cyclone Debbie resulted in a loss of more than 75% of coral cover and the recovery since has been negligible at Holbourne Island. While damage at the Camp Island inshore monitoring site from Cyclone Debbie was minimal due to the cyclone trajectory, 32% of the Camp Island corals were bleached during the 2019–20 survey.¹⁵³

The mean percentage of benthic composition has varied for each site since monitoring began in 2016. At Camp Island, the benthic cover is composed mainly of macroalgae (65% to 32%) sand and bare reef, crustose corallines and algal turf (16% to 46%) and hard coral (25% to 12%) with sponges (0.8% to 4%) and soft corals (0.19% to 0.28%) making up a smaller part of the benthic environment. At Holbourne Island, the benthic cover is composed mainly of sand and bare reef, crustose corallines and algal turf (64% to (92%) with hard corals (4% to 21%), soft corals (1% to 14%), macroalgae (1% to 12%) and sponges making up a smaller component of the benthic environment (0.2% to 0.6%).¹⁵⁴

The corals on the fringing reefs at Camp Island and Holbourne Island are prone to sedimentation due to the natural sediment resuspension and movement during strong winds and/or spring tides. Port related activities such as dredging can also contribute sediment to the water column but during the 2019–2020 survey no such port related activities occurred. During this monitoring period and for the past two years, the percentage of corals with sediment load and the depth of that sediment increased significantly at all locations. Sediment levels were lower at the more offshore Holbourne Island location than at the more coastal Camp Island location. The

¹⁵² Mumby, P.J. (2006). 'Connectivity of reef fish between mangroves and coral reefs: Algorithms for the design of marine reserves at seascape scales', *Biological Conservation* 128: 215-222.

¹⁵³ Ibid

¹⁵⁴ North Queensland Bulk Ports Corporation Limited. (2020). Coral Monitoring Abbot Point. Data available at: <https://nqbp.com.au/sustainability/coral-monitoring>.

bleaching stress of the corals which reduces the coral polps ability to shed sediment from their surface is likely related to the high levels observed during the latest survey.¹⁵⁵

The size and density of inshore reefs does not result in the mass spawning events more commonly associated with mid shelf and outer reefs. Spawning in this area occurs after the full moon in November. Coral recruitment on the GBR fringing reefs generally ranges from 0.6 to 1.8 recruits per m².¹⁵⁶ At the Abbot Point monitoring sites recruitment varied during the 2020 survey. New coral recruits were recorded at low densities on Holbourne Island (0.9 per m² at the deep location and 0.5 per m² at the shallow location) for the third consecutive year, despite plenty of suitable free space at the shallow Holbourne Island site. The low coral recruitment at Holbourne Reef is possibly due to its relatively isolated position. A range of different coral groups were present in the Holbourne Island recruits including *Acropora* species, *Faviids* and *Poritids*. Recruitment densities were relatively high on Camp Island at approximately 2.0 per m² where the dominant recruitment groups were *Acropora* corals and *Turbinaria*.¹⁵⁷

None of the corals identified in the study area are listed under the EPBC Act or NC Act. Although these corals are considered to be an important environmental value within the study area, previous surveys noted that all corals were very small (less than 1cm to 30cm) and generally found as single colonies occurring at very low densities (less than one colony per ha).¹⁵⁸ It was also determined that none of these coral communities have a particularly high biodiversity.

8.8.6 Fish

Fish communities in this region occupy a range of habitats from coral reefs to subtidal areas of seagrass and macroalgae and intertidal areas including estuaries and mangrove forests. Fish play an important ecological role and form vital links in many trophic ecosystems where small predators such as herring and sardines feed on plankton and are subsequently preyed upon by larger predators such as sharks, tuna and mackerel. It has previously been reported that within the Abbot Point region, fish communities consist of approximately 132 species from 51 families including pelagic, reef and benthic fish species.¹⁵⁹

The PMST identified 33 species of seahorse and pipefish (family *Syngathidae*, also known as bony fishes) which are listed 'marine' under the EPBC Act. These species are typically associated with seagrasses, mangroves, reefs and sand or rubble habitats (**Table 37**). Numerous other fish species that have high recreational and commercial value, and those that support these species (for example, as a food source) are likely to be present in the study area.

¹⁵⁵ Mumby, P.J. (2006). 'Connectivity of reef fish between mangroves and coral reefs: Algorithms for the design of marine reserves at seascape scales', Biological Conservation 128: 215-222.

¹⁵⁶ Ayling, A. Unpublished data

¹⁵⁷ Ibid 155.

¹⁵⁸ WPC (2014) as cited in Adaptive Strategies and Open Lines Environmental Consulting. (2015). *Abbot Point Master Planning: Supporting report - environmental, social and cultural heritage values version 3 (Final) October 2015*.

¹⁵⁹ North Queensland Bulk Ports Corporation Limited. (2010). *Environmental Management Plan*. Port of Abbot Point. January 2010.

Table 37: Fish species present or habitat present in the study area

Species	Common name	Presence within study area
<i>Acentronura tentaculate</i>	Shortpouch Pygmy Pipehorse	Species or species habitat may occur within area.
<i>Campichthys tryoni</i>	Tryon's Pipefish	Species or species habitat may occur within area.
<i>Choeroichthys brachysoma</i>	Pacific Short-Bodied Pipefish, Short-Bodied Pipefish	Species or species habitat may occur within area.
<i>Choeroichthys suillus</i>	Pig-Snouted Pipefish	Species or species habitat may occur within area.
<i>Corythoichthys amplexus</i>	Fijian Banded Pipefish, Brown-Banded Pipefish	Species or species habitat may occur within area.
<i>Corythoichthys flavofasciatus</i>	Reticulate Pipefish, Yellow-Banded Pipefish, Network Pipefish	Species or species habitat may occur within area.
<i>Corythoichthys intestinalis</i>	Australian Messmate Pipefish, Banded Pipefish	Species or species habitat may occur within area.
<i>Corythoichthys ocellatus</i>	Orange-Spotted Pipefish, Ocellated Pipefish	Species or species habitat may occur within area.
<i>Corythoichthys paxtoni</i>	Paxton's Pipefish	Species or species habitat may occur within area.
<i>Corythoichthys schultzi</i>	Schultz's Pipefish	Species or species habitat may occur within area.
<i>Cosmocampus darrosanus</i>	D'arros Pipefish	Species or species habitat may occur within area.
<i>Doryrhamphus excisus</i>	Bluestripe Pipefish, Indian Blue-Stripe Pipefish, Pacific Blue-Stripe Pipefish	Species or species habitat may occur within area.
<i>Festucalex cinctus</i>	Girdled Pipefish	Species or species habitat may occur within area.
<i>Halicampus dunckeri</i>	Red-Hair Pipefish, Duncker's Pipefish	Species or species habitat may occur within area.
<i>Halicampus grayi</i>	Mud Pipefish, Gray's Pipefish	Species or species habitat.
<i>Halicampus nitidus</i>	Glittering Pipefish	Species or species habitat may occur within area.
<i>Halicampus spinirostris</i>	Spiny-Snout Pipefish	Species or species habitat may occur within area.
<i>Hippichthys cyanospilos</i>	Blue-Speckled Pipefish, Blue-Spotted Pipefish	Species or species habitat may occur within area.
<i>Hippichthys heptagonus</i>	Madura Pipefish, Reticulated Freshwater Pipefish	Species or species habitat may occur within area.
<i>Hippichthys penicillus</i>	Beady Pipefish, Steep-Nosed Pipefish	Species or species habitat may occur within area.
<i>Hippocampus bargibanti</i>	Pygmy Seahorse	Species or species habitat may occur within area.
<i>Hippocampus kuda</i>	Spotted Seahorse, Yellow Seahorse	Species or species habitat may occur within area.
<i>Hippocampus planifrons</i>	Flat-Face Seahorse	Species or species habitat may occur within area.
<i>Hippocampus zebra</i>	Zebra Seahorse	Species or species habitat may occur within area.
<i>Micrognathus andersonii</i>	Anderson's Pipefish, Shortnose Pipefish	Species or species habitat may occur within area.
<i>Micrognathus brevirostris</i>	Thorntail Pipefish, Thorn-Tailed Pipefish	Species or species habitat may occur within area.
<i>Nannocampus pictus</i>	Painted Pipefish, Reef Pipefish	Species or species habitat may occur within area.
<i>Solegnathus hardwickii</i>	Pallid Pipehorse, Hardwick's Pipehorse	Species or species habitat may occur within area.
<i>Solenostomus cyanopterus</i>	Robust Ghostpipefish, Blue-Finned Ghost Pipefish	Species or species habitat may occur within area.
<i>Solenostomus paradoxus</i>	Ornate Ghostpipefish, Harlequin Ghost Pipefish Ornate Ghost Pipefish	Species or species habitat may occur within area.
<i>Syngnathoides biaculeatus</i>	Double-End Pipehorse, Double-Ended Pipehorse, Alligator Pipefish	Species or species habitat may occur within area.
<i>Trachyrhamphus bicoarctatus</i>	Bentstick Pipefish, Bend Stick Pipefish, Short-Tailed Pipefish	Species or species habitat.
<i>Trachyrhamphus longirostris</i>	Straightstick Pipefish, Long-Nosed Pipefish, Straight Stick Pipefish	Species or species habitat may occur within area.

The EPBC Act listed fish species that are likely to occur within or in close proximity to Abbot Point are listed in **Table 38**.

Table 38: Fish species identified by the Protected Matters Search Tool as potentially occurring in close proximity to Abbot Point

Species	Common name	EPBC Act	NC Act	Presence in study area
<i>Carcharodon carcharias</i>	great white shark	Vulnerable	-	Species or species habitat may occur within area.
<i>Pristis zijsron</i>	green sawfish	Vulnerable	-	Species or species habitat known to occur within area.
<i>Rhincodon typus</i>	whale shark	Vulnerable	-	Species or species habitat may occur within area.

None of these EPBC Act listed fish species have previously been recorded in the study area. Similarly, while giant manta rays are frequently observed within the coastal marine waters of the study area, there are no known aggregation or feeding sites nearby.¹⁶⁰

8.8.7 Fish habitat areas

A declared FHA is an area which protects key fish habitats that are vital for local fish populations and the sustainability of fish stocks, while still allowing legal fishing. Listed as a MSES, FHAs only allow authorised works to be undertaken. This includes limited development, mostly for public works. Private development is restricted. FHAs enable the protection of inshore and estuarine fish habitats (for example, vegetation, sand bars and rocky headlands) in order to facilitate sustainable local and regional fisheries.¹⁶¹

There are two declared FHAs in the study area, the Edgumbe Bay declared FHA located 17km south-east of Bowen, and the Burdekin declared FHA, located within the north-west section of the study area, south of Cape Upstart National Park.

Outside of the FHAs, the study area contains large areas of fish habitat in the western estuary and coastal waters. The intertidal habitats include mangroves, tidal channels with undercut banks, intertidal sand and mud flats in the lower estuary and coastal zone. During high tide periods, these habitats provide shelter and/or foraging areas for fish and shellfish. Subtidal habitats include seagrass and macroalgae which provide refuge during low tide and provide potential breeding and nursery habitat for estuarine and marine fish.¹⁶²

Figure 49 below illustrates the FHAs in the study area.

¹⁶⁰ Ibid 101

¹⁶¹ Department of Environment and Science. (2021). Declared fish habitat areas. <https://parks.des.qld.gov.au/management/managed-areas/fha>.

¹⁶² Ibid 101



Figure 49: Fish habitat areas

8.8.8 Marine reptiles

A total of 22 marine reptiles were identified from the PMST search as potentially inhabiting the study area and are presented in **Table 39**. Of these, three are listed as 'Endangered' and three are listed as 'Vulnerable'. The 'Vulnerable' listed marine species are known to occur in the inshore and offshore waters of the Abbot Point area.

Within the study area, there are no known critical or important habitats for green turtles (*Chelonia mydas*), as defined in the *Recovery Plan for Marine Turtles in Australia*.¹⁶³ The closest identified critical habitat for the survival of green turtles is the Capricorn-Bunker Group islands, 520km south of Abbot Point.¹⁶⁴ A baseline turtle population dynamics study was undertaken in 2003 to determine areas of turtle nesting and foraging at Abbot Point.¹⁶⁵ Green turtles were recorded nesting within the port limits of the priority Port of Abbot Point and 49 green turtles were captured within foraging and courtship areas of Edgumbe Bay. Small populations of green turtles were found residing inside and adjacent to the mouth of Saltwater and Euri creeks and in the sub-tidal rocky reef parallel to the beach at Abbot Point.

A survey of nesting sites in an area extending 6km south of the MOF was undertaken in 2012–13.¹⁶⁶ There was limited evidence of marine turtles nesting with only one track attributed to a green turtle. As per the 2003 baseline assessment, green turtles were associated with the rocky reef that extends approximately 2.5km south of the MOF.

While Abbot Point is not critical to the survival of the green turtle populations as evidenced by the low level of nesting observed, Abbot Point may provide an important mainland nesting habitat in North Queensland and is likely to be ecologically important to individual turtles that return to this nesting beach, as marine turtles show site fidelity to their nesting beaches.¹⁶⁷

¹⁶³ Department of Environment and Energy. (2017). *Recovery Plan for Marine Turtles in Australia*.

¹⁶⁴ Bell, I. (2003). *Turtle population dynamics in the Hay Point, Abbot Point and Lucinda Port Areas*. Funded by NQBP and undertaken by QPWS.

¹⁶⁵ Ibid

¹⁶⁶ CDM Smith. (2013). *Public Environment Report Supplementary - Abbot Point Terminals 0, 2 and 3 Capital Dredging*. Retrieved 2015, from North Queensland Bulk Ports Corporation Limited: <http://www.nqbp.com.au/environment>

¹⁶⁷ GHD Pty Ltd. (2013). *North Galilee Basin Rail Project: Environmental Impact Statement*. GHD Pty Ltd.

The study area is within a Biologically Important Area (BIA) for flatback turtles (*Natator depressus*)¹⁶⁸ (**Figure 50**). Flatback turtle nesting locations occur from the Bundaberg region, north to northern Western Australia and while Abbot Point is not a key nesting area for this species, flatback turtles do nest and forage in the study area.

Flatback turtles were observed nesting and foraging during the baseline survey in 2003¹⁶⁷ and during a marine fauna survey in 2009, 10 observations of flatback turtles were observed in the coastal waters of Abbot Point.¹⁶⁹ Limited evidence of nesting for this species was observed with six tracks attributed to being flatback turtles during a survey undertaken in 2013¹⁷⁰ and 21 tracks in a survey of Abbot Point conducted in 2014.¹⁷¹

As nesting in the Abbot Point area is considered to be low density, this area is not likely to be important or critical to the survival of flatback turtle populations in Queensland, but it may be ecologically important to individual turtles that return to this nesting beach in future.

There are no known critical or important habitat or known nesting (as defined in the *Recovery Plan for Marine Turtles Australia*) for hawksbill turtles (*Eretmochelys imbricata*). No nesting activity has been recorded in the Abbot Point region, however, this species may use the areas of seagrass and macroalgae present in the inshore and offshore areas for foraging.¹⁷²



Figure 50: Biologically Important Area for flatback turtles in the study area

¹⁶⁸ Ibid 183

¹⁶⁹ GHD Pty Ltd. (2009). *Baseline Marine Fauna Report, Port of Abbot Point Baseline Monitoring*. North Queensland Bulk Ports Corporation Limited.

¹⁷⁰ GHD Pty Ltd. (2013). *North Galilee Basin Rail Project: Environmental Impact Statement*. GHD Pty Ltd.

¹⁷¹ Hof, C. and Bell, I. (2014) *Determining the spatial distribution and densities of marine turtle nesting and predator activity in the northern Great Barrier Reef, Queensland*. Final Report to WWF-Australia and Threatened Species Unit, Department of Environment and Heritage Protection.

¹⁷² Ibid 101

Table 39: Marine reptile species of conservation significance present or habitat present in the study area

Species	Common name	EPBC Act	NC Act	Presence within study area
<i>Acalyptophis peronii</i>	Horned Seasnake			Species or species habitat may occur within area.
<i>Aipysurus duboisii</i>	Dubois' Seasnake			Species or species habitat may occur within area.
<i>Aipysurus eydouxii</i>	Spine-tailed Seasnake			Species or species habitat may occur within area or species habitat.
<i>Aipysurus laevis</i>	Olive Seasnake			Species or species habitat may occur within area.
<i>Astrotia stokesii</i>	Stokes' Seasnake			Species or species habitat may occur within area or species habitat.
<i>Caretta caretta</i>	Loggerhead Turtle	Endangered	Endangered	Foraging, feeding behaviour known to occur within area.
<i>Chelonia mydas</i>	Green Turtle	Vulnerable	Vulnerable	Breeding known to occur within area.
<i>Crocodylus porosus</i>	Salt-water Crocodile, Estuarine Crocodile			Species or species habitat likely to occur within area
<i>Dermochelys coriacea</i>	Leatherback Turtle, Leathery Turtle, Luth	Endangered	Endangered	Breeding likely to occur within habitat
<i>Disteira kingii</i>	Spectacled Seasnake			Species or species habitat may occur within area
<i>Disteira major</i>	Olive-headed Seasnake			Species or species habitat
<i>Enhydrina schistosa</i>	Beaked Seasnake			Species or species habitat may occur within area
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	Vulnerable	Endangered	Species or species habitat known to occur within area
<i>Hydrophis elegans</i>	Elegant Seasnake			Species or species habitat may occur within area
<i>Hydrophis mcdowelli</i>	Small-headed Seasnake			Species or species habitat.
<i>Hydrophis ornatus</i>	Spotted Seasnake, Ornate Reef Seasnake			Species or species habitat may occur within area.
<i>Lapemis hardwickii</i>	Spine-bellied Seasnake			Species or species habitat may occur within area.
<i>Laticauda colubrina</i>	a sea krait			Species or species habitat may occur within area or species habitat.
<i>Laticauda laticaudata</i>	a sea krait			Species or species habitat.

<i>Lepidochelys olivacea</i>	Olive Ridley Turtle, Pacific Ridley Turtle	Endangered	Endangered	Breeding likely to occur within area.
<i>Natator depressus</i>	Flatback Turtle	Vulnerable	Vulnerable	Breeding known to occur within area.
<i>Pelamis platurus</i>	Yellow-bellied Seasnake			Species or species habitat may occur within area.

8.8.9 Marine mammals

The study area supports a range of marine fauna species, including species listed under the EPBC Act and the NC Act. Marine fauna includes marine megafauna that are considered as a significant part of the GBR's ecological, cultural and economic values.¹⁷³ Species frequenting coastal waters within the GBR include whales, dolphins, dugongs and marine turtles, sharks, rays, fish and other nekton.

Marine megafauna comprise all large-bodied organisms inhabiting the coastal and open oceans, including bony fishes, sharks and rays, mammals (including whales and dugongs), reptiles (sea turtles), and some species of molluscs including clams, squids, and octopuses.¹⁷⁴

Marine megafauna have a key role in ecosystem functioning and can affect ocean ecosystems in a variety of ways. They consume large amounts of biomass and therefore transport nutrients within and between habitats via excretion. They can connect ocean ecosystems via long-distance migration and physically modifying habitats by way of their feeding, movement and mortality. Marine megafauna include many species that are socially, economically, and culturally important.

Many marine megafauna species are currently threatened by anthropogenic activities, habitat loss, pollution and ocean warming.¹⁷⁵

Marine mammals identified in the PMST are presented in **Table 40** and include species of conservation significance: blue whale, humpback whale and dugong. Abbot Point provides a transitory area for small numbers of humpback whales migrating to and from their breeding grounds within the northern GBR. Known core aggregations areas for humpback whales closest to Abbot Point occur over 100km to the south, off the Mackay coast in the Whitsunday region.¹⁷⁶

Table 40: Marine mammal species of conservation significance present or habitat present in the study area

EPBC Act		NC Act		
E – Endangered		V – Vulnerable		
V – Vulnerable		LC – Least concern		

Species	Common name	EPBC Act	NC Act	Presence within study area
<i>Balaenoptera musculus</i>	Blue Whale	E	LC	Species or species habitat may occur within area.
<i>Megaptera novaeangliae</i>	Humpback Whale	V		Species or species habitat known to occur within area.
<i>Sousa chinensis</i>	Indo-Pacific Humpback Dolphin			Breeding known to occur within area.
<i>Dugong dugon</i>	Dugong			Species or species habitat known to occur within area.

¹⁷³ Ibid 101

¹⁷⁴ Pimiento, C. et al. (2020), Functional diversity of marine megafauna in the Anthropocene. *Science Advances*, 6(16). <https://advances.sciencemag.org/content/6/16/eaay7650>

¹⁷⁵ Ibid

¹⁷⁶ Ibid 101

8.8.9.1 Whales

The humpback whale is a baleen whale that may grow up to 18m in length.¹⁷⁷ The species is migratory, transiting northward from the Southern Ocean feeding grounds toward tropical breeding grounds between May and November each year. Peak northward migration for the east coast population(s) is thought to occur in July and peak southward migration mid-September to October.

Calving along the east coast of Australia is known to occur within the GBR, between about 14°S and 27°S. Calving locations have not been identified precisely, however two areas have been proposed as calving locations including: the southern GBR east of Mackay and an area further south in the Capricorn and Bunker Island groups offshore of Gladstone. Breeding areas within the GBR have not been confirmed. The species is also known to rest in for example, the shallow waters of Hervey Bay, the Whitsundays, Moreton Bay and the Palm Island Group on their southern migration.¹⁷⁸ Subsequently, while there is a BIA for breeding and calving that spans the length of the GBR, this entire area is not expected to represent breeding and calving habitat for this species.

A study by GHD Group¹⁷⁹ indicated that the humpback whale is present seasonally within the Abbot Point area, with 14 individuals sighted in the coastal waters at depths of 5m to 20m within and adjacent to the study area in September 2008. These whales were presumed to be migrating southward as both adults and cow-calf pairs were observed. It is thought that two cow-calf pairs were resting and/or feeding as they remained in an area in 5m water depth on Clark Shoal for some hours.¹⁸⁰ While no important habitat has been identified within the study area this study would indicate the species may opportunistically rest and/or feed on their southward migration within shallow waters.

8.8.9.2 Dolphins

The Abbot Point area supports varying abundances of Australian snubfin and indo-pacific dolphins. The small population may be disconnected from other populations in the region. The indo-pacific humpback dolphin and the Australian snubfin dolphin have been recorded during surveys of the Abbot Point marine area. Over a period of nine months in 2008 and 2009, 112 indo-pacific humpback dolphin and 20 snubfin dolphin sightings were observed at Abbot Point.¹⁸¹ In Australia, these species share similar distributions and habitats. The Abbot Point area provides suitable habitat for these species which prefer shallow (less than 20m deep) coastal waters. In addition, the creek mouths and seagrass beds provide suitable preferred habitat for the snubfin dolphin.¹⁸²

8.8.9.3 Dugongs

The dugong is a large herbivorous marine mammal that is listed as a marine and migratory species under the EPBC Act. Dugongs are seagrass-feeding specialists and are heavily dependent on seagrass for food. Abbot Point is not known to provide any critical breeding, feeding or resting habitat for dugongs in the local or regional area. However, the area is located between two Dugong Protection Areas (DPAs). 'Dugong Sanctuary A' is located at Upstart Bay (44km north-west of Abbot Point) and 'Dugong Sanctuary B' is located at Edgum Bay (35km south-east of Abbot Point).¹⁸³ Local populations of dugongs in these areas are likely to be transient individuals and have a variable abundance in relation to natural variations in seagrass distribution and health.

8.8.10 Migratory marine species

A PMST search on 9 June 2021, identified 22 migratory marine species as potentially occurring within the study area (**Table 41**).

¹⁷⁷ Threatened Species Scientific Committee. (2015). *Commonwealth Conservation Advice for Megaptera novaeangliae*. <http://www.environment.gov.au/biodiversity/threatened/species/pubs/38-conservation-advice10102015.pdf>.

¹⁷⁸ Ibid

¹⁷⁹ GHD Pty Ltd. (2009a). *Terrestrial and Aquatic Ecological Assessment for NQBP Abbot point Multi Cargo Facility (MCF) Environmental Impact Statement*.

¹⁸⁰ Ibid

¹⁸¹ Report for Proposed Abbot Point Multi Cargo Facility: Baseline Marine Fauna Report. Prepared for North Queensland Bulk Ports Corporation Limited.

¹⁸² Eco Logical Australia and Open Lines Environmental Consulting. (2013). *Abbot Point Cumulative Impact Assessment*. Prepared for North Queensland Bulk Ports Corporation Limited. February 2013.

¹⁸³ Ecological Australia and Open Lines. (2013). *Abbot Point Cumulative Impact Assessment Part C – Impact assessment*. Chapter 6 – Threatened and migratory marine fauna.

Table 41: Migratory marine species of conservation significance present or habitat present in the study area

Species	Common name	Presence within study area
Birds		
<i>Anous stolidus</i>	Common Noddy	Species or species habitat known to occur within area.
<i>Apus pacificus</i>	Fork-tailed Swift	Species or species habitat likely to occur within area.
<i>Fregata ariel</i>	Lesser Frigatebird	Species or species habitat may occur within area.
<i>Fregata minor</i>	Great Frigatebird	Species or species habitat may occur within area.
<i>Macronectes giganteus</i>	Southern Giant-Petrel, Southern Giant Petrel	Species or species habitat may occur within area.
<i>Sternula albifrons</i>	Little Tern	Species or species habitat may occur within area.
Mammals		
<i>Megaptera novaeangliae</i>	Humpback Whale	Species or species habitat known to occur within area.
<i>Balaenoptera edeni</i>	Bryde's Whale	Species or species habitat may occur within area.
<i>Balaenoptera edeni</i>	Blue Whale	Species or species habitat may occur within area.
<i>Orcinus orca</i>	Killer Whale, Orca	Species or species habitat may occur within area.
<i>Dugong dugon</i>	Dugong	Species or species habitat known to occur within area.
<i>Orcaella heinsohni</i>	Australian Snubfin Dolphin	Species or species habitat likely to occur within area.
<i>Sousa chinensis</i>	Indo-Pacific Humpback Dolphin [50]	Breeding known to occur within area.
Fish		
<i>Anoxypristis cuspidata</i>	Narrow Sawfish, Knifetooth Sawfish	Species or species habitat likely to occur within area.
<i>Pristis zijsron</i>	Green Sawfish, Dindagubba, Narrowsnout Sawfish	Species or species habitat may occur within area.
<i>Carcharhinus longimanus</i>	Oceanic Whitetip Shark	Species or species habitat may occur within area.
<i>Carcharodon carcharias</i>	White Shark, Great White Shark	Species or species habitat may occur within area.
<i>Lamna nasus</i>	Porbeagle, Mackerel Shark	Species or species habitat may occur within area.
<i>Rhincodon typus</i>	Whale Shark	Breeding known to occur within area.
<i>Manta alfredi</i>	Alfred Manta	Species or species habitat likely to occur within area.
<i>Manta birostris</i>	Giant Manta Ray	Species or species habitat likely to occur within area.
Reptiles		
<i>Caretta caretta</i>	Loggerhead Turtle	Foraging, feeding or related behaviour known to occur within area.

Species	Common name	Presence within study area
<i>Chelonia mydas</i>	Green Turtle	Breeding known to occur within area.
<i>Dermochelys coriacea</i>	Leatherback Turtle, Leathery Turtle, Luth	Breeding known to occur within area.
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	Species or species habitat known to occur within area.
<i>Natator depressus</i>	Flatback Turtle	Breeding known to occur within area.
<i>Crocodylus porosus</i>	Saltwater Crocodile, Estuarine Crocodile	Species or species habitat likely to occur within area.

8.8.11 Potential impacts/threats

Potential impacts on the marine environment, from the port and other coastal industrial development, including coastal residential development and resulting increased anthropogenic activities within the study area are presented in **Appendix P** and summarised below:

Water quality

- vegetation clearing and dredging causing sedimentation and turbidity
- deposition of coal dust causing increased turbidity and smothering of marine communities
- stormwater runoff containing heavy metals, organics and other contaminants
- environmental harm from PASS present in dredge spoil
- coastal processes
- structures placed in the marine environment indirectly changes currents and waves that affect sediment movement
- offshore disposal of dredge spoil resulting in changes to seafloor topography and hydrology.

Mangroves

- clearance of vegetation resulting in edge effects that reduce extent, condition and quality of mangrove and intertidal flora communities
- increased anthropogenic visitation resulting in damage to mangrove seedlings
- accumulation of sediment from dredge plumes in sensitive areas impacting light penetration
- clearing of mangroves as a result of increased coastal development activities including port expansion
- increased coastal development resulting in pollution and decreased water quality which may impact mangrove health.

Seagrass

- increased turbidity due to dredging and placement of rock armour revetment walls resulting in reduced light penetration to seagrass beds causing mortality
- seagrass growth impeded by reduced water quality from surface water runoff containing chemicals and dust
- increased coastal development resulting in increased nutrient, sediment and pesticide loads resulting in seagrass habitat loss
- rising sea surface temperature above tolerance thresholds of seagrass resulting in degradation
- direct loss through port reclamation activities.

Coral reefs

- physical damage and mortality due to maintenance dredging
- mortality and sub-lethal stress from sustained high turbidity and sedimentation following cyclones and flood events

- increased nutrient, sediment and pesticide loads from catchment runoff
- increased ocean acidification from anthropogenic CO₂ emissions resulting in decline of corals.

Fish

- mortality and injury resulting from being trapped within reclamation areas
- surface water runoff, chemical spills and dust deposition resulting in reduced water quality that impacts fish communities
- reduction in breeding/feeding habitat due to increased turbidity and decreased water quality
- port linear infrastructure, upgrades, dredging and land reclamation that result in direct loss or impact to marine plants and waterways that provide fish passage.

Marine megafauna

- increased edge effects by encroachment by residential/industrial development that affects nesting behaviour of turtles
- direct mortality or injury due to vessel strike
- increase in noise, vibration and lighting from ports activities resulting in disruption to migratory routes and behaviour.

Coastal resources

- climate change resulting in increased water temperatures that increases the risk of coral bleaching
- rising concentration of CO₂ increases ocean acidification which affects health of plankton, molluscs, shellfish and coral
- vulnerability of coastal areas to sea level rise (SLR) as the inland migration of wetlands is blocked by growing populations and developments
- coastal areas are vulnerable to increases in intensity of storm surge and heavy rainfall with heavy runoff threatening the health of and quality of coastal waters.

8.9 Biosecurity

8.9.1 Weeds

The PMST indicates Weeds of National Significance, with further desktop investigation undertaken from the search of the Wildnet Database for other potential species. **Table 42** lists the weed species that have been highlighted as potentially occurring and species that have been recorded in the study area. To manage localised weeds a *Biosecurity Management Plan* has been developed for the Whitsunday region¹⁸⁴ to guide pest management within the WRC area.

Chinee apple (*Ziziphus mauritiana*) not listed below has also previously been recorded within the study area. This species is a Category 3 restricted invasive plant under the *Biosecurity Act 2014*.

¹⁸⁴ Whitsunday Regional Council. (2021). *Whitsunday Regional Council Biosecurity Plan: 2021-2025*. Retrieved from <https://www.whitsundayrc.qld.gov.au/downloads/file/209/whitsunday-biosecurity-plan>

Table 42: Weed species identified by the Protected Matters Search Tool as Potentially Occurring in the study area

Species	Common Name	Previously Recorded within the study area	Weed of National Significance ¹⁸⁵
<i>Acacia nilotica subsp. indica</i>	Prickly Acacia	Present	Present
<i>Asparagus aethiopicus</i>	Asparagus Fern	Present	Present
<i>Cryptostegia grandiflora</i>	Rubber Vine	Present	Present
<i>Hymenachne amplexicaulis</i>	Hymenachne	Present	Present
<i>Jatropha gossypifolia</i>	Cotton-Leaved Physic-Nut	Present	Present
<i>Lantana camara</i>	Lantana	Present	Present
<i>Mimosa pigra</i>	Mimosa	Present	Present
<i>Parkinsonia aculeata</i>	Parkinsonia	Present	Present
<i>Parthenium hysterophorus</i>	Parthenium Weed	Present	Present
<i>Prosopis spp</i>	Mesquite	Present	Present
<i>Salvinia molesta</i>	Salvinia	Present	Present

Both the WRC and NQBP have Biosecurity Management Plans. NQBP's *Biosecurity Management Plan*, May 2019 includes additional species: Bellyache Bush (*Jatropha gossypifolia*); Velvet Tree Pear (*Optunia tomentosa*); Chinese Apple (*Ziziphus mauritiana*); Snakeweed (*Stachyarrheta sp*); Rhodes grass (*Chloris sp*); Hyptis (*Hyptis suaveolens*); Red natal (*Melinis repens*); Stinking Passionflower (*Passiflora foetida*); and Tridax Daisy (*Tridax procumbens*).

The WRC *Biosecurity Plan 2021–25*, developed under the Regional Pest Management Strategies, coordinates a feral animal control program and a weed management program. The feral animal control program includes land based and aerial animal baiting and aerial shooting. Its weed management program includes weed mapping, development of property pest plans and spraying noxious weeds.

8.9.2 Pests

The PMST search undertaken in June 2021 identified several fauna pest species as potentially occurring, including the goat, red fox, cat, rabbit, pig, water buffalo and cane toad. Most of these species have been recorded to occur in the study area and are presented in **Table 43**.

Table 43: Pests in the study area

Species	Common Name	Type of presence
Birds		
<i>Acridotheres tristis</i>	Common Myna, Indian Myna	Likely
<i>Anas platyrhynchos</i>	Mallard	Likely
<i>Columba livia</i>	Rock Pigeon	Likely
<i>Lonchura punctulata</i>	Nutmeg Mannikin	Likely
<i>Passer domesticus</i>	House Sparrow	Likely
<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	Likely
<i>Streptopelia chinensis</i>	Spotted Turtle-dove	Likely
<i>Sturnus vulgaris</i>	Common Starling	Likely
Mammals		
<i>Bos taurus</i>	Domestic Cattle	Likely
<i>Canis lupus familiaris</i>	Domestic Dog	Likely
<i>Capra hircus</i>	Goat	Likely

¹⁸⁵ Department of Sustainability, Environment, Water, Population and Communities. (2012). *Weeds of National Significance*. <http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html>.

Species	Common Name	Type of presence
<i>Felis catus</i>	Cat	Likely
<i>Mus musculus</i>	House Mouse	Likely
<i>Oryctolagus cuniculus</i>	Rabbit	Likely
<i>Rattus rattus</i>	Black rat	Likely
<i>Sus scrofa</i>	Pig	Likely
<i>Vulpes vulpes</i>	Red Fox	Likely
Frogs and reptiles		
<i>Rhinella marina</i>	Cane Toad	Likely

Invasive Marine Species can be introduced through a variety of vectors including:

- biofouling on vessel hulls and other external niche areas
- internal biofouling of vessel internal niches (for example, bilge space, ballast tanks etc)
- biofouling on equipment routinely immersed in water (for example, dredging gear)
- biological organisms in ballast water (for example, microscopic larvae, propagules)
- biological organisms in sediment (for example, invertebrates, macroalgae or propagules associated with anchors and anchor chains).

Invasive Marine Species that present a significant risk to biosecurity in the study area are monitored for on a quarterly basis and include:

- Asian green muscle (*Perna viridis*)
- American slipper limpet (*Crepidula fornicata*)
- Asian basket clam (*Potamocorbula amurensis*)
- Asian shore crab (*Hemigrapsus sanguineus*)
- black striped mussel (*Mytilopsis salleri*)
- Chinese mitten crab (*Eriocheir sinensis*)
- Asian paddle crab (*Charybdis japonica*)
- veined whelk (*Rapena venosa*)
- soft shell clam (*Mya arenaria* and *Mya japonica*).

NQBP and all Queensland GBR ports are part of a voluntary pilot program in partnership with DAF which is looking to improve early detection of marine pest threats. The pilot program is based on environmental deoxyribonucleic acid (DNA) monitoring and analysis techniques, for targeted pest species. The program incorporates traditional biosecurity controls but will be reviewed and refined based on monitoring and analysis of DNA results.¹⁸⁶

NQBP maintains a *Biosecurity Management Plan* at Abbot Point as a first point of entry under the *Biosecurity Act 2015* (Cth). The plan identifies key biosecurity risks at the port. Feral pigs can cause considerable damage. Currently, NQBP have engaged the WRC to provide an aerial shooting service to reduce the feral pig population and also to target wild dogs.

8.9.3 Potential impacts/threats

Potential impacts associated with the port, coastal industrial development and residential development include the introduction or spread of pest and weed species resulting in reduced condition and/or quality of vegetation communities and fauna habitat.

¹⁸⁶ Biosecurity Queensland. (2019). *Partnering to improve early detection of marine pest threats*.
https://event.icebergevents.com.au/uploads/contentFiles/files/2019-PAWS/C1_Anita%20Ramage.pdf

8.10 Air quality

8.10.1 Existing environment

A search of the National Pollutant Inventory for 2019–20 air quality data identified three facilities within the study area that contribute a total of 28 substances as emissions:

- Abbot Point Operations
- Liberty Oil Rural
- Aurizon Operations.

The substances emitted include Benzene, Boron, Beryllium, Carbon monoxide, Cobalt, Antimony, Arsenic, Copper and Cumene and associated compounds. The sources of these emissions include water transport support services, mineral, metal and chemical wholesaling and rail freight transport.¹⁸⁷

The key threat to air quality in the study area and surrounds is dust, with the main source of airborne pollutant being predominantly coal dust. The port is one of three existing major coal ports on the coast of Queensland, and coal dust is the primary air pollutant emitted by coal terminals. Dust from natural sources in the study area also include salt spray, pollen, grass seeds and wind erosion of soil.¹⁸⁸

Activities within the port that contribute to dust pollution include clearing, vehicle activity and construction in particular earthworks and excavations, dispersion of coal dust from the existing coal terminal and operations, or from expanded operations at the site.¹⁸⁹ Wind erosion from coal stockpiles, rail operations, the movement of coal through transfer stations, conveyors, stacking, reclaiming and ship loading generate the most significant amount of coal dust in the study area. Windblown dust also occurs from wind erosion of exposed bare ground.

Coal dust contains several chemical contaminants, such as polycyclic aromatic hydrocarbons and trace metals, that can be harmful in low concentrations. The dispersion of dust and coal dust in the study area is dependent on local meteorological conditions, particularly wind speed and direction. The average wind speed and dominant wind direction within the study area is strong at 20km/h to 30km/h that increase into the afternoons from the east to south south-east. These winds have the potential to transport dust to the adjacent marine environment.¹⁹⁰

Air quality monitoring at the port has been limited and baseline air quality in the study area is currently unknown. The absence of baseline air quality is a key gap in understanding air quality within the study area and instead assumptions based on generic air quality data (for example, dust deposition rates for Australian rural areas) are required to assess the impacts of dust deposition on plant photosynthesis and the surrounding marine environment.¹⁹¹

8.10.2 Potential impacts/threats

Potential impacts on air quality in the study area from the port, other coastal industrial development, including coastal residential development are presented in **Appendix P** and summarised below:

- increased dust deposition on plants, fauna and water environments including wetlands
- dust causing increased turbidity a reduced light penetration for corals and seagrass
- nuisance impacts of dust settlement on nearby residential communities
- airborne dust and coal dust particles causing an increase in respiratory illnesses in humans within study area
- dust in the atmosphere reducing natural scenic amenity.

¹⁸⁷ Department of Environment and Energy. (2020). National Pollutant Inventory. <http://www.npi.gov.au/npidata/action/load/emission-by-substance-result/criteria/destination/ALL/source-type/INDUSTRY/subthreshold-data/Yes/substance-name/All/year/2020>

¹⁸⁸ Katestone Environmental Pty Ltd. (2012). *Cumulative Assessment of Air Emissions at the Abbot Point Coal Terminals*. Prepared for Abbot Point Working Group (KE1201092).

¹⁸⁹ NQBP. (2016). *Port of Abbot Point Operations Manual*. North Queensland Bulk Ports Corporation Limited.

¹⁹⁰ BMT WBM. (2014). *Abbot Point Port and Wetland Project Preliminary Documentation for Wetland Hydrology, Water Quality and Aquatic Ecology Component*.

¹⁹¹ Adaptive Strategies and Open Lines Environmental Consulting. (2015). *Abbot Point Master Planning: Supporting report - environmental, social and cultural heritage values version 3 (Final) October 2015*.

8.11 Noise emissions

8.11.1 Existing environment

The acoustic environment in the study area is dominated by:

- existing port facilities
- rail noise
- natural noise, including wind, birds, and insects.¹⁹²

Noise monitoring was carried out in the Abbot Point area by GHD Group in 2009 for the development of T1 and T2. Noise monitoring locations for this study included:

- Location 03: Abbot Point Road – residential dwelling located off Abbot Point Road
- Location 04: Wetland site – access track adjacent to wetland to the west of existing port facility
- Location 05: Concrete slab (near hill) – concrete slab to the north-west of the site.¹⁹³

The results of the study showed that monitoring Location 04 was most impacted by noise emissions from T1. Location 05 had the lowest background and ambient noise levels due to the remoteness from the terminal and transport corridors.

Previous noise modelling revealed that construction noise impacts at Abbot Point that exceeded noise thresholds would extend into the CVW.¹⁹⁴ Construction noise would therefore be expected to have an impact on the behaviour of more noise-sensitive species, including migratory shorebirds, within the wetlands.

Increased noise associated with construction within the study area has the potential to cause localised shifting of noise-sensitive species and individuals away from the sources of noise, thereby disrupting feeding and roosting. Studies of waterbird responses to various types of noise disturbance indicate that the following (conservative) key thresholds for potential impacts on shorebirds would apply at Abbot Point:

- 60dBA (adjusted decibels) for single noise events
- 65dBA (adjusted decibels) for steady continuous noise.¹⁹⁵

In 2015, SLR Consulting Australia Pty Ltd¹⁹⁶ modelled the predicted distribution of cumulative noise associated with the existing noise from T1 and the proposed dredging and installation of a Dredge Material Containment Pond under three different weather conditions (neutral, inversion and inversion with a south-east wind).

The results of noise modelling indicated that:

- noise exceeding the thresholds will extend into the CVW for some project stages (including for activities such as topsoil stripping, embankment preparation and construction, and during the management of dredged material)
- there is only minor variability predicted in the distribution of noise contours in response to differing weather conditions.
- construction noise is expected to elicit some response from MNES utilising the wetland and may therefore have an impact, particularly on behaviour and possible localised shifting of more noise-sensitive species and individuals away from the sources of noise.

The potential effects of noise on terrestrial fauna include physical damage to hearing organs, increased energy expenditure or physical injury while responding to noise, interference with normal animal activities, and impaired communication. The ongoing impacts of these effects can include habitat loss through avoidance, reduced reproductive success and increased mortality.

As with humans, an animal's response to noise depends on a variety of factors including noise level, frequency distribution, duration, number of events, variation over time, rate of onset, noise type, existence and level of

¹⁹² SLR Consulting Australia Pty Ltd. (2014). *Abbot Point Port and Wetland Project, Technical Report – Noise Impact Assessment*.

¹⁹³ Ibid

¹⁹⁴ Ibid 101

¹⁹⁵ Ibid 101

¹⁹⁶ Ibid 192

ambient noise, time of year and time of day. The location, age, sex, and past experience may also affect an animal's response to noise.¹⁹⁷

8.11.1.1 Underwater noise

In 2015, Advisian conducted an underwater noise assessment¹⁹⁸ was also undertaken to consider major sources of ambient noise in the shallow waters around Abbot Point and the impacts of noise on marine fauna.

The assessment found that the existing underwater ambient noise comprises both natural and human-made sounds. The human-made noise primarily consists of noise from shipping, commercial and recreational fishing and sonar activities. Natural noise sources are predominantly wind-generated noise and biological noise from a variety of sources such as fish chorus and snapping shrimps. Other environmental sources include surf noise typically localised near the coast, precipitation noise from rain and hail, seismic noise from volcanic and tectonic activities, and thermal noise. The assessment determined that commercial shipping vessels dominate the ambient noise environmental around Abbot Point.¹⁹⁹

The results of this underwater noise assessment concluded that:

- Marine animals would only experience temporary or permanent impacts if they stayed near the noise sources (10m to 40m) for long periods of time (more than two hours), which was considered to be unrealistic.
- It is unlikely that any dredging activities or vessel movements would cause physical injuries or hearing damage (temporary or permanent) to any marine fauna species with potential to occur in the study area.
- Any dredging activities or vessel movements can potentially cause behavioural responses from marine fauna within a 3km range. Behavioural responses to noise include changes in vocalisation, resting, diving and breathing patterns, changes in mother-infant relationships, and avoidance of the noise sources. However, disturbance is expected to be low considering the existing ambient noise in the study area and ecological characteristics of assessed marine fauna.
- Noise stress caused by vessels travelling between Bowen and Abbot Point is transient in nature and the disturbance effect on marine fauna is expected to be minimal.²⁰⁰

8.11.2 Potential impacts/threats

Potential impacts of noise in the study area from the port, other coastal industrial development, including coastal residential development are presented in **Appendix P** and summarised below:

- increased noise generated from construction and operational activities at the port and other industrial areas:
 - resulting in changed behaviours in some fauna species and fauna lifecycles
 - impacting on nearby residences and communities.
- regional scale noise pollution impacting wildlife behaviour
- underwater noise and vibration impact on marine fauna.

8.12 Existing monitoring programs

Existing monitoring programs relevant to the ports and surrounding areas are listed in **Table 44**. The table briefly describes the program, responsible entity, objectives, parameters, timeframe and longevity, spatial scope and outcomes for each program.

¹⁹⁷ SLR Consulting. (2012). *Abbot Point Cumulative Impact Assessment Technical Report – Construction Noise – Terrestrial*.

¹⁹⁸ Ibid 101

¹⁹⁹ Ibid 101

²⁰⁰ Ibid 197

Table 44: Existing monitoring programs

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe/ longevity	Spatial scope	Benefits/Outcomes
Water resources – marine environment ²⁰¹	<i>Reef 2050 Integrated Monitoring and Reporting Program Strategy</i>	GBRMPA	<p>Coordinate and integrate existing monitoring, modelling and reporting programs within the GBR. Objectives include:</p> <p>enable early detection and trends and changes in reef's environment, inform assessment of key threats and future risks and drive adaptive management</p> <p>inform the evaluation of management effectiveness</p> <p>ensure investments are focused appropriately</p> <p>inform regional stakeholders and national and international communities on whether Reef 2050 Plan is on track.</p>	N/A	<p>Annual</p> <p>2015 to 2019</p> <p>Ongoing program</p>	GBRWhA and adjacent catchment	<p>support reef managers track progress against the Reef 2050 Plan</p> <p>provide reef managers with more information to support management decisions</p> <p>drive better alignment between existing programs</p> <p>help to fill monitoring and modelling knowledge gaps</p> <p>results of program incorporated into five-yearly GBR Outlook report.</p>

²⁰¹ Adaptive Strategies & Open Lines. (2015). *Abbot Point Master Planning: Supporting report – environmental, social and cultural heritage values, October 2015*

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe/ longevity	Spatial scope	Benefits/Outcomes
Water resources – marine environment	<i>Mackay Whitsunday Healthy Rivers to Reef Partnership</i>	Reef Catchments Limited – partnership made up of 22 entities from community, industry, science, tourism and government.	Overarching program established to help improve decision making about resource allocation and environmental management of the region.	Freshwater indicators (water quality, fauna and habitat) Estuarine indicators Inshore indicators (water quality, coral, seagrass and fauna) Offshore indicators Indigenous cultural heritage assessment.	Annual Established 2014 Ongoing program	Covers catchments of Don, O'Connell, Proserpine and Plane basins, the urban area of Mackay, ports of Abbot Point and Hay Point, marinas and coastal marine environment.	Report cards
Marine environment – coral	<i>Ambient Coral Monitoring Program</i>	NQBP and TropWater	Gain greater understanding of ambient conditions and drivers of conditions to better manage potential influences during port related activities such as dredging.	Three locations in vicinity of port of Abbot Point. Measure benthic cover, coral health, sedimentation and coral recruitment.	Bi-annual monitoring started in May 2016.	Shallow site at Holbourne Island, deep site at Holbourne Island and shallow site at Camp Island.	Holbourne Islands were severely impacted by Cyclone Debbie in 2017 and were slow to recover. Macroalgae only important on the Camp Island location where cover decreased from 41% to 33% over three surveys. Hard coral cover increased on Camp Island.
Water quality	DES water quality data.	DES	Collect baseline water quality data to contribute to improvement in water quality entering the GBRWHA.	Surface water: Rainfall, water level, conductivity, temperatures, and pH Groundwater: Rainfall and bore level	Annual Established 2009 Ongoing	12 priority basins that discharge into the GBRWHA.	<i>Great Barrier Reef Catchment Loads Monitoring Program</i> outputs.

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe/ longevity	Spatial scope	Benefits/Outcomes
Water quality Marine turtles	<i>Ambient Water Quality Monitoring Program</i>	NQBP and TropWater	Ambient marine water quality monitoring program in and around the coastal waters of the priority Port of Abbot Point that collectively continue to characterise the natural variability in key water quality parameters, including those experienced at the nearest sensitive receiving habitats.	Dissolved metals Nutrients Chlorophyll-a Pesticides/herbicides Phytoplankton/zooplankton Sediment deposition Turbidity Water depth Water temperature Photosynthetically active radiation Currents.	Biannual Established 2016 Ongoing	Four sites.	Seasonal differences in water temperature. Water column is well mixed, although turbidity higher closer to the benthos and during the wet season, Nitrogen and Chlorophyll-a concentrations exceeded guideline values in 2018–19 metals, herbicides and pesticides detected in 2018–19 but below relevant guideline values.
	Turtle Population Dynamics	NQBP and Queensland Parks and Wildlife Service	Turtle Population Dynamics in the Hay Point, Abbot Point and Lucinda areas' by Mr Ian Bell.	Breeding distribution Foraging populations	One off survey over 12 months in 2002–2003.	Hay Point, Abbot Point and Lucinda port areas.	Low density nesting within Abbot Point but this area provides important mainland nesting habitat for <i>Natator depressus</i> . Peak nesting period in port areas occurs from the last week of November through to first week of December. Sex ratio at Abbot Point was 2:1 females to males.
Marine turtles	Turtle nesting	Mackay District Turtle Watch Association	To improve the understanding of marine turtles and their nesting area	Marine Turtle and nest spotting.	Ongoing	Repulse Bay to Stanage Bay	Data on Marine Turtle numbers, tracks, nests and hatchlings.
Marine fauna	DES StrandNet wildlife stranding database	DES	Collect long-term datasets of marine megafauna strandings and deaths in Queensland waters.	Reports of sick, injured, dying and dead marine fauna, including cetaceans, dugongs, marine turtles and pinnipeds. Incidental information on sharks, rays, seabirds and other marine animals.	Continuous 1996 to present Ongoing and no end date specified.	Queensland waters	Reports are released semi-regularly.

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe/ longevity	Spatial scope	Benefits/Outcomes
Fish	Qfish fisheries catch data	DAF	Collect long term datasets of commercial fishing catch and effort to manage and report on the status of Queensland fisheries. Provide data to undertake ecological and stock assessments of Queensland fisheries.	Species catch Fishing effort Fishing method.	Annual 1990 to present Ongoing program, no end date specified.	Commercial fishery 30-minute reporting grids: N24 O24 O25.	Reports. Survey database online.
Ecology - pests	Ballast water monitoring	DAF	Assess presence of pest species	Ballast water risk	All ships. Ongoing government program.	Ballast water management is a government program. Inspection of dredges and sediment is a compulsory port program.	Internal government data.
Ecology - pests	Invasive pest species.	DAF	Ensure no pest species are introduced during dredging.	Ecology pests Hull inspection Sediment testing.	International dredges inspected for hull fouling sediment inspected for pest species prior to dredging projects. Part of dredging works.	Port area	Invasive pest species removed from vessels prior to commencements of dredging.
Ecology - pests	Invasive Pest Species	NQBP	Early detection of fouling pest species.	Pest species – fouling marine pests	Quarterly inspection of plates. Ongoing long-term program (commenced prior to 2010).	Near port infrastructure	Reporting by exception only (if pest species are found).
Ecology - pests	Invasive Pest Species	NQBP	Feral pig control	Feral pig	Annual	Ongoing	Removal of feral pigs

Environmental value	Program	Responsible entity	Objectives	Parameters	Timeframe/ longevity	Spatial scope	Benefits/Outcomes
Ecology - pests	Land management of weeds	NQBP	Early detection of weeds	Weed maintenance by port Service Workers. Specialised weed removal and maintenance works by specialised weed management contractors.	Routine and regular	Reserve land and natural areas under port ownership including works in bushland and dune/beach systems.	Removal of weed species from reserve land and natural areas.

8.13 Summary

The study area is dominated by wide, low coastal plains separating the coastline from mountain ranges. The landscape zones include forested mountains, farmlands, coastal mangroves and wetlands, boat harbour, industrial areas, rivers and creeks, transport routes, conservation areas, beaches and rocky outcrops and residential areas. The natural scenic amenity remains mostly intact (for example, forested mountains, grazing areas, and wetland area), however this is contrasted with the existing port infrastructure and transport and machinery associated with the port.

At the national level, the study area includes three wetlands of national importance, the GBRMP, the CVW, and the Southern Upstart Bay. It also supports two TECs, 38 threatened species of flora and fauna and 62 migratory species including the following species or species habitat known to occur within the study area: the Australian painted snipe, curlew sandpiper, great knot, eastern curlew, water mouse, loggerhead turtle, green turtle, lesser frigatebird, great frigatebird, humpback whale and Australian snubfin dolphin.

There are three state reserves within the study area including the Abbot Bay, the Cape Upstart and Gloucester Island National Parks. A complex mosaic of 'Endangered' and 'Of concern' REs are also present throughout the study area that comprise a diverse range of vegetation types including mangroves, saltmarshes, saline grasslands and sedgeland, vegetated swamps and wetlands, coastal vine thickets and rainforests, tussock grasslands and a variety of eucalypt woodlands and forests. The major waterways in the study area include Saltwater Creek, Euri Creek, the Don River and Elliot River. Most waterways in the study area drain northwards towards Abbot Bay and the Coral Sea. The CVW, including Lake Caley, are nationally significant wetlands of high ecological significance and are the main wetlands in the study area. The wetlands are fed by a complex system of creeks and groundwater flows. The catchments within the study area feed into the adjacent marine environment, which falls within the GBRWHA. Water quality within the marine environment is influenced by the coastal processes in the study area, land use activities such as agriculture, predominantly sugar cane farming and grazing, and port activities.

The primary air pollutant in the study area is dust, predominantly coal dust, as a result of the coal export operations of the priority Port of Abbot Point coal terminal. Exhaust emissions from plant and machinery also occur but are considered minor compared to coal dust.

The main sources of noise pollution in the study area are associated with port activities, transportation, construction activities and urban areas. Noise from traffic, port operations and other activities can reduce amenity for nearby residents and disturb shorebirds. Underwater noise generated from commercial and recreational shipping vessel movements in the port can also have adverse effects on marine communities such as dolphins and whales.

9. Outstanding Universal Value

9.1 Introduction

A key environmental value of the study area is the GBRWHA. The value specifically relates to the expression of a number of environmental and socioeconomic attributes which contribute to the integrity of the OUV of the GBRWHA at Abbot Point and its surrounds.

The key terrestrial and marine environmental values present in the study area at Abbot Point have been identified based on the following key considerations:

- World Heritage attributes of OUV
- MNES
- MSES
- other notable environmental features.

This chapter provides the following sections:

- World Heritage – **Section 9.2**
- Assessment of presence of key attributes within the study area – **Section 9.3**
- Integrity – **Section 9.4**
- Expression of OUV – **Section 8.5**
- Summary – **Section 9.6.**

9.2 World Heritage

9.2.1 Concept of Outstanding Universal Value

All World Heritage areas demonstrate OUV which is generally the basis of their nomination and listing. The concept of OUV underpins the basis for the listing of properties on the World Heritage List and the protection and management of these properties. The OUV is defined in the Operational Guidelines for the Implementation of the World Heritage Convention.²⁰²

The definition states that OUV is, 'cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity'. For a World Heritage Area to be considered to have OUV, it must meet one or more of the 10 World Heritage criteria listed in the guidelines, meet the conditions of integrity and/or authenticity, noting that authenticity is not relevant to the GBR as a natural area, and have an adequate protection and management system in place.

9.2.2 Criteria for assessing Outstanding Universal Value

For a property to be listed as a World Heritage Area, it must meet one or more of the following World Heritage criteria:

- Criterion (i) represent a masterpiece of human creative genius
- Criterion (ii) exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning or landscape design
- Criterion (iii) bear a unique or at least exceptional testimony to a cultural tradition or to a civilisation which is living, or which has disappeared
- Criterion (iv) be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history

²⁰² UNESCO. (2016). *Operational Guidelines for the Implementation of the World Heritage Convention*. World Heritage Committee, Paris.

- Criterion (v) be an outstanding example of a traditional human settlement, land use, or sea use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change
- Criterion (vi) be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance (the World Heritage Committee considers that this criterion should preferably be used in conjunction with other criteria)
- Criterion (vii) contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance
- Criterion (viii) be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features
- Criterion (ix) be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals
- Criterion (x) contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of OUV from the point of view of science or conservation.

The GBRWHA meets four of the natural World Heritage criteria: Criterion (vii), Criterion (viii), Criterion (ix) and Criterion (x).

9.2.3 Statement of Outstanding Universal Value

The OUV of a World Heritage Area is articulated in a Statement of OUV that is developed at the time of inscription, however, this was not the case for the GBR, where a Statement of OUV was prepared retrospectively and adopted in 2012. The statement describes the attributes of the property that contribute to its OUV and it provides the basis for the future protection and management of the property.²⁰³ The Statement of OUV is also the benchmark against which the state of conservation of a World Heritage Area is assessed by the World Heritage Committee.

9.2.4 Integrity

All World Heritage area are required to meet the conditions of integrity. This is defined by the Operational Guidelines as '*a measure of the wholeness and intactness of the natural and/or cultural heritage and its features*'. An assessment of the integrity of a property is required to determine the extent to which the property:

- includes all elements necessary to express its OUV:
 - is of adequate size to ensure the complete representation of the features and processes which convey the property's significance
 - suffers from adverse effects of development and/or neglect.

For properties nominated under criteria (vii) - (x), such as the GBR, bio-physical processes and landform features should be relatively intact. However, it is recognised within the guidelines that areas may not be entirely pristine and that natural areas are dynamic, and to some extent involve interactions with people. The Statement of OUV²⁰⁴ concludes that in relation to integrity:

- the integrity of the GBR is '*enhanced by the unparalleled size and current good state of conservation across the area*'
- while a number of natural pressures occur (for example, cyclones and crown-of-thorns starfish outbreaks), given the scale of the GBR '*most habitats or species groups have the capacity to recover from disturbance or withstand ongoing pressures*'

²⁰³ Commonwealth of Australia. (2014). *Environment Protection and Biodiversity Conservation Act 1999* referral guidelines for the Outstanding Universal Value of the Great Barrier Reef World Heritage Area.

²⁰⁴ Great Barrier Reef Marine Park Authority (2012). *Retrospective Statement of Outstanding Universal Value adopted by the World Heritage Commission in July 2012* (GBRMPA 2012).

- 'the property is largely intact and includes the fullest possible representation of marine ecological, physical and chemical processes from the coast to the deep abyssal waters enabling the key interdependent elements to exist in their natural relationships'
- Effective conservation programs are essential in areas adjacent to the GBR (for example, coastal catchments) given that some of the key processes of the reef occur outside its boundaries.

9.2.5 Protection and management

All World Heritage areas are required to be adequately managed to ensure that their OUV (including the conditions of integrity at the time of inscription) are sustained or enhanced over time (UNESCO 2016).

The Operational Guidelines outline the requirements for effective management. These include:

- appropriate legislative, regulatory and contractual measures
- boundaries for effective protection
- buffer zones
- appropriate management systems.

Finally, the Operational Guidelines also provide for the sustainable use of World Heritage areas where that use does not adversely impact on the OUV of the property.

The Statement of OUV outlines the management arrangements that are in place for the GBRWHA.

Responsibility for management is shared between the Australian and Queensland Governments. Broadly these arrangements are:

- GBRMPA (an independent Australian Government agency) is responsible for protection and management of the GBRMP. They administer the GBRMP Act, which is a component of the broader environment portfolio.
- The Queensland Government is responsible for management of the GBR Coast Marine Park which is established under the MP Act. This area is contiguous with the GBRMP and covers the 'area between low and high-water marks and many of the waters within the jurisdictional limits of Queensland'. The Queensland Government is also responsible for management of most of the islands within the GBR. Both marine parks have consistent zoning and permitted activity schemes.
- The Australian Government is responsible for administration of the EPBC Act, which provides an overarching mechanism for protecting the World Heritage attributes from inappropriate development, including actions taken inside or outside which could impact its heritage attributes.
- A range of other Australian and Queensland Government legislation provides protection for the World Heritage attributes of the GBR, for example, by addressing such matters as water quality, shipping management, sea dumping and fisheries management.
- There are a range of non-statutory mechanisms in place that protect the World Heritage attributes for the GBR (for example, industry codes of practice and stewardship programs).

In addition to these broad governance arrangements, the Australian and Queensland Governments have introduced a number of administrative and guidance documents to help protect the GBR, these include:

9.2.5.1.1 Intergovernmental Agreement

In 2009, both the Australian and Queensland Governments signed the *Great Barrier Reef Intergovernmental Agreement*, formalising the approach to manage marine and land environments within the GBRWHA.

9.2.5.1.2 Great Barrier Reef Strategic Assessment

The Australian and Queensland Governments have completed two complimentary strategic assessments of the GBR region:

- GBR Coastal Zone Strategic Assessment - July 2014 (Queensland Government)
- GBR Region Strategic Assessment: Strategic assessment report - July 2014 (GBRMPA).

Strategic assessments enable a 'big-picture' approach to environment and heritage protection that provides certainty in the long term, by determining suitable areas for protection, development and the type of development that should be allowed and the conditions under which such development may proceed.

9.2.5.1.3 **Reef 2050 Long-Term Sustainability Plan**

Stemming from the outcomes of the strategic assessment, the Reef 2050 Plan was developed to target areas of action and seek to address gaps for future management of the GBRWHA.

9.2.5.1.4 **Environment Protection and Biodiversity Conservation Act 1999 Referral Guidelines**

The EPBC Act protects the World Heritage values of the GBRWHA from actions that have, will have or are likely to have a significant impact on those values. The protection and management of World Heritage areas should ensure that their values at the time of inscription are sustained and enhanced over time. This is done primarily through the protection of a property's OUV. These referral guidelines are intended to provide guidance to proponents on the need to refer an action to the Federal Minister for the Environment and Energy for assessment and a decision.

9.2.5.1.5 **Great Barrier Reef Outlook Report 2019**

Produced every five years the 2019 GBR Outlook report provides an assessment and findings on the GBR's health, pressures and likely future condition.

9.2.5.1.6 **Great Barrier Reef World Heritage Area**

The Statement of OUV identifies the key features that contribute to the OUV of the GBRWHA. It is noted in the EPBC Act Referral Guidelines (2014) that features may not be expressed equally over the whole GBRWHA and that features can change over time.

9.2.6 **Determining local representation and contribution of Outstanding Universal Value at Abbot Point**

To understand the integrity of the World Heritage Area at the priority Port of Abbot it is first necessary to understand how OUV is expressed locally. Using the methodology developed to determine the local expression of OUV,²⁰⁵ an analysis has been undertaken to identify the presence and local expression of OUV within and surrounding the study area.

9.2.6.1 **Presence of attributes**

For those attributes that are present, an analysis was carried out to determine the location, extent and distribution of the attribute within the study area. This is accompanied, where possible, by information (spatial or contextual) on the distribution and occurrence more broadly within the GBRWHA or adjacent coastal areas. The following terms and definitions have been used as a means of classifying the presence of attributes:

- **Minor presence:** These attributes occur in low abundance or across a small area (relative to the nature of the attributes broader presence within the GBRWHA). Noting that a low abundant attribute that is rare within the GBRWHA may still be important. Temporary fluctuations or seasonal variation were considered.
- **Moderate presence:** These attributes occur in moderate abundance or across a moderately large area (relative to the nature of the attribute across the GBRWHA).
- **Significant presence:** These attributes are present in significant abundances or represent significant examples of the relevant attribute (relative to the nature of the attribute across the GBRWHA).

9.2.6.2 **Attribute contribution to Outstanding Universal Value**

The attributes within the Abbot Point master planned area that contribute to the OUV of the GBRWHA were identified using a desktop analysis and stakeholder engagement as outlined in the following methodology:

- a review of the background information previously prepared for the priority Port of Abbot Point was done
- targeted consultation was undertaken through meetings and follow up correspondence with key stakeholders including:
 - state agencies
 - NQBP

²⁰⁵ Adaptive Strategies. (2021). *Method for identifying the local expression of Outstanding Universal Value within the Great Barrier Reef World Heritage Area*.

- WRC.
- a review and analysis of all available data/documentation relevant to the OUV of the study area was undertaken including:
 - legislation and policy relating to the port
 - planning instruments associated with the port and its precincts
 - existing and proposed land uses
 - existing and proposed infrastructure
 - environmental, social and cultural values.

An analysis was completed to determine the level of contribution of local environmental attributes to the OUV of the World Heritage Area and was based on three levels:

- **Minor contribution (Min):** The attribute is present, however, it occurs in low abundance or singularly and is:
 - not essential to the sustainability of the attribute (for example, substantial breeding population)
 - not recognised as a key feature of the GBRWHA
 - not included in the retrospective Statement of OUV
 - not iconic, unique or a high-quality example of the attribute.
- **Moderate contribution (Mod):** The attribute occurs in moderate abundance or across a moderately large area but is not the prime occurrence or representation of the attribute within the GBRWHA. The attribute does however represent a feature for which the GBR was listed as World Heritage.
- **Significant contribution (Sig):** The attribute represents locally important examples of the attribute relative to the nature of the attribute across the GBRWHA. Such an attribute may be specifically referred to within the retrospective Statement of OUV for the GBRWHA or defined by other legislation, planning instrument or values assessment (for example, 2019 GBR Outlook report). The occurrence of the attribute locally is a prime example of the features mentioned in the retrospective Statement of OUV.²⁰⁶

9.3 Assessment of presence of key attributes within the study area

9.3.1 Great Barrier Reef World Heritage Area attributes expressed at Abbot Point

The priority port of Abbot Point is an existing coal port located adjacent to the GBRMP and within the GBRWHA and contains numerous environmental, cultural and social values.

Table 45 shows a summary of the attributes contributing to the GBRWHA's OUV, and whether they are absent or present in the study area.

²⁰⁶ Adaptive Strategies (2021) op Adaptive Strategies. (2021). Method for identifying the local expression of Outstanding Universal Value within the Great Barrier Reef World Heritage Area.

Table 45: Key features of Outstanding Universal Value for the Great Barrier Reef World Heritage Area and their presence in the study area

Table legend			
	Absent		
	Present		
Natural beauty and natural phenomena	Major stages of Earth's evolutionary history	Ecological and biological processes	Habitat for conservation of biodiversity
Superlative natural beauty above and below the water	Continental shelf	Significant diversity of reef and island morphologies that reflects ongoing geomorphic, oceanographic and environmental processes.	Diversity supporting marine and terrestrial species (global conservation significance)
String of reef structures along the coast	Flat-topped hills of eroded limestone	Cross-shelf, longshore and vertical connectivity	Coral reefs (400 species of corals in 60 genera)
Mosaic patterns of reefs, islands and coral cays that produce an unparalleled aerial panorama of seascapes	Continental islands	Coral reefs, sand banks and coral cays	Diversity of mangroves
Green vegetated islands	Coral cays	Beds of <i>Halimeda</i> algae	Diversity of seagrass
Spectacular sandy beaches	New phases of coral growth	Evolution of hard corals	Dugong
Azure waters	Old massive corals	Other fauna, including microfauna	Species of whales
Vast mangrove forests	Coral reef ecosystem	Over 4000 species of molluscs and over 1500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans	Species of dolphins
Vegetated mountains	Inshore fringing reefs, mid-shelf reefs, and exposed outer reefs	Vegetation of the cays and continental islands	Humpback whale calving
Lush rainforest gullies	Processes of geological and geomorphic evolution	Important role of birds, such as the pied imperial pigeon, in processes such as seed dispersal and plant colonisation.	Marine turtles
Breeding colonies of seabirds and marine turtles	Unique and varied seascapes and landscapes		Green Turtle breeding
Green turtle breeding	Continental slope		Marine turtle rookeries
Over-wintering butterflies	Deep oceanic waters		242 species of birds
Hard and soft corals	Abyssal plains		22 seabird species breeding (cays and some continental islands have globally significant breeding sites)
Thousands of species of reef fish			Plant species and diversity and endemism (species being unique to a defined geographic location)
Coral spawning			Coral cays
Migrating whales			
Nesting turtles			
Significant spawning aggregations of many fish species			

9.3.2 Outstanding Universal Value attributes relevant to Abbot Point

In the following sections, for attributes that have been assessed as present at Abbot Point, an analysis was carried out to assign the level of presence (minor, moderate, significant) within the study area and surrounds.

9.3.2.1 Criterion vii

Criterion vii: Contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.

Table 46 identifies the key attributes that contribute to the OUV of natural beauty and natural phenomena (Criterion vii) of the GBRWHA. Details of each attribute's presence within, or adjacent to the study area are provided below.

Table 46: Key attributes contributing the natural beauty and natural phenomena (Criterion vii)

Natural beauty and natural phenomena (Criterion vii)	Presence within or adjacent to the Abbot Point master planning study area	Description of the presence within or adjacent to the Abbot Point master planning study area
Superlative natural beauty above and below the water	Moderate presence	Large aggregations of shorebirds, seabirds and migratory birds at the CVW. Ocean and island vistas.
String of reef structures along the coast	Not present	
Mosaic patterns of reefs, islands and coral cays that produce an unparalleled aerial panorama of seascapes	Not present	
Green vegetated islands	Minor presence	<p>Island vegetation communities directly relate to the OUV criteria as they represent ecosystems that have evolved over millennia and provide habit for populations of rare or endangered species of flora and fauna.</p> <p>There are six islands present within or adjacent to the study site with varying degrees and types of vegetation.</p> <p>Holbourne Island's vegetation ranges broadly and includes over 90 species of plants such as blady grass, shrubs, low trees and rock fig (<i>Ficus platypoda</i>). There are four REs including the endangered <i>Pisonia grandis</i> and of concern vegetation comprised of grassland or <i>Xanthorrhoea latifolia</i> subsp. <i>latifolia</i> shrubland and <i>Timonius timon</i> shrubland. Pandanus and coastal she oaks are present as a small aggregate on a fore dune on the southern headland.</p> <p>The other islands in the study area have a lower coverage and diversity of vegetation and include:</p> <ul style="list-style-type: none"> • Camp Island contains 15ha of National Park with the dominant vegetation being samphire forland and mangrove communities • Gloucester Island is dominated by rocky outcrops covered with dry vine scrub • Stone Island's vegetation is predominantly Tussock grassland on coastal dunes • Middle Island is dominated Tussock grassland or <i>Xanthorrhoea latifolia</i> shrubland and areas recently colonised by <i>Timonius timon</i> var. <i>timon</i> shrubland • North Head Island consists of mixed low woodland to shrubland with a low diversity of mangrove and saltmarsh communities.
Spectacular sandy beaches	Not present	
Azure waters	Not present	

Natural beauty and natural phenomena (Criterion vii)	Presence within or adjacent to the Abbot Point master planning study area	Description of the presence within or adjacent to the Abbot Point master planning study area
Vast mangrove forests	Minor presence	<p>Mangroves provide valuable environmental benefits including coastal erosion protection, breeding habitat for many species of fish and they act as filters for nutrients, sediments and pollutants assisting in the maintenance of coastal water quality.</p> <p>The CVW contains approximately 673ha of mangrove forests in the western estuarine zone where mangroves are associated with three tidal channels flowing in Curlewis Bay and Saltwater Creek.</p> <p>To the south of the study site, mangroves are associated with the tidal channels of Euri Creek and Menilden Creek.</p> <p>There are small areas of mangroves present on Cape Upstart Island, North Head Island and Stone Island.</p> <p>The <i>Great Barrier Reef Outlook Report 2019</i> identified a newly described hybrid <i>Bruguiera x dungarra</i> from the Cape York to Fitzroy regions.</p>
Vegetated mountains	Minor presence	The landscape within the study area is relatively flat but includes elevations at Mount Roundback (728m), Mount Little (286m) and Mount Luce (286m).
Lush rainforest gullies	Not present	
Breeding colonies of seabirds and marine turtles	Significant presence	<p>The CVW is a nationally important wetland which provide habitat for large numbers of waterbirds and shorebirds including threatened and migratory species. This wetland while not in the GBRWHA, provides connectivity between the wetland and the World Heritage Area and assists in buffering the impact of pollutants entering rivers, creeks and the GBR. Holbourne Island provides habitat for coastal and migratory bird nesting.</p> <p>Low level of nesting by Green turtles at Abbot Point with the closest identified critical habitat for the survival of Green turtles is the Capricorn-Bunker Group islands, 520km south of Abbot Point.</p> <p>While the study area is within a BIA for Flatback turtles, Abbot Point is not a key nesting area for this species with limited evidence of nesting at Abbot Point.</p>
Green Turtle breeding	Minor presence	Low level of nesting by Green turtles at Abbot Point with the closest identified critical habitat for the survival of Green turtles is the Capricorn-Bunker Group islands, 520km south of Abbot Point.
Over-wintering butterflies	Not present	
Hard and soft corals	Minor presence	<p>Reef communities comprising hard and soft corals exist at Camp Island, Middle Island Reef, Holbourne Island, Stone Reef, North Head Reef and Thomas Reef.</p> <p>An annual monitoring program²⁰⁷ at Camp Island and Holbourne Island indicates that:</p> <ul style="list-style-type: none"> The mean percentage of hard coral cover at Camp Island ranges from 12% to 25% and is dominated by fast-growing <i>Acropora</i> and <i>Montipora</i> species with only minimal soft coral cover (0.3%). The mean percentage of hard coral cover at Holbourne Island ranges from 4% to 21% and is dominated at the deep sites by <i>Acropora</i>, <i>Montipora</i>, faviid and poritid corals and <i>Montipora</i> and faviid corals at the shallow sites.
Thousands of species of reef fish	Minor presence	There are a small number of mid-shelf and inshore reefs within the Abbot Point study area and surrounds which support reef fish communities. It has been estimated that in this region there are approximately 132 species of reef fish from 51 families.
Coral spawning	Minor presence	Low density of corals in and adjacent to the study area at Abbot Point. The size and density of inshore reefs does not result in the mass spawning events more commonly associated with mid shelf and outer reefs. Spawning in this area occurs after the full moon in November.

²⁰⁷ Ayling, T. et al. (2020) *Port of Abbot Point Ambient Coral Monitoring Surveys: 2019-2020. Report No. 20/45*. A report for the North Queensland Bulk Ports Corporation Limited.

Natural beauty and natural phenomena (Criterion vii)	Presence within or adjacent to the Abbot Point master planning study area	Description of the presence within or adjacent to the Abbot Point master planning study area
Migrating whales	Minor presence	Abbot Point provides a transitory area for small numbers of humpback whales migrating to and from their breeding grounds within the northern GBR. The species may opportunistically rest and/or feed on their southward migration within shallow waters.
Nesting turtles	Minor presence	Low level of nesting by Green turtles and Flatback turtles at Abbot Point. The area is likely to be ecologically important to individual turtles that return to this nesting beach, as Marine turtles show site fidelity to their nesting beaches.
Significant spawning aggregations of many fish species	Not present	

9.3.2.2 Criterion viii

Criterion viii: Be outstanding examples representing major stages of Earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.

Table 47 identifies the key attributes that contribute to the OUV of the major stages of the Earth's evolutionary history (Criterion viii) of the GBRWHA. Details of each attribute's presence within, or adjacent to the study area are provided below.

Table 47: Key attributes contributing to the major stages of Earth's evolutionary history (Criterion viii)

Major stages of the Earth's evolutionary history (Criterion viii)	Presence within or adjacent to the Abbot Point master planned area	Description of the presence within or adjacent to the Abbot Point master planning study area
Continental shelf	Not present	
Flat-topped hills of eroded limestone	Not present	
Continental islands	Not present	
Coral cays	Not present	
New phases of coral growth	Not present	
Old massive corals	Not present	
Coral RE	Minor presence	Coral reefs exist within the Abbot Point region and consist of near-shore and mid-shelf reefs. Reef communities comprising hard and soft corals exist at Camp Reef, Middle Island Reef, Holbourne Island, Stone Reef, North Head Reef and Thomas Reef. Hard coral cover at Camp Island and Holbourne Island ranges from 4% to 25% with low biodiversity.
Inshore fringing reefs, mid-shelf reefs, and exposed outer reefs	Minor presence	
Processes of geological and geomorphic evolution	Not present	
Unique and varied seascapes and landscapes	Minor presence	A variety of seascapes and landscapes exist in the Abbot Point study area and surrounds that are well represented in other areas of the GBR region coastal areas. These include mountains (Mount Roundback, Mount Little, Mount Luce), wetlands, mangroves, sand beaches, mudflats, open water, coastal islands.
Continental slope	Not present	
Deep oceanic waters	Not present	
Abyssal plains	Not present	

9.3.2.3 Criterion ix

Criterion ix: Be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals

Table 48 identifies the key attributes that contribute to the OUV of ecological and biological processes (Criterion ix) of the GBRWHA. Details of each attribute's presence within, or adjacent to the study area are provided below.

Table 48: Key attributes contributing to the ecological and biological processes (Criterion ix)

Ecological and biological processes (Criterion ix)	Presence within or adjacent to the Abbot Point master planned area	Description of the presence within or adjacent to the Abbot Point master planning study area
Significant diversity of reef and island morphologies that reflects ongoing geomorphic, oceanographic and environmental processes	Minor presence	Coral reefs exist within the Abbot Point region and consist of near-shore and mid-shelf reefs. And there are six islands present within or adjacent to the study site.
Cross-shelf, longshore and vertical connectivity	Minor presence	The offshore areas at Abbot Point form part of the larger longshore connections within the GBR lagoon.
Coral reefs, sand banks and coral cays	Minor presence	Coral reefs exist within the Abbot Point region and consist of near-shore and mid-shelf reefs. Reef communities comprising hard and soft corals exist at Camp Island, Middle Island Reef, Holbourne Island, Stone Reef, North Head Reef and Thomas Reef.
Beds of <i>Halimeda</i> algae	Minor presence	Three species of <i>Halimeda</i> have previously been recorded within areas of low mud content substrate. ²⁰⁸ The algae coverage at inshore fringing reefs in the study area fluctuates seasonally. During 2019–20 the Camp Island monitoring sites were dominated by Sargassum and Holbourne Island was dominated by Padina. ²⁰⁹
Evolution of hard corals	Not present	
Other fauna, including microfauna	Not present	
Over 4000 species of molluscs and over 1500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans	Minor presence	Low density benthic macroinvertebrates populations in deepwater areas at Abbot Point. Diversity is high and typical of deepwater communities found elsewhere in the region. ²¹⁰ It has been estimated that in this region there are approximately 132 species of reef fish from 51 families.
Vegetation of the cays and continental islands	Minor presence	There are six islands present within or adjacent to the study site. Holbourne Island vegetation includes over 90 species of plants and four REs including <i>Pisonia grandis</i> , <i>Xanthorrhoea latifolia</i> subsp. <i>latifolia</i> shrubland and <i>Timonius timon</i> shrubland. Pandanus and coastal she oaks are present as a small aggregate on a fore dune on the southern headland. The other islands with a lesser coverage and diversity of vegetation and include: Camp Island, Gloucester Island, Stone Island, Middle Island and North Head Island.
Important role of birds, such as the pied imperial pigeon, in processes such as seed dispersal and plant colonisation	Minor presence	The CVW supports a significant population of waterbirds with over 40,000 birds and 154 bird species recorded. These birds are likely contributing to the ecological processes in the study area.

²⁰⁸ BMT WBM Pty Ltd (BMT WBM). (2012a). *Port of Abbot Point Offshore Dredged Material Relocation Area Site Selection Report*, prepared for North Queensland Bulk Ports Corporation Limited, July 2012

²⁰⁹ Ayling, T et al. (2020). *Port of Abbot Point Ambient Coral Monitoring Surveys: 2019 – 2020*. Centre for Tropical Water and Aquatic Ecosystem Research (TropWater) Publication 20/45, James Cook University, Cairns.

²¹⁰ Rasheed, M. A. and McKenna, S. (2005). *Port of Abbot Point seagrass, algae and benthic macro*.

9.3.2.4 Criterion x

Criterion x: Contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of OUV from the point of view of science or conservation.

Table 49 identifies the key attributes that contribute to the OUV of conservation of biodiversity (Criterion x) of the GBRWHA. Details of each attribute's presence within, or adjacent to the study area are provided below.

Table 49: Key attributes contributing to habitats for conservation of biodiversity (Criterion x)

Habitats for conservation of biodiversity (Criterion x)	Presence within or adjacent to the Abbot Point master planned area	Description of the presence within or adjacent to the Abbot Point master planning study area
Diversity supporting marine and terrestrial species (global conservation significance)	Significant presence	<p>The CVW is a nationally important wetland which provides habitat for large numbers of waterbirds and shorebirds including threatened and migratory species. This wetland while not in the GBRWHA, provides connectivity between the wetland and the World Heritage Area and assists in buffering the impact of pollutants entering rivers, creeks and the GBR.</p> <p>Holbourne Island provides habitat for coastal and migratory bird nesting.</p> <p>There is the additional minor presence of nesting green and Flatback turtles, migrating whales and other marine fauna including dolphins and dugongs.</p>
Coral reefs (400 species of corals in 60 genera)	Minor presence	<p>Coral reefs exist within the Abbot Point region and consist of near-shore and mid-shelf reefs. Reef communities comprising hard and soft corals exist at Camp Island, Middle Island Reef, Holbourne Island, Stone Reef, North Head Reef and Thomas Reef.</p> <p>Coral diversity at Camp Island and Holbourne Island is dominated by fast growing species including <i>Acropora</i> and <i>Montipora</i>.</p>
Diversity of mangroves	Minor presence	<p>The CVW contains approximately 673ha of mangrove forests in the western estuarine zone where mangroves are associated with three tidal channels flowing in Curlewis Bay and Saltwater Creek.</p> <p>Milky Mangrove (<i>Excoecaria agallocha</i>) is the dominant mangrove species in the Saltwater Creek area, while the Red Mangrove (<i>Rhizophora stylosa</i>) and Yellow Mangrove (<i>Ceriops tagal</i>) dominate in the western estuarine zone of the CVW.</p> <p>To the south of the study site, mangroves are associated with the tidal channels of Euri Creek and Menilden Creek.</p> <p>There are small areas of mangroves present on Cape Upstart Island, North Head Island and Stone Island.</p> <p>The 2019 GBR Outlook report identified a newly described hybrid <i>Bruguiera x dungarra</i> from the Cape York to Fitzroy regions.</p>
Diversity of seagrass	Minor presence	<p>The most recent seagrass survey in 2019 observed five seagrass species at Abbot Point. Deepwater assemblages were dominated by <i>Halophila spinulosa</i> with <i>Halophila decipiens</i> and <i>Halophila ovalis</i> also present. The inshore meadows were dominated by <i>Halophila ovalis</i> with <i>Zostera muelleri</i> occurring near the mouth of Euri creek.</p> <p>During previous surveys other species present have included <i>Cymodocea rotundata</i>, <i>Cymodocea serrulata</i>, <i>Syringodium isoetifolium</i> and <i>Halophila tricostata</i>.</p> <p>The overall condition of the seagrass at Abbot Point is considered satisfactory.</p> <p>Seagrass is an important environmental value in the study area as it is a food source for dugongs and Marine turtles, it provides a foraging ground for certain species of cetaceans and it provides shelter, food and nursery areas for many fish species.</p>
Dugong	Minor presence	<p>Abbot Point is located between two DPAs. 'Dugong Sanctuary A' is located at Upstart Bay (44km north-west of Abbot Point) and 'Dugong Sanctuary B' is located at Edgumbe Bay (35km south-east of Abbot Point).</p> <p>Abbot Point identified as an area of low conservation importance for dugongs in the south of the GBR. Dugongs may forage in the seagrass beds at Abbot Point as they move between the DPAs located to the north and south of Abbot Point.</p>

Habitats for conservation of biodiversity (Criterion x)	Presence within or adjacent to the Abbot Point master planned area	Description of the presence within or adjacent to the Abbot Point master planning study area
Species of whales	Minor presence	A transitory area for Humpback whales migrating to and from their breeding grounds within the north of the GBR. Humpback Whale adults and calves have been recorded within the coastal waters of Abbot Point, potentially using the area for resting on their southern migration from calving grounds. ²¹¹
Species of dolphins	Minor presence	The Indo-Pacific Humpback Dolphin and the Australian Snubfin Dolphin have been recorded during surveys of the Abbot Point marine area. The Abbot Point area provides suitable habitat for these species which prefer shallow (less than 20m deep) coastal waters. In addition, the creek mouths and seagrass beds provide suitable preferred habitat for the Snubfin Dolphin.
Humpback Whale calving	Not present	
Marine Turtle	Minor presence	<p>The EPBC Act Protected Matters search results for the study area indicate that six species of marine turtles are likely or known to occur: Loggerhead Turtle, Green Turtle, Leatherback Turtle, Hawksbill Turtle, Olive-ridley Turtle and Flatback Turtle.</p> <p>There are three vulnerable listed marine species that are known to occur in the inshore and offshore waters of the Abbot Point area.</p> <p>Low level of nesting by Green turtles within the port limits of the priority Port of Abbot Point. Foraging and courtship areas for this species were identified in Edgumbe Bay with small populations residing inside and adjacent to the mouths of Saltwater Creek and Euri Creek.</p> <p>While the study area is within a BIA for Flatback turtles, Abbot Point is not a key nesting area for this species with limited evidence of nesting at Abbot Point.</p> <p>Hawksbill turtles may use the seagrass and macroalgae present in the inshore and offshore areas for foraging.</p>
Green Turtle breeding	Minor presence	
Marine turtle rookeries	Not present	
242 species of birds	Significant presence	<p>A PMST search identified 19 EPBC Act listed bird species that are known to or likely to occur in the study area. Seven species had habitat or roosting areas that were known to occur within the study area and include the Red Knot, Curlew Sandpiper, Great Knot, Great Sand Plover, Lesser Sand Plover, Bar-tailed Godwit and Australian Painted Snipe.</p> <p>The CVW is an important habitat for listed birds and overall species diversity in the area. It is not only the presence of species that is relevant within the CVW, it has significant number of shorebirds as it has suitable migratory shorebird habitat. There are six migratory bird species that have large populations in the wetland including the Red-necked Stint, Sharp-tailed Sandpiper, Latham's Snipe, Great Egret Caspian Tern and the endangered Australian Painted Snipe.</p>
22 seabird species breeding (cays and some continental islands have globally significant breeding sites)	Significant presence	
Plant species and diversity and endemism (species being unique to a defined geographic location)	Minor presence	<p>One TEC, the SEVT of the Brigalow Belt (north and south) and Nandewar bioregions, has been recorded in the study area but are fragmented and vary in size from 2ha to 24ha.</p> <p>The PMST search identified four EPBC Act listed flora species as potentially occurring within the study area and includes <i>Aristida granitica</i>, <i>Dicanthium setosum</i>, <i>Eucalyptus raveretiana</i> and <i>Omphalea celata</i>. Previous surveys of the site have also identified <i>Ozothamnus eriocephalus</i> which is listed as vulnerable.</p>
Coral cays	Not present	

²¹¹ GHD. (2010). *Proposed Abbot Point Multi Cargo Facility Environmental Impact Statement*. Prepared for North Queensland Bulk Ports Corporation Limited.

9.3.3 Summary of local attributes of the Outstanding Universal Value

The locally expressed OUV attributes within the Abbot Point master planned area and their contribution classifications relative to the OUV across the entire GBRWHA are presented in **Table 50**. A summary of the environmental values determined to be key contributors to the local expression of OUV of the GBRWHA are also included in **Table 50**. The contribution classifications have been colour-coded (green = minimum, orange = moderate, red = significant) and applied to the relevant attributes. Attributes are taken directly from the Statement of OUV, which combines breeding colonies of seabirds and marine turtles. The significant rating is based on the seabirds' contribution in relation to the Caley Valley Wetlands. Breeding of marine turtles is not considered to be notable comparable to other areas of the GBRWHA. Refer to the marine turtle attributes for further information.

Table 50: Local attributes that contribute to the Outstanding Universal Value of the Great Barrier Reef World Heritage Area

Category	Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
Corals	Coral reefs (400 species of corals in 60 genera) Coral reefs (400 species of corals in 60 genera)				Min	There is a minor contribution to OUV from corals due to the presence of a small number of near-shore and mid-shelf reefs within and adjacent to the study area.	Coral reefs exist within the Abbot Point region and consist of near-shore and mid-shelf reefs. Reef communities comprising hard and soft corals exist at Camp Reef, Middle Island Reef, Holbourne Island, Stone Reef, North Head Reef and Thomas Reef. Coral diversity at Camp Island and Holbourne Island is dominated by fast growing species including <i>Acropora</i> and <i>Montipora</i> .
	Coral reef ecosystem		Min			The inshore reefs of the region are relatively small and limited in extent in comparison to other inshore reefs. There is low coral cover and low coral diversity at these reefs.	
	Inshore fringing reefs, mid-shelf reefs, and exposed outer reefs		Min			Reefs have persisted over time despite climatic fluctuations driven mainly by cyclonic disturbances. As these reefs are relatively isolated from other systems, they tend to regenerate.	
	Hard and soft corals	Min				More notable examples of reef ecosystems are present in the GBRWHA, such as the Whitsundays and Dry Tropics.	
	Coral reefs, sand banks and coral cays			Min		The size and density of inshore reefs are not the result of mass spawning events more commonly associated with mid shelf and outer reefs.	
	Coral spawning	Min				Local spawning is important for the ongoing presence of inshore reefs, but it is not the result of the mass spawning phenomenon important for reef persistence across the wider World Heritage Area.	
Mangroves	Diversity of mangroves				Mod		

Category	Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
	Vast mangrove forests	Mod				There is <u>a moderate contribution</u> to OUV from mangroves within the tidal channels of the CVW. The 2019 GBR Outlook report lists the diversity and abundance of mangrove species across the whole GBR as very good with a stable trend. The <i>State Party Report on the state of conservation of Australia's Great Barrier Reef – 2022</i> (State Party Report 2022) reviews remote sensing-based canopy cover from 2018–20 which indicates that the general stability of mangrove forests in the reef has probably continued.	The CVW contains approximately 673ha of mangrove forests in the western estuarine zone where mangroves are associated with three tidal channels flowing in Curlew Bay and Saltwater Creek. To the south, mangroves are associated with the tidal channels of Euri Creek and Menilden Creek. Milky Mangrove (<i>Excoecaria agallocha</i>) is the dominant mangrove species in the Saltwater Creek area, while the Red Mangrove (<i>Rhizophora stylosa</i>) and Yellow Mangrove (<i>Ceriops tagal</i>) dominate in the western estuarine zone of the CVW. There are small areas of mangroves present on Cape Upstart Island, North Head Island and Stone Island.
Seagrass and Macroalgae	Beds of <i>Halimeda</i> algae			Min		There is <u>a minor contribution</u> to OUV from seagrass and macroalgae. The 2019 GBR Outlook report states that seagrass has a poor condition, with a stable trend. <i>Halimeda</i> banks condition is listed as very good, with no consistent trend. Current observations from the State Party Report 2022 are that seagrass is recovering. Most seagrass species in the GBRWHA are widely distributed and there are more notable examples such as Barrow Point to Lookout Point and Dunk Island. Although seagrass in the area provides foraging habitat for species of turtles and dolphins and nursery habitat for fish species, coverage fluctuates seasonally. Seagrass presence is typical of other inshore areas throughout the region.	Three species of <i>Halimeda</i> have been recorded within areas of low mud content substrate. The algae coverage at inshore fringing reefs in the study area fluctuates seasonally. Camp Island monitoring sites were dominated by <i>Sargassum</i> and Holbourne Island was dominated by <i>Padina</i> . Seagrass and macroalgae occurs in inshore and offshore areas, the cover of which fluctuates seasonally.
	Diversity of seagrass				Min		
Marine turtles	Marine turtles				Min		

Category	Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
	Green Turtle breeding	Min			Min	There is a <u>minor contribution</u> to OUV from Marine turtles, Green Turtle breeding and nesting turtles at Abbot Point and surrounding beaches. While all breeding is important the contribution to population in comparison to other areas such as Raine Island, Peak Island, Duck Island and Avoid Island is low.	<p>Species of Marine Turtle include: Loggerhead Turtle, Green Turtle, Leatherback Turtle, Hawksbill Turtle, Olive-ridley Turtle and Flatback Turtle.</p> <p>There are low levels of nesting by Green turtles within port limits, with foraging and breeding areas at Edgumbe Bay. There are small populations residing inside and adjacent to the mouths of Saltwater Creek and Euri Creek.</p>
	Nesting turtles	Min					
Marine Mammals	Migrating whales	Min				<p>There is a <u>minor contribution</u> to OUV from whales which may utilise the area during their southern migration. No aggregations areas are known to exist in the vicinity of the port.</p> <p>The 2019 GBR Outlook report notes that Humpback whales have recovered strongly across the reef, with a good condition and stable trend.</p>	<p>Humpback Whale adults and calves have been recorded within the coastal waters of Abbot Point, potentially using the area for resting on their southern migration from calving grounds. No aggregations areas are known to exist in the vicinity of the port.</p>
	Species of whales				Min		
	Dugongs				Min	<p>There is a <u>minor contribution</u> from dugongs. Dugongs may utilise meadows in the area for foraging while transiting between DPAs to the north and south. There are more notable examples of Dugong habitat/population numbers such as at Hinchinbrook Island, Cleveland Bay, Shoalwater Bay and Upstart Bay. The 2019 GBR Outlook report states that there is high-quality evidence and high level of consensus on Dugong data across the reef.</p>	<p>This area is of low conservation importance for Dugongs. Dugongs may forage in the seagrass beds as they move between the DPAs located to the north at Upstart Bay (44km north-west of Abbot Point) and Dugong Sanctuary at Edgumbe Bay (35km south-east of Abbot Point).</p>
	Species of dolphins				Min	<p>There is a <u>minor contribution</u> from dolphins. The 2019 GBR Outlook report recognises that data on dolphins is very limited.</p>	<p>The Indo-Pacific Humpback Dolphin and the Australian Snubfin Dolphin have been recorded during surveys of the Abbot Point marine area. The Abbot Point area provides suitable habitat for these species which prefer shallow (<20m deep) coastal waters. In addition, the creek</p>

Category	Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
							mouths and seagrass beds provide suitable preferred habitat for the Australian Snubfin Dolphin.
Landscapes and seascapes	Green vegetated islands	Min				There is a <u>minor contribution</u> to OUV from landscapes and seascapes. Other areas of the GBR represent more prime examples of these attributes such as Hinchinbrook Island and Curtis Island. There are islands in and adjacent to the master planned area that are protected under legislation, recognising their importance to local ecosystems.	There are six islands present within or adjacent to the study site. Holbourne Island vegetation includes over 90 species of plants and four RE including <i>Pisonia grandis</i> , <i>Xanthorrhoea latifolia</i> subsp. <i>latifolia</i> shrubland and <i>Timonius timon</i> shrubland. Pandanus and coastal she oaks are present as a small aggregate on a fore dune on the southern headland. The other islands with a lessor coverage and diversity of vegetation and include: Camp Island, Gloucester Island, Stone Island, Middle Island and North Head Island. A variety of seascapes and landscapes exist in the study area and surrounds including Mount Roundback, Mount Little, Mount Luce, wetlands, mangroves, sand beaches, mudflats, open water, coastal islands and coral reefs.
	Vegetation of the cays and continental islands			Min			
	Vegetated mountains	Min					
	Unique and varied seascapes and landscapes		Min				
	Significant diversity of reef and island morphologies that reflects ongoing geomorphic, oceanographic and environmental processes			Min			
	Superlative natural beauty	Mod				There is a <u>moderate contribution</u> to OUV from superlative natural beauty based on the large aggregations of waterbirds associated with the CVW which may be considered a superlative natural phenomenon. Ocean and island vistas within and surrounding the study area also contribute to this rating, noting there are more iconic locations in the GBRWHA such as the Whitsundays.	Large aggregations of shorebirds, seabirds and migratory birds at the CVW. Ocean and island vistas.

Category	Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
Species diversity	Over 4000 species of molluscs and over 1500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans			Min		There is a <u>minor contribution</u> to OUV, as diversity is typical of deepwater communities found elsewhere in the region. Reef communities in the area are not extensive or unique. Associated reef fish communities reflect the limited reef communities.	Marine fish are present in FHAs located adjacent to the project site and the seagrass and reef habitats within the project site. There are a small number of mid-shelf and inshore reefs within the study area and surrounds which support reef fish communities. Low density benthic macroinvertebrates populations in deepwater areas at Abbot Point. It has been estimated that in this region there are approximately 132 species of reef fish from 51 families.
	Thousands of species of reef fish	Min					
	Diversity supporting marine and terrestrial species (global conservation significance)				Sig	There is a <u>significant contribution</u> from diversity supporting marine and terrestrial species (global conservation significance) due to the presence of the CVW. The wetlands provide a diverse range of habitat for many plant and animal species, including coastal open waters, dunes, mangrove forests, marsh areas, lakes and streams.	The CVW is a nationally important wetland which provide habitat for large numbers of seabirds and shorebirds including threatened and migratory species. It supports a significant population of waterbirds with over 40,000 birds and 154 bird species recorded. This wetland while not in the GBRWHA, provides connectivity between the wetland and the World Heritage Area. Holbourne Island also provides bird nesting habitat. Species present include the Red Knot, Curlew Sandpiper, Great Knot, Great Sand Plover, Lesser Sand Plover, Bar-tailed Godwit, Australian Painted Snipe, Red-necked Stint, Sharp-tailed Sandpiper, Latham's Snipe and Great Egret Caspian Tern.
	Plant species and diversity and endemism (species being unique to a defined geographic location)				Min	There is a <u>minor contribution</u> to OUV from flora at Abbot Point with a threatened TEC previously recorded in the study area and	One TEC, the SEVTs of the Brigalow Belt (north and south) and Nandewar bioregions are recorded. Listed flora species include <i>Ristida</i>

Category	Attribute	Relevant Outstanding Universal Value Criteria and contribution classifications				Summary of contribution	Environmental value
		vii	viii	ix	x		
						four EPBC Act listed flora species potentially occurring.	<i>granitica</i> , <i>Dicanthium setosum</i> , <i>Eucalyptus raveretiana</i> , <i>Omphalea celata</i> and <i>Ozothamnus eriocephalus</i> .
	Important role of birds, such as the pied imperial pigeon, in processes such as seed dispersal and plant colonisation			Min		There is a <u>minor contribution</u> to OUV as the environments relevant to the ecological role of birds in seed dispersal are limited and sparse in the Abbot Point area.	The seed dispersal role played by birds is important in terrestrial environments and particularly to help maintain biological and genetic diversity between vegetated islands and the mainland. The Imperial pigeon for instance migrates daily as flocks from the islands to the mainland rainforests to eat fruit, returning to the islands at dusk.
	Breeding colonies of seabirds and Marine turtles	Sig				There is a <u>significant contribution</u> to OUV from seabirds, shorebirds and migratory birds within the CVW, which provides important habitat or threatened and migratory species.	Nineteen listed bird species (EPBC Act) are known to or likely to occur in the study area. Seven species had habitat or roosting areas within the study area including the Red Knot, Curlew Sandpiper, Great Knot, Great Sand Plover, Lesser Sand Plover, Bar-tailed Godwit and Australian Painted Snipe.
	242 species of birds				Sig		
	22 seabird species breeding (cays and some continental islands have globally significant breeding sites)				Sig		The CVW is an important habitat for listed birds and overall species diversity. It has a significant number of shorebirds and suitable migratory shorebird habitat. There are six migratory bird species that have large populations in the wetland including the Red-necked Stint, Sharp-tailed Sandpiper, Latham's Snipe, Great Egret Caspian Tern and the endangered Australian Painted Snipe.
Coastal Processes	Cross-shelf, longshore and vertical connectivity			Min		There is a <u>minor contribution</u> to OUV from coastal processes at Abbot Point with the offshore areas forming part of the larger longshore connections within the GBR lagoon	Offshore areas form part of the larger longshore connections within the GBR lagoon.

9.4 Integrity

Integrity of the GBRWHA is a key aspect of the Statement of OUV for the area. The statement recognises that the ecological integrity of the GBR is enhanced by the unparalleled size and good state of conservation across the area. At the time of inscription, it was felt that to include virtually the entire GBR within the property was the only way to ensure the integrity of the coral reef ecosystems in all their diversity.

The components of integrity include wholeness, intactness, and threats.²¹² The potential for the integrity of the World Heritage Area to be altered or lost locally, due to proposed master planning outcomes is considered low. The basis for this is outlined in **Table 51**.

Table 51: Elements to express Outstanding Universal Value and their relevance to the Abbot Point master planning study area

Integrity (wholeness, intactness and threats)	Relevant to the Abbot Point master planning study area
Unparalleled size	The GBRWHA is 348 000km ² the coastal and offshore areas of the Abbot Point study area represent a minor fraction of this area. The future development of Abbot Point will not lead to a decrease in the overall size of the World Heritage Area.
Scale of the GBR ecosystem	The reef ecosystem is extremely large and complex, it is made up of a large number of different but connected ecosystems from coral reefs and lagoons to islands, beaches and mangrove areas. The CVW represents an important component of this ecosystem.
Integrity of the coral reef ecosystem in all their diversity	The nearest significant coral reef ecosystems to Abbot Point are over 20km distant. The reefs at Holbourne Island and Camp Island represent a minor contribution to these ecosystems.
Property is largely intact and includes the fullest possible representation of marine ecological, physical and chemical processes enabling key interdependent attributes to exist in their natural relationships	The Abbot Point study area represents a minor fraction of the property and has been an industrial port since the inception of the World Heritage Area. The future development of Abbot Point will not alter this situation or place any of the individual attributes at risk.
Key ecological, physical and chemical processes essential for long-term conservation of marine and island ecosystems and their associated biodiversity occur outside property's boundaries	The CVW complex represents an important and valuable component of the RE. While not directly within the GBRWHA, the wetland's adjacency allows connectivity between the wetland and the World Heritage Area. This helps ensure that the ecological functions within the World Heritage Area continue to exist and function effectively
Good state of conservation across the property	With the exception of shipping and loading operations, all industrial activities at Abbot Point occur outside of the GBRMP. The integrity and status of this protected area will not be altered by future development.

9.5 Expression of Outstanding Universal Value

The evaluation of key attributes expressed within the study area has determined that there are several attributes that provide either a minor, moderate or significant contribution. These attributes are summarised as follows:

Significant contribution:

- seabirds, shorebirds and migratory birds associated with the CVW
- diversity supporting marine and terrestrial species (global conservation significance).

Moderate contribution:

- diversity of mangroves
- vast mangrove forests

²¹² Commonwealth of Australia. (2014). *Environment Protection and Biodiversity Conservation Act 1999* referral guidelines for the Outstanding Universal Value of the Great Barrier Reef World Heritage Area.

- superlative natural beauty.

Minor contribution

- there is a minor contribution from a range of attributes relating to marine species including:
 - marine turtles, green turtle breeding, and nesting turtles
 - species diversity of molluscs, fish, sponges, anemones, marine worms and crustaceans, thousands of species of reef fish
 - migrating and species of whales
 - dugong
 - species of dolphins
 - coral-related attributes including coral reefs, reef ecosystems, inshore fringing reefs, mid-shelf reefs, exposed outer reefs, hard and soft corals and spawning.
- there is also a minor contribution from a number of ecosystem-related attributes within and adjacent to the study area including:
 - seagrass diversity and *Halimeda* algae
 - unique and varied landscapes and seascapes, including green vegetated islands, vegetation of the cays and continental islands, and vegetated mountains
 - significant diversity of reef and island morphologies that reflects ongoing geomorphic, oceanographic and environmental processes
 - role of birds in processes such as seed dispersal and plant colonisation
 - plant species diversity and endemism
 - cross-shelf, longshore and vertical connectivity.

9.6 Summary

The findings indicate that the OUV of the GBRWHA is expressed within the study area through the significant populations of seabirds, shorebirds and migratory birds, moderate diversity of mangroves/vast mangrove forests associated with the CVW, and superlative natural beauty of the area. A minor contribution is provided by a number of marine species and ecosystem-related attributes.

10. Climate change and natural hazards

10.1 Introduction

Historically, Whitsunday, its hinterland and the Mackay areas (the region), had a warm and tropical climate with an average annual rainfall of 680mm, and a tropical cyclone season between December and April.

Representative Concentrations Pathways (RCP) (RCPs 4.5 and 8.5), developed by the Intergovernmental Panel on Climate Change (IPCC), have been used to project climate change-induced hazards and their influence on the region and the port's operations in different timeframes, including 2030, 2050 and 2090. Data shows that climate change has already influenced the area, and is impacting its social, ecological, and built environments. In the past few years, the region's temperature has been increased, rainfall has become less frequent but more intense, cyclones have become more catastrophic, storm tides have been influencing larger coastal areas, and erosion has become more severe in the port area. Climate change projections suggest that these trends (changes in the climatic conditions) will continue and threaten the port's assets, infrastructure, and operation significantly.

A review of the literature suggests a clear relationship between the region's climate change impacts and natural hazards, where the first exacerbates the likelihood, intensity and frequency of the latter. In this respect, it is projected that the region will experience, for example, more frequent and more intense bushfires due to warming temperature and increases in duration and frequency of heatwaves. Flooding and coastal inundation, landslide and coastal erosion are expected to increase in the future because of more intense rainfall, SLR, and its associated impacts such as storm surge. The review also indicated the existence of some mitigation and adaptation tools in the region's planning and policy sphere (for example, state²¹³ and WRC²¹⁴ mitigation and adaptation plans and policies).

This chapter provides the following sections:

- Overview of relevant policies and strategies – **Section 10.2**
- Climate change hazard maps – **Section 10.3**
- Known or potential natural hazards, risks and resilience factors – **Section 10.4**
- Natural hazards and climate change – **Section 10.5**
- Summary – **Section 10.6**.

10.2 Overview of relevant policies and strategies

A detailed review of literature and documents relevant to the climate change and natural hazard in Queensland, and the region was conducted. The literature and documents were reviewed according to their relevance to infrastructure and ports operation. **Table 52** shows main climate change and natural disaster policies and strategies in the areas and their overall relevance to the port's operation. However, it should be noted that climate change policies and strategies normally are developed on a broad scale (such as regional and local scales), unless developed specifically for the port site.

Table 52: Reviewed policies and plans and the overall relevance to the port

Policy/Strategy	Potential relevance to the port
<i>Pathways to a climate resilient Queensland: Queensland Climate Adaptation Strategy: 2017–30</i> ²¹⁵	Shows the Queensland Government's direction in addressing climate-related risks, with potential influence on informing the port's climate resilience strategies in the future.
<i>SPP</i> ²¹⁶	State planning instrument that influences the port's future development, and related restrictions and opportunities related to climate change and natural hazards.

²¹³ Department of Environment and Heritage Protection. (2017). *Pathways to a climate resilient Queensland, Queensland Climate Adaptation Strategy, 2017–2030*. Queensland Government.

²¹⁴ Whitsunday Regional Council. (2016). *Whitsunday Regional Council Climate Change Adaptation Strategy 2016–2020*.

²¹⁵ Ibid 213

²¹⁶ Department of Infrastructure Local Government and Planning. (2017). *State Planning Policy*. Queensland Government.

Policy/Strategy	Potential relevance to the port
<i>Built environment and infrastructure sector adaptation plan 2017</i> ²¹⁷	Shows the specific climate change adaptation actions for infrastructure such as ports.
<i>Queensland Strategy for Disaster Resilience 2017</i> ²¹⁸	State level strategy to respond to natural hazards that could impact the ports operation and infrastructure, and future development of natural hazard strategy.
<i>Whitsunday Climate Change Mitigation Policy 2018</i> ²¹⁹	Addresses emission reduction policy for the WRC.
WRC Climate Change Adaptation Strategy 2016–20 ²²⁰	Local level adaptation plan, informing the port's authorities about local adaptation strategies.
Reef 2050 Plan. ²²¹	Shows Australian Government level regulation and frameworks that the port need to consider in regard to impacting coral reefs.
<i>Sustainability review 2015–17, NQBP</i> ²²²	Influence NQBP sustainability policy development and responses to climate change risks and opportunities.

Historically, the region has had a warm and tropical climate with an average temperature of 27°C in summer and 17°C in winter. See **Figure 51** illustrating the location of the wet tropics area.²²³



Figure 51: Wet Tropic Natural Resources Management sub-cluster

²¹⁷ Department of Environment and Science. (2017). *Built environment and infrastructure sector adaptation plan*. Queensland Government.

²¹⁸ Queensland Government. (2017). *Queensland Strategy for Disaster Resilience*. Queensland Government.

²¹⁹ Whitsunday Regional Council. (2016). *Whitsunday Regional Council Climate Change Adaptation Strategy 2016 – 2020*.

²²⁰ Whitsunday Regional Council. (2018). *Whitsunday Climate Change Mitigation Policy*.

²²¹ Australian Government. (2018). *Reef 2050 Long-Term Sustainability Plan*.

²²² North Queensland Bulk Ports Corporation Limited. (2015). *Sustainability review, October 2015 – June 2017*.

²²³ <https://www.climatechangeinaustralia.gov.au/en/overview/impacts-and-adaptation/wet-tropics/>

The average rainfall is 689mm per year, which is mainly distributed between November and April. The region's climate is influenced by geographical variables (topography, vegetation etc.) and global climatic phenomena such as El Niño and the Southern Oscillation. The region's climate is also influenced by tropical cyclones which extended between December to April.²²⁴

Climate change is already influencing the region, and impacting its multiple land uses differently. Data shows that in the past few years, the region has been getting warmer, rainfall has become less frequent but more intense, cyclones have become more catastrophic, storm tide has been influencing larger coastal areas, and erosion has become more severe.²²⁵ In general, climate change impacts society, ecosystems and infrastructure in two different ways:

- Increasing the likelihood and severity of natural hazards. These hazards are normally rapid and episodic creating short to medium-term catastrophic impacts (for example, bushfire, flooding and storm surge events).
- Creating new hazard factors that are normally incremental and cause medium- to long-term impacts (such as SLR, saltwater intrusion, ocean acidification).

The port, its infrastructure and operations, are likely to be impacted by climate change induced hazards in the future.

Climate change impacts are projected according to multiple 'scenarios'. Scenarios are used as a basis for assessing risk of crossing identifiable thresholds and represents the assumptions about greenhouse gas concentrations in the atmosphere for different future timeframes. These scenarios are called RCPs, ranging from RCP 2.6 (the lowest concentration scenario), to RCP 8.5 (the highest concentration scenario).

RCPs has been used in the IPCC report, *AR5 Climate Change 2014: Impacts, Adaptation and Vulnerability*²²⁶ to refer to the concentrations of greenhouse gases that result in total radioactive forces increasing by a target amount by 2100, relative to pre-industrial levels. The RCP number refers to the radiation level in watts per square metre.

The change in temperature predicted under these scenarios is presented below (from the IPCC report).

Representative Concentrations Pathways	Change in Temperature (°C) by 2100
RCP 2.6	1.6
RCP 4.5	2.4
RCP 6.0	2.8
RCP 8.5	4.3

RCP 2.6 represents a pathway where greenhouse gas emissions are strongly reduced. RCP 8.5 is a pathway where greenhouse gas emissions continue to grow unmitigated – a 'do nothing' approach. RCP 4.5 and RCP 6.5 are pathways that represent medium stabilisation pathways. With greenhouse gas reduction measures now proposed by major world economies, RCP 4.5 and RCP 6.0 appear the most likely scenarios to be achieved.

Figure 52²²⁷ illustrates the RCPs and how they potentially impact Australia's climatic and environmental variables. It shows different scenarios of change according to multiple RCPs. For example, under RCP 8.5 climate hazards would be more extreme, therefore, require expensive adaptation options (such as building seawalls). However, as emissions are reduced (from top to bottom), hazards become less destructive and adaptation option become less expensive.

Available national, state and regional information was accessed via online search. This information projects changes in the climatic variables (such as temperature, rainfall, etc.) under RCPs 4.5 and 8.5, and for 2030, 2050 and 2090 timeframes.

²²⁴ Department of Environment and Science (2019). Climate change in the Whitsunday, Hinterland and Mackay region. Version 1. Queensland Government.

²²⁵ Queensland Government. (2018). State of the Environment. Retrieved from State of the Environment (Department of Environment and Science) (des.qld.gov.au)

²²⁶ Intergovernment Panel on Climate Change. (2014). AR5 Climate Change 2014: Impacts, Adaptation and Vulnerability. Retrieved from <http://www.ipcc.ch/report/ar5/wg2/>

²²⁷ CoastAdapt (n.d.) What are the RCPs? Australian Government <https://coastadapt.com.au/sites/default/files/infographics/15-117-NCCARFINFOGRAPHICS-01-UPLOADED-WEB%2827Feb%29.pdf>

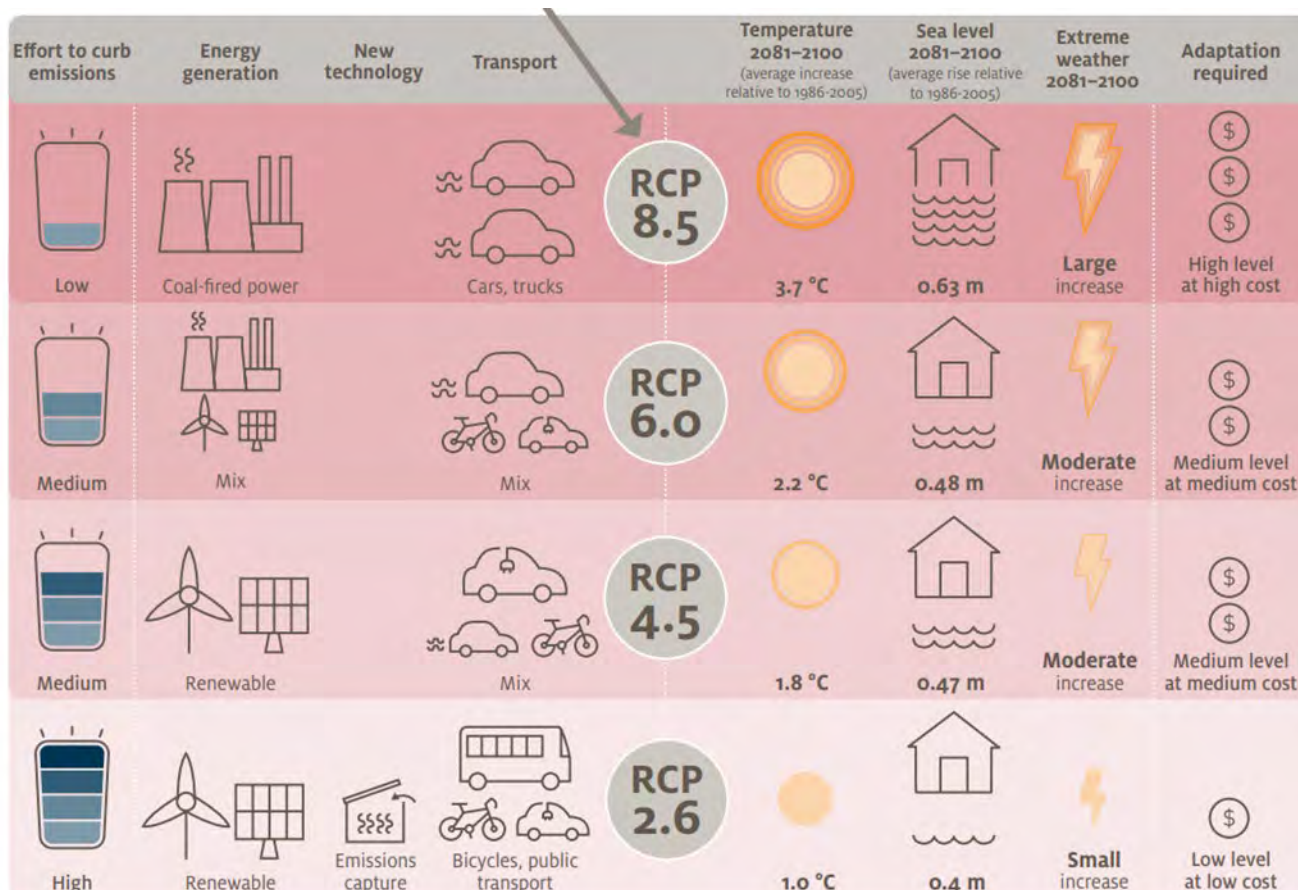


Figure 52: Representative Concentrations Pathways on Australia's climatic and environmental variables

10.2.1 Interrelationship between climate change and natural hazards

The review of the existing literature suggests a relationship between the ongoing climate change and the likelihood and severity of natural hazards in the short and long term. For example, the SPP indicates that the ongoing climate change is projected to amplify the frequency and severity of natural hazards across the state.²²⁸ The policy indicates five major natural hazards including bushfire, flood, landslide, storm tide and inundation, and erosion. The QCoast 2100, *Developing a Coastal Hazard Adaptation Strategy: Minimum Standards and Guideline for Queensland Local Governments* (October 2016)²²⁹ report indicated that the ongoing climate change triggers more severe coastal hazards (such as inundation and storm surge and SLR) which could expose larger areas of the state's coasts.

The Taskforce on Climate Financial Disclosure, defines two different, but interrelated, risks to organisations (such as ports)²³⁰ including:

- Physical climate-risks: these are risks that result from the physical effects of climate change and natural hazards on the condition, function and operating life of assets, infrastructure, people, food production systems and/or natural environments
- Transitional risks: mandatory or voluntary transitions to a low or zero carbon economy challenges 'business as usual'. Transitional climate change risks arise due to changes in regulatory systems and stakeholder values that require corporations to address greenhouse gas emissions and build climate resilience into their business model and operations (see **Table 53** for some examples of climate transition risk).

²²⁸ Ibid 101

²²⁹ QCoast 2100. (2016)., *Developing a Coastal Hazard Adaptation Strategy: Minimum: Standards and Guideline for Queensland Local Governments*. Queensland Government and LGAQ.

²³⁰ Taskforce on Climate Financial Disclosure. (2017) *Recommendations of the task force on climate related financial disclosures*. Basil, Switzerland.

Table 53: Climate change, natural hazards and potential impacts on the port

Potential climate change and natural hazards	Potential risks/impacts on ports infrastructures and operation
<p>More frequent fluvial and pluvial flooding due to heavier and more intense rainfall (increased probability of extreme and rare rainfall event).</p> <p>More frequent coastal hazard (flooding, inundation and storm surge) due to SLR and changes in the climatic variables (such as wind speed and stronger cyclones).</p>	<p>Damage or loss of assets and infrastructure (for example, road networks).</p> <p>More pressure on critical infrastructure (for example, stormwater, sewerage).</p> <p>Increased operation and maintenance costs (for example, clean up after flooding).</p> <p>Insurance risk (Loss of access to insurance due to reduction of insurance coverage).</p> <p>Supply chain risk (Disruption of access to production inputs and roads).</p>
Extended dry season and more exposure to drought due to changes in rainfall patterns	Delivering essential water requirement for operation.
Increased bushfire risk due to extended bushfire season (drier and hotter weather)	<p>Damage or loss of assets and relevant infrastructure (for example, road networks).</p> <p>Insurance risk.</p> <p>Increased operation and maintenance costs (for example, mending damaged assets, clean up after bushfire).</p> <p>Supply chain risk (Disruption of access to production inputs and roads).</p>
Warmer temperature and more frequent heatwave	<p>Health and wellbeing problems for port staff.</p> <p>Increased operation and maintenance coast (for example, more energy consumption).</p>
Less frequent but more intense and disruptive storm (including cyclones) due to change in the global and local ocean and climatic variables (such as El Niño, weather and water surface temperature, wind speed etc.)	<p>Damage or loss of assets and relevant infrastructure (for example, road networks).</p> <p>Increased operation and maintenance costs (for example, mending damaged assets, clean up after storm surge).</p> <p>Insurance risk (Loss of access to insurance due to reduction of insurance coverage).</p> <p>Supply chain risk (Disruption of access to production inputs and roads).</p>
More exposure to land erosion and land slide due to intense rainfall and flooding events	<p>Change of sediment transport pattern and change of coastal landform and water depth.</p> <p>Supply chain risk (Disruption of access to production inputs and roads).</p>

Table 54: Potential transition risk to the port's operation and financial situation²³¹

Risks	Potential business impacts
<p>Legal and policy risks:</p> <p>Changes in greenhouse gasses emissions pricing</p> <p>Enhanced emissions-reporting obligations</p> <p>Mandates on and regulation of existing products and services</p> <p>Exposure to litigation.</p>	<p>Increased operating costs (for example, higher compliance costs, increased insurance premiums).</p> <p>Write-offs, asset impairment, and early retirement of existing assets due to policy changes.</p> <p>Increased costs and/or reduced demand for products and services resulting from fines and judgments.</p>
<p>Technological risks:</p> <p>Substitution of existing products and services with lower emissions options</p> <p>Costs to transition to lower emissions technology</p>	<p>Write-offs and early retirement of existing assets.</p> <p>Reduced demand for products and services.</p> <p>Costs to adopt/deploy new practices and processes.</p>
<p>Market risks:</p> <p>Changing customer behaviour</p> <p>Uncertainty in market signals</p> <p>Increased cost of raw materials.</p>	<p>Reduced demand for goods and services due to shift in consumer preferences.</p> <p>Abrupt and unexpected shifts in energy costs – Change in revenue mix and sources, resulting in decreased revenues.</p> <p>Re-pricing of assets (for example, fossil fuel reserves, land valuations, securities valuations).</p>

²³¹ Taskforce on Climate Financial Disclosure. (2017) Recommendations of the task force on climate related financial disclosures. Basel, Switzerland.

Risks	Potential business impacts
Reputation: Shifts in consumer preferences Stigmatisation of sector Increased stakeholder concern or negative stakeholder feedback.	Reduced revenue from decreased demand for goods/services. Reduced revenue from negative impacts on workforce management and planning (for example, employee attraction and retention). Reduction in capital availability.

10.2.2 Existing and planned responses to climate change for the port and surrounding areas

A variety of state and local scale adaptation and hazard mitigation responses apply to the region and could potentially influence the port's operations. Some of these documents include, but are not limited to:

- *Pathways to a climate resilient Queensland: Queensland Climate Adaptation Strategy: 2017–2030*²³²
- SPP²³³
- *Built Environment and Infrastructure Sector Adaptation Plan 2017*²³⁴
- QCoast 2100, *Developing a Coastal Hazard Adaptation Strategy: Minimum: Standards and Guideline for Queensland Local Governments 2016*²³⁵
- *Queensland Strategy for Disaster Resilience 2017*²³⁶
- *Whitsunday climate Change Mitigation Policy 2018*²³⁷
- WRC Climate Change Adaptation Strategy 2016–2020²³⁸
- Reef 2050 Plan.²³⁹

In general, these responses encompass a range of statutory and non-statutory instruments. For example, in respect to coastal areas, the *Coastal Protection and Management Act 1995* is the key state level legislation for ensuring that coastal natural values and economic interests are protected across the state. Another major response to climate change includes Queensland Climate Adaptation Strategy.²⁴⁰ The strategy highlights the state's plan to adapt to climate change and its impacts. The Climate Adaptation Strategy encompasses the following response areas:

- developing government's adaptation action plan
- facilitating industry-led sector adaptation plans
- supporting local governments and regions to adapt
- establishing Queensland Climate Resilient councils
- improving community capacity and resilience.

Other key planning or management tools that contain responses to climate change and hazards are shown in **Table 55**.

²³² Department of Environment and Heritage Protection. (2017). *Pathways to a climate resilient Queensland*, Queensland Climate Adaptation Strategy, 2017–2030. Queensland Government.

²³³ Ibid 101

²³⁴ Department of Environment and Science. (2017). *Built environment and infrastructure sector adaptation plan*. Queensland Government.

²³⁵ QCoast 2100. (2016). *Developing a Coastal Hazard Adaptation Strategy: Minimum: Standards and Guideline for Queensland Local Governments*. Queensland Government and LGAQ.

²³⁶ Queensland Reconstruction Authority.. (2017). *Queensland Strategy for Disaster Resilience*. Queensland Government

²³⁷ Whitsunday Regional Council. (2016). *Whitsunday Regional Council Climate Change Adaptation Strategy 2016–2020*.

²³⁸ Whitsunday Regional Council. (2018). *Whitsunday climate Change Mitigation Policy*.

²³⁹ Commonwealth of Australia. (2018). *Reef 2050 Long-Term Sustainability Plan*.

²⁴⁰ Department of Environment and Heritage Protection. (2017). *Pathways to a climate resilient Queensland*, Queensland Climate Adaptation Strategy, 2017–2030. Queensland Government

Table 55: Other responses to climate change and hazards in the key documents

Key response tool/instrument	Description
Shoreline erosion management plans	Prepared by councils in collaboration by the Queensland Government to protect coastal area against erosion.
Coastal Management District (CMD)	Supported by the <i>Coastal Protection and Management Act 1995</i> to respond to coastal vulnerability.
Coastal Management Plans	Non-statutory guidelines for coastal management.
Natural Disaster Relief and Recovery Arrangements	A joint venture by the Australian and Queensland Governments to support communities affected by natural hazards (remedial response).
<i>QCoast 2100, Developing a Coastal Hazard Adaptation Strategy: Minimum: Standards and Guideline for Queensland Local Governments</i> (2016)	A mutual partnership between the Queensland Government and Local Government Association of Queensland. The program aims to assist coastal communities with delivering responses to climate change hazards (preventive).
Queensland Strategy for Disaster Resilience ²⁴¹	Aims to enhance the state resilience against all hazards (such as floods, bushfires, cyclones, severe storms, storm surges, landslips, tsunamis, earthquakes, oil spills, droughts and extreme heat events).
Drought and Climate Adaptation Program ²⁴²	Aims to establish producers for better management of drought and climate impacts (https://www.longpaddock.qld.gov.au/dcap/).
WRC climate adaptation and mitigation policies ^{243 244}	Highlights the council's position regarding climate change impacts.
NQBP Sustainability Review 2015+ ²⁴⁵	Indicates climate change risks and opportunities (physical and transition) to the port's assets and infrastructure.

Most of the responses focused on strategies/actions to avoid hazard prone areas or mitigate and adapt to the existing and potential hazards/risks. For example, the SPP identifies natural hazard, risk and resilience as a significant state interest which needed to be included in the short- and long-term infrastructure planning (including strategic ports). In this regard, Part E of the policy ensures: 'Planning for infrastructure indicate that infrastructure is appropriately designed and located (including considering the projected impacts of climate change)'.

QCoast 2100²⁴⁶ provide an eight-step methodology for developing local adaptation response to Queensland's coastal climate change and hazards issues. These steps include:

- plan stakeholder communication and engagement during the project's lifecycle
- scoping coastal hazards for the project area
- identify existing and potential coastal hazards
- identify key exposed assets/properties
- conduct risk assessment exposed areas/assets
- develop potential adaptation options
- evaluate social/economic aspect of adaptation options
- development implementation strategies, review and monitor.

QCoast 2100²⁴⁷ disputes the conventional static responses to climate change and natural hazards in most organisations, and advocates for developing more dynamic, flexible and adaptive coastal hazard adaptation strategy. Adaptive Management Framework, as referred in the QCoast 2100, is constant cyclic procedure of

²⁴¹ Queensland Government. (2017) *Queensland Strategy for Disaster Resilience 2017, Making Queensland the most disaster resilient state in Australia*.

²⁴² Queensland Government. (2021). *The Long Paddock* retrieved from <https://www.longpaddock.qld.gov.au/dcap/>

²⁴³ Whitsunday Regional Council. (2016) *Whitsunday Regional Council Climate Change Adaptation Strategy 2016 – 2020*. Whitsunday

²⁴⁴ Whitsunday Regional Council. (n.d.) *Whitsunday Regional Council Climate Change Mitigation Strategy*.

²⁴⁵ North Queensland Bulk Ports Corporation. (2017). 2017-18 Annual Report.

²⁴⁶ Ibid 235

²⁴⁷ Ibid

planning, implementation, monitoring and responding see **Figure 53**. This process that allows integration of new information and knowledge into the planning/management cycle as they arise.

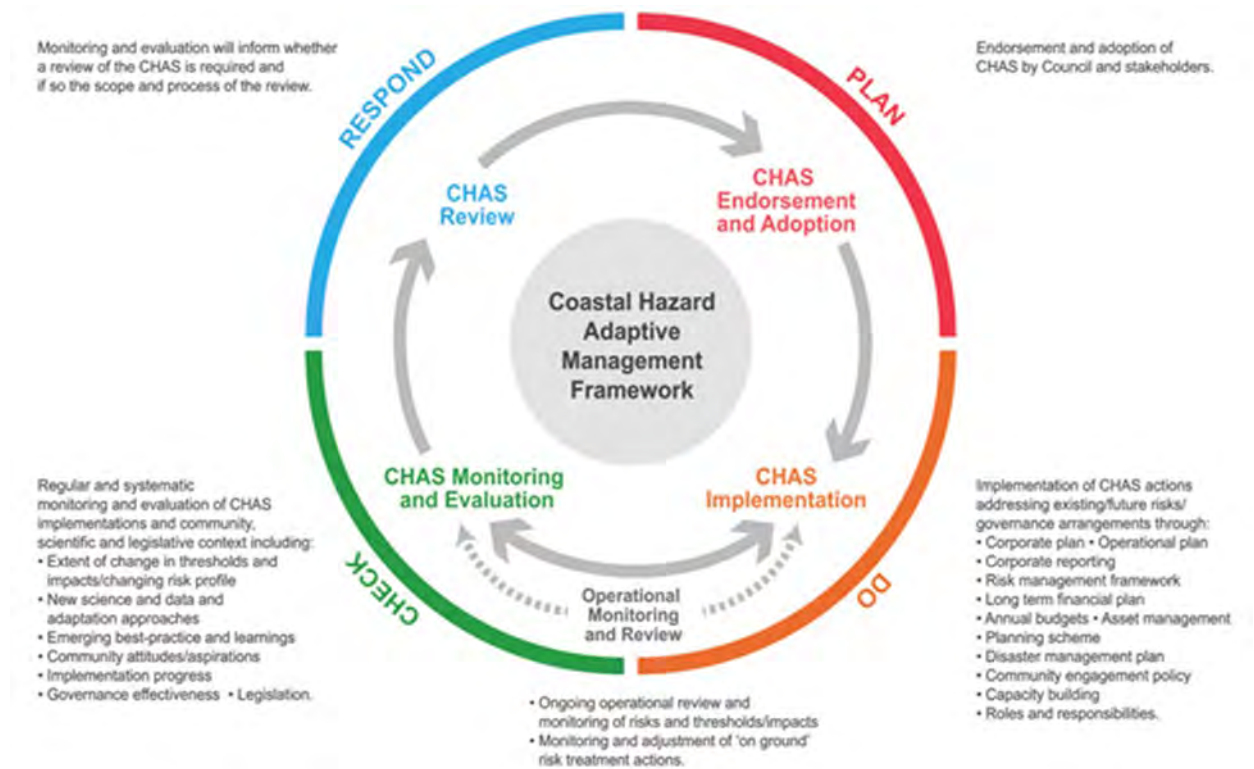


Figure 53: Coastal Hazard Adaptive Management Framework for continuous improvement²⁴⁸

Furthermore, the *State of the Environment Report 2020*²⁴⁹ provides a number of management responses to climate change. These responses, which are aimed to be developed in collaboration with industries and private section, include:

- emission reduction to zero greenhouse gas mission by 2050
- carbon farming and carbon offsetting plans
- developing sector adaptation plans - identifying and prioritising adaptation responses required by each sector (adaptation plan already completed for infrastructure sector)
- building community capacity and resilience
- Queensland Strategy for Disaster Resilience
- Drought and Climate Adaptation Program
- State Planning Framework, including guidelines to address the impacts of climate change.

WRC has developed climate mitigation and adaptation policies and strategies to respond to climate change impacts on the region's environmental and social systems and infrastructure.

NQBP 'sustainability review' addresses the vulnerability of NQBP's assets and infrastructure to climate change risks and hazards, therefore, the board developed some broad climate change responses (commitments) including:

- facilitate discussion on climate change risks, opportunities and boundaries to inform and align future NQBP climate change actions and investments
- shape a relevant and consistent climate change dialogue with stakeholders
- identify actions for NQBP to strengthen its climate change resilience within a broader sustainability mandate

²⁴⁸ Ibid 235

²⁴⁹ Department of Environment and Science. (2018). *Queensland State of the Environment*. Queensland Government.

- assessing current operations and planned developments and infrastructure for each port to understand climate vulnerability
- identifying steps to mitigate and adapt to the risk
- sharing information and learnings with stakeholders and taking the lead in the port sector.

10.3 Climate change hazard maps

This section illustrates the climate change implications to the port and study area according to RCP 4.5 and RCP 8.5, and for 2030, 2050 and 2090 timeframes. To identify the climate change hazard, the projections database provided by the Queensland Government in the Future Climate Change Dashboard²⁵⁰ was used as the main source of information. SLR information was mainly adopted from Coast Adapt tool²⁵¹. It should be noted that all the are relative to the baseline climate of 1986–2005.

10.3.1 Annual mean temperature

The analysis of the annual mean temperature data suggests a warmer climate for the region in the future.

By 2030 the annual mean temperature is projected to rise by 0.9°C under RCP 4.5 and by 1°C under RCP 8.5.

By 2050, the region's annual mean temperature is likely to increase by 1.3°C and 1.7°C under RCPs 4.5 and 8.5 respectively.

In the longer-term by 2090, hotter weather is projected for the region with an annual mean temperature of 3.6°C under the higher emission scenario.

Figure 53 to Figure 54 show the mean annual temperature rise under RCPs 4.5 and 8.5 for 2030, 2050 and 2090 periods.

²⁵⁰ Queensland Government. (2021). Queensland Future Climate Dashboard. Retrieved from longpaddock.qld.gov.au/qld-future-climate/dashboard/

²⁵¹ National Climate Change Adaptation Research Facility and Australian Government. *Coast Adapt: A Changing climate in coastal Australia: Build knowledge, take action*. Retrieved from <http://coastadapt.com.au>

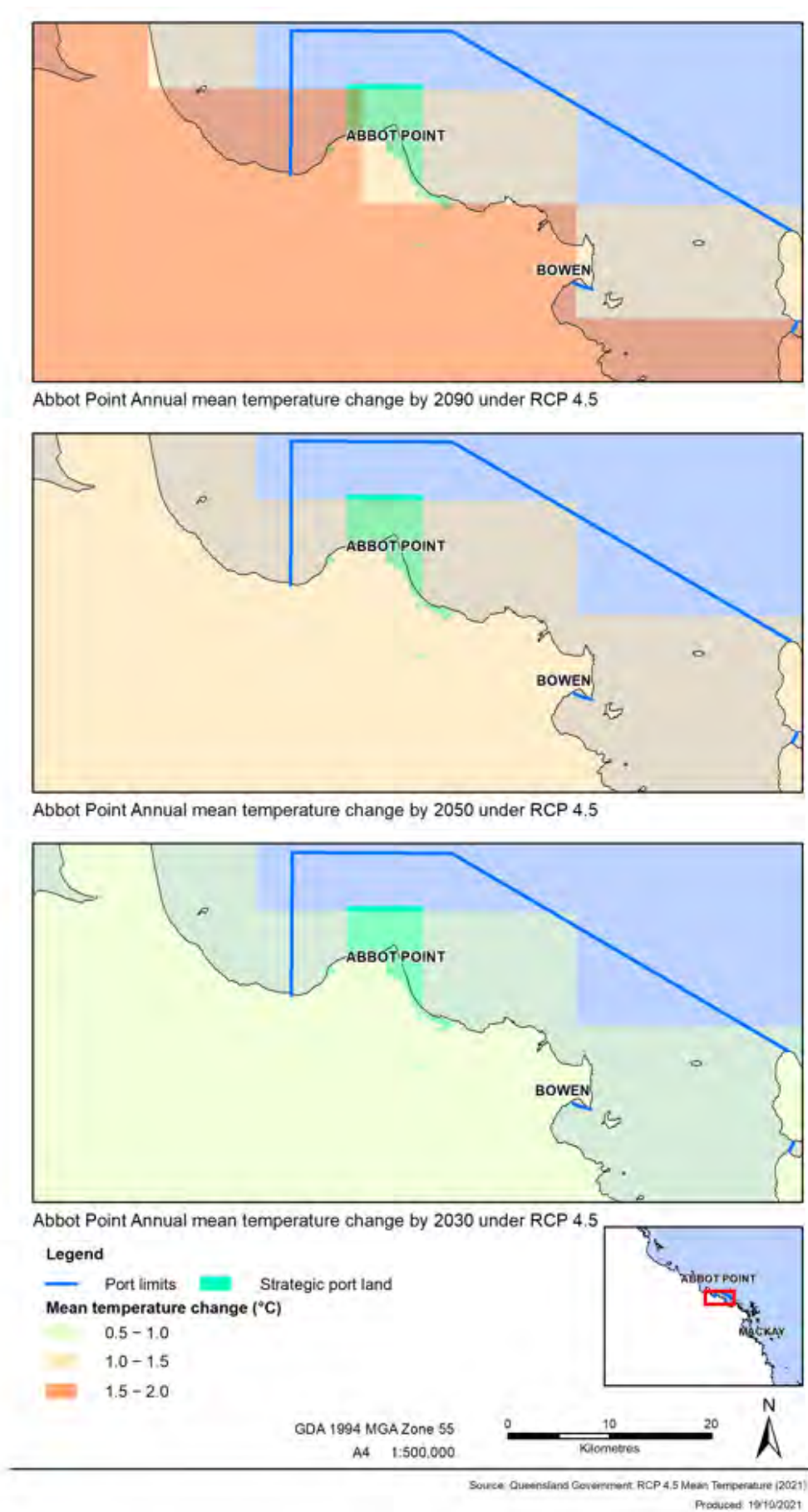


Figure 54: Annual mean temperature change in the region 2030 to 2090 under Representative Concentrations Pathway 4.5

Figure 54 demonstrates the RCP 4.5 temperature change of a projected 2.4°C increase to 2100. It is considered a medium stabilisation pathway most likely to be achieved.

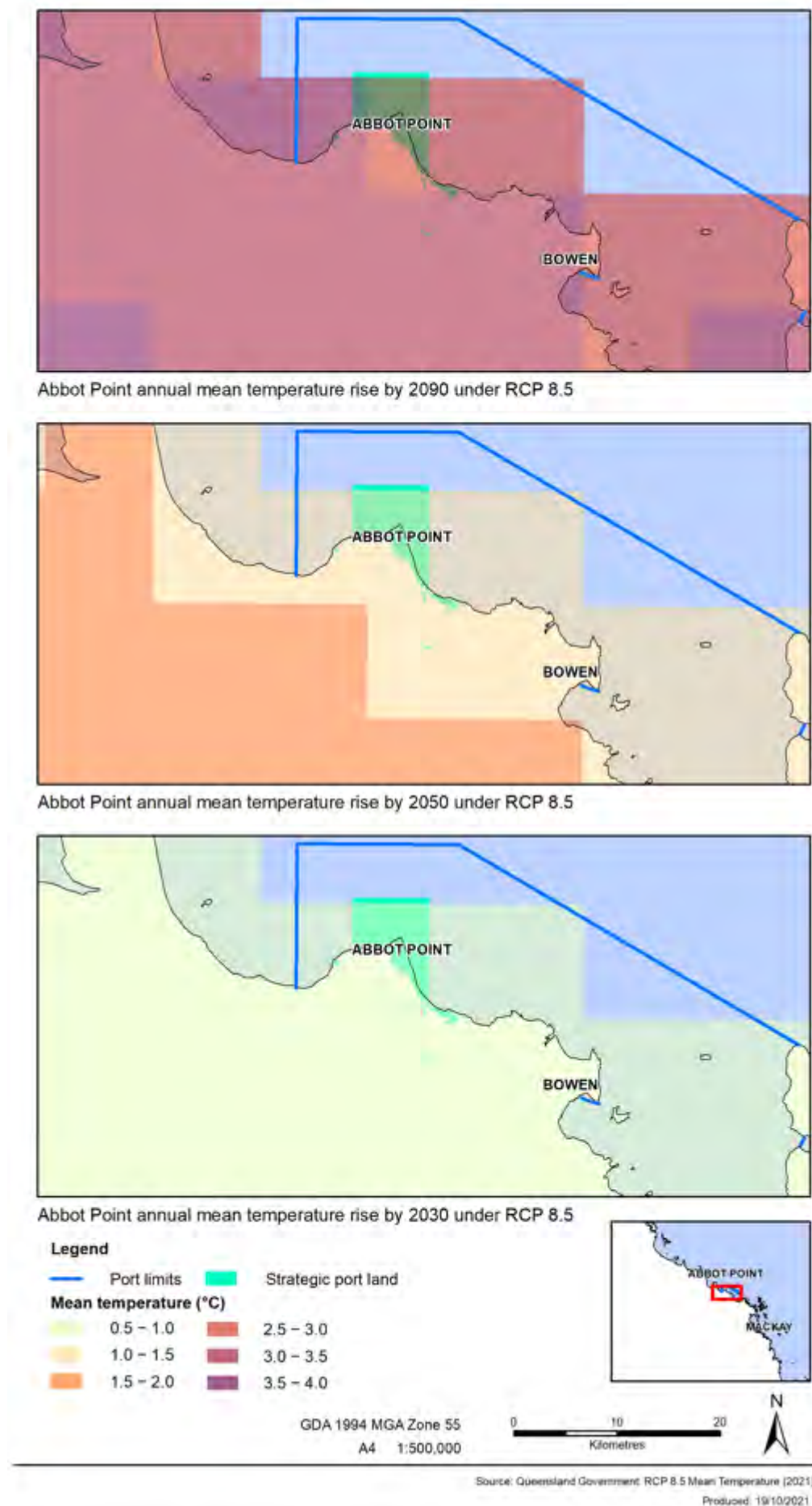


Figure 55: Annual mean temperature rise in the region 2030 to 2090 under Representative Concentrations Pathway 8.5

Figure 55 demonstrates the RCP 8.5 temperature change of a projected 4.3°C increase to 2100. It assumes greenhouse gas emissions continue to rise unmitigated, 'do nothing approach'.

10.3.2 Annual mean rainfall change

The analysis of data shows an overall decline in the annual mean rainfall across the region in the future. By 2030, annual mean rainfall decreases by 3% from the baseline average applying RCP 4.5. Under a higher emissions scenario, the uncertainty of projected rainfall change is greater, with annual rainfall change between 18% increase to a 26% decrease.

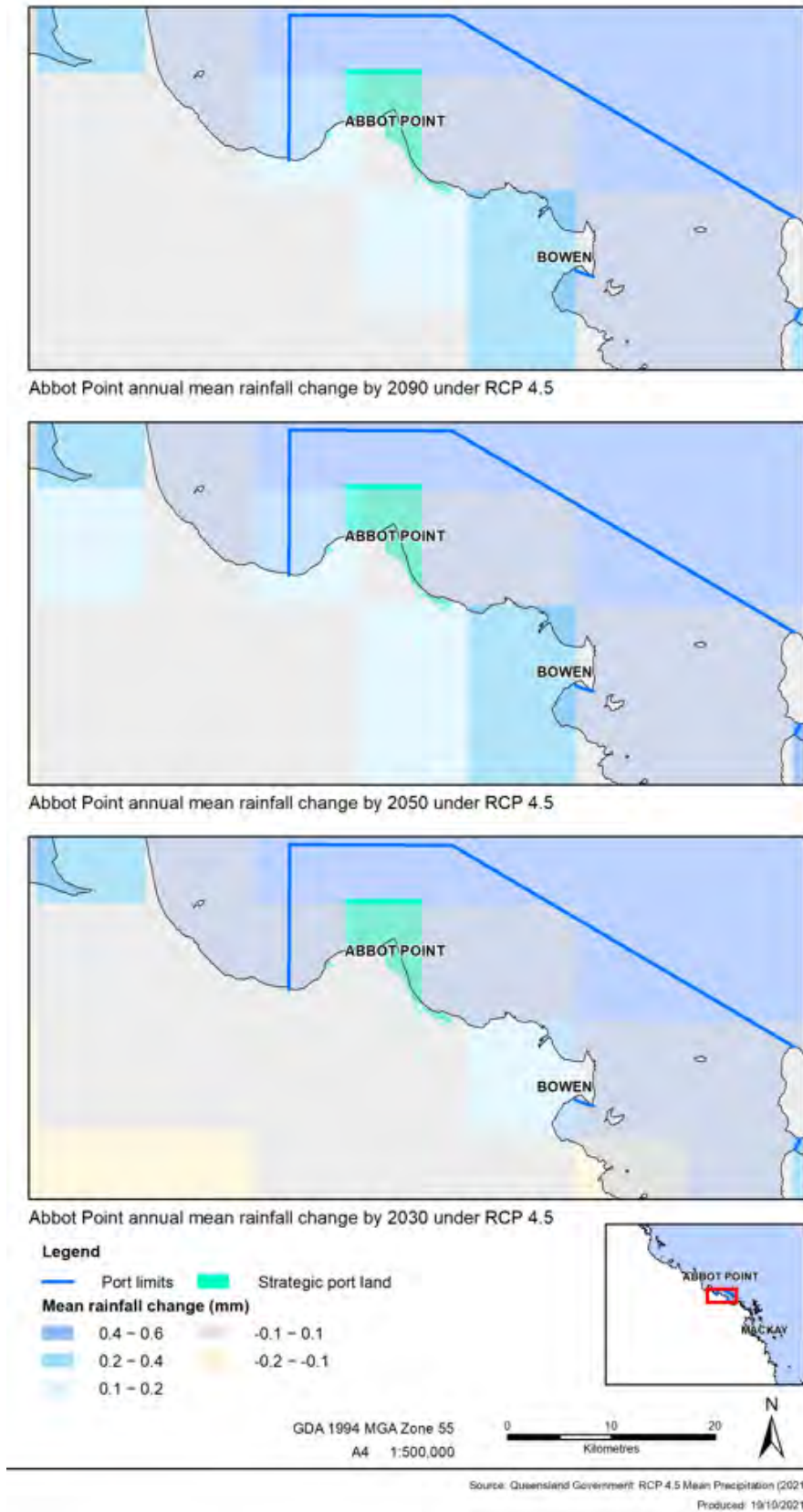
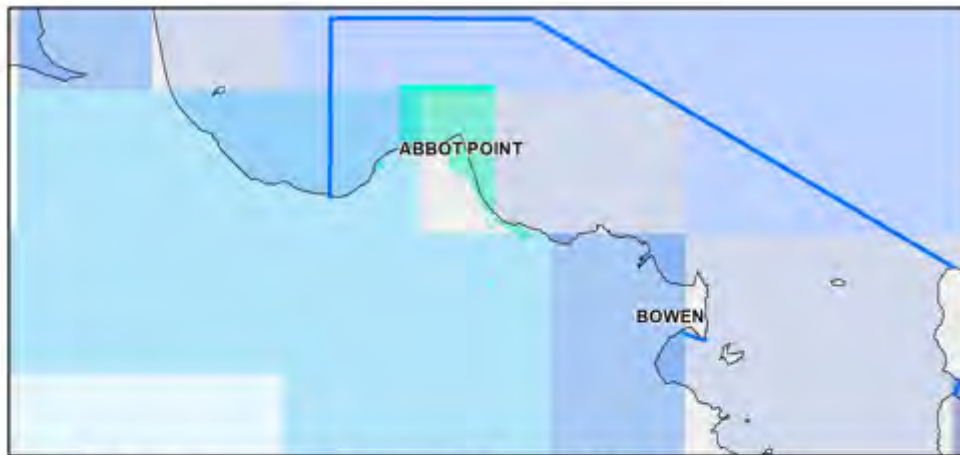


Figure 56: Annual mean rainfall change in the region 2030 to 2090 under Representative Concentrations Pathway 4.5

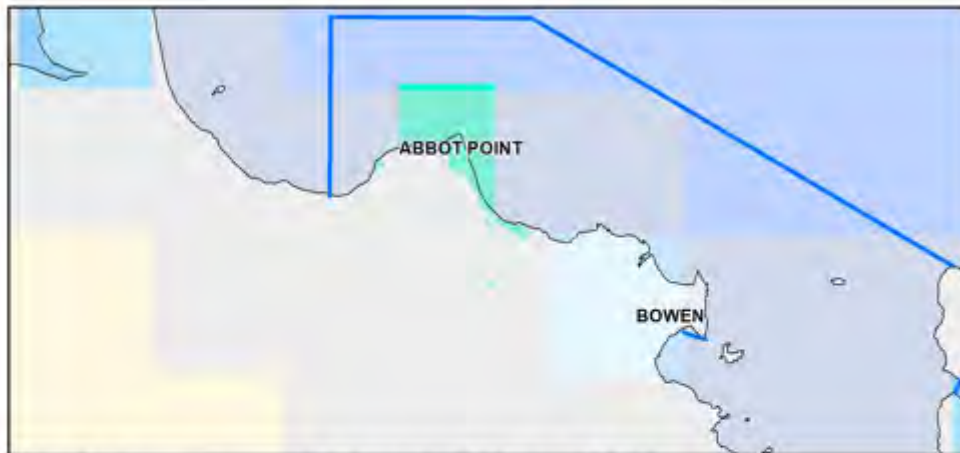
Figure 56 demonstrates the anticipated mean average annual rainfall applying an RCP of 4.5, being considered a most likely scenario to be achieved.



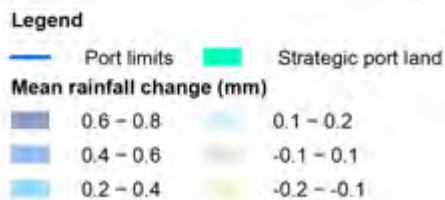
Abbot Point annual mean rainfall change by 2090 under RCP 8.5



Abbot Point annual mean rainfall change by 2050 under RCP 8.5



Abbot Point annual mean rainfall change by 2030 under RCP 8.5



GDA 1994 MGA Zone 55
A4 1:500,000

0 10 20
Kilometres



Source: Queensland Government, RCP 8.5 Mean Precipitation (2021)
Produced: 19/10/2021

Figure 57: Annual mean rainfall change in the region 2030 to 2090 under Representative Concentrations Pathway 8.5

Figure 57 demonstrates the anticipated mean average annual rainfall applying an RCP of 8.5 where greenhouse gas emissions continue to rise unmitigated.

10.3.3 Hot days and heatwave (bushfire risk)

Future changes in the number of hot days, and heatwave duration and frequency were selected as indicators of future bushfire hazard in the region. Data shows that the region is likely to experience more hot and extreme hot days in the future. Under the RCP 8.5 scenario, the port area is likely to experience an average of 1.5, 4.8 and 23 more extreme hot days in 2030, 2050 and 2090 respectively. Also, heatwave duration and frequency are projected to increase under both RCPs for all three timeframes. By the end of the century and under RCP 8.5, the heatwave duration and frequency are likely to rise by 16 and 33 days (average) for July to June period (annually). This indicates an increased risk of bushfire in the port's region in the future shown in **Figure 58** to **Figure 59**.

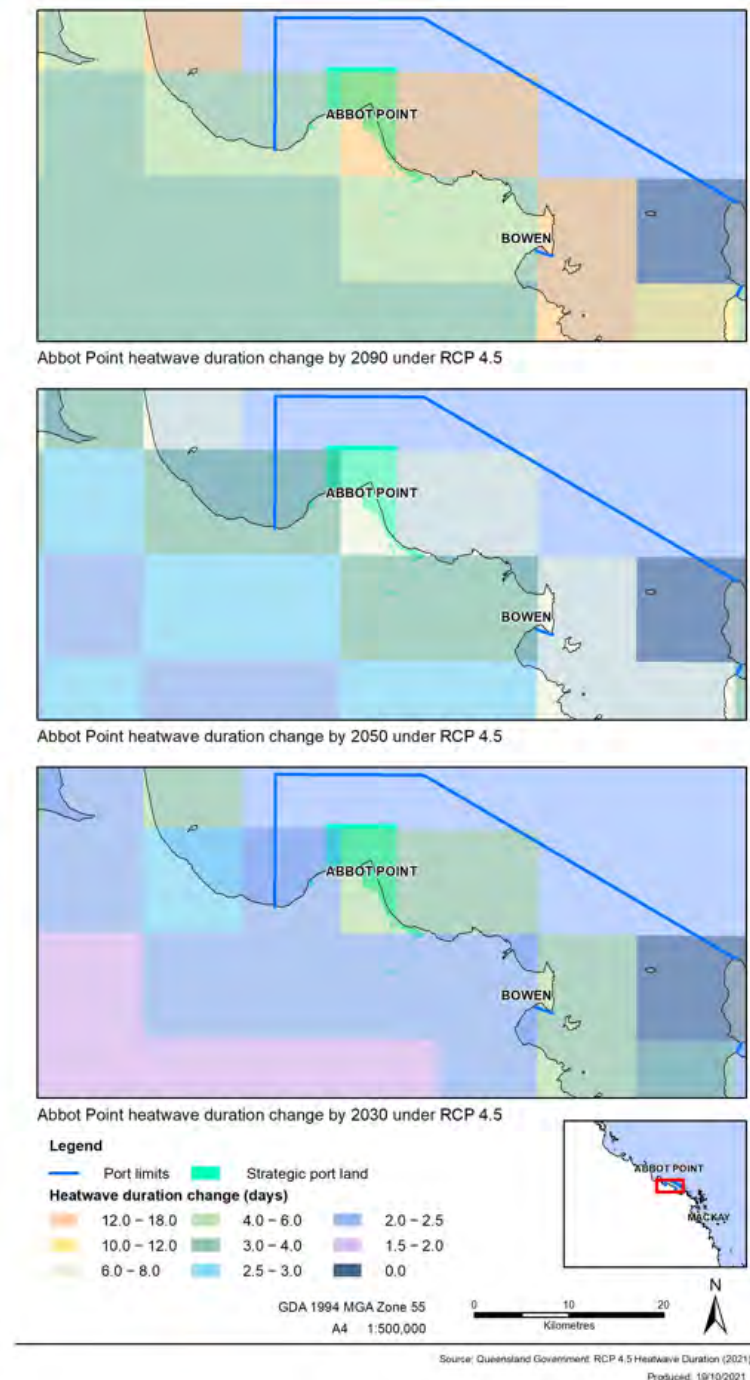


Figure 58: Heatwave duration change in the region 2030 to 2090 under Representative Concentrations Pathway 4.5

Figure 58 demonstrates the anticipated change in heatwave duration applying an RCP of 4.5, being considered a most likely scenario to be achieved.

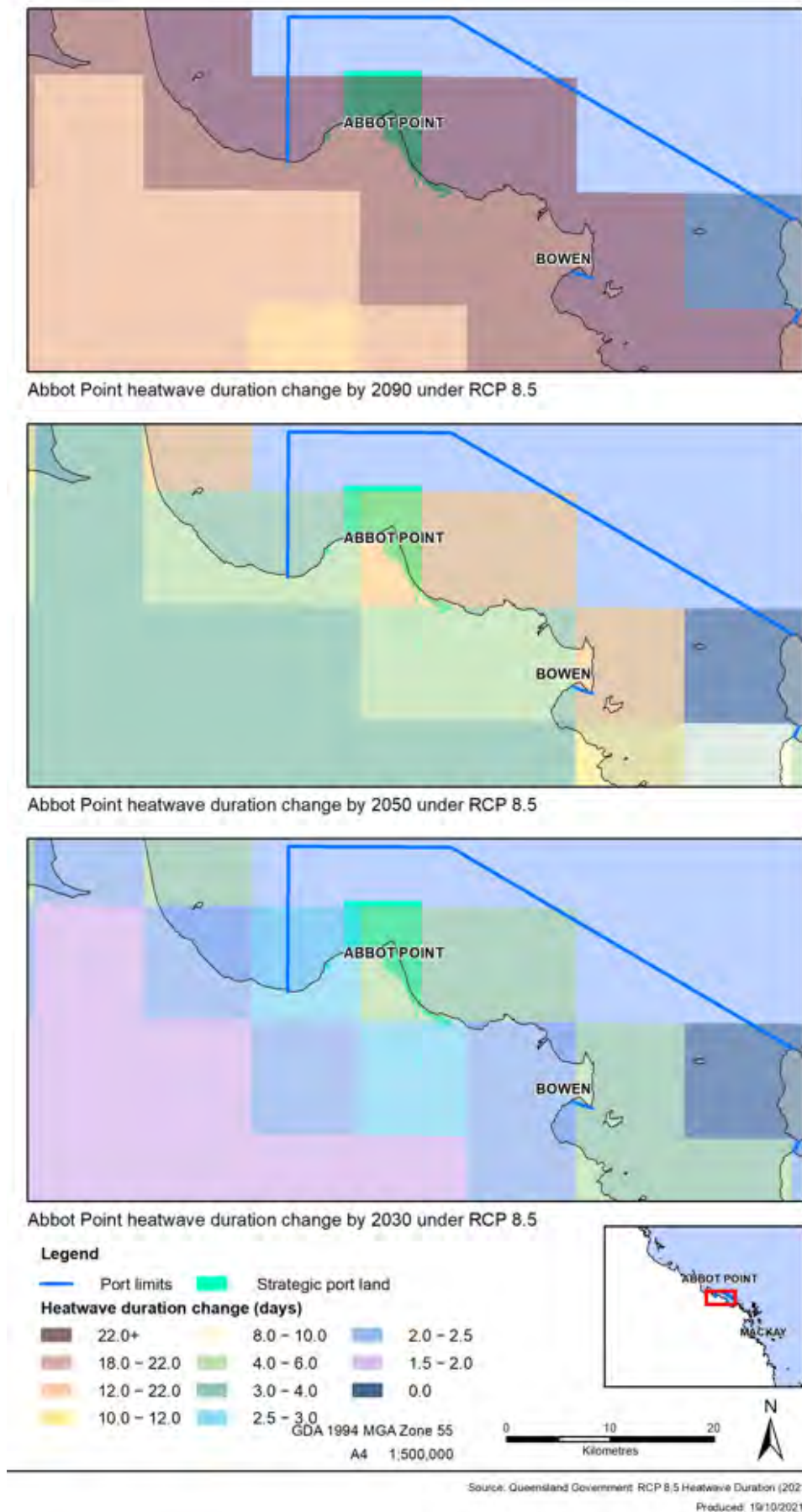


Figure 59: Heatwave duration change in the region 2030 to 2090 under Representative Concentrations Pathway 8.5

Figure 59 demonstrates the anticipated change in heatwave duration applying an RCP of 8.5, being considered a most likely scenario to be achieved.

10.3.4 Duration of drought

Drought severity and duration is presented by standardised precipitation index (SPI). SPI is a simple indicator of drought and also very wet conditions. It is based on the accumulated precipitation for a certain period (12 months in this case, SPI12), compared with the long-term average precipitation for that period. This precipitation difference (or anomaly) is 'standardised' by dividing by the long-term standard deviation of precipitation for that period. As the data shows, drought is likely to be more severe, frequent and longer in the future of the port's region. For example, extreme drought is likely to increase meaningfully by the end of the century and is projected to last longer in the area.

Figure 60 and **Figure 61** show the duration of drought under RCPs 4.5 and 8.5 for 2030, 2050 and 2090 periods for the region.

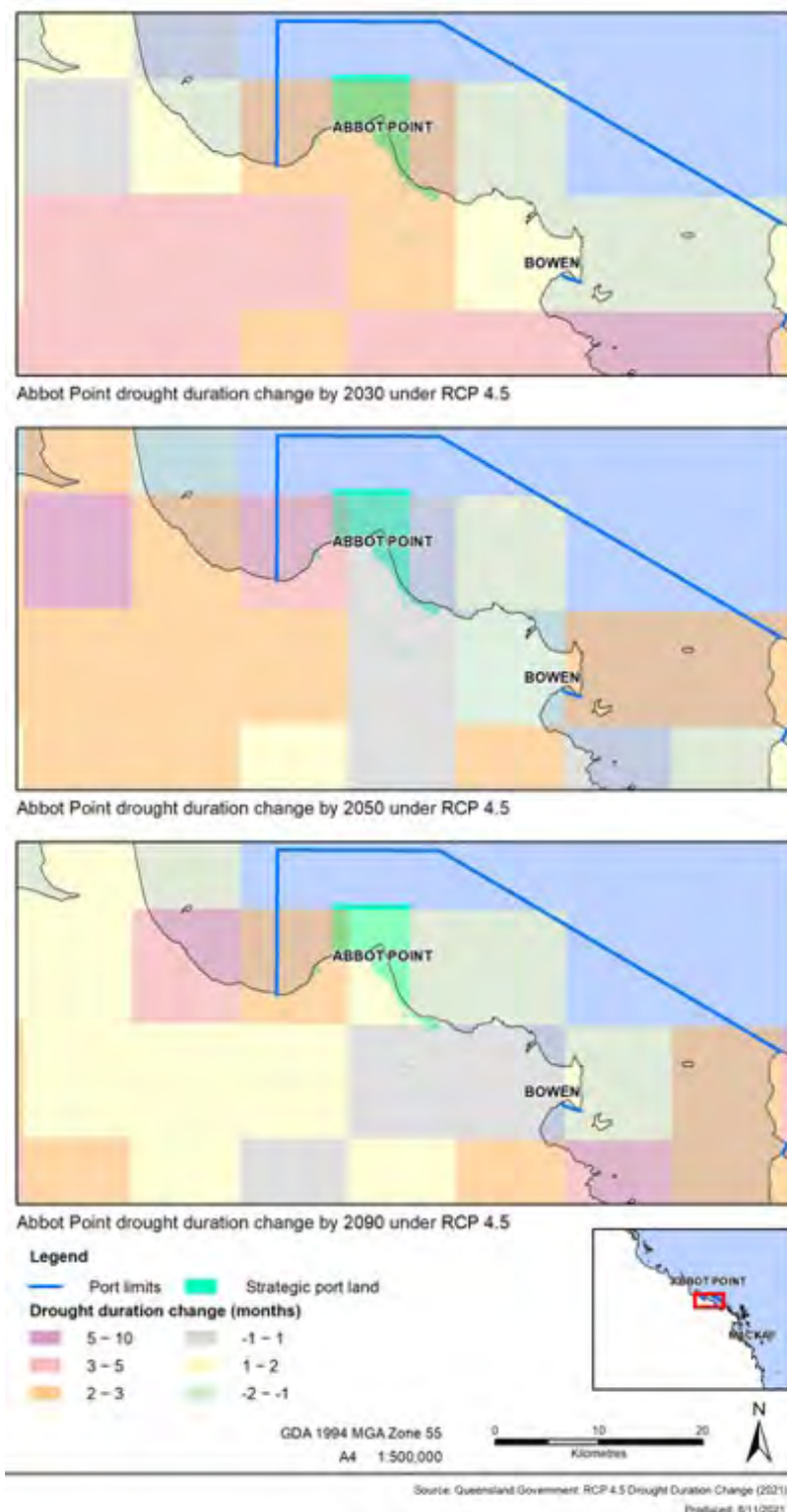
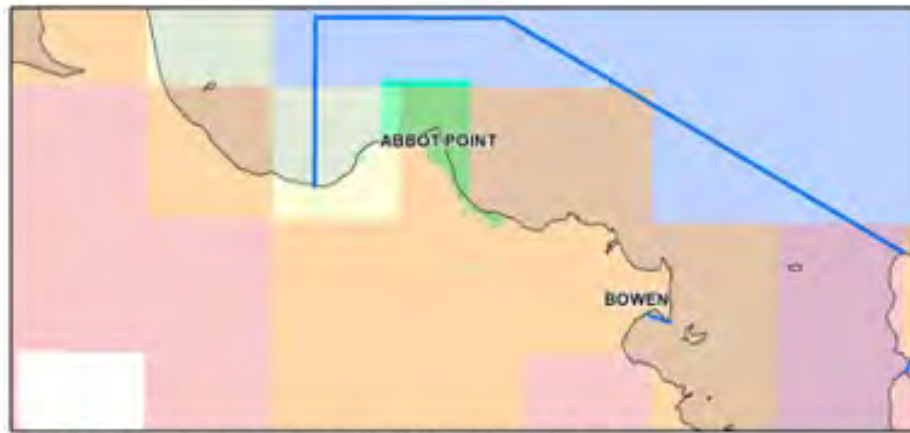


Figure 60: Drought duration change in the region 2030 to 2090 under Representative Concentrations Pathway 4.5



Abbot Point drought duration change by 2030 under RCP 8.5



Abbot Point drought duration change by 2050 under RCP 8.5



Abbot Point drought duration change by 2090 under RCP 8.5



GDA 1994 MGA Zone 55
A4 1:500,000

0 10 20
Kilometres



Source: Queensland Government, RCP 8.5 Drought Duration Change (2021).
Produced: 8/11/2021

Figure 61: Drought duration change in the region 2030 to 2090 under Representative Concentrations Pathway 8.5

10.3.5 Sea level rise and coastal flooding

Data shows that the region's sea levels are likely to continue to rise by 0.8m by the end of the century and under RCP 8.5 (compared with 1986 to 2005 average level) noted in **Table 56** below. This indicates coastal areas are expected to be impacted by coastal hazards such as inundation, flooding and storm surge (tide).

Table 56: Sea level rise projections for the region²⁵²

Timeframe	RCP 4.5
2030	0.13 (0.09 - 0.17)
2050	0.23 (0.16 - 0.31)
2090	0.47 (0.30 - 0.64)

SLR impacts on the study area include:

- increased coastal erosion and inundation and its impacts on coastal infrastructure
- increased coastal erosion rate that threaten the port's assets and infrastructures
- higher storm surges that will affect the port's infrastructure
- threats to economically significant industries and infrastructure including ports.

Figure 62 shows SLR and the HAT under RCP 8.5 for 2030, 2050 and 2090 periods for the region.

²⁵² CSIRO and Bureau of Meteorology. (2015). *Climate Change in Australia: Information for Australia's Natural Resource Management Regions: Technical Report*.

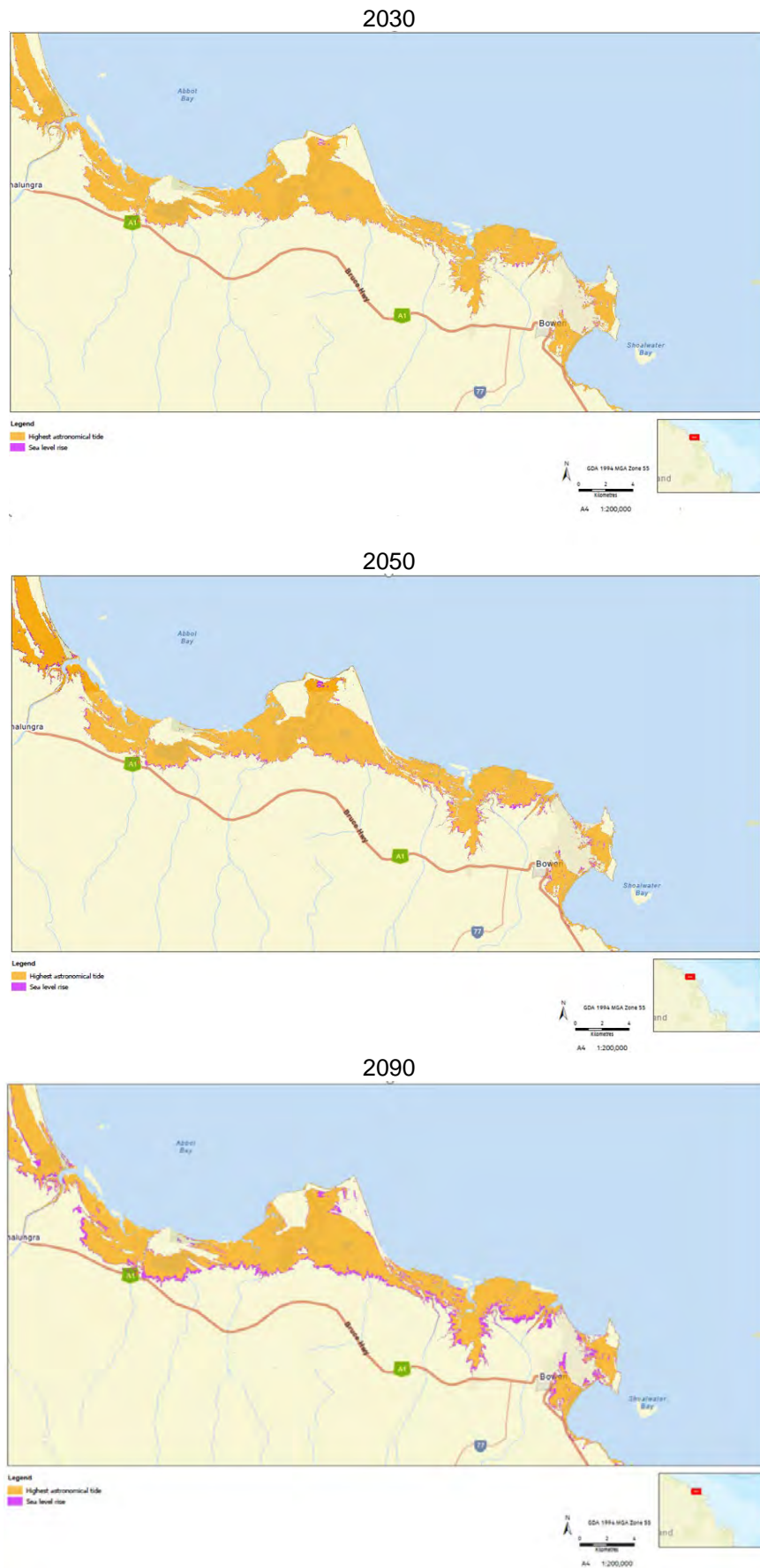


Figure 62: Sea level rise and highest astronomical tide in the region 2030 to 2090 under Representative Concentrations Pathway 8.5

10.4 Known or potential natural hazards, risk and resilience factors

The port and its surrounding area are located in a multi-hazard zone including bushfire, flooding, landslide, coastal erosion, and storm tide and inundation. **Figure 63** to **Figure 66** show the port's immediate zone is in a high and medium hazard area for storm tide and inundation. Bushfire, coastal erosion and flooding are other natural hazards threatening the port's operation.

The risk and resilience factors in the study area include:

Resilience factors

- the GBR works as natural protection against more severe storm tide, inundation and erosion
- NQBP's intention to address climate change hazard and associated risks
- existing (or development of) climate change mitigation and adaptation tools by the state and local councils such as WRC climate change adaptation and mitigation policies, *Mackay, Isaac and Whitsunday Regional Resilience Strategy*²⁵³
- availability and accessibility of climate change and natural hazards information.

Risk factors

- coral bleaching and deterioration of the GBR as natural protection option against coastal hazard
- flooding and inundation by seasonal hurricanes
- cascading effects including synergic impacts of multiple hazard factors, such as flood and inundation, and cumulating effects including scaffolding risk of incremental hazard factors over time, such as erosion and SLR and landslide
- coal storage could exacerbate the risk to the port's assets and infrastructure during bushfire.

²⁵³ Mackay, Isaac and Whitsunday Regional Council. (n.d.) *Mackay, Isaac and Whitsunday Regional Resilience Strategy*. Retrieved from <https://www.qra.qld.gov.au/regional-resilience-strategies/mackay-issac-whitsunday#:~:text=The%20Regional%20Regional%20Stratagy%20for,flood>

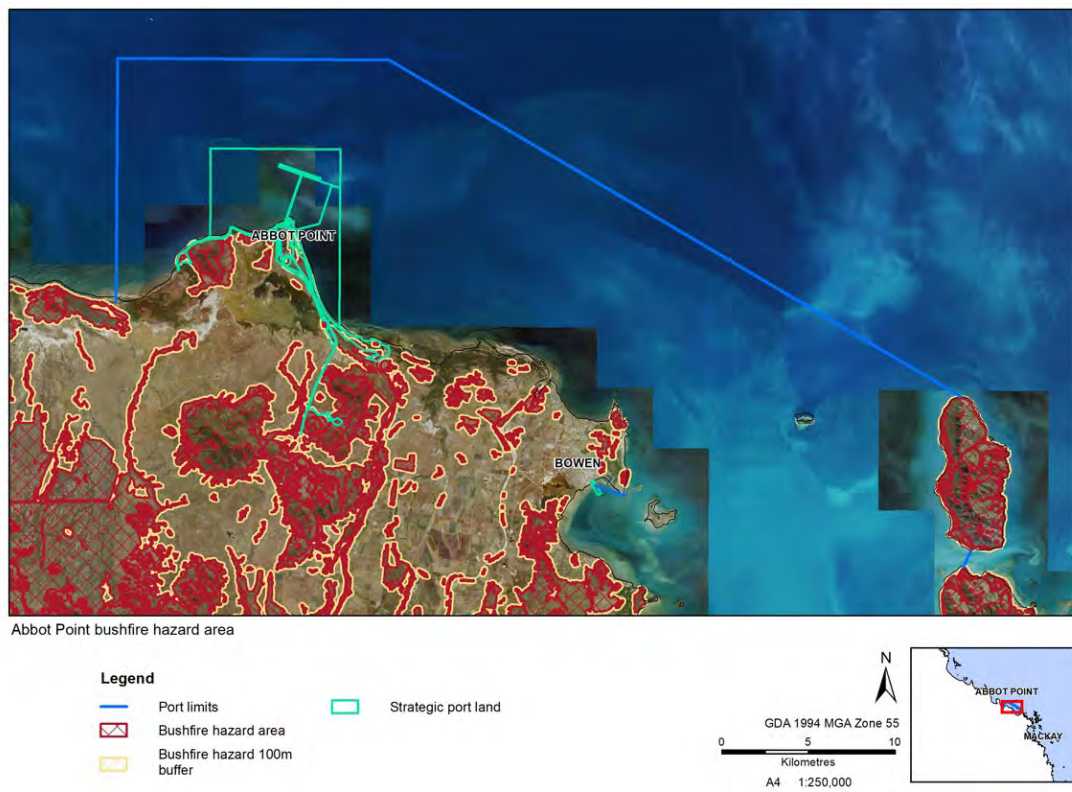


Figure 63: Bushfire hazard (2021)

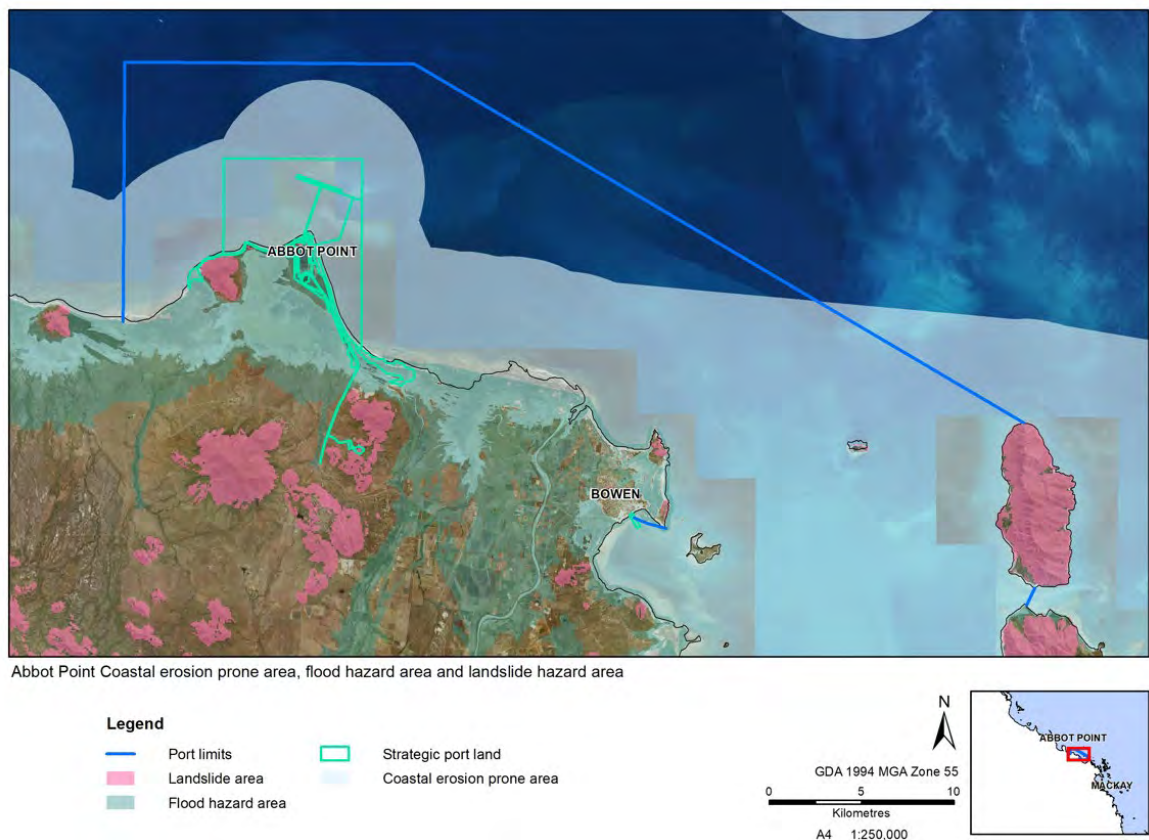


Figure 64: Coastal Erosion (2016), Flooding and Landslide Areas (2021)

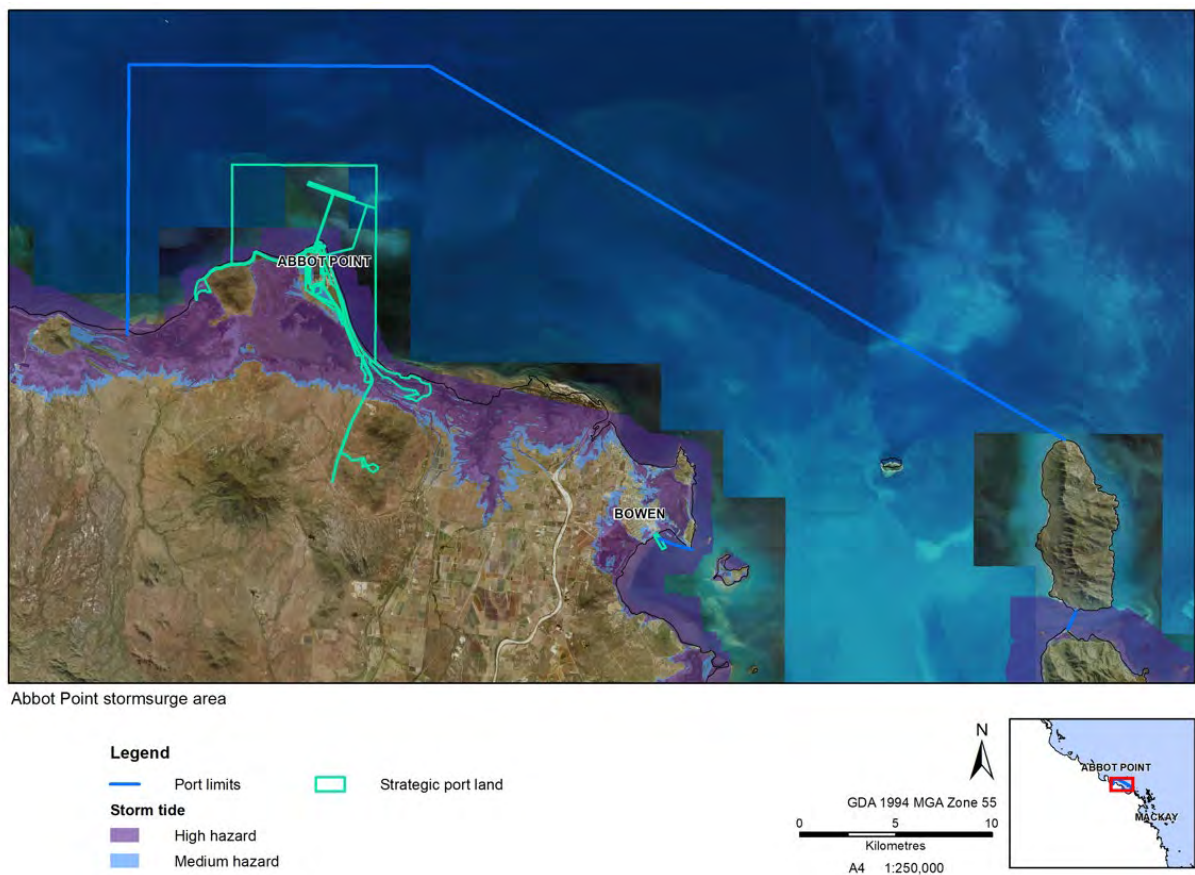


Figure 65: Storm surge (tide) hazard (2015)

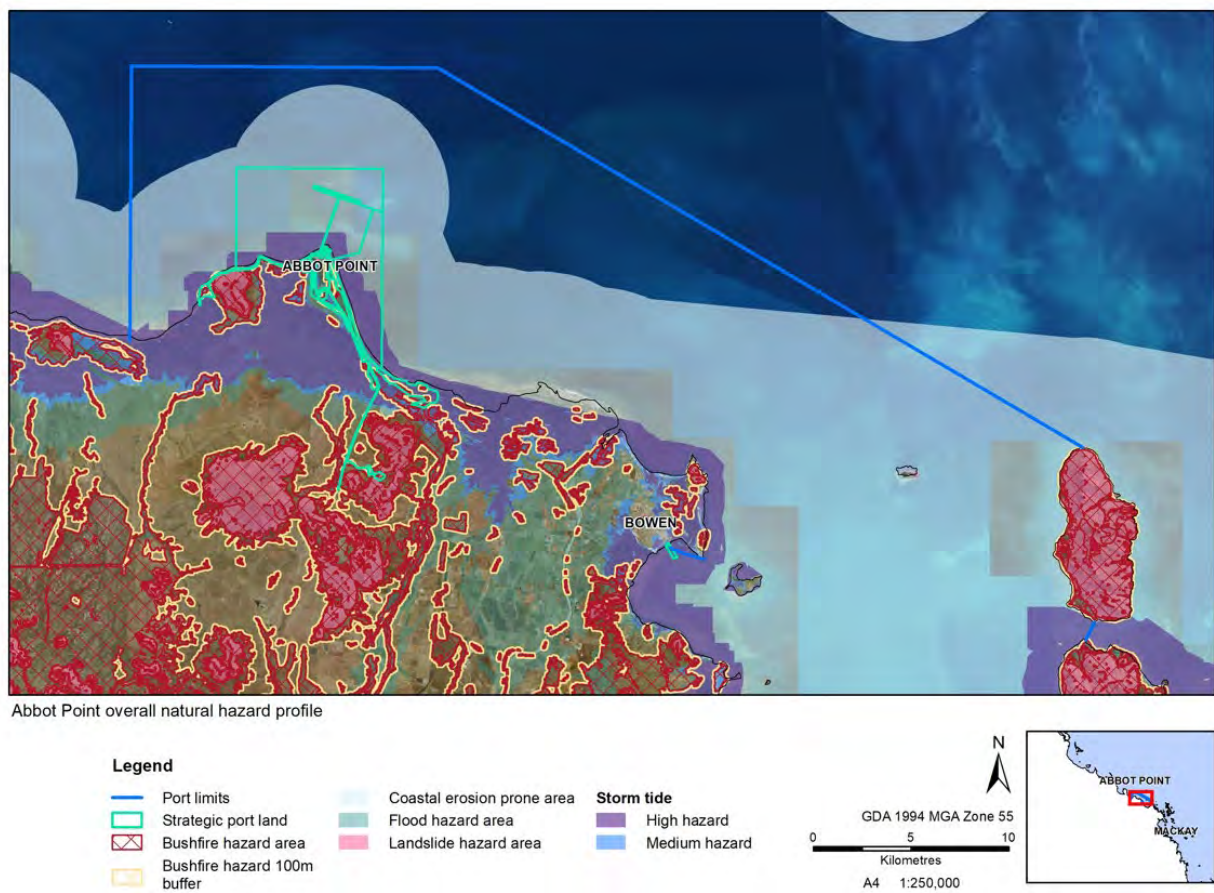


Figure 66: Overall natural hazard profile

10.5 Natural hazards and climate change

This section presents overlay views of selected natural hazards with the most relevant and available climate change hazards information. Bushfire hazard was overlayed on a heatwave frequency map. Natural hazards were overlayed with the worst-case RCP scenario (RCP 8.5) for all timeframes.

Figure 67 and **Figure 68** show overlays of selected natural hazards with selected climate change.

These overlays illustrate the impacts of climate change-induced hazards on natural hazards under RCP 8.5 for 2030, 2050 and 2090 periods. **Figure 67** shows by the end of the century, more areas in the region (port and its surrounding areas) are exposed to bushfire hazards.

Figure 68 illustrates storm surge, sea level rise and highest astronomical tide in the region from 2030 to 2090.

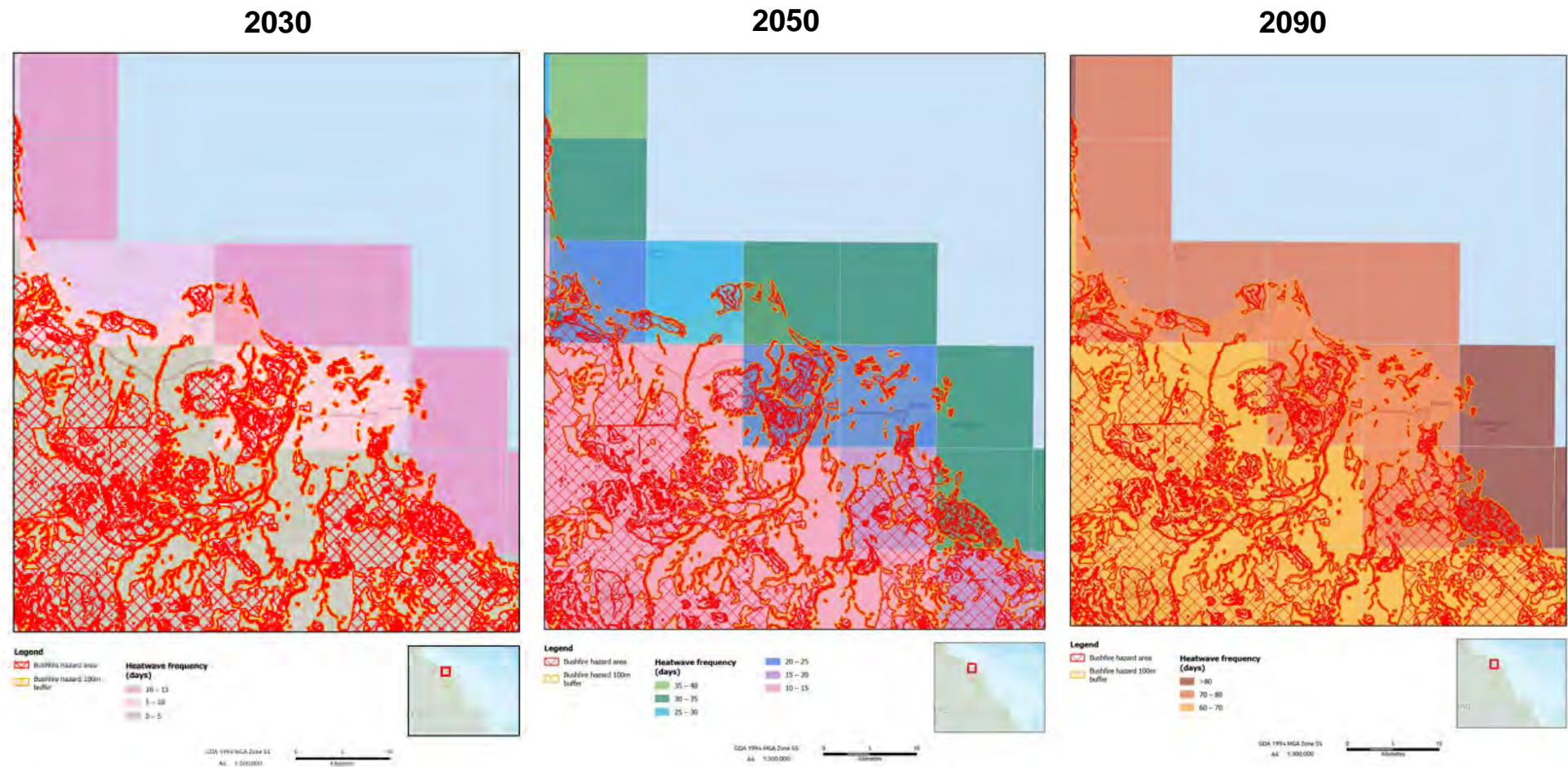


Figure 67: Bushfire hazard and heatwave frequency from 2030 to 2090 under Representative Concentrations Pathway 8.5



Figure 68: Storm surge, Sea level rise and highest astronomical tide from 2030 to 2090 under Representative Concentrations Pathway 8.5

10.6 Summary

The priority Port of Abbot Point and its surrounds are already being impacted by climate change-induced hazards. Climate change induced hazards are projected to continue to impact the port's assets, infrastructure and operation in the future. These hazards include, but are not limited to:

- warming temperature and more frequent and longer heatwaves, which increase bushfire risks
- less frequent but more intense rainfall, which increases the chance of flash flooding, erosion and landslide
- more frequent and longer drought periods, which impacts water availability and quality
- SLR and associated hazards, which increase the chance coastal inundation and erosion.

The port is located in a multi-hazard zone for natural hazards including bushfire, coastal inundation, erosion, landslide, and flood. The future intensity and severity of natural hazards are very likely to increase due to climate change.

RCPs 4.5 and 8.5, developed by the IPCC have been used to project climate change-induced hazards and their influence on the region and the port's operations in different timeframes, including 2030, 2050 and 2090. Data shows that climate change has already influenced the area, and is impacting its social, ecological, and built environments.

In the past few years, the region's temperature has been increased, rainfall has become less frequent but more intense, cyclones have become more catastrophic, storm tides have been influencing larger coastal areas, and erosion has become more severe in the port area. Climate change projections suggest that these trends will continue and threaten the port's assets, infrastructure, and operation significantly.

A review of the literature suggests a clear relationship between the region's climate change impacts and natural hazards, where the first exacerbates the likelihood, intensity and frequency of the latter. In this respect, it is projected that the region will experience more frequent and more intense bushfires due to warming temperatures and increases in duration and frequency of heatwaves.

Flooding and coastal inundation, landslide and coastal erosion are expected to increase in the future because of more intense rainfall, SLR, and its associated impacts such as storm surge.

The review also indicated the existence of some mitigation and adaptation tools in the region's planning and policy sphere (for example, the Queensland Government²⁵⁴ and WRC²⁵⁵ mitigation and adaptation plans and policies).

²⁵⁴ Department of Environment and Heritage Protection. (2017). *Queensland Climate Adaption Strategy: Built environment and infrastructure sector adaptation plan*.

²⁵⁵ Whitsunday Regional Council. (2016). *Whitsunday Regional Council Climate Change Adaptation Strategy 2016–2020*. and Whitsunday Regional Council. (2018). *Whitsunday Climate Change Mitigation Policy*.

11. Infrastructure

11.1 Introduction

The priority Port of Abbot Point has one operating terminal, T1. The terminal is owned by NQBP and leased under a 99-year leasehold to North Queensland Export Terminal Holdings Pty Ltd (formerly Mundra Port Pty Ltd). Abbot Point Operations manage the operations of the terminal. The terminal operates 24 hours per day.

The terminal has been in operation since 1984 and it has a current export capacity of 50mtpa. Coal is supplied by rail through the Newlands Rail System. The terminal services mines in the northern Bowen Basin and the Galilee Basin.

NQBP owns and operates the MOF located just east of the terminal. This infrastructure is a common-user, multi-purpose facility and allows for safe and efficient operations.

This chapter identifies and describes the infrastructure networks, their characteristics and how they relate to the port and surrounding areas. It is divided into two parts, land-based infrastructure and marine based infrastructure. Both existing and future (planned and approved) infrastructure is detailed to provide an overview of the operation of the port and associated supply chain interdependencies.

This chapter provides the following sections:

- Land based infrastructure – **Section 11.2**
- Marine infrastructure – **Section 11.3**
- Projects – **Section 11.4**
- New Industry – Hydrogen – **Section 11.5**
- Summary – **Section 11.6.**

11.2 Land-based infrastructure

11.2.1 Existing road network

The Bruce Highway which connects Brisbane to Far North Queensland is the major north-south road that runs through the study area. It forms part of the National Land Transport Network and is therefore considered under the *National Land Transport Act 2014* (Cth), to be a nationally significant major road link.

The main inland connection is provided by Peter Delemothe Road which connects the Bruce Highway to Collinsville (south-west of Bowen) and is a Type 1 road train route. Neither Peter Delemothe Road nor the Bruce Highway connect directly to the port itself. As part of the wider supply chain to support mining operations in the Bowen and Galilee Basins, the Inland Highway (Gregory Development Road) and Flinders Highway are essential links. This corridor facilitates Type 2 road train access (as of right) between the Port of Townsville to the mines and is used to haul plant and equipment.

The port is accessed by Abbot Point Road which runs east of the Bruce Highway and is a private road owned by NQBP.

Major roads within the vicinity of the port that are a necessary component of the wider supply chain, are described in **Table 57**.

Table 57: State controlled, local government and private roads

Road	Description	Comments
State-controlled roads		
Bruce Highway	two lane undivided carriageway, 100km/hour west of Merinda.	Approved B-doubles (25m) National highway One tonne mass transfer network

Road	Description	Comments
		3,204 2018 annual average daily traffic just south of Abbot Point Road
Peter Delemothe Road/Bowen Development Road	Two lane undivided carriageway, 100km/hour.	Approved Type 1 Road Train (and lower) One tonne mass transfer network 1,401 2018 annual average daily traffic just west of Burnfoot Road
Local government roads		
East Euri Road	Two lane undivided carriageway, no street view available to determine posted speed.	Approved B-double (25m) One tonne mass transfer network
Private roads		
Abbot Point Road	Two lane undivided carriageway, 100km/hour speed limit.	Level crossing at Bruce Highway connection.

In addition to the roads listed above, there are also a number of unformed access tracks across EDQ, NQBP and Office of the CG land.

The road infrastructure network is provided in **Figure 69**.



Figure 69: Existing road infrastructure network

11.2.2 Existing rail network

The rail line that leads to the port is part of the Newlands System, which is owned by Aurizon Holdings Limited. The Newlands System is a 1067mm narrow gauge railway and connects Abbot Point to Collinsville via 98km of track and comprises of a concrete sleeper track with 53kg/m rail, accommodating 26.5 tonne axle load traffic at a maximum speed of 80km/h.

The rail line has two-rail loops at the port end with unloading stations for unloading coal from bottom discharge (Kwik Drop Door) wagons at Abbot Point. Between Abbot Point and Kaili (13km), the track structure is a mix of 60kg/m (turnouts) and 53kg/m (mainline) rail, all on concrete sleepers. The terrain of the track is generally flat.

The Newlands System connects Abbot Point in the north to a number of coal mines to the south and inland, and a connection to the Goonyella System which goes from Hay Point through to Oaky Creek in the south and back north to North Goonyella Coal Mine. The Newland System starts in the south at North Goonyella Coal Mine in Moranbah and also services Newlands Coal Mine, Sonoma Coal Mine and Collinsville Coal Mine. The Newlands System and Goonyella System are shown in **Figure 70**.

The maximum grade that a northbound train will encounter is one in 826, while for a southbound train the maximum grade is one in 94.

The railway is operated by Remote Controlled Signalling with power operated points between Abbot Point and Collinsville.

The road network crosses with the rail network twice near the study area, once at a level crossing on Abbot Point Road and another as a rail bridge near Merinda. The rail bridge has a clearance of 6m for vehicles travelling underneath it. The rail line continues parallel to the Bruce Highway heading North from Abbot Point Road.



Figure 70: Newlands Rail System

11.2.3 Existing water, power and sewage infrastructure

The LGIP trunk infrastructure data shows sewer, water and stormwater assets within the town centre of Bowen, however these do not extend past Merinda (refer **Figure 71**).

Power to the port is supplied by Powerlink,²⁵⁶ from the Bowen North Substation providing 132 kilovolts (kV) and Ergon via its Merinda Substation ²⁵⁷ providing 66kV/11kV (refer **Figure 72**). These substations are located approximately 17km south east of Abbot Point. Abbot Point has a dedicated transmission line from Merinda Substation and a tee off from the 66kV Merinda to Home Hill Transmission line. The Powerlink Bowen North substation does not provide power to the public.

Powerlink has proposed installation of a second 132kV substation at Bowen North Substation to support potential increase in load at the port and SDA. However, this project is only a proposed and not yet committed project.

Aurizon Holdings Limited provides signalling and telecommunications along the rail corridor.²⁵⁸

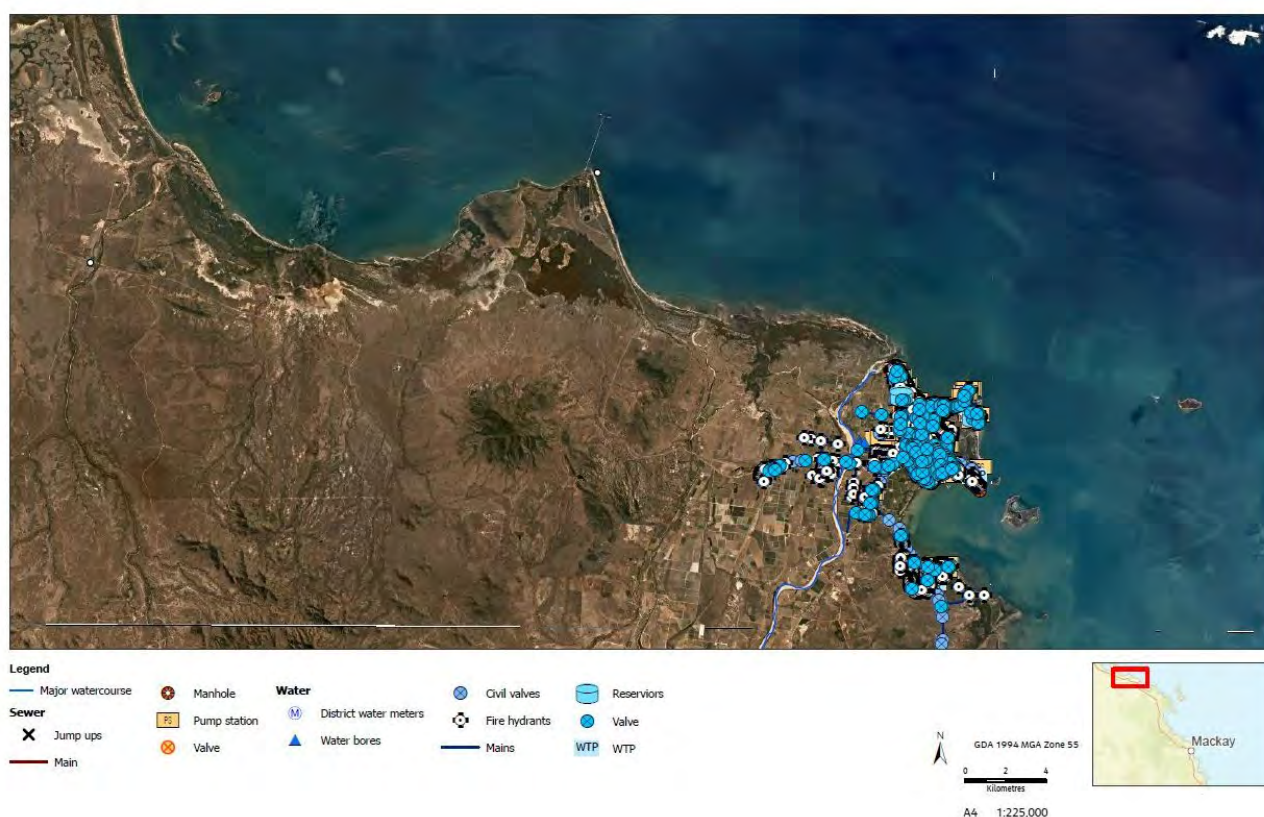


Figure 71: Existing local government trunk infrastructure

²⁵⁶ Powerlink Queensland (2020). *Transmission Annual Planning Report 2020*.

²⁵⁷ Ergon Energy. (2020). *Distribution Annual Planning Report 2020*.

²⁵⁸ Department of Infrastructure, Transport, Regional Development, Communications and the Arts. *Dial Before You Dig*. Accessed 28 June 2021. Retrieved from <https://www.byda.com.au>.

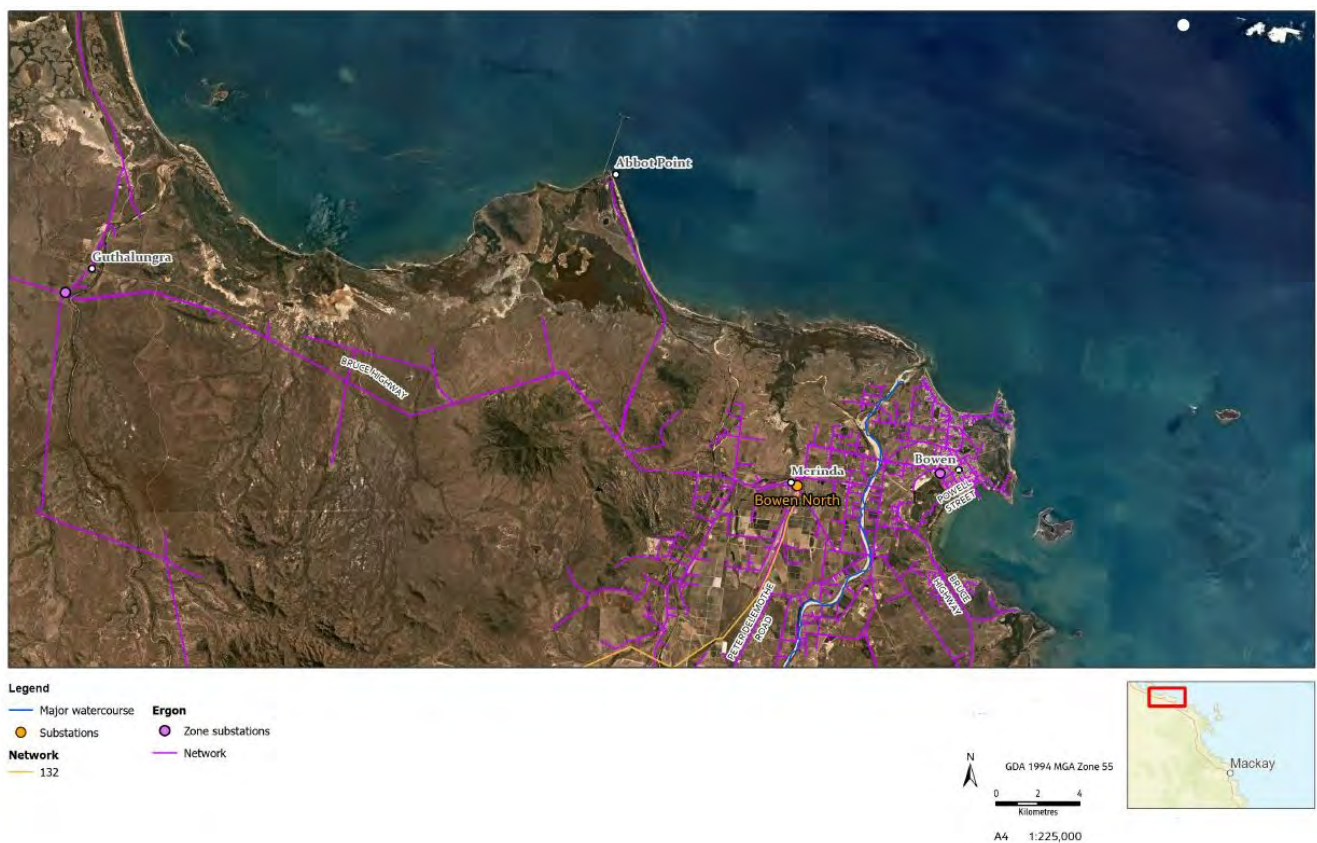


Figure 72: Sub-station location

11.2.4 Planned infrastructure networks

The Queensland Transport and Roads Investment Program (QTRIP) for 2021–22 to 2024–25 noted the following road infrastructure of interest to the priority Port of Abbot Point:

- Various works on the Bruce Highway between Proserpine and Ayr – work commenced in 2020–21 and will continue for the duration of the investment period. This includes constructing overtaking lanes, intersection upgrades and pavement formation. Specifically, northbound and southbound overtaking lanes between West Euri Road and Abbot Point Road should be complete by 2024–25.
- Inland Freight Route (Gregory Development Road section) – improved pavement condition, bridges, safety, capacity and flood immunity – to commence in 2023–24 to 2024–25 and continue beyond (outside study area boundaries).

Planned upgrades are mapped in **Figure 73**.²⁵⁹

²⁵⁹ Department of Transport and Main Roads. (2021) *Queensland Transport and Road Investment Program*. Queensland Government.



Figure 73: Queensland Transport and Roads Investment Program road infrastructure of interest to the priority Port of Abbot Point

11.2.5 On-shore port infrastructure

*NQBP Port of Abbot Point Operations Manual*²⁶⁰ provides details of the onshore port infrastructure.

The present nameplate capacity of the T1 is 50mtpa. Trains transport coal by bottom dumping wagons to a rail unloading facility at T1 on a balloon rail loop comprised of two separate rail lines. Once unloaded, the coal is then conveyed from the unloading facility to the stockpile area and stacked by a stacker/reclaimer machine. The stockyard is capable of holding more than two million tonnes of coal equivalent (mtce).

During shiploading operations, coal is delivered to a large surge bin before being conveyed along the trestle to the wharf where it is then loaded onto ships via the shiploading units. The port has two offshore berths serviced by a conveyor system 2.75km from the stockpiles. Berth 1 shiploader has a loading rate of 6000 tonnes per hour (tph) and Berth 2 loading rate is 7200tph.

11.2.6 Infrastructure relationships

The efficient operation of the port heavily relies on the supporting rail infrastructure, the Newlands System. Equipment supplies for maintenance and upgrades to T1 rely on the road infrastructure, principally the Bruce Highway and Abbot Point Road. The port's MOF also provides the ability to import large oversize equipment to the port by barge from either the Port of Townsville or the Port of Mackay.

Given the transport limitations of large freight vehicles of all modes, it is essential for freight infrastructure to be interconnected to maximise efficiency of the wider network. More specifically, the effective operation of the port relies on various elements of supporting infrastructure and transportation corridors to support supply chains. This includes the consideration of transport corridor routes, access to the port and wharves, berth utilisation and product compatibility.

²⁶⁰ North Queensland Bulk Ports Corporation Limited. (2016). *Abbot Point Operations Manual*.

The Inland Highway (Gregory Development Road) and Flinders Highway, for example, are critical to the wider supply chains for the Bowen and Galilee Basins. Delays along these corridors will likely affect the movement of product from the ports.

11.2.6.1 Infrastructure and supply chain

A number of national and state infrastructure plans are in place to ensure the ongoing support and development of supply chain infrastructure in the area.

The *Australian Infrastructure Plan 2016*²⁶¹ highlights a new national freight and supply chain strategy to nationally map significant strategic supply chains and their connections across ports, airports, rail and coastal shipping. The plan also stated that freight rail reforms are delivering effective infrastructure that will play an important role in the movement of goods between ports and inland freight terminals.²⁶²

At a more local level, the *Queensland Freight Action Plan 2020–2022*²⁶³ also details a plan to meet key challenges including building effective partnerships and unlocking economic opportunity through system productivity.

The *State Infrastructure Plan 2016*²⁶⁴ provides the policy context for infrastructure planning in Queensland. It identifies the need for the Queensland Government to work with the private sector to plan and prioritise infrastructure projects that will support economic growth. The plan recognises the role that reliable supply chains play in regional Queensland's economic success and in particular the ability to untap coal reserves in the Galilee Basin will have significant economic benefits for centres such as Bowen.

The *State Infrastructure Plan 2016* represents the state's strategic directions for infrastructure through setting out a set of 'objectives' and 'directions' for infrastructure planning Queensland. These are considered in the context of a number of identified challenges facing the state. This strategic framework is set out in **Figure 74**. Directly relevant to infrastructure planning to support the port are:

Challenges: Domestic Economy – Shifting global demand is altering the economic base Queensland has historically relied upon, risking job growth and revenue to fund public services. This challenge identifies the need to direct resources towards Queensland's most competitive export-oriented industries.

Objectives: Infrastructure that connects our communities and markets – This objective recognises the role that infrastructure linkages play in the operation of efficient markets.

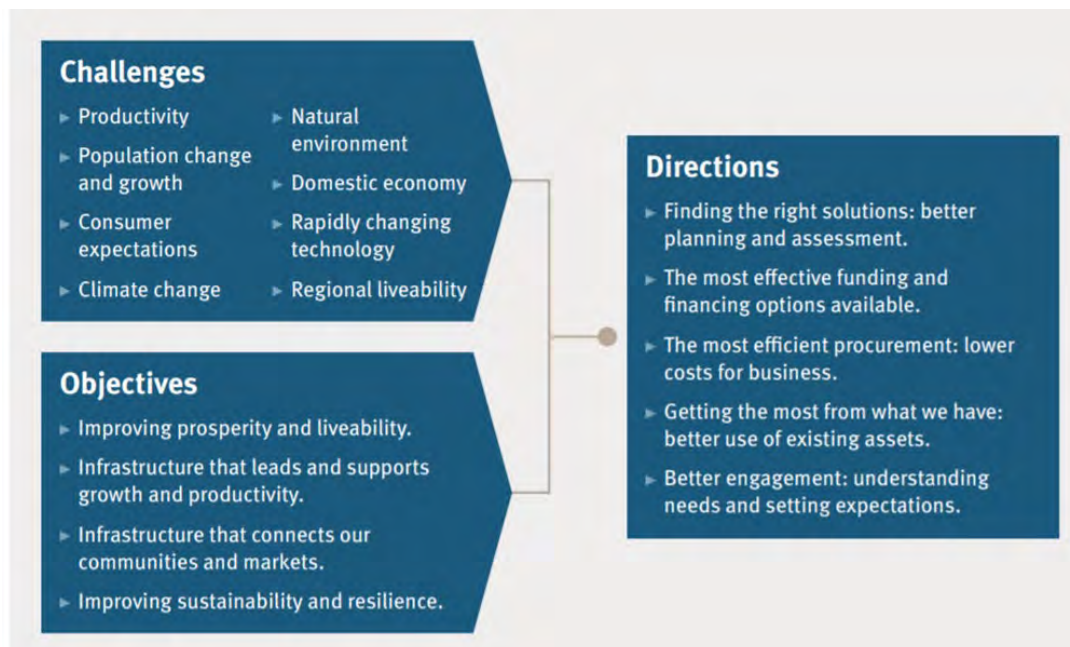


Figure 74: State Infrastructure Plan challenges, objectives and directions

²⁶¹ Infrastructure Australia. (2016). *Australian Infrastructure Plan 2016*, Infrastructure Australia.

²⁶² Ibid

²⁶³ Department of Transport and Main Roads. (2020). *Queensland Freight Action Plan 2020-2022*.

²⁶⁴ Department of Infrastructure, Local Government and Planning. (2016). *State Infrastructure Plan Part B: Program*. Queensland Government.

The *Mackay Isaac Whitsunday Regional Transport Plan 2018*²⁶⁵ recognises the relationship between effective supply chains and economic development. One key objective included in the plan is to facilitate supply chains that efficiently link producers, distributors and consumers on an integrated network.

More specifically it includes the following actions to support this objective:

- investigate rail network upgrades to improve port connectivity
- work with DSDILGP and the region's ports to create port master plans that optimise supply chains, meet transport servicing requirements and protect the region's natural assets.

There are several additional actions which are also relevant for the port, specifically:

- develop a multi-modal freight strategy to identify and prioritise productivity and safety improvements throughout the region in response to statewide freight and heavy vehicle network strategies
- DSDILGP will investigate opportunities to lower transport and logistics costs across the region's supply chain in support of the growth and development of the region's economy
- define the optimum dimensions for Oversize Overmass clearance envelopes on the region's key freight routes, and identify priority upgrades for inclusion in future works programs (including Peak Downs Highway, Gregory Developmental Road, Fitzroy Developmental Road and Suttor Developmental Road)
- undertake a review of the *Bowen Developmental Road – Staged Development*²⁶⁶ Identify deficiencies and identify efficiency priorities that respond to the link's vision standards and future demand
- undertake planning, design and business case development for the Bruce Highway's safety, capacity and resilience improvements
- trial rail safety system technologies in the region to improve safety at level crossings.

At a larger more strategic scale, the *Northern Queensland Regional Transport Plan 2020* also has relevant actions to the port supply chain, including:²⁶⁷

- safety improvements including for the Flinders Highway and Gregory Development Road
- road network resilience investigations including for the Flinders Highway and Gregory Development Road
- planning to improve the resilience of the road network including bridges and structures on the Flinders Highway and Gregory Development Road
- route and link planning for high priority inter-regional links such as the Flinders highway and Gregory Development Road
- consider the strategic transport opportunities for supporting future development and diversification in the mining and resources sector when undertaking transport planning.

11.2.6.2 Infrastructure requirements

The *National Freight and Supply Chain Strategy National Action Plan 2019* listed two key, relevant outcomes:

- improve landside access to major freight gateways
- develop Northern Australia's freight infrastructure.

Specific aims to support these outcomes include improving all weather access to export gateways and increasing freight flows through trade gateways by better coordinating operators in port supply chains.²⁶⁸

²⁶⁵ Department of Transport and Main Roads (2018) *Mackay Isaac Whitsunday: Regional Transport Plan 2018*. Queensland Government.

²⁶⁶ Department Infrastructure, Transport, Regional Development, Communications and the Arts. (2021). *Bowen Developmental Road – Staged Development*. Australian Government.

²⁶⁷ Department of Transport and Main Roads. (2020). *Northern Queensland: Regional Transport Plan 2020*. Queensland Government.

²⁶⁸ Department of Infrastructure, Transport, Cities and Regional Development. (2019). *National Freight and Supply Chain Strategy: National Action Plan*. Queensland Government.

The port with its current focus on coal is heavily dependent on the rail network from the mines. The mines in the Bowen and Galilee Basins are also heavily dependent on the road network for construction and operations, particularly the Inland Highway and Flinders Highway as the key corridor to the Port of Townsville and the Peak Downs Highway and the Suttor Developmental Road to the Port of Mackay. Large projects such as those for which an EIS is required are needed to address infrastructure requirements as part of the approval process, see Section 8.5. NQBP's *Port of Abbot Point Land Use Plan 2010*²⁶⁹ commits to working with infrastructure providers and planners to ensure the provision of infrastructure to the port.

Other planning instruments such as the development scheme of the APSDA and the WRC Planning Scheme all contain requirements to ensure that development demonstrates that it has access or is able to provide access to an appropriate level of infrastructure to support the use. Where a development is unable to demonstrate this infrastructure requirements or contributions may be set as a condition of approval.

11.3 Marine infrastructure

11.3.1 Existing marine infrastructure

The priority Port of Abbot Point was originally established to export coal from the northern Bowen Basin coal fields. The marine facilities include an access trestle extending 2.75km from the shoreline to the two offshore berths. Berth 1 is 268m long and Berth 2 is 252m long. There are two offshore shiploaders located on the berths for loading coal onto ship holds. Shiploader 1 has a capacity to load up to 6000tph and Shiploader 2 can load up to 7200tph.²²⁴

The terminal berths are not protected from sea conditions by any natural features or artificial breakwaters. Dredging has been undertaken to form the berth pockets and adjacent vessel manoeuvring areas.

To the east of the terminal, a permanent MOF that can handle barges has been constructed within a small breakwater. This permanent facility has been developed from a temporary facility constructed for the original construction phase of the terminal. See **Figure 75** for marine facilities at the priority Port of Abbot Point.

²⁶⁹ North Queensland Bulk Ports Corporation Limited. (2010). *Port of Abbot Point Land Use Plan*.



Figure 75: Abbot Point marine facilities

11.3.2 Navigation

There are no channels in the port. The natural deepwater of the port allows ship berthing and departure from the port without any set path.

The Abbot Point waters are monitored by Vessel Traffic Services (VTS) operated by MSQ. The regional operating centre is located at Townsville.

11.3.3 Maximum Vessel Size

The maximum length overall (vessel) (LOA) for Berth 1 is 300m LOA or 198,000 metric tonnes displacement. The maximum vessel LOA for Berth 2 is 320m LOA or 260,000 metric tonnes displacement.

Any vessels over this size may be able to enter the harbour at the discretion and determination of the Regional Harbour Master Townsville upon written application.

Note: This information is current as of August 2021. Refer to MSQ's *Port Procedures and Information for Shipping – Abbot Point*.²⁷⁰

11.3.4 Tugs and Pilotage

All ocean-going ships visiting Abbot Point require the support of two tugs for berthing and two for departure. Tug services are provided by Engage Marine under an operating licence from NQBP. This tug operator

²⁷⁰ Maritime Safety Queensland. (2021). *Port procedures and information for shipping – Abbot Point*. Queensland Government. Retrieved from Port Procedures and Information for Shipping – Abbot Point (Maritime Safety Queensland) (msq.qld.gov.au)

commenced in October 2021. Two *Damen 3212 Azimuth Stern Drive* tugs were commissioned specifically for Abbot Point with a third similar tug joining the fleet in late October 2021.

The tugs are normally based at Abbot Point but use facilities on the Bowen Wharf for refuelling and maintenance activities. NQBP and the operators are currently working towards identifying a new tug facility closer to the port to further improve the operational efficiency of the service.

The following sections of the GBR are subject to compulsory pilotage for merchant vessels 70m in length and over, and all oil, gas and chemical tankers irrespective of size:

- Torres Strait
- Great North East Channel
- Inner Route between Torres Strait and Cairns Roads
- Hydrographer's Passage off Mackay
- Whitsunday Passage north of Mackay.

11.3.5 Tides

The tidal flows are approximately parallel to the wharf with the ebb flowing at 289° (Timing) and the flood at 109° (Timing). Abbot Point is a standard port in the Queensland Tide Tables. A summary of the key tidal planes is summarised in **Table 58**.

Table 58: Abbot Point tidal plane summary

Tidal Plane	Tide Level
HAT	3.60m
Mean High Water Spring	2.69m
Mean High Water Neap	2.07m
Mean Low Water Neap	1.29m
Mean Low Water Spring	0.67m

Tide level datum is Low Astronomical Tide.

The tidal times and heights for standard Queensland ports including Abbot Point are available on the BOM website.²⁷¹

11.3.6 Depths of Water

The port has no dredged channel, instead the natural deepwaters of the port allow access by large vessels without strict approach or departure paths.

11.3.7 Anchorages

Vessels calling at the priority Port of Abbot Point from overseas ports navigate the GBR via charted passages. Coastal vessels follow courses within the GBR. MSQ's document, *Port Procedures and Information for Shipping – Abbot Point*²⁷² (MSQ, 2019) specifies anchorage locations and pilot boarding locations. The maritime facilities in the vicinity of the port are shown in **Figure 76**. They include both onshore and offshore marks.

²⁷¹ www.bom.gov.au

²⁷² Maritime Safety Queensland. (2022). *Port Procedures and Information for Shipping – Abbot Point*. Retrieved from <http://www.msq.qld.gov.au/shipping/port-procedures/port-procedures-abbot-point>

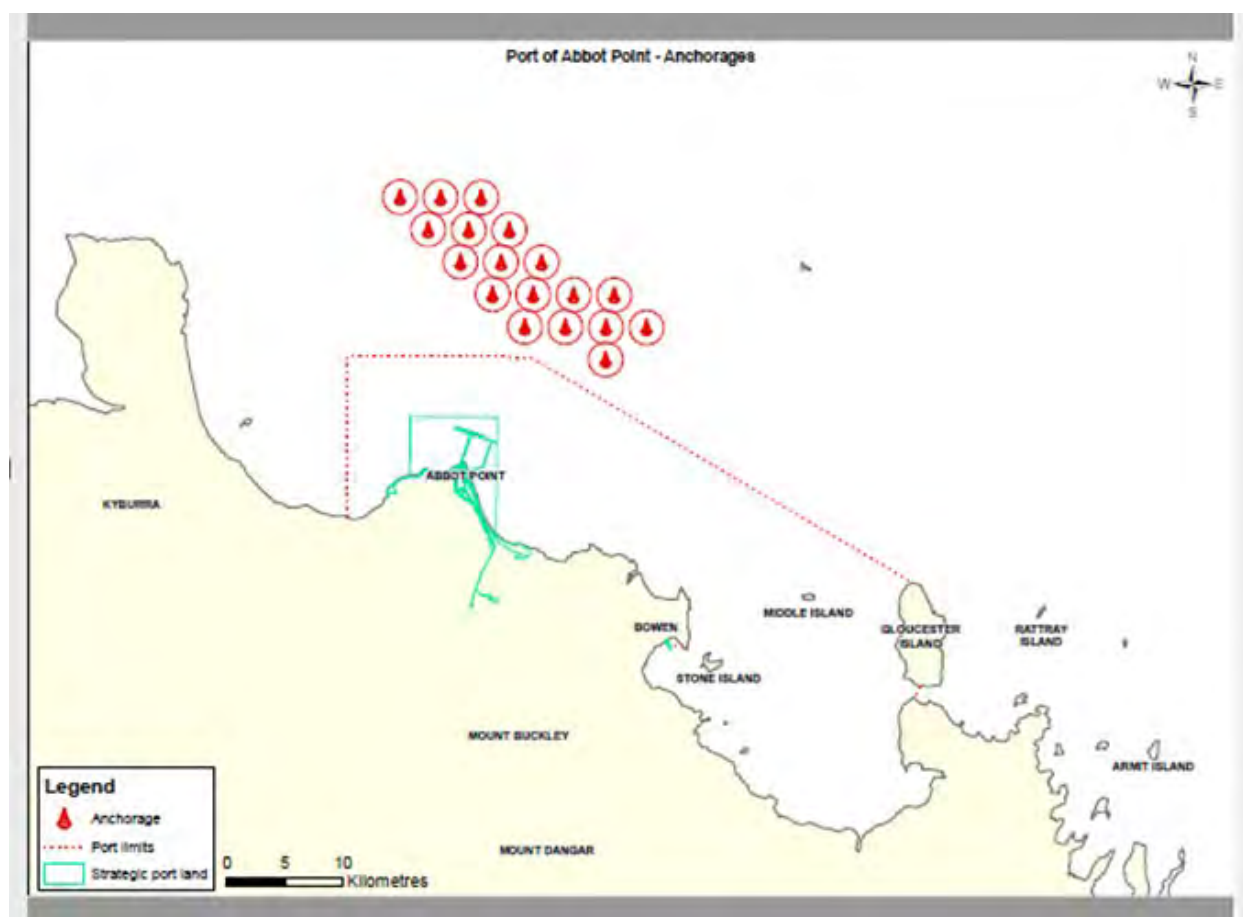


Figure 76: Map of the Port of Abbot Point showing anchorages and navigation channels

11.3.8 Navigational aids

Navigational aids for the priority Port of Abbot Point are provided below in **Table 59**.

Table 59: Summary of Abbot Point Navigational Aids²⁷³

Name	Description
Bald Hill Landfall Light	Marks Gloucester Passage
Front leading beacon	Situated on the western side of trestle conveyor
Common leading beacon	Serves as a front lead when in transit with Bald Hill Landfall Light on approximately bearing 225° and serves as a rear lead when in transit with the front lead on the trestle conveyor on approximately bearing 164°.
Wharf approach leads (two) sets	Established to define 15° approach angles from centre point of wharf face — both sets of lights, front and rear
Clark Shoal Beacon	East cardinal
Abbot Point Departure Channel Sector Light	Sector light
Abbot Point MOF - Front Lead	Front lead light
Abbot Point MOF - Rear Lead	Rear lead light

11.3.9 Dredging works

Dredging has been undertaken in the following areas:

²⁷³ Maritime Safety Queensland. (2021). *Port procedures and information for shipping – Abbot Point*. Queensland Government. Retrieved from Port Procedures and Information for Shipping – Abbot Point (Maritime Safety Queensland) (msq.qld.gov.au)

- berths (berth pockets)
- apron areas (vessel manoeuvring areas) seaward of the berths
- MOF.

Maintenance dredging of these areas is very infrequent.

The *Port of Abbot Point Long-term Maintenance Dredging Management Plan 2018*²⁷⁴ was developed in accordance with TMR's Maintenance Dredging Strategy for GBRWHA Ports (2016) and presents the overall strategy for managing dredging operations, the nature of the material to be dredged, summarises historic dredging campaigns, and likely future dredging requirements. Some of the key information has been summarised in the sections below.

11.3.10 Requirement for dredging

Berth pockets and berth apron areas have been deepened to allow for safe navigation, movement, loading and transit of the vessels trading at the port. Accretion of seabed sediments results in 'high spots' or 'high areas' within the navigational areas, above which safe navigational depths are enforced by the Regional Harbour Master. This can result in reduced 'declared' depths, which can affect the operation and efficiency of the port.

Due to the alignment of the berths with the coastal currents, sediment accretion within the offshore berths and apron at Abbot Point is minimal under normal conditions with any maintenance dredging requirements being very infrequent, mainly being the result of a major storm or cyclonic events.

The MOF is exposed to nearshore sediment transport processes from sand moving along the coast (longshore drift) and settling and accreting in the MOF basin. Maintenance dredging of the MOF area can be required and will depend on the size of vessels expected to use the facility.

Laboratory testing of dredge material has consistently shown that the sediment in the Abbot Point area is suitable for ocean placement with very low levels of contamination and bioavailability.²⁷⁵

11.3.11 Previous dredging campaigns

Since 1984, only limited sediment management activities have been required at the port to maintain the design depths. This is due to the naturally deepwater around the berths and apron areas and is also thought to be due to relatively low sediment transport rates in the area.²⁷⁶

In 2008, a capital dredging of 201,315m³ was undertaken to create Berth 2 and the approach directly adjacent to it. As part of the 2008 dredging program, maintenance dredging of the existing berth was also undertaken with the volume removed estimated to be less than 20,000m³. The sediment which was removed during the program was relocated to an offshore Dredge Management Placement area located approximately 5km to the west-north-west of the port.

Since the maintenance and capital dredging in 2008, there have been three bed levelling programs undertaken (2014, 2015 and 2016). Since 2016, bed levelling has not been required, but this was mainly due to Tropical Cyclone Debbie reducing the bed level of the approaches by approximately 0.1m. The historic bed levelling has targeted areas of the approaches to the berths which have been at or above the design depth of -17.2m LAT.

In 2017, dredging was undertaken to reinstate the design depths in the MOF. Approximately 9000m³ of sediment was removed and re-used to nourish the nearby beach.

²⁷⁴ Adaptive Strategies. (2018). *Port of Abbot Point Long-term Maintenance Dredging Management Plan*

²⁷⁵ Commonwealth of Australia. (2009). *National Assessment Guidelines for Dredging*. Australian Government.

²⁷⁶ Port and Coastal Solutions. (2018). *Port of Abbot Point Avoid and Reduce Assessment*. Report prepared for North Queensland Bulk Ports.

11.3.12 Maintenance dredging

A bathymetric analysis²⁷⁷ of historical hydrographic survey data of the port and sediment movements to better understand future sedimentation rates and bathymetric changes in the navigational areas of the port was undertaken.

Analysis of historic bathymetric data has shown that very little net sedimentation has historically occurred in the berths and approaches of the port. Based on the results, no ongoing sediment management is expected to be required within the berths while some sediment management of localised areas of sedimentation will be required in the approaches. It has been estimated that five days of bed levelling will be required every two years to remove high spots from the approaches to the berths to ensure depths remain below the design depth.

The MOF has been found to be subject to net sedimentation in the 12 months following maintenance dredging. As such, ongoing sediment management will be required in the MOF to maintain the design depths and ensure the MOF remains operational. The average annual sedimentation rate in the MOF berth is in the order of 3000m³/year. Based on this, it is estimated that approximately 30,000m³ of sediment will require managing for the MOF to remain operational over the next 10 years.

Due to the clean sandy nature of the material accumulating in the MOF (deposited from long-shore coastal drift), previous dredging actions in this area have used the dredged material for beach replenishment along Abbot Point Beach to the south of the MOF.

It is important to note that there is the possibility that an extreme event (such as a cyclone) could result in high sedimentation at the port and so there is the possibility that emergency maintenance dredging could be required after a significant storm event.

11.4 Projects

There are a number of large-scale projects, which have undertaken an EIS, whose footprints, existing or proposed, are located within the study area or have the potential to impact the study area.

11.4.1 Projects with Environmental Approvals

11.4.1.1 North Queensland Export Terminal 1 upgrade - X60 project

The X60 project is a 10mtpa proposed expansion of the existing T1, increasing the terminal capacity from 50mtpa to 60mtpa. This expansion is located almost entirely within the footprint of the current terminal. It involves a new conveyor and transfer tower, plus upgrades to some existing infrastructure. The project does not involve any new offshore berth. The project has received Australian and Queensland Government environmental approvals. Because there is currently spare capacity in the existing terminal, no project timing has been announced by the proponent.

11.4.1.2 North Queensland Export Terminal 0 project — Stage 1

T0 project involves a greenfield development to the east of the current terminal. It will increase the existing terminal capacity by 30mtpa. The T0 project involves:

- two new stockpile rows
- a new 2.75km long trestle structure supporting an outloading conveyor and roadway
- a new piled offshore wharf structure with shiploader. A new berth pocket and apron area will be dredged for the wharf.

The project has received Australian Government approvals and some of the required Queensland Government approvals.

²⁷⁷ Ibid 276

11.4.1.3 Abbot Point Terminal 3

The T3 project²⁷⁸ supports the construction of an independent coal terminal at the port. The project will allow for the export of up to 60mtpa additional coal delivered by a standard gauge rail line from the Galilee Basin (the action was originally referred to as the X110 coal terminal expansion).²⁷⁹ Key components of the T3 project include:

- a new rail loop with two rail unloading stations
- four stockpile rows providing 2mt of stockyard capacity
- the stockyard would be serviced by two stacker/reclaimer machines.

The project has received Australian Government approval, however has not received Queensland Government approvals.

11.4.1.4 Abbot Point Growth Gateway project

The Abbot Point Growth Gateway project²⁸⁰ supports the construction and operation of the T0 through capital dredging works and the provision of onshore ponds for the processing of dredged material. Key components of the project include:

- the construction of containment ponds for dredged material adjacent to the existing port area within the APSDA
- capital dredging of approximately 1.1 million m³ of the seabed to create two new offshore ship berth pockets and apron
- temporary pipeline infrastructure to allow the dredged material to be pumped to the material containment ponds and seawater to be returned offshore
- operation of the ponds.

This project has obtained both Australian and Queensland environmental approvals.

11.4.1.5 Carmichael Coal Mine and Rail project

The Carmichael Coal Mine and Rail project²⁸¹ involves an open-cut and underground coal mine and a 189km railway line. The coal mine has an approval for up to 60mtpa production, but it will be ramped up to this capacity over a number of years. Components of the project include:

- six open-cut pits and five underground mines
- coal handling and processing plant
- water-supply infrastructure
- 189km rail line from the mine to Moranbah where it will join the existing Goonyella System
- off-site infrastructure including workers' accommodation village and airport.

Construction of the mine commenced in 2019.

11.4.1.6 Other regional mining projects

There are a number of other coal mining projects proposed in the Galilee Basin that could ship coal through the port which have received Australian Government environmental approvals but have not commenced mine construction:

- Kevin's Corner project
- Galilee Coal and Rail project (Waratah Coal)

²⁷⁸ GVK Hancock Coal. (n.d.) *GVK Hancock Coal Our assets Rail and Port*. GVK Hancock Coal. Rail & Port (gvkhancockcoal.com)

²⁷⁹ Department of Sustainability, Environment, Water, Population and Communities. (2012). *Final Approval Decision Hancock Coal Infrastructure Pty Ltd, Abbot Point Terminal 3, Port of Abbot Point*, QLD (EPBC 2008/4468). GVK Hancock Coal. EPBC 2008/4468 (gvkhancockcoal.com)

²⁸⁰ Ibid 28

²⁸¹ GHD. (2013). Carmichael Coal Mine and Rail Project. Adani Australia. Retrieved from <https://eisdocs.dsdp.qld.gov.au/>

- Alpha Coal Mine (Hancock Coal).

11.4.2 Infrastructure projects currently undergoing assessment

11.4.2.1 Urannah Dam project

The Urannah Dam project²⁸² proposes a dam and hydro-electric scheme located in the Broken River Valley approximately 80km west of Mackay. A key feature of the project is a water distribution network from the proposed Dam to the Peter Faust Dam and on to Bowen and Abbot Point.

11.5 New Industry - Hydrogen

In the past few years, there has been significant interest worldwide in the use of hydrogen, both as a clean fuel or as an energy source to integrate hydrogen into future energy markets as a zero-greenhouse gas emitter. Hydrogen can be produced by a number of different technologies, but the principal low emission method in the future is likely to be through the use of electricity to split water into hydrogen and oxygen through an electrolysis process. The hydrogen can then be used in a gaseous form as a fuel or liquefied under high pressure and low temperature for storage and transportation to its end user. When hydrogen is subsequently burnt as a fuel, the only emission product is water. If hydrogen is produced using renewable energy, such as solar or wind power, then there are no greenhouse gas emissions.

The port is well suited for the large-scale production of hydrogen for export because of a number of key advantages, including:

- access to solar or wind power generated in regional Renewable Energy Zones (REZs) or potentially on site
- significant areas of industrial land available for production facilities, with the land being well distanced from any residential area
- Abbot Point has an existing deep-water port for the export of product overseas
- there is a highly skilled regional workforce.

A recent study by Advisian for the Queensland Government indicated potential for generation of up to 2.35mtpa of hydrogen for export at Abbot Point. The study highlighted the following infrastructure needs at Abbot Point:

- **Electricity:** There are several Renewable Energy Zones (REZs) that could supply power to a hydrogen production facility at Abbot Point. These include the Northern Queensland REZ, the Isaac REZ and the North Queensland Clean Energy Hub REZ. Electricity networks however would need to be significantly upgraded and grid stability improved. There is also significant potential for some of the electricity to be generated in the APSDA by solar and wind sources, which would reduce electricity transmission and system upgrade costs.
- **Water:** Hydrogen is created by splitting water molecules. Water is a major process input. There is some unallocated raw water currently available in the region from the Peter Faust Dam and the Burdekin Falls Dam, but this would still need to be supplemented by a significant volume of fresh water created by desalinated seawater. A desalination plant would be required on site and the concentrated brine discharged to the ocean or used for other purposes.
- **Land Availability:** There is significant industrial land available in the APSDA that can easily meet land requirements for a hydrogen project. The land is well distanced from any residential areas and close to port facilities.
- **Port Facilities:** The priority Port of Abbot Point is a natural deepwater port with offshore berths. It can accommodate large ships for export of liquefied hydrogen without new navigational channels. There may be spare capacity in the existing shipping berths or a new offshore berth may be required. The

²⁸² Queensland Government. (2021). *Urannah Project*. Department of State Development, Infrastructure, Local Government and Planning. Urannah Project | Department of State Development, Infrastructure, Local Government and Planning

only disadvantage is that any new offshore berth would likely need to have a 4km long jetty to the offshore berth to reach the natural deepwater.

11.6 Summary

There is significant onsite infrastructure at the port associated with T1, to support the export of up to 50mtpa, with environmental approvals for a future expansion of up to 90mtpa in place. To assist the port in its successful operation and export of resources, several key land infrastructure components are necessary:

- Coal is transported exclusively to the port via the Newlands System.
- The road network, principally the Bruce Highway and the Abbot Point Road, supports the port operation primarily by providing access for workers and for the transport of equipment for maintenance or expansion activities.
- Power to the port is supplied by the Powerlink, from the Bowen North Substation providing 132kV and Ergon via its Merinda Substation providing 66kV/11kV. Powerlink has proposed the installation of a second 132kV substation at Bowen North Substation to support the potential increase in load at the priority Port of Abbot Point.
- The transportation of coal at the port from rail to ship is facilitated through rail unloading facilities, stockpiles, materials handling conveyors and mobile equipment required to stack and reclaim the coal.
- The marine facilities include access trestles extending from the shoreline to two offshore berths. The berths are not protected from sea conditions by any natural features or artificial breakwaters.
- Only small-scale maintenance dredging activities are normally required in the port.

The port is well suited for the large-scale production of hydrogen for export as a new industry. Hydrogen can be used in a gaseous form as a fuel or liquefied under high pressure and low temperature for storage and transportation to its end user.

If hydrogen is produced using renewable energy, such as solar or wind power, there are no greenhouse gas emissions. Access to solar or wind power generated in regional REZs or potentially on site, large areas of industrial land available for production facilities well distanced from residential area, an existing deepwater port for export and a highly skilled regional workforce make such a development ideal at the port.

Future planning and approvals of new infrastructure would need to be in accordance with the existing port land use plan and the current regulation frameworks described in this report.

12.Economic

12.1 Introduction

The port supports the regional development of Central Queensland and is significant to the economic resilience of the entire state. The port is the country's northernmost coal export facility linking coal mines in the northern Bowen Basin to several international destinations supporting steelmaking and energy industries. Opportunities to expand the role of the port within the state's port network could increase as a result of the Queensland Government's goal to diversify trade into 'new' commodities including hydrogen and hydrogen-related industries.

Economic factors provide insight into throughput tonnage trends which assist with gauging future opportunities for the port, associated industries and the region. This leads to better informed planning for infrastructure optimisation and developments that aligns to the goal of meeting long-term needs of customers in a cost-effective way. Understanding the economic context of ports can assist investment decision making for port infrastructure and related landside supply chains such as enhanced rail facilities and upgraded roads supporting high productivity freight vehicles and sea-based infrastructure requirements.

A desktop analysis of the relevant economic factors for the port aims to guide priority port master planning and draw attention to role the port plays in the economic resilience of the region and the state.

This chapter provides the following sections:

- Economic profile – **Section 12.2**
- Economic relationships and functions between the priority ports of Abbot Point and Hay Point/Mackay – **Section 12.3**
- Global trade trends – **Section 12.4**
- Economic development strategies and plans – **Section 12.5**
- Global shipping trends – **Section 12.6**
- Summary – **Section 12.7.**

12.2 Economic profile

The economic profile of the port is related to its trade performance. Two reports provide insights on this front:

- TMR, *Trade and Statistics for Queensland Ports*, (Throughput statistics for the five years ending 30 June 2020)²⁸³
- *NQBP Annual Report 2019–20* ²⁸⁴— Leading the transition to sustainable port trade.

12.2.1 Trade Statistics for Queensland Ports

TMR, *Trade and Statistics for Queensland Ports*, throughput statistics for the five years ending 30 June 2020 provides:

- Trade statistics by port, including details of imports and exports and summary vessel statistics by length and gross tonnage
- Trade statistics by commodity, including details of imports and exports through Queensland's ports by commodity group.

With regard to the port the report states:

²⁸³ Department of Transport and Main Roads. (2020). *Trade and Statistics for Queensland Ports: Throughput statistics for the five years ending 30 June 2020*. Queensland Government.

²⁸⁴ North Queensland Bulk Ports Corporation. (2020). *Annual Report 2019–20*. Retrieved from http://nqbp.com.au/_data/assets/pdf_file/0030/35859/NQBP-Annual-Report-2019-20_FINAL.pdf

- The entirety of the port's annual throughput consists of coal exports from the northern Bowen Basin coalfields. Exports are variable from year-to-year but showed an overall growth trend from 27mtpa in 2015–16 to 31.9mtpa in 2019–20.
- The peak throughput year was 2019–20 with 31.9mtpa exported, a 10.2% increase compared to the previous year throughput, and the lowest throughput year was 2016–17 with 25mtpa.

More recent data in this series is available on the NQBP website at <https://nqbp.com.au/trade/throughputs>.

12.2.2 *North Queensland Bulk Ports Corporation Limited Annual Report 2020–21*

The *NQBP Annual Report 2019–20* provides a summary of the major projects and achievements of NQBP, and the organisation's financial and non-financial performance for the 2019–20 financial year.

The annual report contains a statement from NQBP's Chair and Chief Executive Officer, a summary of the highlights for each of NQBP's ports, summarises the organisation's performance against its strategic objectives, and provides a series of financial statements.

It reports trade performance in line with the Trade Statistics for Queensland Ports and further details of the export trade of the port:

- the port had an annual throughput of 31.88mtpa in 2019–20, continuing a trend of strong trade volume growth year-on-year over the previous 10-years (113% greater than in 2010–11, which had a throughput of 15.0mtpa)
- the port saw 395 vessel calls in 2019–20, continuing a trend of strong annual growth trend (108% greater than 2010–11, which had 190 vessel calls)
- in 2019–20, the port exported 17.05mtpa (53.5%) of thermal coal and 14.83mtpa (46.5%) of metallurgical coal.

The annual report highlights NQBP's business and infrastructure planning within the context of the changing landscape surrounding NQBP's key trade commodities. The annual report notes that industries presently supported by NQBP ports (such as coal mining and associated industries) will continue to trade and form NQBP's core business while NQBP trade transition takes place in line with the transition of the global energy market.

12.3 **Economic relationships between the ports of Abbot Point and Hay Point/Mackay**

The priority Port of Abbot Point is a single-commodity port exporting thermal and metallurgical coal from coal mines in the northern Bowen Basin. The Port of Mackay as a MCF, imports petroleum, magnetite, and other commodities such as machinery which support coal mining operations inland. Consequently, a relationship exists between imports to the Port of Mackay and the exports from the ports of Abbot Point and Hay Point.

Supporting this relationship are landside supply chains. Rail transports high-volume goods such as mining products, while road generally transports palletised goods. Neither road nor rail modes can suitably meet all requirements of the other. The supply chains exist purely through demand for the transportation of imports and exports to and from the ports.

The vast bulk of imports through the Port of Mackay are moved by road to coal mines, including petroleum products, magnetite and machinery.

While connected by high quality rail systems, in practice there are few operating linkages between the ports of Abbot Point and Hay Point because coal exports are directed to the closest coal export port to minimise landside transport costs. These interconnected rail systems are Aurizon's Central Queensland Coal Network (**Figure 77**)²⁸⁵ and are made up of four components:

²⁸⁵ Aurizon. (2019). Central Queensland Coal Network Map. Aurizon. Retrieved from <https://www.aurizon.com.au/-/media/aurizon-media-library/what-we-deliver/network/odrl/rail-network-map.pdf>

- Newlands System – non-electrified line from Abbot Point to North Goonyella
- Goonyella System – electrified system connecting Hay Point to Coppabella with spurs to Hail Creek, North Goonyella, Blair Athol, and Gregory
- Blackwater System – electrified system connecting Gladstone to Blackwater with spurs to Gregory, Minerva, and Rolleston
- Moura System – electrified line connecting Gladstone to Moura.

These systems are connected in an effect to create a central ‘spine’ running north-south along the Bowen Basin, each feeding one of the ports of Abbot Point, Hay Point, and Gladstone. They operate to provide greater flexibility to exporters, providing access to three potential export terminals via three main rail routes. Closure of rail lines due to flooding from adverse weather occurs from time to time and can last for several weeks. Other coal transport and export port options can be useful in such circumstances.

The Queensland Government has acknowledged the importance of landside supply chains through investments under the QTRIP for 2021–22 to 2024–25.

Similarly, electricity, water and other utilities are essential for production and manufacturing activities. An increase in their reliability and decrease in price in turn would contribute to increased production and port throughput.’

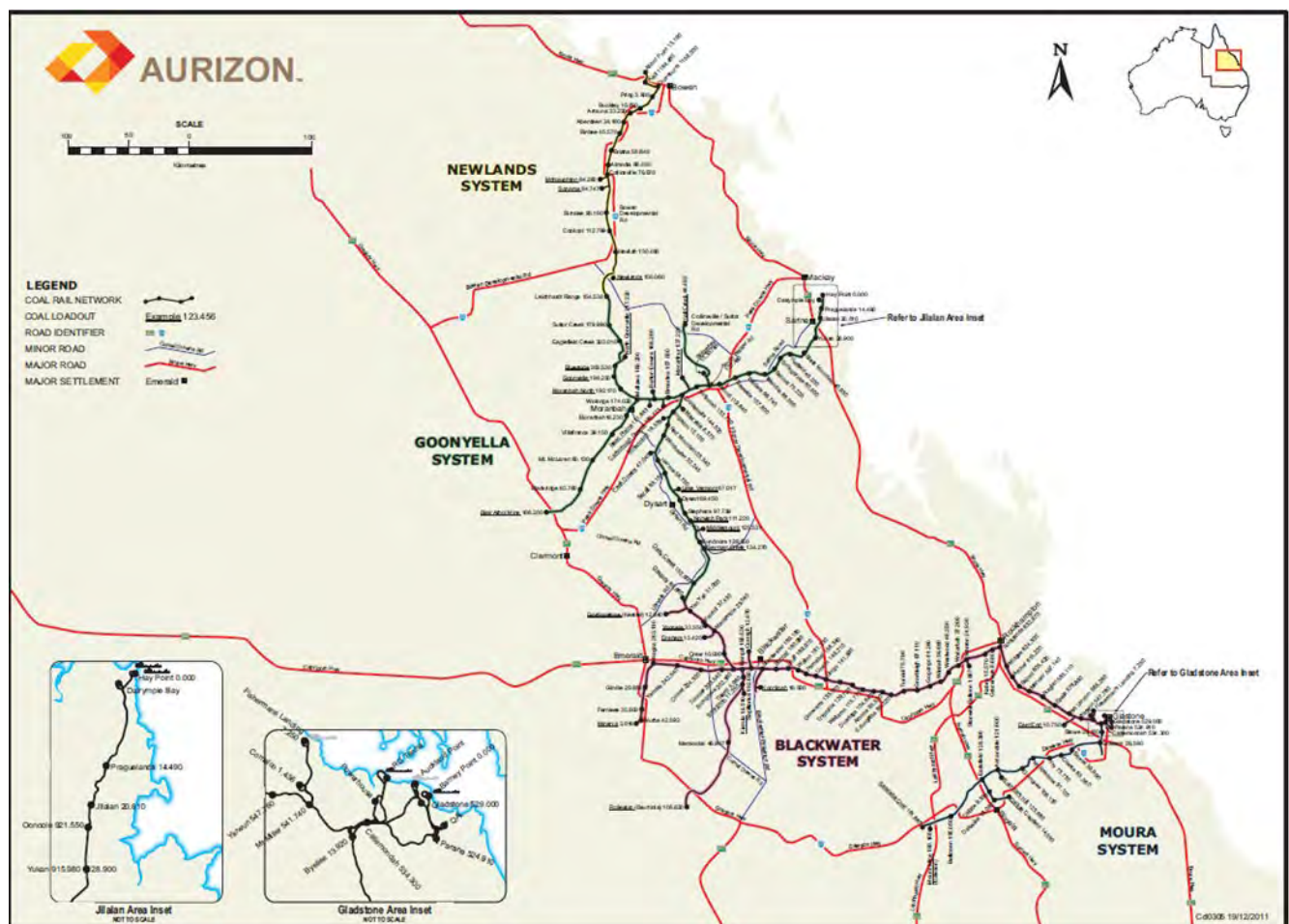


Figure 77: Aurizon Central Queensland Coal Network

12.4 Global trade trends

This analysis considers metallurgical and thermal coal trade trends, issues and outlook separately, as there is substantial evidence that they are not identical. For each type of coal, the analyses set out factors and views that support continued growth in coal exports, followed by alternative factors and views suggesting declining volumes.

12.4.1 Trade trends and volumes – metallurgical coal

Metallurgical coal is primarily used to make steel, with 780kg of metallurgical coal typically being required to manufacture one tonne of steel in a blast furnace. Metallurgical coal is of higher quality than thermal coal as it contains more carbon and less ash and moisture and is typically priced 50% higher per tonne than thermal coal.²⁸⁶

Metallurgical coal represented 1100mt of the 7605mtpa total global coal consumption in 2019 (14.5%). 32% of this demand was met through imports (352mt), of which 88% was seaborne (310mt).²⁸⁷

According to the International Energy Agency's (IEA) *Coal 2020*, global consumption of thermal and metallurgical coal was 7605mt in 2019. Trade accounted for 19% of global coal consumption (1445mt) in 2019, representing its highest volume ever. The balance, referred to as domestic demand, was sourced and consumed within the same country. Of the 1445mt of coal traded, 92% (1331mt) was seaborne.²⁸⁸ Seaborne trade accounts for around 17.5% of overall coal consumption and the IEA notes that seaborne export forecasts are not necessarily aligned with that of overall coal demand, which is dominated by domestically sourced coal.

The structure of global coal trade of metallurgical has evolved in recent years. Historically, Japan, Korea, and Europe accounted for most coal imports and operated in a largely separated 'Atlantic system' and 'Pacific system'. This has shifted in recent years with the trade market increasingly focusing on Asia.²⁸⁹ Coal imports to Europe have dropped primarily due to lower demand.

According to the Office of the Chief Economist's *Resources and Energy Quarterly June 2021*,²⁹⁰ Australia is the world's largest exporter of metallurgical coal by volume and exported 177mt in 2019–20, which represented 54% of the world's total exports. 29% of Australia's metallurgical coal exports in 2019–20 went to China, 21% to India, 16% to Japan, 12% to South Korea, and 10% to the EU.

12.4.1.1 Factors suggesting continued growth – metallurgical coal

The Minerals Council of Australia, a mining industry association, forecasts in *Commodity Outlook 2030* that seaborne metallurgical coal trade will have grown by 23.7% over 2019 levels by 2030. This is expected to be driven by rapid development in India and southeast Asia as coal reserves in these nations are not suited to metallurgical uses.²⁹¹ Demand in China, Japan, and South Korea are expected to grow or remain steady to 2030 and decline gradually thereafter as adoption of alternative steel manufacturing processes starts to affect demand beyond 2030.

The IEA's long-term outlook for metallurgical coal trade depends heavily on the rate and magnitude of transition to alternative steel manufacturing processes. Under Stated Policies Scenario (STEPS)²⁹² the IEA expects international metallurgical coal is expected to grow by 16.7% to 2040 from 2019 levels. This is attributed to a rising scarcity of metallurgical coal due to the limited number of projects at an advanced stage of development. Under this scenario, international demand (particularly India and China) would support Queensland's metallurgical coal exports for the coming two decades.

The Chief Economist's *Resources and Energy Quarterly March 2021* (which provides longer-term forecasts than the June 2021 issue) forecasts global metallurgical coal exports will increase from 293mt in 2020 to 331mt in 2023 and plateau thereafter. It also forecasts Australian metallurgical coal exports to increase from 172mt in 2020 to 191mt in 2023 and plateau thereafter (**Table 60**). As stated above, the IEA note in Coal

²⁸⁶ Department of Industry, Science, Energy and Resources Office of the Chief Economist. (2021). *Resources and Energy Quarterly June 2021*. Australian Government. Retrieved from <https://publications.industry.gov.au/publications/resourcesandenergyquarterlyjune2021/index.html>

²⁸⁷ International Energy Agency. (2020). *Coal 2020*. IEA. Retrieved from <https://www.iea.org/reports/coal-2020>

²⁸⁸ Ibid

²⁸⁹ Ibid

²⁹⁰ Department of Industry, Science, Energy and Resources Office of the Chief Economist. (2021). *Resources and Energy Quarterly June 2021*. Australian Government. Retrieved from <https://publications.industry.gov.au/publications/resourcesandenergyquarterlyjune2021/index.html>

²⁹¹ Minerals Council of Australia. (2021). *Commodity Outlook 2030*. Minerals Council. Retrieved from <https://www.minerals.org.au/sites/default/files/Commodity%20Outlook%202030.pdf>

²⁹² International Energy Agency. (n.d.) *Stated Policies Scenario*. Retrieved from <https://www.iea.org/reports/world-energy-model/stated-policies-scenario-steps>.

2020²⁹³ that coal export forecasts are not necessarily aligned with overall production due to their differing market drivers.

Table 60: Medium-term Australian metallurgical coal export forecast (f)

	2020	2021f	2022f	2023f	2024f	2025f	2026f
Australian annual metallurgical coal exports (mtpa) ²⁹⁴	172	179	185	191	192	191	191

Metallurgical coal's use in steel production has few readily available substitutes that can be implemented at a national scale, which will remain the principal driver of demand. By way of example, this has led the European Union (EU) to maintain metallurgical coal's classification as a 'critical resource' despite efforts to phase out use of thermal coal. BHP and Anglo American, two large multinational mining companies, have sought to reduce their exposure to thermal coal while maintaining their interests in metallurgical coal production.

Table 61 shows a list of all known and 'more-advanced'²⁹⁵ Australian metallurgical and combined metallurgical and thermal coal export projects. Twenty-one of the 27.5mt of planned capacity is based in Central Queensland. The IEA analysis has linked 17mt of all 'more advanced' and 251mt of 'less advanced' thermal and metallurgical coal export projects to Abbot Point, and 5mt and 46mt to Hay Point respectively.²⁹⁶ The ports of Abbot Point and Hay Point would stand to directly benefit from several of the identified future coal export projects.

12.4.1.2 Factors suggesting declining volumes – metallurgical coal

The IEA's Sustainable Development Scenario (SDS)²⁹⁷ forecasts a 22.6% decline in international metallurgical coal trade by 2040 based on 2019 levels due to a rapid increase of steel scrap recycling and more efficient use of steel in construction, and adoption of alternative steelmaking processes that do not use metallurgical coal.

The IEA forecasts in Coal 2020²⁹⁸ that global metallurgical coal exports will decrease from 352mt in 2018 to 332mt in 2021 and 308mt in 2025. It also forecasts that Australia's total thermal and metallurgical coal production will reduce from 429mt in 2019 to 381mt in 2030 under STEPS and 241mt under the SDS, and that Australia's medium-term metallurgical coal exports will decline from 180mt in 2021 to 163mt in 2025 under their sole forecast scenario.

IEA's Coal 2020²⁹⁹ provides a list of all known coal export mining projects worldwide as of December 2020. Projects are classified into 'more advanced' and 'less advanced' stages of development³⁰⁰ and whether they are seeking to extract and export metallurgical coal, thermal coal, or both. The IEA defines a more-advance project as at a minimum having been approved and obtaining a final investment decision, or those that are under construction. All other projects that do not fit this classification are classed as "less-advanced".

Ninety-two mt of 'more advanced' coal export projects were identified worldwide across both metallurgical and thermal coal, 70% of these are metallurgical or combined metallurgical and thermal coal projects (64mt), of which Australia accounts for 44% (28mt). These projects are listed in **Table 61**.

²⁹³ International Energy Agency. (2020). *Coal 2020: Analysis and forecast to 2025*. Retrieved from https://iea.blob.core.windows.net/assets/00abf3d2-4599-4353-977c-8f80e9085420/Coal_2020.pdf

²⁹⁴ Department of Industry, Science, Energy and Resources Office of the Chief Economist. (2021, March). *Resources and Energy Quarterly March 2021*. Australian Government. Retrieved from <https://publications.industry.gov.au/publications/resourcesandenergyquarterlymarch2021/index.html>

²⁹⁵ Ibid 293

²⁹⁶ Ibid

²⁹⁷ Ibid

²⁹⁸ Ibid

²⁹⁹ Ibid

³⁰⁰ Ibid

Table 61: Australian metallurgical coal export projects in 'more advanced' stage of development 2020

Project	Company	Location	Proposed start-up	Proposed full capacity (mtpa)	Resource
Aquila project	Anglo-American / Mitsui	Bundoorra, Queensland	2022	3.5	Metallurgical
Byerwen Stage 2	QCoal/JFE Steel	Suttor, Queensland	2021	7	Thermal and metallurgical
Curragh Extension	Coronado Global	Blackwater, Queensland	2023	3	Thermal and metallurgical
Olive Downs Stage 1	Pembroke Resources	Moranbah, Queensland	2022	4.5	Metallurgical
United-Wambo	Glencore and Peabody	Warkworth, New South Wales	2020	6.5	Thermal and metallurgical
Winton-Fairhill	Futura Resources	Wyuna, Queensland	2021	3	Metallurgical

There was 40mtpa of 'more-advanced' metallurgical coal export projects identified globally. Of these, 11mtpa are located in Australia and 10mtpa in Russia. The remainder of projects are located in the United States of America (6mtpa), Mongolia (3mtpa), Indonesia (2mtpa), South Africa (2mtpa), and Canada (2mtpa).³⁰¹

By contrast, there are 217mtpa of 'less advanced' metallurgical coal export projects identified worldwide, 34% (74mtpa) which are located in Australia. There are a further 164mtpa of 'less advanced' combined thermal and metallurgical coal export projects worldwide, of which 80% (132mtpa) are located in Australia.

The disparity in the capacity of coal export projects between the 'more advanced' and 'less advanced' stages of development are partially attributed by the IEA to difficulty in attracting investment for coal projects leading to many projects failing to advance beyond the 'less developed' phase.

Queensland Treasury's study of Long-Term Global Coal Demand³⁰² undertook an analysis of IEA's World Energy Outlook from the perspective of the Queensland coal industry. The report found that the long-term prospects for metallurgical coal exports are highly uncertain and highlights the following key challenges for the coal industry:

- General demand uncertainty – with forecasts ranging from modest increases over the coming decades, through a flat outlook, to steep declines.
- The increasing difficulty in attracting investment and funding and approvals for new projects will impact production (and therefore exports) just as much as demand-side forces. The report notes this supply-side dimension is almost impossible to predict.
- Similarly, decisions by key players in the coal supply chain such as banks, insurance companies, and other key service providers to exit the coal industry entirely can negatively impact the deliverability of otherwise-viable project.
- The decisions of third parties to exit the coal industry is fed by various forms of community activism whose future scale and impact again are impossible to predict.

The report expects that these key uncertainties will first push out the 'smaller players' as they have more difficulty in overcoming these obstacles and leave coal mining activities to multinational diversified or state-backed mining groups.

12.4.1.3 Supply chain diversification by Australian metallurgical coal customers – metallurgical coal

The Chief Economist's Resources and Energy Quarterly identifies that Australia's relative dominance over the metallurgical coal supply chain has contributed to efforts in key present and future export markets in

³⁰¹ Ibid 293

³⁰² Queensland Treasury. (2020). *A Study of Long-Term Global Coal Demand*. Queensland Government. Retrieved from <https://s3.treasury.qld.gov.au/files/A-Study-of-Long-Term-Global-Coal-Demand.pdf>

China and India to diversify away from Australian metallurgical coal to reduce perceived supply chain vulnerabilities.

For example, India has stated intentions to diversify metallurgical coal supply chain sources and prioritise imports from Russia, Mongolia, and the United States of America to reduce vulnerabilities in their supply chain which have been exposed by flooding of Queensland coalfields experienced in recent years.

Australian exports of metallurgical coal have also been limited in recent years by China's informal import restrictions of Australian coal and efforts to diversify their supply chains, which has led to increased competition between individual Australian producers for access to non-Chinese markets. This has primarily favoured larger and more diversified producers with lower production costs.

The Chief Economist's report notes that these forces add an additional dimension of complexity to Australian metallurgical coal export forecasts.

12.4.1.4 Long-term threat – Transition of steel production processes – metallurgical coal

Alternative steelmaking technologies are expected to become more prominent as they are further developed and utilised. The identified reports have conflicting views on rate of this transition (which range from years to decades) but largely agree they will increase over time as the technologies are further developed and deployed on a national scale. Specific technologies identified in the Queensland Treasury report include electric arc furnaces (which use no metallurgical coal), hydrogen-based processes, and steel production process that uses gasified thermal coal and gas-based steel production method, the latter two of which are already being used in several projects in China and India.

The Queensland Treasury report ultimately concludes that India will increasingly become the key export market for Australian metallurgical coal in the long term. The extent to which this growth will offset the decline in demand from other nations driven by adoption of alternative production processes, and the rate of this production transition, are not yet clear. This is identified as the primary underlying driver behind metallurgical coal's conflicting demand forecasts.

12.4.2 Trade trends and volumes – thermal coal

Thermal coal is primarily used in electricity generation and accounted for 38% of all power generated globally in 2018.³⁰³

Thermal coal made up 6505mt of the 7605mt of total global coal consumption in 2019 (85.5%). The 17% (1093mt) of this demand was met through imports, of which 94% (1012mt) was seaborne. The majority of this seaborne trade activity took place in the Asia Pacific region.³⁰⁴

According to the Office of the Chief Economist's *Resources and Energy Quarterly June 2021*,³⁰⁵ Australia is the world's second largest exporter of thermal coal, accounting for 200mt of the 890mt traded globally in 2020 (22%). The 31% of Australia's thermal coal exports in 2019–20 were to China, 21% to India 15% to Japan, 12% to South Korea, and 8% to Taiwan.³⁰⁶ Lower grade 5500 kilocalories/kilograms of coal is typically exported to China and India, and higher-grade 6000 kilocalories/kilograms of coal to Japan.

Similar to metallurgical coal, thermal coal exports have been limited by China's informal import restrictions, with Australian producers making efforts to diversify to Indian and South Asian markets.

12.4.2.1 Factors suggesting continued growth – thermal coal

The Minerals Council of Australia, forecasts in *Commodity Outlook 2030* that global seaborne thermal coal trade will grow by 23% by 2030 over 2019 levels. This is expected to be driven primarily by developing Asian economies where cheap electricity will be in demand for supporting expansion of heavy industry.³⁰⁷

³⁰³ Ibid 294

³⁰⁴ Ibid 293

³⁰⁵ Ibid 303

³⁰⁶ Ibid

³⁰⁷ Minerals Council of Australia. (2021). *Commodity Outlook 2030*. Minerals Council. Retrieved from <https://www.minerals.org.au/sites/default/files/Commodity%20Outlook%202030.pdf>

The Minerals Council report notes that their forecast for seaborne thermal coal demand is not necessarily the same as that of overall thermal coal consumption (which they note is expected to largely decline by 2040) as the majority of thermal coal production is used to service domestic demand and is not exported.

The Chief Economist's *Resources and Energy Quarterly March 2021* forecasts global thermal coal exports will increase from 1036mt in 2020 to 1101mt in 2023 and decline gradually thereafter. The forecasts expect that Australian thermal coal exports (**Table 62**) will increase from 200mt in 2020 to 230mt in 2023 and plateau in the medium-term thereafter, likely following downwards trend in the long term, however the magnitude of this change and its precise timings are not certain.

Table 62: Medium-term Australian thermal coal export forecast

	2020	2021f	2022f	2023f	2024f	2025f	2026f
Australian annual thermal coal exports (mtpa) ³⁰⁸	199	218	227	230	232	231	231

Table 62 contains a list of all known and 'more advanced' Australian thermal and combined thermal and metallurgical coal export projects, 20.7mtpa of the at least 27.2mtpa (76%) of planned capacity is based in Queensland. The IEA analysis has linked 17mtpa of all 'more advanced' and 251mtpa of 'less advanced' thermal and metallurgical coal export projects to Abbot Point and 5mtpa and 46mtpa to Hay Point respectively.³⁰⁹ The ports of Abbot Point and Hay Point would stand to directly benefit from several of the identified future coal export projects.³¹⁰

12.4.2.2 Factors suggesting declining volumes – thermal coal

There has been a trend over recent years for nations to favour domestic production of thermal coal over imports where possible as a means of supporting domestic industry and reduce reliance on overseas suppliers for critical resources. For example, India's state-owned coal producer, Coal India Limited is aiming to replace thermal coal imports with domestic production, and the government mandated Coal India Limited replace 100mt of imports with domestic production in 2020–21.³¹¹

Low coal prices in 2020 combined with high labour costs compared with other coal exports meant many thermal coal mines have been operating at a loss and have reduced output or in some cases have been 'mothballed'.³¹²

Consequently, the IEA forecasts in *Coal 2020*³¹³ that global thermal coal exports will decrease from 1081mt in 2018 to 991mt in 2021 and 963mt in 2025. Australia's total coal production is forecasted to reduce from 429mt in 2019 to 381mt in 2030 under STEPS, and 241mt under SDS. Australia's medium-term thermal coal exports are expected to remain flat from 208mt in 2018 to 205mt in 2021 and 208mt in 2025 under their sole forecast scenario.

The Queensland Treasury's, study of long-term coal demand³¹⁴ undertook an analysis of IEA's *World Energy Outlook* from the perspective of Queensland coal industry. The report found that thermal coal trade is expected to decline by 15.5% by 2040 from 2019 levels under STEPS, and by 77.1% under SDS. This structural decline will be driven by a transition in energy generation sources in key export markets of China, Japan, South Korea, and India.

The IEA's *Coal 2020*³¹⁵ provides a list of all known coal export mining projects worldwide as of December 2020. Projects are classified into 'more advanced' and 'less advanced' stages of development and whether they are seeking to extract and export metallurgical coal, thermal coal, or both.

There was 92mtpa of 'more advanced' coal export projects identified worldwide across both metallurgical and thermal coal. 57% of these are thermal or combined thermal and export coal projects (52mtpa), of which 54% (28mtpa) are based in Australia. These projects are listed in **Table 63**.

³⁰⁸ Ibid 303

³⁰⁹ Ibid 293

³¹⁰ Ibid

³¹¹ Ibid

³¹² Ibid

³¹³ Ibid 303

³¹⁴ Ibid 302

³¹⁵ Ibid 303

Table 63: Australian thermal coal export projects 'more advanced' development 2020

Project ³¹⁶	Company	Location	Earliest proposed start-up	Proposed full capacity (Mtpa)	Resource
Byerwen Stage 2	QCoal/JFE Steel	Suttor, Queensland	2021	7	Thermal and metallurgical
Cambey Downs	Yancoal Australia	Hookwood, Queensland	2020	0.7	Thermal
Carmichael	Bravus	Belyando, Queensland	2021	10	Thermal
Curragh Extension	Coronado Global	Blackwater, Queensland	2023	3	Thermal and metallurgical
Mandalong Southern Extension	Centennial Coal	Mandalong, New South Wales	2022+	Unknown	Thermal
United-Wambo	Glencore and Peabody	Warkworth, New South Wales	2020	6.5	Thermal and metallurgical

There was 28mtpa of 'more-advanced' thermal coal export projects identified globally. Of these, 14mtpa were located in South Africa, 11mtpa in Australia, and 4mtpa in Russia.

Of the 831mtpa of 'less advanced' coal export projects identified worldwide, 74% (614mtpa) are thermal or combined thermal and metallurgical coal projects. 75% (463mtpa) of these projects are based in Australia.

Establishment of new thermal coal production faces similar challenges to that of metallurgical coal but often to a more severe extent. These include difficulties in thermal coal projects securing funding and investment, trend of third parties removing themselves from the thermal coal supply chain and community activism. This leads to many projects being held indefinitely in this less advanced stage.

The Queensland Treasury's *A Study of Long-Term Global Coal Demand*³¹⁷ notes that irrespective of the pace and magnitude of decline in thermal export coal demand, there is little likelihood of a significant production increases in Central Queensland due to the issues associated with declining volumes, including significant up-front costs amid a highly uncertain and transitioning market, associated difficulty in securing financing and investment, decisions by key players to cease involvement in the coal supply chain, and community activism.

The long-term and structural challenges facing thermal coal have been manifest in decisions by large mining groups including Anglo American, BHP and Rio Tinto to exit the thermal coal business in its entirety in recent years.

12.4.3 Other commodities and activities

The port is a single-commodity coal port, however there is increasing effort by the Queensland Government to develop its sustainable future growth. In relation to hydrogen industry development, the port presents a major opportunity for the export of renewable hydrogen. The port is in proximity to gas fields and 'new economy minerals' in Bowen and the North West Minerals Province (NWMP) that have potential to generate trade in supporting commodities and new export commodities for the port.

DSDILGP's, *New Economy Minerals*³¹⁸ identifies substantial deposits of rare earth metals including copper, lead, zinc, nickel, cobalt, gold, graphite, silver, phosphate, and vanadium in Queensland across 'large areas of under-explored land with high prospectively for the discovery of 'Tier 1 projects'. The report establishes the following initiatives to develop these 'new economy minerals', including:

- \$5 million to re-examine old mine tailings and core samples for rare earth minerals
- \$9 million to develop better geological information to help industry identify new projects

³¹⁶ Ibid 293

³¹⁷ Ibid 203

³¹⁸ Department of State Development, Infrastructure, Local Government and Planning. (2020, July). *New Economy Minerals: Investment opportunities in Queensland's minerals provinces*. Queensland Government. Retrieved from https://www.statedevelopment.qld.gov.au/__data/assets/pdf_file/0023/32918/nwmp-investment-prospectus.pdf

- \$14.8 million to continue investigating feasibility of the CopperString project to connect the NWMP to the National Electricity Market
- \$10 million of exploration grants over four years
- \$500 million over five years to boost mineral freight exports on the Mount Isa Line
- \$27.12 million geological survey of Queensland's *Strategic Resources Exploration Program*³¹⁹ aimed at expanding resources exploration and development for gas and other minerals in North West Queensland. Includes funding exploration, mineral geophysics, mineral geochemistry, mineral synthesis, and the Geoscience Data Modernisation project³²⁰.

Most of these resources are located in the NWMP (which contains approximately 75% of Queensland's total metalliferous resources) and are exported through the Port of Townsville due to its proximity to the Mount Isa-Townsville railway line and Flinders Highway.

The report identifies specific gold, silver, copper, lead, and zinc opportunities in and around Bowen including:

- active silver and gold mines at Mount Wright, Ravenswood, Pajungo, Wirrallee, and Twin Hills (closed)
- silver, gold, and copper mine at Mount Carlton
- identified Silver and gold resources at Mount Coolon and Belyando
- identified Zinc, copper, lead, gold, and silver resources at Waterloo, Lione town, and Thalanga.

The Queensland Government are supporting development of the Bowen gas fields through construction of the Bowen Basin Pipeline, which will connect the Bowen gas fields around Moranbah to the east coast gas market and export facilities at Gladstone.³²¹ Development of the Bowen gas fields is unlikely to directly affect the port but has potential to generate new supporting trades.

12.4.3.1 Rocket launch site proposal

The Queensland Government is facilitating the development of a space launch facility within the APSDA as part of an action under the *Queensland Space Industry: Strategy 2020–2025: Progress Report*³²² released in February 2020 (Queensland Space Industry Strategy).

The Queensland Government announced in July 2020 that it had identified the APSDA as preferred site and would be undertaking a technical investigation due diligence process on the site.

The Queensland Government announced in May 2021 that this due diligence process had confirmed the APSDA may be suitable for launch activities and that Gilmour Space Technologies had expressed interest in developing the site for small-scale launch vehicles to service small satellite launches into both geostationary orbit (orbiting above a fixed point on the equator) and inclined orbit (orbiting on a plane inclined to the equator). This market is expected to grow to \$57.1 billion globally by 2028.

The Queensland Government is currently progressing discussions with Gilmour, the proponent, to advance the proposal, with development being subject to Gilmour receiving all regulatory approvals.

If developed, the launch site could generate port trade enhancement from space-related development. Port planning should remain open to the needs of possible new export trades and supporting import commodities they may demand.

³¹⁹ Department of Resources. (n.d.) *Strategic Resources Exploration Program*. Queensland Government.³¹⁹

³²⁰ Department of Resources. (n.d.) *Geoscience Data Modernisation Project*. Retrieved from <http://www.resources.qld.gov.au/mining-exploration/initiatives/geoscience-data-modernisation-project>

³²¹ Queensland Government. (2021). *New Study to Unlock Potential of Bowen Basin*. Queensland Government. Retrieved from <https://statements.qld.gov.au/statements/92488>

³²² Department of State Development, Infrastructure, Local Government and Planning. (2020, February). *Queensland Space Industry: Strategy 2020–2025: Progress Report*. Queensland Government. Retrieved from https://www.statedevelopment.qld.gov.au/__data/assets/pdf_file/0026/17576/space-industry-strategy-2020-25.pdf

12.5 Economic development strategies and plans

12.5.1 Australian Government

12.5.1.1 Developing Northern Australia³²³

Developing Northern Australia is a white paper setting out the Australian Government's 'priorities to drive growth in Australia's north' over the 20-years from publication in June 2015

The white paper provides a 20-year plan to grow Northern Australia across six themes:

- simpler land arrangements to support investment
- developing the north's water resources
- business, trade and investment gateway
- infrastructure to support growth
- the northern workforce
- good governance for Northern Australia

The white paper provides two-, five-, 10-, and 20-year implementation plans to deliver on the paper's objective.

The white paper seeks to promote Northern Australia as a trade and investment gateway to Asia by attracting greater business and educational links with Australia's regional partners and providing a more streamlined regulatory environment.

It establishes the \$5 billion Northern Australian Infrastructure Facility to provide concessional loans for major infrastructure works.

The white paper will work with Indigenous communities, businesses and jurisdictions to simplify land arrangements, including making the native title simpler.

12.5.1.1.1 Port trade outlook implications, influences, impacts and threats

- General support for port development as facilitators of trade.
- Northern Australia Infrastructure fund.
- No specific or immediately implementable implications apparent.

12.5.1.2 Australia's Long-Term Emissions Reduction Plan

Australia's long-term emissions reduction plan³²⁴ outlines Australia's pathway to net zero emissions by 2050.

The plan is based on five key principles:

- technology not taxes
- expand choices, not mandates
- drive down the cost of a range of new energy technologies
- keep energy prices down with affordable and reliable power
- be accountable for progress.

The plan proposes:

'More than 100,000 new jobs could be created in industries including critical minerals, clean hydrogen, renewable energy, green steel and alumina, many in Australia's regions. Australia's export-oriented sectors

³²³ Department of Industry, Science, Energy and Resources. (2015, June). *Our North, Our Future: White Paper on Developing Northern Australia*. Australian Government. Retrieved from https://www.industry.gov.au/sites/default/files/June%202018/document/pdf/nawp-fullreport.pdf?acsf_files_redirect

³²⁴ Australian Government. (2021). *Australia's, Long-term Emissions Reduction Plan: A Whole-of-economy Plan to achieve net zero emissions by 2050*. Commonwealth of Australia.

are projected to grow significantly in aggregate, with the value of Australian exports more than tripling between 2020 and 2050.'

12.5.1.2.1 Port trade outlook implications, influences, impacts and threats

- General support for port development as facilitators of trade, for new and existing export industries.
- No specific or immediately implementable implications apparent.

12.5.2 Queensland Government

12.5.2.1 Queensland Climate Action

The Queensland Government has set targets³²⁵ to support emissions reduction: 50% renewable energy target by 2030; 30% emissions reduction below 2005 levels by 2030; and zero emissions by 2050.

The plan sets out the priority sectors for action over the next decade to achieve zero net emissions by 2050, power Queensland with 50% renewable energy by 2030 and reduce greenhouse gas emissions by at least 30% below 2005 levels by 2030.

Climate actions provides the strong foundation needed for Queensland to meet its targets, attract investment, and create more jobs in the future economy.

12.5.2.1.1 Port trade outlook implications, influences, impacts and threats

- Potential for future port trade enhancement from development in new industries.

12.5.2.2 Zero Net Emissions Transport Roadmap³²⁶

The Queensland Government is developing a Zero Net Emissions Transport Roadmap^{327 328} to chart a pathway towards zero net emissions by 2050 for Queensland's transport sector.

The transport roadmap is one of several sectorial roadmaps in development to support Queensland Government efforts to address climate change, including energy, buildings, agriculture and infrastructure. Transport Roadmap actions and targets will contribute to the Queensland's *Climate Actions Plan 2030* target.

12.5.2.2.1 Port trade outlook implications, influences, impacts and threats

- Potential for future port trade enhancement from development in new industries.

12.5.2.3 A Study of Long-Term Global Coal Demand

*A Study of Long-Term Global Coal Demand*³²⁹ examines the long-term demand for Queensland coal considering the global coal industry and IEA World Energy Outlook, and implications for Queensland's coal production and export activities.

The study conducts an analysis of the IEA's 2019 World Energy Outlook and other sources of information to discuss potential implications for Queensland's metallurgical and thermal coal industries to 2040.

Under the IEA's main STEPS, which includes the effect of in-force policies and policies announced in official targets and plans, the total global trade in thermal coal is expected to decrease by 15.5%, and trade in metallurgical coal is expected to increase by 16.3%.

Under the IEA's SDS which reflects the potential outcome if global policies were to align with the United Nations Sustainable Development Goals, the total global trade in thermal coal is expected to decrease by 77.1%, and trade in metallurgical coal is expected to decrease by 22.6%.

³²⁵ Queensland Government. (2030). *Queensland Climate Action*. Retrieved from <https://www.des.qld.gov.au/climateaction>

³²⁷ Department of Transport and Main Roads. (n.d.) *A net-zero emissions transport roadmap for Queensland*. Retrieved from <https://www.stateoftheenvironment.des.qld.gov.au/pollution/management-response/policy-and-programs/a-net-zero-emissions-transport-roadmap-for-queensland>

³²⁷ Department of Transport and Main Roads. (n.d.) *A net-zero emissions transport roadmap for Queensland*. Retrieved from <https://www.stateoftheenvironment.des.qld.gov.au/pollution/management-response/policy-and-programs/a-net-zero-emissions-transport-roadmap-for-queensland>

³²⁸ Department of Transport and Main Roads. (n.d.) *A net-zero emissions transport roadmap for Queensland*. Retrieved from <https://www.stateoftheenvironment.des.qld.gov.au/pollution/management-response/policy-and-programs/a-net-zero-emissions-transport-roadmap-for-queensland>

³²⁹ Queensland Treasury. (2020). *A Study of Long-Term Global Coal Demand*. *Queensland Government*. Retrieved from <https://s3.treasury.qld.gov.au/files/A-Study-of-Long-Term-Global-Coal-Demand.pdf>

The IEA highlighted that the long-term outlook for coal demand is uncertain and long-term outcomes could viably arrive at any point between the STEPS and SDS.

12.5.2.3.1 Port trade outlook implications, influences, impacts and threats

The long-term demand for coal exports has significant implications for the port due to its role in handling coal from the northern Bowen Basin and the absence of any other commodities handled at the port.

Queensland's future coal demand and therefore Abbot Point's future throughput are expected to be driven by demand for coal in key Asian economies. Future exports of metallurgical coal are particularly dependant on demand from China and India.

Queensland's coal industry has several key advantages over other jurisdictions including its geographic proximity to Asia and the quality of its coal relative to alternatives. Therefore *'under the IEA's STEPS, it is likely that international demand will support Queensland's coal exports over the two decades to 2040, with the long-term outlook for metallurgical coal likely to be more favourable than for thermal coal.'*

The report noted that there is a significant degree of uncertainty given the long-term nature of the outlook and rate of change in the global energy market.

12.5.2.4 Strategic Blueprint for Queensland's North West Minerals Province (in the vicinity of Mount Isa and Cloncurry)

The Strategic Blueprint for Queensland's North West Minerals Province ³³⁰ *'provides a platform on which the Queensland Government will collaborate with other levels of government, business, industry, and communities to support a smooth transition to a stronger and more diversified economy in the longer term'.*

The blueprint builds on existing initiatives and provides \$39 million over four years as part of the 2017–18 State Budget for new measures and is focused on three key strategic priorities:

- facilitating continued resources sector development
- diversifying the regional economy and creating employment opportunities
- working with businesses and communities to deliver integrated and appropriate services.

12.5.2.4.1 Port trade outlook implications, influences, impacts and threats

- General ongoing support from the Queensland Government for developing and supporting the minerals industry.

12.5.2.5 Queensland Hydrogen Industry Strategy 2019–24

The *Queensland Hydrogen Industry Strategy 2019–24*³³¹ defines a strategy for developing 'an economically sustainable and competitive hydrogen industry that creates economic growth, opportunities for new export markets, highly skilled jobs, and supports the transition to a low-emission economy.'

The strategy sets actions within five focus areas that address challenges to developing a hydrogen industry, which were identified through consultations with industry, researchers, and the public and include:

- supporting innovation in industry and manufacturing
- facilitating private sector investment
- ensuring an effective policy framework for sustainable development that provides flexibility and certainty
- building community awareness and confidence in hydrogen
- facilitating skills development to ensure the workforce is adequately skilled to produce, handle, and use hydrogen.

The strategy recommended the following actions relevant to developing a hydrogen industry in Queensland:

³³⁰ Queensland Government. (2017). *A strategic Blueprint for Queensland's North west Minerals Province: Supporting strong and prosperous regional communities.*

³³¹ Queensland Government. (2017). *A strategic Blueprint for Queensland's North west Minerals Province: Supporting strong and prosperous regional communities.*

- ensure investment programs are responsible to hydrogen industry development opportunities and support competitive production, storage, transport and use
- assist private sector proponents with information on developing hydrogen projects, provide project and investment facilitation services, promote investment opportunities to international partners, and deliver the Hydrogen Industry Development Fund to facilitate private sector investment
- support demonstration projects to showcase the applications of hydrogen.

12.5.2.5.1 Port trade outlook implications, influences, impacts and threats

- Potential for future port trade enhancement from development in new industries with linkages to emerging opportunities of the APSDA.

12.5.2.6 Queensland Biofutures – 10 Year Roadmap and Action Plan

Queensland Biofutures³³² sets out a vision for Queensland's bioproduct and biotechnology industry in 2026. It defines how the state will realise associated opportunities for growth and aims to provide assurance for existing operations and future investments.

The document defines 'biofutures', discusses key industry drivers and the global context, the Queensland Government's vision for the state's biotechnology and bioproduct industry, and discusses strengths, weaknesses, opportunities, challenges and associated actions.

The report identifies specific opportunities at Wilmar's bioethanol plant at Sarina, about 40km south of Mackay, Australia's largest producer of molasses-based ethanol with capacity to produce 60 million litres of ethanol per year, and the Mackay Renewable Biocommodities Pilot Plant, 'a pilot-scale research and development biorefinery for the conversion of cellulosic biomass into bioethanol and other high-value commodities'.

The report specifically identifies sugarcane bagasse as a potential feedstock for producing succinic acid in the Whitsunday region.

A selection of recommended actions include:

- providing direct support for biofutures industry initiatives using various development fund and grant programs and providing broad industry development support
- identify and promote investment opportunities using marketing and communications campaigns and various initiatives to encourage investment
- provide strong government leadership to create and maintain an attractive investment environment through strong government sectoral focus, establishing Queensland Biofutures, and investigate policy and development opportunities.

12.5.2.6.1 Port trade outlook implications, influences, impacts and threats

- No specific or immediately implementable implications apparent, partly due to location of the two specific opportunities near Mackay.
- Port development planning should remain open to the needs of possible new export trades and supporting import commodities they may demand.

12.5.2.7 Abbot Point Growth Gateway project

The Abbot Point Growth Gateway project³³³ is associated with the construction of a second trestle (T2) at the Port of Abbot Point, to increase the port's capacity from 50 to 120mtpa. The project would involve the placement of 1.1 million m³ of dredged seabed, on vacant industrial land next to the existing coal terminal (T1).³³⁴

³³² Department of State Development, Infrastructure, Local Government and Planning. (2016). *Queensland Biofutures: 10-Year Roadmap and Action Plan*, Edition 2. Advance Queensland, Queensland Government

³³³ Department of State Development, Infrastructure, Local Government and Planning. (2016). *Queensland Biofutures: 10-Year Roadmap and Action Plan*, Edition 2. Advance Queensland, Queensland Government

³³⁴ <https://www.statedevelopment.qld.gov.au/regions/regional-priorities/abbotpoint-eis>

The EIS³³⁵ for the proposed project was published in August 2015 and details the scope of the project and associated management measures for any potential environmental impacts.

Public consultation on the EIS was conducted in August and September 2015 and after consideration of submissions, a final EIS was prepared.

Following review of the final EIS, the Australian Government approved the dredging and construction associated with the project subject to 29 environment conditions³³⁶ considered the strictest in Australian history.³³⁷ The proposal does not involve the placement of dredged material on the CVW or within the GBRWHA.

The proposal has gained key Queensland Government approvals for the onshore construction works and the dredging works offshore. The Queensland Government approvals are subject to 28 and 68 conditions.

The economic impact assessment for the project estimated a gross value generated in the MIW region of \$23 million to \$46.5 million per annum due to the economic benefits of increasing coal exports from the region.

This project facilitates development of the Carmichael Coal Mine, North Galilee Basin Rail, the Bravus Mining and Resources Abbot Point T0 project development, and increased shipping resulting from the T0 project development.

12.5.2.7.1 Port trade outlook implications, influences, impacts and threats

Construction of the second trestle is expected to support increased throughput at the port arising from the Carmichael Coal Mine and other developments. Other associated projects include North Galilee Basin Rail and T0 project development.

12.5.2.8 Abbot Point Launch Site Investigation

The Abbot Point Launch Site Investigation summarises the Queensland Government's investigation into the potential for an area within the APSDA to host a space launch facility, which was undertaken under its Queensland Space Industry Strategy³³⁸.

The summary document outlines the opportunity, why the Abbot Point location, and the scope of the launch site investigation.

The document references a study undertaken by Deloitte Access Economics that found '*a launch site and space-related infrastructure at Abbot Point would be catalytic for the space industry*' and provide research and development and market opportunities for Queensland worth \$3.5 - \$6 billion to the state economy by 2036.

The Queensland Government will support Gilmore Space Technologies (Gilmore) in the development of a space launch facility and will continue to investigate whether there is another site in Queensland that could support the government's longer-term vision for a large-scale facility servicing multiple size rockets.³³⁹

12.5.2.8.1 Port trade outlook implications, influences, impacts and threats

- Potential for port trade enhancement from space-related development in the SDA adjacent to the port and possible new import trades they may demand.

12.5.2.9 Queensland Space Industry Strategy

The Queensland Space Industry Strategy³⁴⁰ outlines Queensland's five-year strategy to develop a space industry. It builds on the 'Queensland Aerospace and other priority sector 10-year Roadmaps and Action Plans' to provide actions more targeted to growing a space industry.

The strategy defines the vision, opportunity and potential benefits for the wider Queensland economy, explores Queensland's existing space-related industry, and discusses Queensland's key strengths with

³³⁵ Ibid 334

³³⁶ <https://www.awe.gov.au/environment/epbc/key-assessments#abbot-point-growth-gateway-project-qld>

³³⁷ <https://www.awe.gov.au/sites/default/files/env/pages/cb8a9e41-eba5-47a4-8b72-154d0a5a6956/files/factsheet-abbot-point.pdf>

³³⁸ Ibid 322

³³⁹ Department of State Development, Infrastructure, Local Government and Planning.

https://statedevelopment.qld.gov.au/_data/assets/pdf_file/0021/54633/abbot-point-launch-site-investiation-factsheet.pdf

³⁴⁰ Ibid 322

respect to developing a space industry (being its favourable location for hosting launch activities and ground stations), and Queensland's existing space-enabled industries (including geoscience, advanced manufacturing and robotics).

The strategy also summarises key growth opportunities for Queensland's 'space economy', industry-wide challenges, and key actions.

The overarching vision of the strategy is that 'By 2025, Queensland's space industry will be recognized as a leading centre in Australasia for launch activities, ground systems, Earth observation, niche manufacturing, and robotics and automation'.

Key recommended actions include:

- promoting development of supporting capabilities in infrastructure (including development of common user space-related infrastructure, development of a data analytics and commercialization hub, and development of a ground station in Queensland), workforce capability, and commercial capability (including leveraging the Defence and Aerospace Industry Development Fund, supporting organisations seeking to enter the space supply chain, and support industry's involvement in international space missions)
- growing Queensland's industry by working to connect Queensland's space industry to international and domestic market opportunities and develop downstream space-enabled industries.

12.5.2.9.1 Port trade outlook implications, influences, impacts and threats

- Potential for port trade enhancement from space-related development in the SDA adjacent to the port and possible new import trades they may demand.

12.5.2.10 State of Queensland Agriculture Report

The *Queensland AgTrends 2020–21 Report*³⁴¹ was developed in response to industry consultation for the Queensland agricultural strategy and collates and analyses data for use by the agricultural industry for the purposes of making investment decisions and planning for the future.

The report provides a range of metrics across the agricultural production process for Queensland's key agricultural industries including forestry and commercial fisheries including resource availability, productivity, markets, and production costs.

Data is provided from a range of sources including government, investment institutions, and industry organisations.

The report reiterates the Queensland Government's objective of doubling agricultural production from 2014 to 2040 and highlights opportunities in key export markets such as China, India, and Indonesia but caveats that seasonal variability remains a major challenge facing Queensland agriculture.

12.5.2.10.1 Port trade outlook implications, influences, impacts and threats

- No specific or immediately implementable implications apparent but remain open to the needs of possible new export trades and supporting import commodities they may demand.

12.5.2.11 Queensland AgTrends

The *Queensland AgTrends 2020–21 Report*³⁴² aims to help industry improve its competitiveness and plan for the future by publishing data on industry performance, consumer behaviour, and social and demographic trends.

Data tracked includes gross value of production (GVP) of Queensland's primary industries, GVP at the farm gate, climate outlook, and primary industry forecasts by commodity.

³⁴¹ Department of Agriculture, Fisheries and Forestry. (2020). *AgTrends 2020-21: Forecasts and trends in Queensland agricultural, fisheries and forestry production*. Queensland Government. Retrieved from <https://www.publications.qld.gov.au/dataset/queensland-agtrends/resource/0e8e2b36-a33d-47a5-bc1d-c30cbd672e76>

³⁴² Department of Agriculture, Fisheries and Forestry. (2020). *AgTrends 2020-21: Forecasts and trends in Queensland agricultural, fisheries and forestry production*. Queensland Government. Retrieved from <https://www.publications.qld.gov.au/dataset/queensland-agtrends/resource/0e8e2b36-a33d-47a5-bc1d-c30cbd672e76>

According to the report, for 2020–21 the total value of Queensland's primary industry commodities comprising GVP at the farm gate and first-stage processing was forecast to be \$18.41 billion – 1% less than 2019–20 and 4% less than the average for the past five years. This comprises \$14.5 billion GVP and \$3.9 billion value-added production. The report noted that the largest contributors to the total are livestock meats (\$6.16 billion) and horticulture (fruit, nuts, and vegetables) (\$2.98 billion).

The total forecast value has decreased for the fourth consecutive year after one of the worst droughts in 100 years.

Queensland exports approximately 58% of all agricultural output – 50% of all meat products, 16% of all fruit and vegetables, 83% of sugar, 93% of grains, 74% of cotton and wool, and 47% of seafood products. In 2019–20 Queensland exported approx. \$10 billion of agricultural and food products.

12.5.2.11.1 Port trade outlook implications, influences, impacts and threats

- No specific or immediately implementable implications apparent but remain open to the needs of possible new export trades and supporting import commodities they may demand.

12.5.2.12 Advancing Queensland's Priorities

Advancing Queensland's Priorities³⁴³ outlines the Queensland Government's high-level priorities following the 2017 State Election.

The document outlines the six core priorities (job creation, early childhood, health, community safety, protecting the GBR, and improving ease of use of government services) and a series of measurable goals.

Specific goals include:

- creating 60,000 jobs per year through State Budget initiatives from 2018–19 to 2020–21
- increase private sector investment in Queensland by 15% by 2020–21
- reduce Queensland's net greenhouse gas emissions by 30% from 2018 levels by 2030
- improve the quality of water flowing into the GBR lagoon through a 60% reduction in anthropogenic end-of-catchment dissolved inorganic nitrogen loads by 2025, and a 25% reduction in anthropogenic end-of-catchment sediment loads.

12.5.2.12.1 Port trade outlook implications, influences, impacts and threats

- Potential for port trade enhancement from development in SDAs adjacent to ports.
- Likelihood of greater scrutiny of possible water quality impacts for port and related developments near the GBRWHA.

12.5.2.13 Queensland's Economic Recovery Plan

Queensland's Economic Recovery Plan³⁴⁴ defines the Queensland Government's plan for long-term recovery from the COVID-19 pandemic, developed following extensive business, industry, regional, and community stakeholders.

The plan describes a range of recovery and support initiatives within the 2021–22 State Budget as part of a broader \$14.2 billion funding for 'recovery initiatives'. Examples of these initiatives include targeted support measures for industry and small business, cost of living relief measures for households, and infrastructure projects.

Relevant economic measures included in the 2021–22 State Budget are:

- \$140 million funding for businesses to employ staff who were previously unemployed
- \$10 million for the *Business Investment Fund*, which seeks to 'invest in small-to-medium businesses that have significant growth potential'

³⁴³ Queensland Government. (2018). *Our Future State: Advancing Queensland's Priorities*. Queensland Government. Retrieved from <https://cabinet.qld.gov.au/documents/2018/Mar/OFSAQ/Attachments/Priorities.PDF>

³⁴⁴ Queensland Government. (2021b). *Queensland's COVID-19 Economic Recovery Plan: 2021-22 budget update*. Queensland Government. Retrieved from https://budget.qld.gov.au/files/Budget_2021-22_Covid_Economic_Recovery_Plan.pdf

- \$25 million in new grants and programs to support small businesses
- \$3.34 billion to support industry and job-creation, including the \$2 billion *Queensland Renewable Energy and Hydrogen Jobs Fund*
- \$100 million to 'grow the waste management and resource recovery sector'
- \$200 million for minor infrastructure works and maintenance in regional Queensland
- \$9 billion of funding for capital works in areas outside of Greater Brisbane
- \$270 million for the Queensland Reef Water Quality Program
- \$71 million for the Drought Assistance and Reform Package
- \$200 million per year for upgrade of priority sections of the Bruce Highway.

12.5.2.13.1 Port trade outlook implications, influences, impacts and threats

- Potential for port trade enhancement from development in SDAs adjacent to ports

12.5.2.14 Mackay-Whitsunday Regional Economic Recovery

Mackay-Whitsunday Regional Economic Recovery Action Plan³⁴⁵ defines the Queensland Government's plan for long-term recovery of the Mackay-Whitsunday region from the COVID-19 pandemic, developed following extensive business, industry, regional, and community stakeholders.

The plan describes a range of recovery and support initiatives within the 2021–22 State Budget. Examples of these initiatives include targeted support measures for industry and small business, cost of living relief measures for households, and infrastructure projects.

Relevant economic measures included in the 2021–22 State Budget include:

- \$5.5 million for establishment of Salisbury Plains Industrial Precinct
- \$38.9 million to widen and seal the Bruce Highway (Proserpine-Bowen), Emu Creek to Drays Road
- \$37 million to widen the Bruce Highway (Mackay-Proserpine), Hamden-Kattabum upgrade
- \$102.4 million to widen the Bruce Highway (Mackay-Proserpine) between Ron Camm Bridge and Mackay Ring Road
- \$28.9 million to pave and seal Bowen Developmental Road between Rockingham Creek and Mount Coolon
- support for the Olive Downs coal mine – a recently approved metallurgical coal mine located 40km south-east of Moranbah with a 79-year expected lifespan that will export an estimated 15mtpa by rail to the Dalrymple Bay Terminal.

12.5.2.14.1 Port trade outlook implications, influences, impacts and threats

- No specific or immediately implementable implications apparent but remain open to the needs of possible new export trades and supporting import commodities they may demand.
- Potential for port trade enhancement from development in SDAs adjacent to ports.

12.5.2.15 State Infrastructure Plan

The *State Infrastructure Plan*³⁴⁶ 'sets a clear vision to guide infrastructure investment and provides a cohesive model for infrastructure planning and delivery which integrates with land use and economic planning' and 'coordinates infrastructure planning across Queensland Government agencies'.

The *State Infrastructure Plan* provides a framework to guide the planning and prioritisation of infrastructure investment and delivery by:

- setting a strategic direction and promoting innovation in planning and delivering infrastructure

³⁴⁵ Queensland Government. (2021a). *Mackay-Whitsunday Regional Recovery Action Plan*. Queensland Government. Retrieved from https://www.covid19.qld.gov.au/data/assets/pdf_file/0022/140377/mackay-whitsunday-action-plan.pdf

³⁴⁶ Department of Infrastructure, Local Government and Planning. (2016). *State Infrastructure Plan Part A: Strategy*. Queensland Government. Retrieved from https://www.statedevelopment.qld.gov.au/__data/assets/pdf_file/0020/31727/sip-part-a.pdf

- identifying the anticipated service needs and infrastructure investment opportunities
- developing a program of investment
- providing a framework for improved coordination between public and private infrastructure.

The *State Infrastructure Plan* provides a framework for the infrastructure options assessment process and highlights a preference (in descending order of preference) for non-build (policy options), better use (demand management), improve existing (upgrade options), and new construction works.

The plan highlights that multiple options may be used in conjunction, such as a demand management and improve existing as a means of delaying new infrastructure works or combining policy reform with new infrastructure to minimise the scope and cost of new capital works.

12.5.2.15.1 Port trade outlook implications, influences, impacts and threats

No specific or immediately implementable implications apparent but remain open to the framework's implications for new capital works at the port.

12.5.3 Local government

12.5.3.1 Whitsunday Economic Development Strategy 2017–21

The *Whitsunday Economic Development Strategy 2017–21*³⁴⁷ provides 'a clear, actionable, and achievable 'road map' for economic development until 2021.'

It is aligned with the wider regional objectives of the *Greater Whitsunday Alliance, Regional Development Australia Mackay-Isaac-Whitsunday*, and the Queensland Government's *Advancing Our Cities and Regions Strategy*.

The strategy covers six key themes, each with its own set of actions. These are:

- A Diverse and World-Class Tourism Destination
- A Sustainable and Profitable Farming Region
- An Environmentally Sustainable Region Supported by Climate-Adapted Industries
- A Globally connected and Dynamic Region of Choice for Investment
- A Skilled Workforce and Prosperous Mining and Small Business Sector
- A Region of Vibrant Towns and Centres.

Key relevant actions within the strategy include:

- prepare a business case for the Bowen Marina site to include a marine services hub
- support completion of the Urannah Dam feasibility study and establish a clear policy position on infrastructure for long-term water security for the Whitsunday region
- support development of a business case for the Bowen food processing plant
- prepare a business cases for delivery of transport infrastructure to support graziers'
- support the Water for Bowen project to allow land to be opened up for increased farming production in alternative crops
- work with the Bowen Gumlu Growers Association to develop international export markets
- partner with the DSDILGP to plan for strategic development sites throughout the region
- specific examples include redundant industrial sites and sites suitable for re-vitalisation and strategically located government-owned vacant land
- work with DSDILGP to identify a long-term water supply to the APSDA

³⁴⁷ Whitsunday Regional Council. (2017). *Whitsunday Region Economic Development Strategy, 2017-2021*. Whitsunday Regional Council. Retrieved from <https://yoursay.whitsundayrc.qld.gov.au/23862/documents/61924>

- work with TMR for the prioritisation of key regional roads, including access to the priority Port of Abbot Point, Galilee Basin, Shute Harbour Road, and implementation of the *Bruce Highway Action Plan*.

12.5.3.1.1 Port trade outlook implications, influences, impacts and threats

- Remain open to the needs of possible new export trades and supporting import commodities they may demand.
- Potential for port trade enhancement from development in SDAs adjacent to ports.

12.5.4 Other

12.5.4.1 International Energy Agency – World Energy Outlook 2020

The *International Energy Agency's World Energy Outlook 2020*³⁴⁸ provides a comprehensive view of how the global energy system could develop in the coming decades, with a key focus on the next 10 years and impact of the COVID-19 pandemic on the energy sector and near-term actions to accelerate clean energy transitions.

The report was published in October 2020 and assesses the demand for various energy sources in 2020 compared to previous years and explores several different possible energy demand scenarios, primarily focusing on the ten years to 2030.

The report found that global energy demand was expected to drop by 5% in 2020, and energy investment by 18%. However, this varied significantly by fuel – coal experienced a 7% decline in demand, while demand for renewables increased by 1%.

The report highlights the significant degree of uncertainty surrounding energy futures, and that it is too early to make any judgement on whether the COVID-19 pandemic will represent a setback for the broader clean energy transition or a catalyst that accelerates the rate of change, however all scenarios modelled by the IEA predict that 'COVID-19 has catalysed a structural decline in coal demand' that will never return to pre-crisis levels.

This is attributed to coal use for power generation being heavily affected by decreased electricity demand, its use in the industry being affected by lower economic activity, and coal phase-out policies and growing competition from renewables and natural gas leading to the retirement of significant amounts of coal-fired capacity.

The report explores four key energy demand scenarios:

- STEPS – COVID-19 is brought under control in 2021 with the global economy returning to pre-crisis levels in that same year. This scenario reflects all announced policy intentions and targets that are backed by detailed measures
- Delayed Response Scenario (DRS) – Same policy assumptions as STEPS except the global economy does not return to its pre-COVID-19 size until 2023
- SDS – A surge in clean energy policies and investment sees the energy system achieve its sustainability objectives, including the Paris Agreement that would see global net-zero by 2070. Same economic assumptions as in STEPS
- Net Zero Emissions by 2020 (NZE2050) – extends the SDS to model what is required to achieve global net-zero emissions by 2050.

The IEA predicts that global coal demand, which was approximately 5000mtce in 2020, will decline in a broadly linear manner to 4750mtce in 2040 under STEPS (the strongest demand scenario for coal), 4200mtce in 2040 under DRS, and 1800mtce under SDS.

Coal demand is expected to increase in developing countries in Asia, however the IEA expects this will not be enough to offset large structural declines in demand from developed countries – in particular the EU and the United States of America.

³⁴⁸ Ibid 293

The IEA predicts that the global supply of low-carbon fuel in 2040 will be dominated by solid biomass under all scenarios, which is expected to have a global supply of 856 million tonnes of oil equivalent (mtoe) in 2040 under STEPS, and 1012 under SDS, compared to 530mtoe in 2020:

- there will be a small amount of trade in liquid biofuels (241mtoe) in 2040 under STEPS, and 358mtoe under SDS, compared to 97mtoe in 2020)
- there will be some production of Biogases (144mtoe in 2040 under STEPS, and 221mtoe under SDS, compared to 48mtoe in 2020)
- future supply of low-carbon Hydrogen is highly uncertain but is expected to be relatively minor in all scenarios (10mtoe under STEPS in 2040, and 215mtoe under SDS).

12.5.4.1.1 Port trade outlook implications, influences, impacts and threats

The report noted a significant degree of uncertainty surrounding global energy demand into the future, however all scenarios modelled forecasted that global coal demand will not return to pre-COVID-19 levels, and that expected growth in demand from developing economies in Asia will not be enough to offset large declines in demand from developed economies (particularly the EU and the United States of America).

The IEA report noted that the forecasts made in this report are more unfavourable towards coal than the 2019 World Energy Outlook, which formed the basis of the Queensland Government's, A Study of Long-term Global Coal Demand.

The forecasts expect that global trade in low-carbon fuels will be dominated by solid biomass, with liquid biofuels and biogases forming much of the balance of low-carbon fuel supply. Low-carbon hydrogen is not expected to be a significant commodity – even in the most optimistic scenarios.

The change in global demand for coal is expected to heavily affect trade through the priority Port of Abbot Point as this commodity constitutes all of its trade.

12.5.4.2 BP Statistical Review of World Energy 2021

The BP Statistical Review of World Energy 2021³⁴⁹ provides detailed statistics related to global energy production and demand.

The review provides tables of key statistics related to energy reserves, production, and consumption by commodity and country.

According to the review, primary energy consumption fell by 4.5% in 2020, driven primarily by reductions in oil, natural gas, and coal, and partially offset by growth in wind, solar, and hydroelectricity production.

Coal consumption fell by 6.2 exajoules (EJ) (or 4.2%) in 2020, led primarily by the United States of America and India. Coal consumption across OECD nations fell to the lowest level in the available data series which began in 1965.

China and Malaysia had some growth (0.5 EJ and 0.2 EJ respectively), though this was not sufficient to offset declines in other nations.

Coal production had declined by 8.3 EJ (5.2%), driven primarily by large declines in the United States of America, Indonesia, and Colombia. China had some production growth (1.1 EJ), though again this was not sufficient to offset declines in other nations.

Renewable energy production (including biofuels and excluding hydro) rose by 9.7% (2.9 EJ) in 2020, driven primarily by solar (1.3 EJ) and wind (1.5 EJ). China was the largest individual contributor to renewables growth (1 EJ), followed by Europe (0.7 EJ) and the United States of America (0.4 EJ).

Port trade outlook implications, influences, impacts and threats

- Reiterates the IEA's forecast of a decline in demand for coal in 2020, combined with strong growth in renewable energy production.
- Potential for future port trade enhancement from development in new industries.

³⁴⁹ BP. (2021). *Statistical Review of World Energy 2021*. Retrieved from <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf>

12.6 Global shipping trends

12.6.1 Shipping trends

The United Nations Council on Trade and Development (UNCTAD) in the *Review of Maritime Transport 2020*³⁵⁰ projects that the volume of international maritime trade fell by 4.1% in 2020 due to supply chain disruptions, demand contractions and broader global economic uncertainty.

Challenges within the industry experienced throughout the pandemic have unfolded against the existing trend of elevated global trade tensions and policy uncertainty that has restricted the growth in global trade volumes and has driven a change in trade flows away from China towards other South-East Asian economies.

The report noted a continuation of the overall trend towards fewer and larger ports experiencing more ship calls from bigger vessels. This is expected to bring performance and connectivity benefits to the industry by reducing the overall time a vessel spends in port and helps carriers to generate economies of scale benefits (though the UNCTAD notes these benefits are realized mostly by carriers and are not usually passed on). This trend often leads to a 'increase in demand for trucks, yard space, and intermodal connections, dredging, and larger cranes' in the ports that are classified as 'winners' of this trend.

The report noted that dry and liquid bulk freight rates have been highly volatile throughout the pandemic due to significant demand and supply imbalances. This is especially apparent for larger vessel types.

Efforts to reduce greenhouse gas emissions from international shipping remains a key long-term trend that includes initiatives to improve ship energy efficiency and adoption of alternative fuels. The report notes that the trend of newer, larger, and more efficient vessels replacing older less-efficient vessels has limited the growth of total carbon dioxide emissions from shipping activities while growing total global fleet tonnage.

The UNCTAD report notes that environmental efficiency improvements realized to date, including implementation of the International Maritime Organisation sulphur cap on 1 January 2020, will not be sufficient to meet the International Maritime Organisation target of reducing total annual greenhouse gas emissions by 50% from 2008 levels by 2050, with achievement of these targets requiring 'radical changes to propulsion and fuel technologies'.

Stakeholders consulted during production of the UNCTAD report identified the following key trends shaping the shipping industry that have emerged from lessons learnt throughout the pandemic:

- Maritime transport policy agendas and business planning will have a greater focus on resilience-building and enhanced risk-management and contingency planning.
- The slowdown of globalisation through increased 'onshoring' of supply chains and increased redundancy within supply chains will see a shift from the historic focus on 'just-in-time' supply chains to resilient supply chains. Initiatives specifically identified include:
 - diversification away from single country-centric sourcing towards diverse sourcing, routing and distribution channels
 - increased investment in warehousing and storage to ensure larger inventories can be maintained
 - increased focus on developing onshore capabilities
 - an increased focus on digitisation following the pandemic's demonstrated that first-movers in technological uptake (such as online platforms and electronic trade documentation) have proven more resilient to unexpected external events.
 - as a consequence of increased digitisation, cybersecurity is becoming a major concern in light of increased frequency of cyberattacks, this risk is expected to grow as the shipping sector become more digitised due to its economic importance
 - the UNCTAD expects that the pandemic will drive stakeholders to explore new business opportunities to improve business resilience, also some shipping lines and port operators have

³⁵⁰ United Nations Conference on Trade and Development. (2020). *Review of Maritime Transport 2020*. United Nations. Retrieved from https://unctad.org/system/files/official-document/rmt2020_en.pdf

been exploring opportunities in the inland logistics supply chain to become 'end-to-end logistics service providers'.

12.6.1.1 Global vessel size trends

There has been significant growth in the capacity of the global bulk carrier merchant fleet. **Figure 78** shows data from the UNCTAD on the carrying capacity of the global fleet, which has grown from 181.9 million deadweight tonnes³⁵¹ (DWT) in 1980, to 913.0 million DWT in 2021³⁵².

Most of this growth has occurred in the last 10 years, when the global fleet increased by 67% from 547.2 million DWT to 913.0 million DWT.

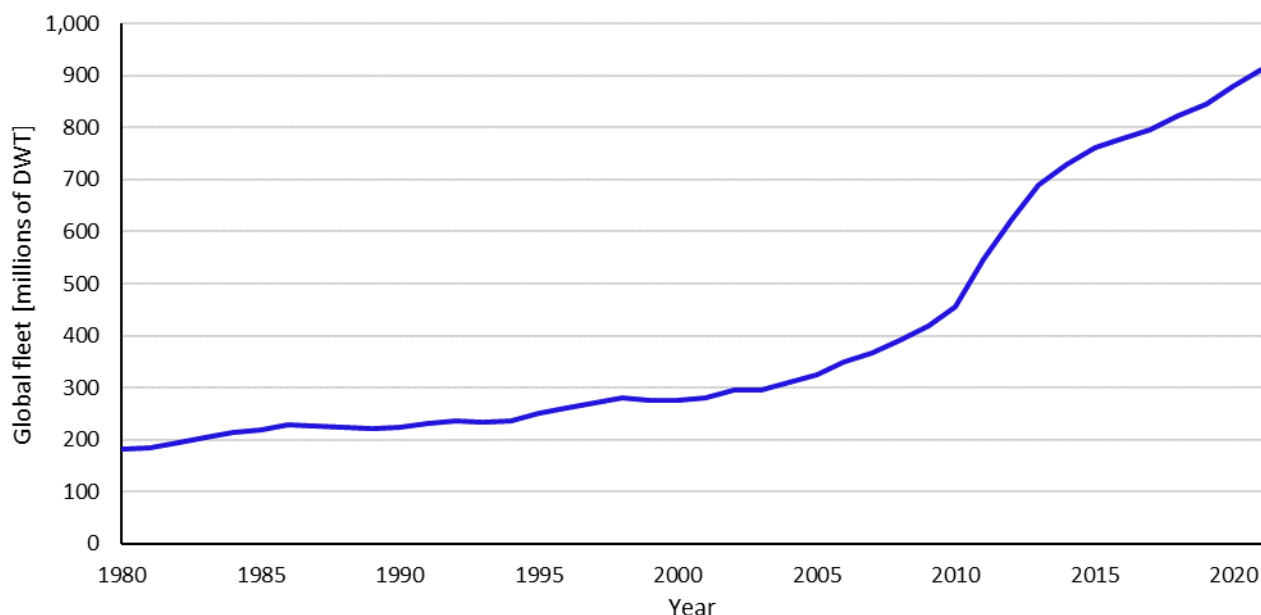
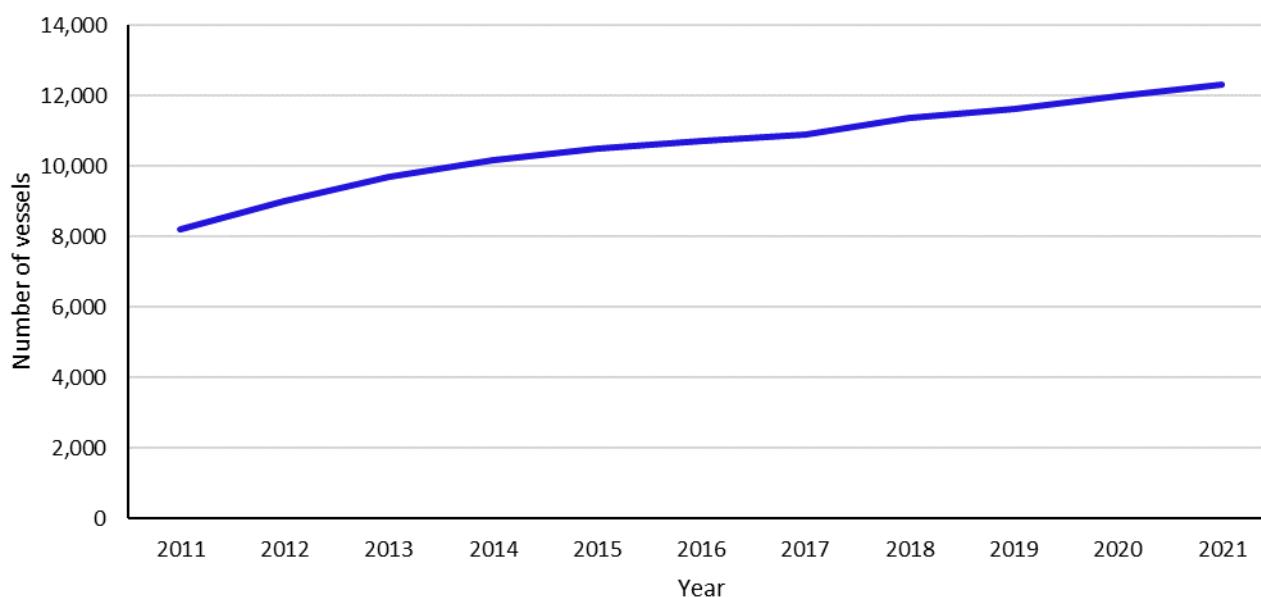


Figure 78: Size of Global Bulk Carrier Merchant Fleet in deadweight tonnes

This has been met with a comparatively smaller growth in the total number of bulk merchant vessels in the global fleet (**Figure 79**), from 8 228 in 2011 (the first year for which data is available) to 12,325 in 2021, representing a 50% increase.



³⁵¹ Deadweight Tonnes – a measure of the carrying capacity of a ship. It includes cargo, fuel, water, crew, provisions etc. For bulk cargo vessels, DWT is only marginally greater than the mass of the maximum cargo that can be carried.

³⁵² Deadweight Tonnes – a measure of the carrying capacity of a ship. It includes cargo, fuel, water, crew, provisions etc. For bulk cargo vessels, DWT is only marginally greater than the mass of the maximum cargo that can be carried.

Figure 79: Number of vessels in global bulk carrier merchant fleet

The average bulk vessel size has increased by 11.4 per cent from 66,504DWT in 2011 to 74,080 in 2021³⁵³ (**Figure 80**) as new bulk vessels have tended to be larger than those that they replace.

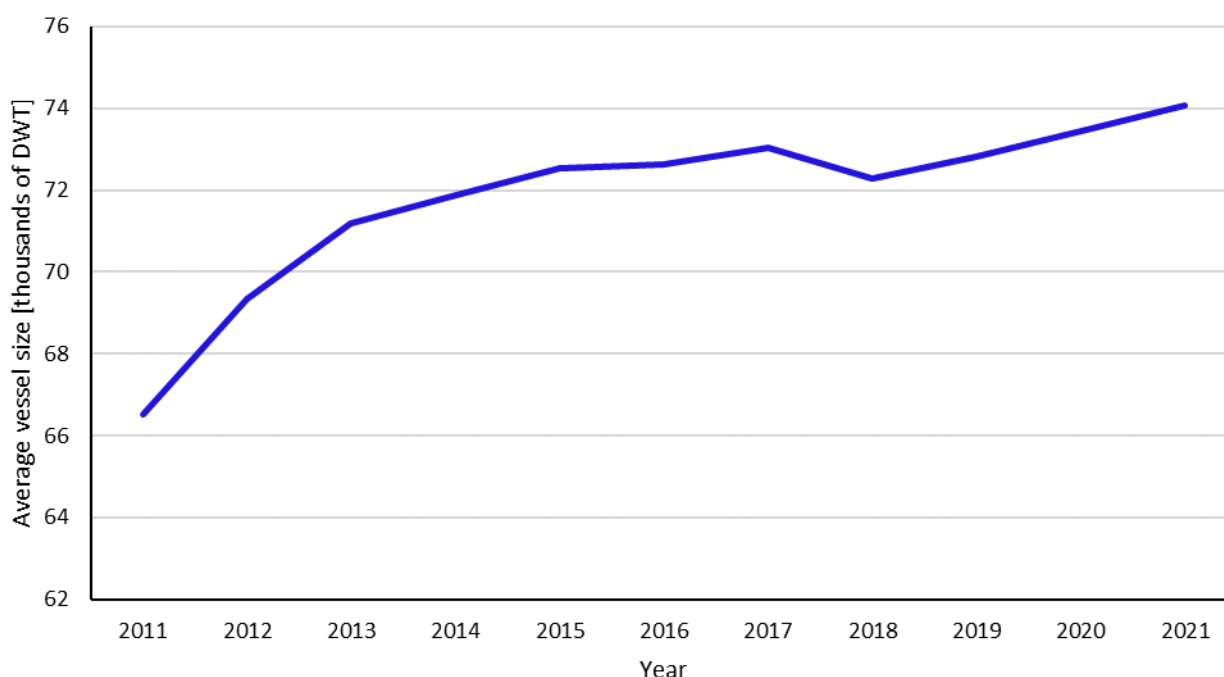


Figure 80: Average bulk carrier vessel across the entire global merchant fleet

United Nations Conference on Trade and Development's *Review of Maritime Transport report*³⁵⁴ discusses this trend of 'fewer and larger ports experiencing more ship calls from bigger vessels' and notes that this is expected to bring performance and connectivity benefits to the industry by reducing the overall time each vessel spends in port, due to greater quantities of faster loading and unloading equipment at these ports. It helps carriers to generate economies of scale benefits.

This shift to larger vessels has led to an 'increase in demand for trucks, yard space, and intermodal connections, dredging, and larger cranes' in the ports that are the 'winners' of this trend.

12.6.2 Vessels and throughput at Abbot Point

The port solely services dry bulk vessels. A summary of coal throughput and vessel statistics for the eight years to 2019–20 are provided in **Table 64** and shows strong historic growth in number of annual vessel visits, slower growth recently in coal throughput, and highly variable average tonnes per vessel.

Table 64: Point coal throughput and vessel visits

	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21
Coal exports (mtpa) ³⁵⁵	13.602	17.745	22.896	28.730	27.054	25.408	27.993	28.943	31.882	29.556
Vessel visits	174	201	289	325	324	311	306	348	395	-
Average kt coal / vessel	78.172	88.284	79.225	88.400	83.500	81.698	91.480	73.273	80.714	-

³⁵³ North Queensland Bulk Ports Corporation Limited. (2020) *Annual reports 2011/12 to 2019/20*. NQBPC. Retrieved from <https://nqbp.com.au/about-us/publications>

³⁵⁴ United Nations Conference on Trade and Development. (2020). *Review of Maritime Transport 2020*.

³⁵⁵ See <https://transportgeography.org/contents/chapter5/maritime-transportation/vessel-size-groups/> for definitions of classes, carrying capacities and general descriptions of bulk carrier ships

Over the fortnight 8 to 22 July 2021, the port saw 19 vessel visits, comprising three Supramax³⁵⁶ vessels, five Panamax, five Neo-Panamax, five capsize, and one Very Large Ore Carrier (VLOC)-class vessel.

Appendix Q shows a comprehensive list of vessel visits and classes over this period. The median sized vessel to call at the port over this period was a Neo-Panamax vessel with 230m LOA, 14.5m summer draft, 38m beam, and 92,300DWT.

12.6.3 Relevance to port planning

A long-term global trend towards larger average vessel sizes, seen in UNCTAD's global merchant fleet data, is not expected to have a material long-term impact on the port given its existing capability to accommodate vessels up to a VLOC-class.

12.7 Summary

Coal exports makes up all of the port's trade. Exports are variable from year-to-year but showed an overall growth trend from 27.1mt in 2015–16 to 31.9mt in 2019–20.

The peak throughput year was 2019–20 (31.9mt as above) and the lowest throughput year was 2016–17 with 25.4mt. The port solely services dry bulk vessels.

Strong historic growth in number of vessel visits, increasing from 174 in 2011–12 to 395 in 2019–20. Most coal exported from the port was thermal coal at 17.05mt in 2019–20 (53.5% of total throughput), compared with 14.83mt (46.5% of total throughput) of metallurgical coal.

12.7.1.1 The outlook for coal

The longer-term outlook for coal is uncertain but ranges from generally steady at best, to pessimistic, from the short-term onwards. Most commentators forecast a more pessimistic outlook for thermal coal than for metallurgical coal. Under the IEA's STEPS, which includes the effect of in-force policies and policies announced in official targets and plans, the total global trade in thermal coal is expected to decrease by 15.5%, and trade in metallurgical coal is expected to increase by 16.3%.

The IEA's SDS which reflects the potential outcome if global policies were to align with the United Nations Sustainable Development Goals, the total global trade in thermal coal is expected to decrease by 77.1%, and trade in metallurgical coal is expected to decrease by 22.6%. The IEA highlighted that the long-term outlook for coal demand is uncertain and long-term outcomes could viably arrive at any point between the STEPS and SDS.

The longer-term threat to metallurgical coal exports comes from transition of steel production processes to technologies which do not require as much, or any, metallurgical coal. Specific technologies identified include electric arc furnaces (which use no metallurgical coal), hydrogen-based processes, production from gasified thermal coal and gas-based production. Queensland Treasury's *A Study of Long-Term Global Coal Demand*³⁵⁷ concludes that India will increasingly become the key export market for Australian metallurgical coal in the long-term. The extent to which this growth will offset the decline in demand from other nations driven by adoption of alternative production processes, and the rate of this production transition, are not yet clear. This is identified as the primary underlying driver behind metallurgical coal's conflicting demand forecasts.

The Queensland Treasury's long-term coal demand study³⁵⁸ notes that irrespective of the pace and magnitude of decline in thermal export coal demand, there is little likelihood of a significant production increase in Central Queensland due to significant up-front costs amid a highly uncertain and transitioning market, associated difficulty in securing financing and investment, decisions by key players to cease involvement in the coal supply chain, and community activism.

³⁵⁶ See <https://transportgeography.org/contents/chapter5/maritime-transportation/vessel-size-groups/> for definitions of classes, carrying capacities and general descriptions of bulk carrier ships

³⁵⁷ BP. (2021). *Statistical Review of World Energy 2021*. Retrieved from <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf>

³⁵⁸ Ibid

The long-term and structural challenges facing thermal coal have been manifest in the decisions by large mining groups including Anglo American, BHP and Rio Tinto to exit the thermal coal business in its entirety in recent years.

12.7.1.2 Port development outlook

The port is a single-commodity coal port, but there is increasing effort by the Queensland Government to develop gas field and 'new economy minerals' in Bowen and the NWMP that have potential to generate trade in supporting commodities and new export commodities for the port.

The trend is towards fewer and larger ports experiencing more ship calls from bigger vessels, bringing performance and connectivity benefits to the industry by cheaper per tonne shipping costs in larger vessels. It also reduces the time each vessel spends in port, due to greater quantities of faster loading and unloading equipment at these ports. These factors generate economies of scale benefits.

This shift to larger vessels has led to an increase in demand for deeper channels, larger berths and greater capacity landside infrastructure at the ports that have successfully attracted larger vessels.

In common with major coal exporting ports worldwide, the priority Port of Abbot Point will be impacted by longer-term demand trends from coal exporters in assessing any increases in port capacity and will have the opportunity to seek repositioning and repurposing of existing infrastructure to support emerging regional industries.

13. Port optimisation and forward planning

13.1 Introduction

Forward planning by a port authority, or infrastructure owner or lessee, is vital to make the best, most efficient use of the land and assets available and to continually develop the port to best serve current markets/customers and future markets not currently being accommodated.

Priority port master planning will consider the development of new infrastructure and expansion of existing infrastructure where required but should also prioritise the optimisation of existing infrastructure to adapt to changing markets and shipping trends. This process aims to minimise capital and operational expenditure while meeting market demand and providing quality of service for users/customers.

Local and national strategic plans exist for Abbot Point along with more specific planning documents for activities such as dredging and port development. Forward planning is already being undertaken by NQBP and the coal terminal lessee and will be further developed as part of the planning process for the port.

This chapter focusses on industry practices for forward planning, with an emphasis on optimisation, and site-specific considerations, relating to the characteristics of the port and existing infrastructure. Comments are provided on the planning and optimisation measures already in place and areas where further optimisation could potentially be achieved.

Local and national strategic plans exist for the priority Port of Abbot Point along with more specific planning documents. There are new and growing industries, outside of those currently served by the port, which could justify development and expansion, including space launch facilities and renewable energy production, however focus should also be on the continued optimisation of the existing port facilities to handle existing cargo in the safest, quickest, and most efficient way possible.

This chapter provides the following sections:

- International, national, state and local policies – **Section 13.2**
- Key approaches to port optimisation and planning – **Section 13.3**
- Existing and planned optimisation – **Section 13.4**
- Summary – **Section 13.5**.

13.2 International, national, state and local policies

Planning and optimisation should be undertaken in alignment with international and national best practices, and national, state, and local policies. Relevant documents include:

- *National Ports Strategy, 2011* ³⁵⁹(Australian Government)
- *Leading Practice: Port Sustainability Strategy Development Guide – Approaches and Future Opportunities 2020* ³⁶⁰
- *Leading Practice: Port Master Planning – Approaches and Future Opportunities August 2013* ³⁶¹
- *Leading Practice: Port and Supply Chain Protection Current Practice and Future Opportunities 2014* ³⁶²
- *North East Shipping Management Plan* ³⁶³ (Queensland Government)
- *QTRIP* ³⁶⁴(Queensland Government)

³⁵⁹ Infrastructure Australia. (2011). *National Ports Strategy, 2011*. Australian Government.

³⁶⁰ Ports Australia. (2020). *Leading Practice: Port Sustainability Strategy Development Guide – Approaches and Future Opportunities 2020*.

³⁶¹ Ports Australia. (2013). *Leading Practice: Port Master Planning – Approaches and Future Opportunities August 2013*.

³⁶² Ports Australia. (2020). *Leading Practice: Port and Supply Chain Protection – Current Practice and Future Opportunities 2014*.

³⁶³ Australian Maritime Safety Authority. (2014). *North East Shipping Management Plan*. Australian Government.

³⁶⁴ Ibid 295

- Reef VTS³⁶⁵(Queensland Government)
- NQBP related business documents and strategies
- *Sustainable Port Development Guidelines*³⁶⁶.

National, state, and local infrastructure planning strategies and approved infrastructure projects for the site are described in the Infrastructure chapter. Future planning and approvals of new infrastructure would need to be in accordance with the regulatory frameworks and land use planning.

NQBP's planning documents include the *Land Use Plan for the Port of Abbot Point, 2011*³⁶⁷ which aims to achieve sustainable and carefully planned development that will meet future demand and support and grow the local and national economy. The plan provides a framework and processes for forward planning and highlights some of the key considerations and desired outcomes for development. Land use designations and proposed uses are provided which will guide the master planning process.

13.3 Key approaches to port optimisation and planning

Port optimisation is typically a process of further developing or upgrading existing infrastructure to improve operational efficiency or to make changes to serve a different purpose or market need. Port optimisation is part of commercial management of the port and reflecting the Queensland Government objectives to concentrate development at priority ports, port optimisation is a consideration in priority port master planning.

Port optimisation incorporates a range of considerations:

- market analysis and forecasting to understand what is and will be needed from the port infrastructure
- existing conditions analysis to assess the existing infrastructure with respect to condition, functionality, and opportunities/constraints impacting potential upgrades and expansion
- strategic planning and port zoning to derive a clear plan for the future layout and function of the port
- legislation, stakeholder engagement and approvals to ensure the proposed measures are feasible and aligned with goals and objectives of key stakeholders before optimisation measures are put into practice.

Optimisation can relate to the physical infrastructure at the port, including fixed infrastructure and cargo handling equipment, but also the management and processes used to operate the port such as automation, software, and technology. Every aspect of how the cargo moves through the port, from arrival, handling, storage, and departure can be optimised to facilitate the most effective and efficient process which will in turn reduce costs and improve service.

Optimisation of physical infrastructure can involve strengthening of structures, marine navigation improvements, new cargo handling equipment, or potentially the reconfiguration of berths and yard areas to improve operations or to cater for new operations.

Processes may be optimised through use of new software and technology to better manage labour, plan for maintenance, and to reduce operational downtime.

Some of the key considerations which are currently being discussed and incorporated in master planning and optimisation of port terminals globally include:

- changing markets and demand, such as changes in energy sources and growth of tourism industries
- identifying and packaging land and infrastructure in a form that is of interest, and in a way that the information is accessible for new entries and expansions (easier investment decisions and pathways)
- automation and modernisation of ship berthing, cargo handling, and road/rail gate processes

³⁶⁵ Australian Maritime Safety Authority. (2022). *Great Barrier Reef and Torres Strait Reef Vessel Traffic Service: User Guide - 2022*. Australian Government.

³⁶⁶ Ibid 8

³⁶⁷ North Queensland Bulk Ports. (2010). *Port of Abbot Point Land Use Plan*, North Queensland Bulk Ports Corporation Limited.

- improved software and the use of Artificial Intelligence for onsite operations but also related to the road/rail/ship transport outside of the port and better managing and predicting arrivals
- resiliency of ports in relation to water levels and environmental conditions, ensuring that existing infrastructure is protected and new infrastructure is designed with consideration for future conditions
- wider adoption of digital twin, discrete event and element simulations, and real time monitoring and data collection that assist the calibration of models. Digital twin technology can use real time data to better manage operations/processes and to create simulations to test optimisation scenarios and see outcomes without risking impact to real operations
- asset management and GIS allowing ports to better monitor condition of assets and to plan for required improvements/upgrades and associated costs
- The Queensland Climate Action Plan and the Zero Net Emissions for Transport Roadmap set to achieve net zero emissions by 2050.

13.4 Existing and planned port optimisation

An overview of the different areas of potential optimisation within a port are given in the subsections below, together with a site-specific summary of implemented optimisation/forward planning measures and areas for further investigation that could identify additional opportunities.

13.4.1 Terminal Optimisation

The existing T1 is leased by Adani Ports and Special Economic Zone Limited from the Queensland Government. As lessee of the terminal, it ensured the ongoing optimisation of the existing multi-user infrastructure, which occurs before any further expansions are contemplated.

13.4.2 Navigation

Dredged areas can be widened, deepened, or realigned to cater for increasing ship sizes or different ship types for new cargo types. This will typically involve capital dredging and addition of new aids to navigation such as channel markers and leading/range lights.

The *Port of Abbot Point Long-term Maintenance Dredging Management Plan*³⁶⁸ discusses the overall strategy for managing dredging operations, the nature of the material to be dredged, summarises historic dredging campaigns, and likely future dredging requirements. Key information summarised in Infrastructure includes details of proposed capital dredging for new berth pockets associated with the 'T0 project' expansion.

The port does not have a dredged channel due to its naturally deepwater at the existing berths. A major port expansion may require new offshore berths, with associated capital dredging of berth pockets and aprons for ship loading and departure.

Capital dredging to deepen the existing berth pockets and apron areas could also be feasible if there was a need to do so to accommodate larger, deeper draught, ships, although sedimentation and maintenance dredging cost would need to be considered to investigate feasibility. Note that this approach may need simultaneous upgrades to other infrastructure elements to realise the operational benefits, such as strengthening of the jetty structures, providing ship loaders suiting the larger vessels, and having landside storage and rail capacity to suit larger parcel shipments.

Further opportunity may include deepening of the berth at the MOF located to the south of the coal jetty for the handling of smaller vessels, such as for breakbulk cargo. Upgrading of the facility was completed in 2016, however, there could be justification for further upgrades if there was a clear market need.

For maintenance dredging, optimisation is achieved through regular survey of the existing dredged areas and careful planning of required maintenance dredging volumes so that sedimentation and the dredging activity itself has limited impact on berth availability or allowable vessel draught. Existing plans show good

³⁶⁸ Adaptive Strategies. (2018). *Port of Abbot Point Long-term Maintenance Dredging Management Plan*

planning and management of this aspect of the facility. Plans should be reviewed and updated regularly as required to maintain an accurate schedule for future maintenance dredging. As has been done in the past, where possible, dredge material should be reused in concurrent projects in order to minimise disposal costs.

13.4.3 Coastal structures

Coastal structures such as breakwaters can provide additional protection to ships during approach, berthing, and mooring. Apart from the safety benefits, the use of breakwaters provides easier and quicker manoeuvring and reduces port downtime. Depending on port location, berth alignment, and local environmental conditions, the expansion or addition of coastal structures can give a reduction in port downtime and can effectively increase the capacity of a berth with no change to the berth infrastructure or the handling equipment being used.

The coal jetties at Abbot Point are located in open water with no breakwater protection. Due to its naturally deepwater offshore, the construction of a protected harbour using breakwaters has not been needed for bulk cargo vessels currently using the port. Construction of a harbor for cargo vessels would only be justified at Abbot Point if a new cargo required protection from wave and current action, such as containers or bulk liquids. In that case, construction would need to be in shallower water closer inshore to make the breakwater a feasible option. The MOF located at the shore also has a rock revetment on the seaside of the breakwater. For each of these elements, the key function is to protect the shoreline and the marine structures to ensure cargo transport and handling can be undertaken with limited downtime or delay.

Optimisation in relation to these protection structures therefore involves asset management rather than design changes, including planning for inspection, condition assessment and repairs when required. While storm damage is sometimes unavoidable, having a process in place for sourcing materials and undertaking quick repairs will help to minimise the risk of damage to the protected structures and the subsequent impact to the cargo handling operations.

13.4.4 Berths

Existing berths can be optimised through expansion, structural changes, changes to cargo handling equipment, or through reconfiguration. Modifications such as strengthening, upgrades to bollards/hooks and fenders, and berth deepening can allow exiting berths to accommodate larger ships.

The type and position of a berth can be a constraint for certain cargo types. For example, offshore jetties connected to the shore by an approach trestle would be suitable for the transfer of liquid and dry bulk cargo but would not be best suited for the ship to shore transfer of container or breakbulk cargo due to the lack of protection from wave and current action, and a lack of working space at the berth for cargo handling.

The coal berths use piled structures to support ship loaders, conveyors and access roadways, piled berthing and breasting dolphins. Optimisation of the function of the berths can either be in form of upgrades to increase functionality such as accommodating larger ships or through improvements in asset management and maintenance to ensure that the current function is maintained for as long as possible while minimising impacts or risk of impacts to the ship to shore handling operation.

Berth upgrades and deepening for larger ships is feasible but may not be likely in the near term, particularly with the possible construction of additional berths under the expansion project already approved. Therefore, focus should be on the protection of the existing structures, including regular above and below water inspection, proactive protection of structural members, and resolving issues quickly when identified. The same applies to the MOF ramps and berthing/breasting structures.

13.4.5 Cargo handling equipment

Optimisation of cargo handling equipment such as conveyors, stacker reclaimers or shiploaders, may involve the installation of newer, faster equipment. In the event that the function of an existing facility is to be changed for a new cargo, from dry bulk to liquid bulk cargo for example, material handling equipment could be replaced altogether to make use of existing berth infrastructure for a different purpose.

The limited alternative market opportunities identified coupled with the nature of the infrastructure used for bulk coal transport means that the use of the existing coal jetties for a different cargo/purpose would be challenging. The existing cargo handling equipment includes the shiploaders at the berths, the conveyor

systems running along the berth and back to shore along the access trestle, stacker reclaimers at the landside stockpiles, and the conveyors and transfer stations for the rail operation. Assuming no major changes to ship and parcel size, the available means of optimising the operation is to improve cargo handling speed and efficiency.

To identify what changes can be made to improve speed and efficiency, an in-depth review of each of the handling processes and interfaces is required to understand what elements are limiting and where the bottlenecks exist. For example, improving the productivity of the ship loaders may have no impact on speed of transport if the conveyor speed is limiting. This type of optimisation has been undertaken at T1 prior to any expansion activities.

At the berths, the shiploader productivity is a key factor in overall berth capacity/occupancy. Condition, age and design specification will dictate the productivity and so either full replacement or upgrade or more minor modifications could provide some improvements. Higher speed conveyors and faster stacker reclaimers could also be explored but would need to be explored with consideration to rail arrival patterns and storage capacity in the stockpiles.

For all elements of the supply chain regular inspection, condition assessment and planned maintenance/cleaning should be undertaken as part of a well-maintained asset management system. Planned and unplanned downtime for equipment can be a significant constraint on the cargo handling process and minimising the downtime and subsequent impacts should be a priority.

13.4.6 Cargo storage

The layout of the onshore yard areas is typically arranged to suit the specific cargo being handled and the nature of the cargo. A change in cargo type will typically require a change to the physical infrastructure within the yard such as pavement, presence of material handling equipment, and provision of utilities such as lighting and power.

With the primary cargo type unlikely to change in the short to mid-term at Abbot Point, changes to the overall storage yard/stockpile layout is unlikely. However, there may be an opportunity to review the use of the surrounding yard areas not part of the main stockpiles to make improvements to the overall port operation. This would be something addressed as part of the overall terminal planning process. Overall expansion of the stockpiles and the available capacity is an option but may not be required unless berth expansion occurs concurrently. As noted with other elements, this should be assessed in conjunction with upstream and downstream parts of the supply chain to first understand whether increased capacity is needed.

13.4.7 Landside transport links

The arrangement of port gates and transfer zones related to the arrival/departure of cargo inland varies for different cargo types. For cargo arriving/departing by road, measures can be taken to optimise gate processes and data collection through the use of automated equipment and software. For dry bulk and container cargo arriving/departing via rail, intermodal rail yards and the process by which cargo is moved between rail cars and the port storage can be optimised to make better use of existing land and to increase overall throughput capacity.

The Port has rail and road connections, but with the primary cargo being coal arriving by rail for export, it is the rail infrastructure that has a major impact on the port's operations. Maintenance and improvements to the rail infrastructure and transfer stations could provide some efficiencies and increase in speed of turnaround for individual trains, however, a key factor is the train arrival schedule which is not controlled by the port and is unlikely to change significantly from the current operations. As with other elements of the supply chain having well maintained equipment with minimal downtime should be a primary focus.

The rail line that leads to the port is part of the Newlands system, which is owned by Aurizon. The Newlands System connects Abbot Point in the north to a number of coal mines to the south and inland, and a connection to the Goonyella System which goes from Hay Point in the Mackay region through to Oaky Creek in the south and back north to North Goonyella coal mine. The Goonyella to Abbot Point Expansion project was completed by Aurizon encompassing passing loops line extension/links, and road/bridge infrastructure with the aim of providing a narrow-gauge link between the Goonyella and Newlands systems with an ability to run 106 tonne trains.

A number of expansion studies which would provide benefits to the priority Port of Abbot Point are being undertaken and are described in the Aurizon '*Network Development Plan, 2019*', including Newlands expansion studies to accommodate 124 wagon trains and to increase annual throughput capacity.

13.4.8 Operations and maintenance systems

Digital technology and software are key parts of the cargo handling operation, both in terms of managing the handling process from end to end and for running an effective asset management system which allows the operator/owner to maintain an efficient process and reduce life cycle costs.

With operating system capability improving and the use of Artificial Intelligence/smart technology developing quickly, the current processes and operating systems are something that should be reviewed regularly together with products available on the market to identify early on where some of these technologies could help, in areas such as material tracking, real time information, quality management, and automation.

13.4.9 New market opportunities

In May 2021, the Queensland government announced Abbot Point, close to the priority Port of Abbot Point, as its preferred location for a potential space hub. This facility and other possible related developments could provide enough demand to justify further improvements and or major expansion of the MOF facility with the need to import/export components and other materials associated with the industry.

Hydrogen export is another industry that local and national government have been investing in significantly with the aim of establishing Queensland as a world leader in renewable energy exports. NQBP is already exploring the feasibility of developing an export facility at the port following market interest in recent years. A key consideration is the supply of services such as power and water to support the facility. The Infrastructure chapter, discusses the water, power, and sewerage links to the port and notes that there has been planning, not yet committed, for an additional substation to feed future increased power demand.

13.5 Summary

Review of future market opportunities has shown that there are new and growing industries, outside of those currently served by the port, which could justify development and expansion. Some of these markets, such as development of a space launch facility and renewable energy production, could provide additional demand for the MOF facility, however, capture of a significant volume of new cargo would require a greenfield development with a new facility, albeit within the existing port. Such facilities have been conceptualised in the past and should continue to be considered as markets change, but a primary focus should be on the optimisation of the existing port facilities and the handling of coal.

Together with major projects providing step change increases in capacity and handling capability, ports can also optimise existing infrastructure and processes to improve current operations and to offset and minimise capital investment. This optimisation process has been an on-going process at Abbot Point and is being achieved through proactive asset management to manage risk, investing in maintenance and improvements to increase design life and equipment capacity, and the use of new technology and software to aid almost every aspect of the port. This can have a significant financial benefit and improve the quality and efficiency of the service being provided.

Significant port optimisation activities have already been undertaken at the port and will continue in conjunction with forward planning, to ensure the maximum possible efficiency is achieved in a cost-effective way.

14. References

- Abbot Point Master Planning. (2015) *Supporting - environmental, social and cultural heritage values*.
- Adaptive Strategies. (2021). *Method for identifying the local expression of Outstanding Universal Value within the Great Barrier Reef World Heritage Area*.
- Adaptive Strategies. (2018). *North Queensland Bulk Ports Corporation: Port of Abbot Point Long-term Maintenance Dredging Management Plan 2018-2043*. Adaptive Strategies.
- Adaptive Strategies. (2018). *Port of Abbot Point Long-term Maintenance Dredging Management Plan*.
- Adaptive Strategies and Open Lines Environmental Consulting. (2015). *Abbot Point Master Planning: Supporting report - environmental, social and cultural heritage values version 3 (Final) October 2015*.
- Advisian. (2015). *Abbot Point Growth Gateway Project: Environmental Impact Statement: Volume 1 – Executive Summary*. Advisian - Worley Parsons Group.
- Advisian. (2015). *Abbot Point Growth Gateway Project: Environmental Impact Statement: Volume 2 – Environmental Impact Statement*. Advisian - Worley Parsons Group.
- Aldrick, J.M. (1988). *Soils of the Elliot River- Bowen Area, North Queensland*.
- Aurizon. (2019). Central Queensland Coal Network Map. Aurizon. Retrieved from <https://www.aurizon.com.au/-/media/aurizon-media-library/what-we-deliver/network/odrl/rail-network-map.pdf>
- Australasian Groundwater and Environmental Consultants Pty Ltd (AGE). (2014). *Report on the Port of Abbot Point Expansion Groundwater Studies*. Worley Parsons, Project No. G1702A November 2014.
- Australian Bureau of Statistics. (2016). *Aboriginal and Torres Strait Islander Peoples Profile – I02*. Retrieved from Queensland Regional Profile. Accessed 2 June 2021.
- Australian Bureau of Statistics. (2016a). *Census of Population and Housing, General Community Profile - G25*. Retrieved from Queensland Regional Profile. Accessed 2 June 2021.
- Australian Bureau of Statistics. (2016b). *Census of Population and Housing: Socio-Economic Indexes for Areas*. Retrieved from Queensland Regional Profile. Queensland Treasury. 2 June 2021.
- Australian Bureau of Statistics. (2016c). *Census of Population and Housing, General Community Profile - G02 and G17*. Retrieved from Queensland Regional Profile. 2 June 2021.
- Australian Bureau of Statistics. (2016). *Census of Population and Housing, General Community Profile – G32*, taken from Queensland Regional Profile 2 June 2021.
- Australian Bureau of Statistics. (2016). *Census of Population and Housing, General Community Profile – G33*, taken from Queensland Regional Profile 2 June 2021.
- Australian Bureau of Statistics. (2016d). *Census of Population and Housing, General Community Profile - G51 and unpublished data*. Retrieved from Queensland Regional Profile. 2 June 2021.
- Australian Bureau of Statistics. (2016e). *Census of Population and Housing, General Community Profile - G16, G40 and G46*. Retrieved from Queensland Regional Profile. 2 June 2021.
- Australian Bureau of Statistics. (2019). *Population by Age and Sex: Regions of Australia*. Retrieved from Queensland Regional Profile. 23 July 2021.
- Australian Bureau of Statistics. (2020). *2016 Census Quick Stats*. Retrieved from https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/036. Accessed 10 August 2021
- Australian Export Grains Innovation Centre. (2018). *Australia's Grain Outlook 2030*. Department of Primary Industries and Grains Research and Development Corporation. Retrieved from <https://aegic.org.au/wp->
- Australian Government. (1984). *Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth)*. Retrieved from <https://www.legislation.gov.au/content/uploads/2021/03/AEGIC-Australias-Grain-Outlook-2030.pdf>
- Australian Government. (n.d.) *Australia's Commonwealth Heritage List*. Retrieved from <http://www.dcceew.gov.au/parks-heritage/heritage/places/commonwealth-heritage-list>

Australian Government. (2015). *Biosecurity Act 2015*. Retrieved from <https://www.legislation.gov.au/>

Australian Government. (1981). *Environment Protection (Sea Dumping) Act 1981* (Cth). Retrieved from <https://www.legislation.gov.au/>

Australian Government. (1999). *Environment Protection and Biodiversity Conservation Act 1999* (Cth). Retrieved from <https://www.legislation.gov.au/>

Australian Government. (1975). *Great Barrier Reef Marine Park Act 1975* (Cth). Retrieved from <https://www.legislation.gov.au/>

Australian Government. (1993). *Native Title Act 1993* (Cth). Retrieved from <https://www.legislation.gov.au/>

Australian Government. (2014). *National Land Transport Act 2014* (Cth). Retrieved from <https://www.legislation.gov.au/>

Australian Government. (2021). National Skills Commission, Small Area Labour Markets Australia, various editions; Australian Bureau of Statistics. (2016). Census of Population and Housing, General Community Profile - G51 and unpublished data, taken from Queensland Regional Profile 2 June 2021.

Australian Government. (2012). *Navigation Act 2012* (Cth). Retrieved from <https://www.legislation.gov.au/>

Australian Government. (1983). *Protection of the Sea (prevention of Pollution from Ships) Act 1983* (Cth). Retrieved from <https://www.legislation.gov.au/>

Australian Government. (1987). *Sea Installations Act 1987* (Cth). Retrieved from <https://www.legislation.gov.au/>

Australian Government. (n.d.). The Register of the National Estate. Retrieved from <http://www.dcceew.gov.au/parks-heritage/heritage/publications/about/naational-estate>

Australian Government. (2018). *Underwater Cultural Heritage Act 2018* (Cth). Retrieved from <https://www.legislation.gov.au/>

Australian Government. (2021). *Australia's, Long-term Emissions Reduction Plan: A Whole-of-economy Plan to achieve net zero emissions by 2050*. Commonwealth of Australia.

Australian Government. (n.d.). Australasian Underwater Cultural Heritage Database. Retrieved from <http://www.environment.gov.au/shipwreck/public/wreck/>

Australian Government and Queensland Government. (2018). Reef 2050 Long-Term Sustainability Plan. Commonwealth of Australia, 2015. Retrieved from <http://www.environment.gov.au/system/files/resources/35e55187-b76e-4aaf-a2fa-376a65c89810/files/reef-2050-long-term-sustainability-plan-2018.pdf>.

Australian Institute of Marine Science. (2021). *A vulnerability assessment for the Great Barrier Reef*. https://www.gbrmpa.gov.au/_data/assets/pdf_file/0017/21743/VA-Seagrass-31-7-12.pdf. Accessed July 2021.

Ayling, T et al. (2020). *Port of Abbot Point Ambient Coral Monitoring Surveys: 2019 – 2020*. Centre for Tropical Water and Aquatic Ecosystem Research (TropWater) Publication 20/45, James Cook University, Cairns.

BMT WBM. (2014). *Abbot Point Port and Wetland Project Preliminary Documentation for Wetland Hydrology, Water Quality and Aquatic Ecology Component. Volume 1: Executive Summary*.

Bureau of Rural Sciences. (2019). Digital Atlas of Australian Soils. Bioregional Assessment Source Dataset.

Department of Climate Change, Energy, the Environment and Water (2018). *Reef 2050 Long-Term Sustainability Plan*. Australian Government. Retrieved from <http://www.deccw.gov.au/sites/default/files/documents/reef-2050-long-term-sustainability-plan-2021-2025.pdf>

Department of Climate Change, Energy, the Environment and Water. (2022). *State Party Report on the state of Conservation of Australia's Great Barrier Reef – 2022*. Australian Government. Retrieved from <http://dcceew.gov.au/parks-heritage/heritage/publicaitons/state-party-report-gbr-2022>

Department Infrastructure, Transport, Regional Development, Communications and the Arts. (2021). *Bowen Developmental Road – Staged Development*. Australian Government.

- Australian National Committee of International Council on Monuments and Sites. (2013) *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance 2013*. Deakin University, Burwood, Victoria.
- Barker, B. (1999). *A Cultural Heritage Assessment of Ports Corporation (Queensland) Holdings at Abbot Point/Bowen region* (Bowen Shire), Ports Corporation.
- Barker, B. (2006). The Temporality of Cultural Material on a deflated Dune System at Abbot Point, Central Queensland Coast. *Australian Archaeology*.
- Bell, I. (2003). *Turtle population dynamics in the Hay Point, Abbot Point and Lucinda Port Areas*. Funded by NQBP and undertaken by QPWS.
- Blake, T. (2005). *Queensland Cultural Heritage Places Context Study*. Report to the Queensland Government.
- BMT. (2018). *GBR Quantitative Sediment Budget Assessment*. BMT.
- BMT WBM Pty Ltd (BMT WBM). (2012a). *Port of Abbot Point Offshore Dredged Material Relocation Area Site Selection Report*, prepared for North Queensland Bulk Ports Corporation Limited, July 2012
- BMT WBM. (2015). *Abbot Point Growth Gateway Project: Technical Report for Wetland Hydrology, Water Quality and Aquatic Ecology Components (MNES)*.
- BMT WBM. (2012). Kaili (Caley) Valley Wetlands Baseline Report.
- BP. (2021). Statistical Review of World Energy 2021. BP. Retrieved from <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf>
- Bureau of Meteorology. (2021). Climate statistics for Australian locations: Monthly climate statistics. http://www.bom.gov.au/climate/averages/tables/cw_033257.shtml.
- Bureau of Meteorology. (2021). Tropical Cyclone Debbie 25-29 March 2017 Summary. <http://www.bom.gov.au/cyclone/history/debbie17.shtml>.
- Cardno. (2017). *Scenic Amenity Study*, Whitsunday Region Scenic Amenity Study. WE15037.
- Cardno (2019) *Whitsunday Landslide Study, Landslide Susceptibility Investigation and Mapping*. Whitsunday Regional Council.
- Cardo Chenoweth ELA. (2012). *Abbot Point Cumulative Impact Assessment- Visual Impact Assessment*.
- CDM Smith. (2013). *Public Environment Report Supplementary - Abbot Point Terminals 0, 2 and 3 Capital Dredging*. Retrieved 2015, from North Queensland Bulk Ports Corporation Limited: <http://www.nqbp.com.au/environment>.
- CoastAdapt (n.d.) What are the RCPs? Australian Government <https://coastadapt.com.au/sites/default/files/infographics/15-117-NCCARFINFOGRAPHICS-01-UPLOADED-WEB%2827Feb%29.pdf>
- Council of Australia Energy Council. (2019). *Australia's National Hydrogen Strategy*. COAG Energy Council Hydrogen Working Group. Commonwealth of Australia.
- Colliver, F.S. (1973) *Some Plant Foods of The Queensland Aboriginal*. Archaeology Papers 2. Department of Aboriginal and Islanders Advancement, Archaeology Branch. Australian Government. (2009). *National Assessment Guidelines for Dredging*. Commonwealth of Australia. Commonwealth Scientific and Industrial Research Organisation and Bureau of Meteorology. (2015). *Climate Change in Australia: Projections for Australia's Natural Resource Management Regions: Technical Report*. CSIRO.
- Commonwealth of Australia. (2014). *Environment Protection and Biodiversity Conservation Act 1999* referral guidelines for the Outstanding Universal Value of the Great Barrier Reef World Heritage Area.
- Commonwealth of Australia. (2009). *National Assessment Guidelines for Dredging*. Australian Government.
- Department of Agriculture, Fisheries and Forestry. (2020). *AgTrends Update: At a Glance April 2020*. State of Queensland 2020. Retrieved from <https://www.publications.qld.gov.au/dataset/queensland-agtrends/resource/985ad029-f704-4054-85a6-9db59a158a11>
- Department of Agriculture and Fisheries. (2020). *Queensland AgTrends 2020-2021: Forecasts and trends in Queensland agricultural, fisheries and forestry production*. State of Queensland. Retrieved from <https://www.publications.qld.gov.au/dataset/83d36400-85ee-48d3-a05d-2c6aabc8f109/resource/0e8e2b36-a33d-47a5-bc1d-c30cbd672e76/download/qld-agtrends-2020-21.pdf>

Department of Agriculture, Fisheries and Forestry. (2014). *State of Queensland agricultural report*. State of Queensland. Retrieved from <https://www.publications.qld.gov.au/dataset/c7d86a85-7a05-4a67-915b-eff5dc3e5cce/resource/1c4ac429-da34-464d-845c-f3ad536588f8/download/state-of-queensland-agriculture-report-june-2014.pdf>

Department of Agriculture, Water and the Environment. (n.d.). *Calidris canutus – Red Knot, Knot Species Profile and Threats Database*. Available at [Calidris canutus – Red Knot, Knot \(environment.gov.au\)](http://environment.gov.au)

Department of Agriculture, Water and the Environment. (n.d.). *Neochima ruficauda ruficauda – Star Finch (eastern), Star Finch (southern) Species Profile and Threats Database*. [Neochmia ruficauda ruficauda – Star Finch \(eastern\), Star Finch \(southern\) \(environment.gov.au\)](http://environment.gov.au).

Department of Agriculture, Water and the Environment. (n.d.). *Numenius madagascariensis – Eastern Curlew, Far Eastern Curlew Species Profile and Threats Database*. Retrieved from [Numenius madagascariensis – Eastern Curlew, Far Eastern Curlew \(environment.gov.au\)](http://environment.gov.au).

Department of Environment. (2015). *Conservation Advice Numenius madagascariensis*. [Conservation Advice Numenius madagascariensis eastern curlew \(environment.gov.au\)](http://environment.gov.au).

Department of Agriculture, Water and the Environment. (n.d.). *Poephila cincta cincta – Southern Black-throated Finch Species Profile and Threats Database*. [Poephila cincta cincta – Southern Black-throated Finch \(environment.gov.au\)](http://environment.gov.au).

Department of Climate Change, Energy, the Environment and Water (n.d.) Australia's Commonwealth Heritage List. Australian Government. Retrieved from <http://www.dcceew.gov.au/parks-heritage/heritage/places/commonwealth-heritage-list>

Department of Defence. (2008) *State of the Environment Report for Shoalwater Bay Training Area*. Australian Government.

Department of Education. (2019). *Queensland Schools Planning Reference Committee – Cross-Sectoral New Schools Demand Mapping 2021 to 2041 Whitsunday Regional Council – 2 July 2019*. Retrieved from <https://education.qld.gov.au/schools-and-educators/school-types/Documents/qsprc-demand-maps-wrc-2019.pdf>

Department of Environment and Energy. (2016). *Coastal wetlands – Mangroves and saltmarshes*. Department of Environment and Energy. (2020). National Pollutant Inventory. <http://www.npi.gov.au/npidata/action/load/emission-by-substance-result/criteria/destination/ALL/source-type/INDUSTRY/subthreshold-data/Yes/substance-name/All/year/2020>

Department of Environment and Energy. (2017). *Recovery Plan for Marine Turtles in Australia*.

Department of Environment and Heritage Protection. (2017). *Pathways to a climate resilient Queensland: Queensland Climate Adaptation Strategy, 2017–2030*. Queensland Government.

Department of Environment and Heritage Protection. (2017). *Queensland Climate Adaption Strategy: Built environment and infrastructure sector adaptation plan*. State of Queensland.

Department of Environment and Resource Management. (2011). *Holbourne Island National Park and adjoining State Waters Central Queensland Coast Bioregion*.

Department of Environment and Science. (2018). *A Biodiversity Planning Assessment for the Brigalow Belt Bioregion*. Queensland Government.

Department of Environment and Science. (2017). *Built environment and infrastructure sector adaptation plan*. Queensland Government.

Department of Environment and Science. (2019). *Climate change in the Whitsunday, Hinterland and Mackay region. Version 1*. State of Queensland.

Department of Environment and Science. (2021). Declared fish habitat areas. <https://parks.des.qld.gov.au/management/managed-areas/fha>.

Department of Environment and Science. (2020) Queensland heritage places destroyed. Retrieved 29.06.2021 from <https://www.stateoftheenvironment.des.qld.gov.au/heritage/historic/queensland-heritage-places-destroyed>.

Department of Environment and Science. (2017). Queensland Heritage Register, Retrieved from <https://apps.des.qld.gov.au/heritage-register>

Department of Industry, Science, Energy and Resources, Office of the Chief Economist. (2021). *Resources and Energy Quarterly March 2021*. Australian Government. Retrieved from <https://publications.industry.gov.au/publications/resourcesandenergyquarterlymarch2021/index.html>

Department of Industry, Science, Energy and Resources, Office of the Chief Economist. (2021). *Resources and Energy Quarterly June 2021*. Retrieved from <https://publications.industry.gov.au/publications/resourcesandenergyquarterlyjune2021/index.html>

Department of Industry, Science, Energy and Resources. (2015). *Our North, Our Future: White Paper on Developing Northern Australia*. Australian Government. Retrieved from https://www.industry.gov.au/sites/default/files/June%202018/document/pdf/nawp-fullreport.pdf?acsf_files_redirect

Department of Infrastructure, Local Government and Planning. (2016). *State Infrastructure Plan Part A: Strategy*. Queensland Government. Retrieved from https://www.statedevelopment.qld.gov.au/_data/assets/pdf_file/0020/31727/sip-part-a.pdf

Department of Infrastructure Local Government and Planning. (2017). *State Planning Policy*. Queensland Government.

Department of Infrastructure, Transport, Cities and Regional Development. (2019). *National Freight and Supply Chain Strategy: National Action Plan*. Commonwealth of Australia.

Department of Infrastructure, Transport, Regional Development, Communications and the Arts. *Dial Before You Dig*. Accessed 28 June 2021. Retrieved from <https://www.byda.com.au>.

Department of Local Government and Planning. (2012). *Mackay, Isaac and Whitsunday Regional Plan*. Queensland Government.

Department of Natural Resources and Mines. (2010). National recovery plan for the “Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions” ecological community. Queensland Government.

Department of Resources. (2020). *Queensland Regional Profile*. - Property Sales, 2021. Retrieved from <https://statistics.qgso.qld.gov.au/qld-regional-profiles>

Department of Resources. (n.d.) *Strategic Resources Exploration Program*. Queensland Government.

Department of Resources. (n.d.) *Geoscience Data Modernisation Project*. Retrieved from <http://www.resources.qld.gov.au/mining-exploration/initiatives/geoscience-data-modernisation-project>

Department of State Development, Infrastructure and Planning. (2014). *Abbot Point State Development Area Development Scheme*. Queensland Government.

Department of State Development, Infrastructure, Local Government and Planning. (n.d). *Abbot Point Launch Site Investigation*. Queensland Government.

Department of State Development, Infrastructure, Local Government and Planning. (2018). *China Stone Coal Project – Coordinator-General’s evaluation report on the environmental impact statement*. Queensland Government. Retrieved from <https://www.statedevelopment.qld.gov.au/coordinator-general/assessments-and-approvals/coordinated-projects/completed-projects/china-stone-coal-project>

Department of State Development, Infrastructure, Local Government and Planning. (2007). *Abbot Point Coal Terminal Expansion Stage 3* Queensland Government. Retrieved from <https://www.statedevelopment.qld.gov.au/coordinator-general/assessments-and-approvals/coordinated-projects/completed-projects/abbot-point-coal-terminal-expansion-stage-3>

Department of State Development, Infrastructure, Local Government and Planning. (2019). *Alpha Coal Project*. Queensland Government. Retrieved from <https://www.statedevelopment.qld.gov.au/coordinator-general/assessments-and-approvals/coordinated-projects/completed-projects/alpha-coal-project>

Department of State Development, Infrastructure, Local Government and Planning. (2019). *Kevin’s Corner Project*. Queensland Government. Retrieved from <https://www.statedevelopment.qld.gov.au/coordinator-general/assessments-and-approvals/coordinated-projects/completed-projects/kevin-s-corner-project>

Department of State Development, Infrastructure, Local Government and Planning. (2020). *New Economy Minerals: Investment opportunities in Queensland’s minerals provinces*. The State of Queensland. Retrieved

from https://www.statedevelopment.qld.gov.au/data/assets/pdf_file/0023/32918/nwmp-investment-prospectus.pdf

Department of State Development, Infrastructure, Local Government and Planning. (2016). *Queensland Biofutures: 10-Year Roadmap and Action Plan*, Edition 2. Advance Queensland, Queensland Government

Department of State Development, Infrastructure, Local Government and Planning. (2020). *Queensland Space Industry Strategy 2020-2025*. Queensland Government.

Department of State Development, Infrastructure, Local Government and Planning. (2019). *Queensland Hydrogen Industry Strategy 2019-2024*. Queensland Government.

Department of State Development, Infrastructure, Local Government and Planning. (2020). *State Development Assessment Provisions Version 2.6*. Queensland Government.

Department of State Development, Infrastructure, Local Government and Planning. (2021). *Urannah Project*. Queensland Government. Retrieved from <https://www.statedevelopment.qld.gov.au/coordinator-general/assessments-and-approvals/coordinated-projects/current-projects/urannah-project>

Department of State Development, Infrastructure, Local Government and Planning. (2021). *Winchester South Project*. Queensland Government. Retrieved from <https://www.statedevelopment.qld.gov.au/coordinator-general/assessments-and-approvals/coordinated-projects/current-projects/winchester-south-project>

Department of Sustainability, Environment, Water, Population and Communities. (2013). *Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies: Significant impact guidelines 1.2: Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth of Australia.

Department of Sustainability, Environment, Water, Population and Communities. (2012) *Final Approval Decision Hancock Coal Infrastructure Pty Ltd*. Australian Government.

Department of Transport and Main Roads. (2018). *Mackay Isaac Whitsunday: Regional Transport Plan*. Queensland Government.

Department of Transport and Main Roads. (2020). *Northern Queensland: Regional Transport Plan*. Queensland Government.

Department of Transport and Main Roads. (2019). *Port Procedures and Information for Shipping – Port of Abbot Point*. Queensland Government.

Department of Transport and Main Roads. (2020). *Priority ports master planning guideline: Queensland-Australia-2020*. Queensland Government.

Department of Transport and Main Roads. (2020). *Queensland Freight: Action Plan 2020-2022*. Queensland Government.

Department of Transport and Main Roads. (2021). *Queensland Transport and Roads Investment Program 2021–22 to 2024–25*. Queensland Government.

Department of Transport and Main Roads. (2019). *Trade Statistics for Queensland Ports: Throughput statistics for the five years ending 30 June 2019*. Queensland Government.

Ecological Australia. (2013). *Abbot Point Cumulative Impact Assessment. Part C Chapter 8 Semi-evergreen Vine Thicket*.

Eco Logical Australia and Open Lines Environmental Consulting (Open Lines). (2013). *Abbot Point Cumulative Impact Assessment*. Prepared for North Queensland Bulk Ports Corporation Limited.

Enoch, L. The Hon. (2020). *First Nations language to be acknowledged in naming of national parks*. Retrieved from <https://statements.qld.gov.au/statements/90294>

Ergon Energy Network. (2020). *Distribution Annual Planning Report 2020*. Ergon Energy Corporation Limited.

Evans, R.L. (1971). *Queensland's First Aboriginal Reserve: Part 1 – the promise of reform*. Queensland Heritage Vol 2 Issue 4.

Environmental Protection Agency (1999) *Strategy for the Conservation and management of Queensland's wetlands*. Queensland Government.

- Garnett, S., and Crowley, G. (2000). *The Action Plan for Australian Birds 2000*. Canberra, ACT: Environment Australia and Birds Australia. <http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html>.
- Garnett, S., Szabo, J. and Dutson, G. (2011). *The Action Plan for Australian Birds 2010*. CSIRO Publishing. <http://birdsindanger.net/taxatable>.
- Great Barrier Reef Marine Park Authority. (2011). *A vulnerability assessment for the Great Barrier Reef: Sharks and Rays*.
- Great Barrier Reef Marine Park Authority. (2013). *Don basin assessment: Burdekin dry tropics natural resource management region*. GBRMPA, Townsville.
- Great Barrier Reef Marine Park Authority (2012). *Retrospective Statement of Outstanding Universal Value adopted by the World Heritage Commission in July 2012* (GBRMPA 2012).
- Geoscience Australia. (2021). Geoscience Australia Portal. <https://portal.ga.gov.au/restore/38ed09a9-9e23-45eb-9016-dbe1dc92531d>.
- GVK Hancock Coal. (n.d.). *GVK Hancock Coal: Our Assets Rail and Port*. GVK Hancock Coal. Retrieved from <http://gvkhancockcoal.com/our-assets/rail-port>
- GHD. (2012) *Abbot Point, Terminals 0, 2 and 3 Capital Dredging Sediment Sampling and Analysis Plan Implementation Report*. Mackay: North Queensland Bulk Ports Corporation Limited.
- GHD Pty Ltd. (2012). *Abbot Point Cumulative Impact Assessment: Coastal processes and Hydrodynamics Technical Report, August 2012*. Abbot Point Working Group.
- GHD Pty Ltd. (2012). *Abbot Point Cumulative Impact Assessment: Part C Chapter 8 Semi-evergreen Vine Thicket*. Abbot Point Working Group.
- GHD Pty Ltd. (2012). *Abbot Point, T0, Terminal 2 and Terminal 3 Capital Dredging Public Environment Report* (EPBC 2011/6213/GBRMPA G34897.1)
- GHD. (2013). *Carmichael Coal Mine and Rail Project*. Adani Australia. Retrieved from <https://eisdocs.dsdlp.qld.gov.au/>
- GHD Pty Ltd. (2013). *North Galilee Basin Rail Project: Environmental Impact Statement*. Adani Mining Pty Ltd.
- GHD Pty Ltd. (2010). *Proposed Abbot Point Multi Cargo Facility: Draft Environmental Impact Statement*. North Queensland Bulk Ports Corporation Limited.
- GHD Pty Ltd. (2009). *Report for Proposed Multi Cargo Facility, Abbot Point: Preliminary Sediment Quality Assessment*. Ports Corporation of Queensland.
- GHD Pty Ltd. (2009a). *Terrestrial and Aquatic Ecological Assessment for NQBP Abbot point Multi Cargo Facility (MCF) Environmental Impact Statement*.
- GVK Hancock Coal. (n.d.) *GVK Hancock Coal Our assets Rail and Port*. GVK Hancock Coal. Rail & Port (gvkhancockcoal.com).
- Goudkamp, K. and Chin, A. June. (2006). 'Mangroves and Saltmarshes' in Chin, A, (ed) *The State of the Great Barrier Reef On-line*, Great Barrier Reef Marine Park Authority, Townsville. Viewed on 7/09/2021, http://www.gbrmpa.gov.au/publications/sort/mangroves_saltmarshes.
- Healthdirect. (n.d). Find a health service. Retrieved from: <https://www.healthdirect.gov.au/australian-health-services>
- Higgins, P. and Davies, S. (1996). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons*. Melbourne, Victoria: Oxford University Press; Department of Agriculture, Water and the Environment. (n.d). *Calidris canutus* – Red Knot, Knot Species Profile and Threats Database. Available at [Calidris canutus — Red Knot, Knot \(environment.gov.au\)](http://Calidris.canutus—RedKnot.environment.gov.au)
- Hof, C. and Bell, I. (2014) *Determining the spatial distribution and densities of marine turtle nesting and predator activity in the northern Great Barrier Reef, Queensland*. Final Report to WWF-Australia and Threatened Species Unit, Department of Environment and Heritage Protection.
- Infrastructure Australia. (2016). *Australian Infrastructure Plan 2016*. Australian Government.
- Intergovernmental Panel on Climate Change. (2014). *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Full Report Part A: Global and Sectoral Aspects*. Contribution of Working Group II to the Fifth

Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, United Kingdom and New York, United States of America.

International Energy Agency. (2020). *Coal 2020: Analysis and Forecast to 2050*. International Energy Agency. Retrieved from <https://www.iea.org/reports/coal-2020>

International Energy Agency. (n.d.) *Stated Policies Scenario*. Retrieved from <https://www.iea.org/reports/world-energy-model/stated-policies-scenario-steps>.

Infrastructure Australia. (2016). *Australian Infrastructure Plan 2016*, Australian Government.

International Energy Agency. (2020). *World Energy Outlook 2020: Part of World Energy Outlook*. International Energy Agency. Retrieved from <https://www.iea.org/reports/world-energy-outlook-2020>

Jones, K. The Hon. (2020). *Queensland space launch site one step closer to lift off*. Queensland Government. Retrieved from <https://statements.qld.gov.au/statements/90272>

Katestone Environmental Pty Ltd. (2012). *Cumulative Assessment of Air Emissions at the Abbot Point Coal Terminals*. Prepared for Abbot Point Working Group (KE1201092).

Lloyd, P., Sanderson, C. and Popple, L. (2020). Waterbird surveys of the Caley Valley Wetland in wet and dry seasons, Abbot Point, Queensland. *Stilt*: 73 – 74: 6:17.

Lovelock, C. (1993). *Field Guide to the Mangroves of Queensland*. Australian Institute of Marine Science, Townsville. p72. <http://www.aims.gov.au/pages/reflib/fgmangroves/pages/fgm-qld-index.html>

Maritime Safety Queensland. (2019). *Port procedures and information for shipping – Abbot Point*. Queensland Government. Retrieved from msq.qld.gov.au

Maritime Safety Queensland (2021) Semidiurnal Tidal Planes 2021. <https://www.msq.qld.gov.au/Tides/Tidal-planes> Accessed: 20/07/2021

Maritime Safety Queensland. (2021). *Shipping Movements in Queensland*. Queensland Government. Retrieved from <https://qships.tmr.qld.gov.au/webx/>

Maritime Safety Queensland (2021). Tide record data (10-minute readings) for Bowen (station 061007A).

McKenna, S. A., Sozoy, A. M., Scott, E. L. and Rasheed, M. A. (2016). Port of Abbot Point Long-Term Seagrass Monitoring Annual Report 2014 – 2015. Report No. 16/21.

Minerals Council of Australia and Commodity Insights. (2021). *Commodity Demand: Outlook 2030*. Minerals Council of Australia.

Minerals Council of Australia. (2021). *Commodity Outlook 2030*. Minerals Council. Retrieved from <https://www.minerals.org.au/sites/default/files/Commodity%20Outlook%202030.pdf>

Minton, C. (2002). *Personal communication*. Australasian Wader Studies Group.

Mumby, P.J. (2006). 'Connectivity of reef fish between mangroves and coral reefs: Algorithms for the design of marine reserves at seascape scales', *Biological Conservation* 128: 215-222.

National Climate Change Adaptation Research Facility and Australian Government. *Coast Adapt: A Changing climate in coastal Australia: Build knowledge, take action*. Retrieved from <http://coastadapt.com.au>

National Skills Commission. (2021). *Small Area Labour Markets*. Various quarterly editions. Australian Government.

National Transport Commission Australia. (2011). *National Ports Strategy: Infrastructure for and economically, socially and environmentally sustainable future 2011*. Australian Government.

National Trust. (n.d.). *About us*. Retrieved from <https://www.nationaltrust.org.au/about-us/>

North Queensland Bulk Ports Corporation Limited. (2021). *Berths and Wharf Capability*. North Queensland Bulk Ports. Retrieved from <https://nqbp.com.au/trade/berths-and-wharf-capability>

North Queensland Bulk Ports Corporation Limited. (2020). Coral Monitoring Abbot Point. Data available at: <https://nqbp.com.au/sustainability/coral-monitoring>.

North Queensland Bulk Ports Corporation Limited. (2020). *Leading the Transition To Sustainable Port Trade: Annual Report 2019/20*. North Queensland Bulk Ports Corporation Limited.

North Queensland Bulk Ports Corporation Limited. (2010). *Port of Abbot Point Land Use Plan*. North Queensland Bulk Ports Corporation Limited.

North Queensland Bulk Ports Corporation Limited. (2016). *Port of Abbot Point Operations Manual: Revised 2016*. North Queensland Bulk Ports Corporation Limited.

North Queensland Bulk Ports Corporation Limited. (2018). *Sustainable Port Development Guidelines*. North Queensland Bulk Ports Corporation Limited.

North Queensland Bulk Ports Corporation Limited. (2015). *Sustainability Review, October 2015 – June 2017*.

Open Lines and Adaptive Strategies. (2016). Abbot Point Strategic Planning Project: Abbot Point environmental Values Input.

Papenmeier, S et al. (2020). *Seafloor Geomorphology as Benthic Habitat (Second Edition)* GeoHab Atlas of Seafloor Geomorphic Features and Benthic Habitats. PP 451-460.
<https://www.sciencedirect.com/science/article/pii/B9780128149607000257>.

Pearce, H. (2009). *WWII NQ: A cultural heritage overview of significant places in the defence of north Queensland during World War II*, Queensland Environmental Protection Agency.

Pimiento, C. et al. (2020), Functional diversity of marine megafauna in the Anthropocene. *Science Advances*, 6(16). <https://advances.sciencemag.org/content/6/16/eaay7650>

Port and Coastal Solutions. (2018). *Port of Abbot Point Avoid and Reduce Assessment*. Report prepared for North Queensland Bulk Ports Corporation Limited.

Ports Corporation of Queensland. (2006). *Abbot Point Coal Terminal: Stage 3 Expansion: Environmental Impact Statement: Executive Summary*. Ports Corporation of Queensland.

Powerlink Queensland. (2020). *Transmission Annual Planning Report 2020*. Powerlink Queensland.

QCoast 2100. (2016). *Developing a Coastal Hazard Adaptation Strategy: Minimum: Standards and Guideline for Queensland Local Governments*. Queensland Government and LGAQ.

Queensland Government. (2003). *Aboriginal Cultural Heritage Act 2003*. Retrieved from <https://www.legislation.qld.gov.au/>

Queensland Government. (2017). *A strategic Blueprint for Queensland's North west Minerals Province: Supporting strong and prosperous regional communities*.

Queensland Government. (2019). Bowen Hospital. Retrieved from <https://www.mackay.health.qld.gov.au/your-hospitals/bowen-hospital/>

Queensland Government. (2014). *Biosecurity Act 2014*. Retrieved from <https://www.legislation.qld.gov.au/>

Queensland Government. (1995). *Coastal Protection and Management Act 1995*. Retrieved from <https://www.legislation.qld.gov.au/>

Queensland Government. (2021). *Development Assessment*. State of Queensland (Planning). Retrieved from <https://planning.statedevelopment.qld.gov.au/planning-framework/development-assessment>.

Queensland Government. (2012) *Economic Development Queensland Act 2012*. Retrieved from <https://www.legislation.qld.gov.au/>

Queensland Government. (2014). *Environmental Offsets Act 2014*. Retrieved from <https://www.legislation.qld.gov.au/>

Queensland Government. (1993). *Environmental Protection Act 1994: Environmental Protection Regulation 2019*. Retrieved from <https://www.legislation.gov.au/>

Queensland Government. (2018). Great Barrier Reef Marine Park. Retrieved from <https://www.qld.gov.au/environment/coasts-waterways/marine-parks/about/gbrp>

Queensland Government. (2009). *Local Government Act 2009*. Retrieved from <https://www.legislation.qld.gov.au/>

Queensland Government. (2021). *New Study to Unlock Potential of Bowen Basin*. Queensland Government. Retrieved from <https://statements.qld.gov.au/statements/92488>

Queensland Government. (2018). *Our Future State: Advancing Queensland's Priorities*. Queensland Government. Retrieved from <https://cabinet.qld.gov.au/documents/2018/Mar/OFSAQP/Attachments/Priorities.PDF>

Queensland Government. (2017). Queensland Heritage Register. Retrieved from <http://apps.des.qld.gov.au/heritage-register/>

Queensland Government. (2020). *State of the Environment Report 2020*. Department of Environment and Heritage.

Queensland Government. (2021). *Urannah Project*. Department of State Development, Infrastructure, Local Government and Planning. Urannah Project | Department of State Development, Infrastructure, Local Government and Planning.

Queensland Reconstruction Authority. (2017). *Queensland Strategy for Disaster Resilience*. Queensland Government. Retrieved from <http://www.qrc.qld.gov.au>

Queensland Treasury. (2020, September). *A Study of Long-Term Global Coal Demand*. Queensland Government. Retrieved from <https://s3.treasury.qld.gov.au/files/A-Study-of-Long-Term-Global-Coal-Demand.pdf>

Skilleter, G.A. and Loneragan, N.R. (2002). 'Assessing the Importance of Coastal Habitats for Fisheries, Biodiversity and Marine Reserves: A New Approach Taking into Account "Habitat Mosaic"', in Aquatic Protected Areas. What works best and how do we know? Proceedings of the World Congress on Aquatic Protected Areas, eds J. Beumer, A. Grant and D.C. Smith, Cairns, Australia, 240-249pp.

Rasheed, M. A. and Mckenna, S. (2005). *Port of Abbot Point seagrass, algae and benthic macro*.

Report for Proposed Abbot Point Multi Cargo Facility: Baseline Marine Fauna Report. Prepared for North Queensland Bulk Ports Corporation Limited.

Rowland, M.J. and S. Ulm. (2011). *Indigenous Fish Traps and Weirs of Queensland*. Queensland Archaeological Research 14.

State of Queensland Department of Natural Resources. (2020). Mines and Energy 2020, QTopo, Abbot Point 8558-3 (1:10,000). <https://qtopo.information.qld.gov.au/>.

SGS Economics and Planning. (2010). *Bowen Abbot Point Accommodation and Community Infrastructure Study: Final Report*.

SLR Consulting Australia Pty Ltd. (2014). *Abbot Point Port and Wetland Project, Technical Report – Noise Impact Assessment*.

Stanley, J. (1984). *The Foundation of a North Queensland Port Settlement 1861-1880*. Department of History, University of Queensland, Brisbane.

State of Queensland. (2020). *Mackay-Whitsunday Regional Recovery Action Plan*. Retrieved from <http://covid19.qld.gov.au/>

Taskforce on Climate Financial Disclosure. (2017) *Recommendations of the task force on climate related financial disclosures*. Basil, Switzerland.

Threatened Species Scientific Committee. (2015). *Commonwealth Conservation Advice for Megaptera novaeangliae*. <http://www.environment.gov.au/biodiversity/threatened/species/pubs/38-conservation-advice10102015.pdf>.

Threatened Species Scientific Committee. (2016). *Conservation Advice Calidris canutus Red knot*. Available at [855 - Conservation Advice Calidris canutus- Red knot - approved 5 May 2016 \(environment.gov.au\)](http://855-ConservationAdviceCalidriscanutus-Redknot-approved5May2016.environment.gov.au); Department of Agriculture, Water and the Environment. (n.d). *Calidris canutus – Red Knot*, Knot Species Profile and Threats Database. Available at [Calidris canutus — Red Knot, Knot \(environment.gov.au\)](http://Calidriscanutus-RedKnot.Knot.environment.gov.au).

Van De Wetering, C et al. (2020). *Port of Abbot Point Long-Term Seagrass Monitoring Program – 2019. Report No. 20/12*. A Report for the North Queensland Bulk Ports Corporation Limited (NQBP). Centre for Tropical Water & Aquatic Ecosystem Research (TropWater). James Cook University.

Vision Environment (2016). *Abbot Point Ambient Water Quality Monitoring: October 2015 to October 2016*. North Queensland Bulk Ports. Vision Environment, Gladstone Australia.

Vision Environment (2017). *Abbot Point Ambient Water Quality Monitoring: July 2016 to June 2017*. North Queensland Bulk Ports. Vision Environment, Gladstone Australia.

Waratah Coal (2011) *China First- Acid Sulphate Soils Assessment Vol 5- Appendices | Appendix 9- Acid Sulphate Soils Assessment E3 Consult*.

- WBM Oceanics Australia (WBM). (2005). *Sampling and Analysis Plan for Capital Dredging Material – Port of Abbot Point*. Ports Corporation of Queensland.
- WetlandMaps, online data search 6th September 2021.
- Whitsunday Shire Council. (2003). *Soils and land suitability of the Whitsunday Coast Area, Central Queensland*.
- Whitsunday Regional Council. (2020). *Whitsunday Regional Council's Adopted Charge Resolution (No. 1) 2022*. Retrieved from <http://www.whitsundayrc.qld.gov.au/downloads/file/1197/infrastructure-charges-resolution-no-1-2020>.
- Whitsunday Regional Council. (2016). *Whitsunday Regional Council Climate Change Adaptation Strategy 2016–2020*. Retrieved from <https://www.whitsundayrc.qld.gov.au/downloads/file/372/11-climate-adaptation-strategy-2016-2020>
- Whitsunday Regional Council. (2021). *Whitsunday Regional Council Biosecurity Plan: 2021-2025*. Retrieved from <https://www.whitsundayrc.qld.gov.au/downloads/file/209/whitsunday-biosecurity-plan>
- Whitsunday Regional Council. (2018). *Whitsunday Climate Change Mitigation Policy*. Retrieved from <http://www.whitsundayrc.qld.gov.au/downloads/file/705/climate-change-mitigation-policy>
- Whitsunday Regional Council. (2014). *Whitsunday Regional Council: Local Heritage Register*. Retrieved from <https://whitsundayrc.qld.gov.au/community-and-environment/our-community/history-and-heritage>
- WorleyParsons. (2015). *Abbot Point Growth Gateway Project Dredging and Onshore Placement of Material Numerical Modelling Report*.
- WorleyParsons. (2015). *Abbot Point Growth Gateway Project Terrestrial Ecology Report: Matters of National Environmental Significance: Appendix 13*.
- UNESCO. (2016). *Operational Guidelines for the Implementation of the World Heritage Convention*. World Heritage Committee, Paris.

15. Appendix

15.1 Appendix A: Regulatory frameworks

15.1.1 Commonwealth legislation

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i>	<i>Aboriginal and Torres Strait Islander Heritage Protection Regulations 1984</i>	The Act provides for the making of declarations to preserve and protect places, areas and objects of particular significance to Aboriginal and Torres Strait Islander people in accordance with Aboriginal tradition. Aboriginal tradition is taken to include traditions, observances, customs or beliefs relating to certain people, areas, objects or relationships.	Heritage	Declarations of areas and objects Compliance and enforcement Operational registrations, licences, approvals	Department of Agriculture, Water and the Environment (DAWE) The Attorney-General's Department
<i>Biosecurity Act 2015</i>	<i>Biosecurity Regulation 2016</i> <i>Biosecurity (Human Health) Regulation 2016</i>	Diseases and pests that may cause harm to human, animal or plant health or the environment within the Australian territory (Australia and up to 12 nautical miles from the coastline including the airspace over, and coastal seas, of these areas). The scope of the Act includes risks related to biosecurity, contagions, human disease and –ballast water and sediment. The Act gives effect to Australia's international rights and obligations, including under the International Health Regulations 2005, the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) and the Convention on Biological Diversity 1992 (Biodiversity Convention).	Environment (biosecurity)	Administration and governance Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DAWE
<i>Coastal Trading (Revitalising Australian Shipping) Act 2012</i>	<i>Coastal Trading (Revitalising Australian Shipping) Regulation 2012</i>	Coastal trading in Australia. The Act seeks to promote a viable shipping industry that contributes to the broader Australian economy, facilitate the long-term growth of the Australian shipping industry, enhances the efficiency and reliability of Australian shipping as part of the national transport system, and ensures	Economic	Compliance and enforcement Operational registrations, permissions or limitations	Department of Infrastructure, Transport, Regional Development,

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		efficient movement of passengers and cargo between Australian ports.			Communications and the Arts.
<i>Environment Protection (Sea Dumping) Act 1981</i>	<i>Environment Protection (Sea Dumping) Regulations 1983</i>	Protection of the environment by regulating dumping into the sea, incineration at sea and artificial reef placements. The scope of the Act includes applications to dump material and other objects at the sea including dredged material, excavated material, artificial reefs, platforms, controlled materials and people for burial purposes.	Environment (marine)	Compliance and enforcement Operational registrations, permissions or limitations	DAWE
EPBC Act	<i>Environment Protection and Biodiversity Conservation Regulations 2000</i>	Protection of nationally and internationally important flora, fauna, ecological communities and heritage places, defined in the Act as MNES. The scope of the Act includes promoting environmental protection and biodiversity conservation informed by indigenous peoples' knowledge of biodiversity and engagement with the community. The Act promotes ecologically sustainable development and provides for controlled actions, biodiversity plans, assessment pathways and bilateral agreements. Development proposals having a significant impact on MNES needs approval under the Act in addition to any state and local development approvals. Examples of MNES that the Act applies to include national heritage places, wetlands of international importance, nationally threatened species and ecological communities, migratory species, Commonwealth marine areas and the GBRMP	Environment (protection)	Declaration of places or world heritage value or wetlands of international importance Compliance and enforcement Development assessment Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DAWE
GBRMP Act	<i>Great Barrier Reef Marine Park Regulations 2019</i>	Long-term protection and conservation of the environment, biodiversity and heritage values of the GBR region. The Act seeks the ecologically sustainable use of the GBR region for uses including recreational, economic and cultural activities, encourages collaboration and engagement with the community and industry, and facilitates Australia to meet its international responsibilities in relation to the environment and protection of World Heritage.	Environment (GBR)	Administration and governance Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DAWE

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		The Act establishes the GBRMPA and provides for zoning plans, plans of management and regulation of the GBRMP.			
<i>Marine Safety (Domestic Commercial Vessel) National Law Act 2012</i>	N/A	Marine incidents, and standards relating to the operation, design, construction and equipping of domestic commercial vessels. A domestic commercial vessel is taken to be a vessel that is for use in connection with a commercial, governmental or research activity.	Safety (marine)	Compliance and enforcement Standards, guidelines or reporting requirements	Department of Infrastructure, Transport, Regional Development, Communications and the Arts
<i>Native Title Act 1993</i>	<i>Native Title (Indigenous Land Use Agreements) Regulations 1999</i>	Native title in relation to land or waters. The Act recognises and protects native title, provides a process for claims to native title, and provides for or permits the validation of past acts, and intermediate period acts, invalidated because of the existence of native title.	Native title	Compliance and enforcement Operational registrations, permissions or limitations	The Attorney-General's Department Department of the Prime Minister and Cabinet
<i>Navigation Act 2012</i>	<i>Navigation Regulation 2013</i>	Maritime safety including to promote the safety of life at sea and safe navigation, and the prevention of pollution of the marine environment. The scope of the Act includes the health and welfare of seafarers, aids to navigation, vessel safety, tonnage certificates and wrecks including their salvage.	Safety (marine) Environment (marine)	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	Department of Infrastructure, Transport, Regional Development and Communications and the Arts
<i>Protection of the Sea (Prevention of Pollution from Ships) Act 1983</i> [?]	N/A	Protection of the sea from pollution. The Act prohibits the carriage, transfer or discharge of certain oils, noxious substances, packaged harmful substances, sewage, garbage and air pollution. The scope of the Act includes the development of emergency plans, a duty to report incidents, record keeping and cleaning.	Environment (sea and air)	Compliance and enforcement	Department of Infrastructure, Transport, Regional Development, Communications and the Arts
<i>Sea Installations Act 1987</i>	<i>Sea Installations Regulations 2018</i>	Operation of sea installations and the safety of the people using them and of the people, ships and aircraft near them. Sea installations are taken to be man-made structures used for an environment related activity such as business, tourism or recreation uses.	Safety (sea)	Compliance and enforcement Operational registrations, permissions or limitations	DAWE

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
UCH Act	UCH Act (Protected Zones) Declaration Instrument 2019 Underwater Cultural Heritage Rules 2018	Underwater cultural heritage. Different kinds of articles of underwater cultural heritage are, or can be, protected, depending on the kinds of articles, their heritage significance and their location. Some articles are, or can be, protected even if they have already been removed from those water. The Act provides for the identification, protection and conservation of Australia's underwater cultural heritage. The scope of the Act includes declaration of articles, ownerships or areas, making the Underwater Cultural Heritage Rules, permit requirements, and prohibited and notifiable activities.	Heritage (underwater)	Declaration of protected articles or zones Compliance and enforcement Operational registrations, permissions or limitations	DAWE
<i>Work Health and Safety Act 2011</i>	Various regulations and codes of practice	Protection of people's health, safety and welfare. The scope of the Act includes health and safety duties, incident notification and consultation.	Safety (WHS)	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	The Attorney-General's Department

15.1.2 State legislation (Queensland)

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
ACH Act	N/A	Focus—recognition, protection and conservation of Aboriginal cultural heritage. The scope of the Act includes management of activities that may harm Aboriginal cultural heritage and ensuring Aboriginal people are involved in processes for managing the recognition, protection and conservation of Aboriginal cultural heritage including the development of CHMPs, cultural heritage studies and stop orders.	Heritage	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DOR
<i>Aboriginal Land Act 1991</i>	<i>Aboriginal Land Regulation 2011</i>	Focus—recognition of the interests and responsibilities of Aboriginal people in relation to land and thereby to foster the capacity for self-development, and the self-reliance and cultural integrity, of the Aboriginal people of Queensland.	Aboriginal land	Compliance and enforcement Operational registrations, permissions or limitations	DOR

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		The Act provides for the process of applying for, and granting, the land in fee simple under the Land Act, claims for claimable land and making, amending or repealing freehold instrument. The scope of the Act includes appointing grantees of land, provision for leasing, transferring, selling or mortgaging land, and special provisions about prescribed Deed of Grant in Trust land and prescribed reserve land.		Standards, guidelines or reporting requirements	
<i>Biosecurity Act 2014</i>	<i>Biosecurity Regulation 2016</i>	Focus—animal and plant diseases and pests, animal feed, fertilisers and other agricultural inputs. The Act establishes a framework to minimise biosecurity risk and help manage biosecurity issues or events. The scope of the Act includes alignment with relevant national and international obligations and managing risks from pests and diseases on the natural and built environment, industry including agriculture, tourism, service and infrastructure sectors.	Environment (biosecurity)	Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DAF
<i>Building Act 1975</i>	<i>Building Regulation 2021</i>	Focus—building work, classifications and certifiers, fire safety, pool safety and sustainable housing. The Act provides for building development applications, building assessment provisions, and matters that a local government may designate for the Building Code of Australia or Queensland Development Code.	Planning and development (building work)	Designation of transport noise corridors Development assessment Plan making Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	Department of Energy and Public Works
<i>Coastal Protection and Management Act 1995</i>	<i>Coastal Protection and Management Regulation 2017</i>	Focus—protection and management of the coast through coordinated and integrated planning and decision-making. The Act provides for the protection, conservation, rehabilitation and management of the coastal zone, including its resources and biological diversity, and ensure decisions about land use and development safeguard life and property from the threat of coastal hazards.	Environment (coastal areas)	Declaration of CMDs Declaration of erosion prone areas Compliance and enforcement Development assessment Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DES

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
<i>Environmental Offsets Act 2014</i>	<i>Environmental Offsets Regulation 2014</i>	Focus—to counterbalance significant residual impacts of activities on matters of national, state or local environmental significance and to establish an environmental offsets framework. The Act sets out a process for offset conditions, environmental offsets policies, agreed delivery arrangements and environmental offset agreements.	Planning and development (offsets)	Compliance and enforcement Development assessment Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DES
EP Act	<i>Environmental Protection Regulation 2019</i> <i>Environmental Protection (Air) Policy 2019</i> <i>Environmental Protection (Noise) Policy 2019</i> <i>Environmental Protection (Water and Wetland Biodiversity) Policy 2019</i>	<p>Focus—environment and ecological sustainable development. The scope of the Act includes promoting environmental responsibility and involvement within the community, integrating environmental values into land use planning and management of natural resources, and ensuring all reasonable and practicable measures are taken to protect environmental values from all sources of environmental harm.</p> <p>The Act provides for:</p> <ul style="list-style-type: none"> • the OUV of the GBR • environmental offsets • notifiable activities • best practice environmental management • environmental protection policies • EIS • environmental authorities and environmentally relevant activities. <p>Environment includes ecosystems; natural and physical resources; qualities and characteristics that contribute to biological diversity, scientific value or interest, and amenity; and any related social, economic, aesthetic and cultural conditions.</p>	Environment	Compliance and enforcement Development assessment Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DES
Fisheries Act	<i>Fisheries Declaration 2019</i> <i>Fisheries (General) Regulation 2019</i>	Focus—fisheries resources and fish habitats. The scope of the Act includes management, use, development and protection of fisheries resources and fish habitats, the management of aquaculture activities and helping to prevent shark attacks s on	Fisheries	Declaration of FHA Compliance and enforcement Development assessment	DES DAF

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		humans in coastal waters of the state adjacent to coastal beaches used for bathing. The Act seeks to promote ecologically sustainable development and access to fisheries resources in a way that maximises the potential economic, social and cultural benefits to the community.		Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	
<i>Forestry Act 1959</i>	<i>Forestry Regulation 2015</i> <i>Forestry (State Forests) Regulation 1987</i>	Focus—forest reservations, state forests, forest products and quarry material, and the property of the Crown on State forests, timber reserves and on other lands.	Environment (state forests)	Declaration of a state forest Compliance and enforcement Development assessment Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DES DAF
Land Act	<i>Land Regulation 2020</i>	Focus—administration and management of land (generally non-freehold land) including land that may become covered by water subject to tidal influence. The Act provides for allocating land for development in the context of the state's planning framework and balancing the economic, environmental, cultural and social opportunities and values of land, and indigenous access and use agreements.	Land management	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DOR
MP Act	<i>Marine Parks (Declaration) Regulation 2006</i> <i>Marine Parks (Great Barrier Reef Coast) Zoning Plan 2004</i>	Focus—marine parks and the conservation of the marine environment including the recognition of the cultural, economic, environmental and social relationships between marine parks and other areas, whether of water or land. The purpose of the Act is achieved through a cooperative and coordinated approach towards Australia's international responsibilities, intergovernmental agreements and instruments, and Acts or other laws of the Commonwealth and other states involving conservation of the marine environment. Application of the Commonwealth zoning plan under the <i>Great Barrier Reef Marine Park ZONING PLAN 2003</i> and designation of shipping areas within the marine park worked out by extending a	Environment (marine parks)	Declaration of marine parks Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DES

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		Commonwealth shipping area that is at low water to the landward boundary of the marine park.			
NT Act	N/A	<p>Focus—the Australian Government has proposed legislation to provide a national scheme for the recognition and protection of native title and for its coexistence with the existing land management systems. This Act seeks to ensure that Queensland law is consistent with standards set by the <i>Native Title Act 2004</i> (Cth) for future dealings affecting native title.</p> <p>The Act includes provisions to validate past acts, and intermediate period acts, invalidated because of the existence of native title and to confirm certain rights including the ownership of natural resources and certain water and fishing access rights, and public access to and enjoyment of beaches and certain other places.</p>	Native title	Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DOR
NC Act	<i>Nature Conservation (Protected Areas Management) Regulation 2017</i> <i>Nature Conservation (Protected Areas) Regulation 1994</i>	Focus—conservation of nature including the protection and management of native wildlife and its habitat, ecological sustainability and recognition of the interest and involvement of Aborigines and Torres Strait Islanders in nature and its conservation. The scope of the Act includes ecosystems, natural and physical resources, natural processes, biological diversity and integrity, and the intrinsic or scientific value of places.	Environment (conservation)	Protection of wildlife Declaration of protected areas Compliance and enforcement Development assessment Plan making Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DES
Planning Act	Planning Regulation	<p>Focus—land use planning and development assessment to facilitate the achievement of ecological sustainability.</p> <p>The scope of the act includes the:</p> <ul style="list-style-type: none"> sustainable use of renewable and non-renewable natural resources Aboriginal and Torres Strait Islander knowledge, culture and tradition 	Planning and development	Declaration of premises for development of infrastructure Compliance and enforcement Development assessment Plan making	DSDILGP Department of Energy and Public Works

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		<ul style="list-style-type: none"> cultural heritage housing choice, diversity and affordability economic resilience and diversity coordinated infrastructure delivery built environment design, conservation and amenity minimising adverse environmental effects of development. <p>The Act establishes Queensland's plan making, development assessment and dispute resolution systems. The Act provides for:</p> <ul style="list-style-type: none"> protecting or giving effect to State interests a hierarchy of planning instruments processes for plan making, development assessment and designations Ministerial powers to protect, or give effect to, relevant State interests designation of premises for development of infrastructure accepted, assessable and prohibited development development exempt from assessment and development that cannot be made assessable assessment managers and referral agencies 		Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	
QH Act	<i>Queensland Heritage Regulation 2015</i>	Focus—conservation of Queensland's cultural heritage for the benefit of the community and future generations. The Act seeks to retain the cultural heritage significance of places and artefacts and provide the greatest sustainable benefit to the community consistent with the conservation of their cultural heritage significance. The scope of the Act includes local and State heritage places and State protected areas, archaeological artefacts, and underwater cultural heritage artefacts.	Heritage	Declaration of protected areas Compliance and enforcement Development assessment Plan making Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DES
RPI Act	RPI Regulation	Focus—regulated activities on areas of the State that contribute, or are likely to contribute, to Queensland's	Planning and development	Compliance and enforcement	DSDILGP DAF

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
		economic, social and environmental prosperity. The Act seeks to manage the impact of resource activities and other regulated activities on areas of regional interest, and a process to assess and manage impacts. The Act provides for RIDAs, exempt resource activities and exempt regulated activities. Regional interest areas are defined in the Act as priority agricultural areas, priority living areas, SCAs and strategic environmental areas. DOR certifies the 'Trigger Map for SCL' for use under the Act.		Development assessment Operational registrations, permissions or limitations	
SDPWO Act	<i>State Development and Public Works Organisation Regulation 2020</i> <i>State Development and Public Works Organisation (SDAs) Regulation 2019</i>	Focus—State planning and development through a coordinated system of public works organisation and for environmental coordination. Under the Act, the CG may declare a project to be a coordinated project for which an EIS or IAR is required. The Act provides for SDAs, approved development schemes, and assessment and approval of particular coordinated projects under bilateral agreement made under the EPBC Act.	Planning and development (SDAs)	Declaration of SDAs and coordinated projects Compliance and enforcement Development assessment Plan making Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DSDILGP
Ports Act	<i>Sustainable Ports Development Regulation 2018</i>	Focus—protection of the GBRWHA through managing port-related development in and adjacent to the area. The purpose of the Act is achieved through prohibiting certain development and providing for master planning of the priority ports. To do this, the Act seeks to concentrate port development in the priority ports, recognise the diversity of the port network, and plan for the expansion of the port network and related supply chain and infrastructure capacity. The Ports Act designates the following priority ports: Port of Abbot Point, Port of Gladstone, the Port of Hay Point/Mackay, and the Port of Townsville.	Priority ports	Designation as a priority port Development assessment Plan making Master planning	TMR
TIA	<i>Transport Infrastructure (Ports) Regulation 2016</i>	Focus—effective integrated planning and efficient management of a system of transport infrastructure. For ports, the Act's focus is to establish a regime	Infrastructure (transport)	Port declaration and land management	TMR

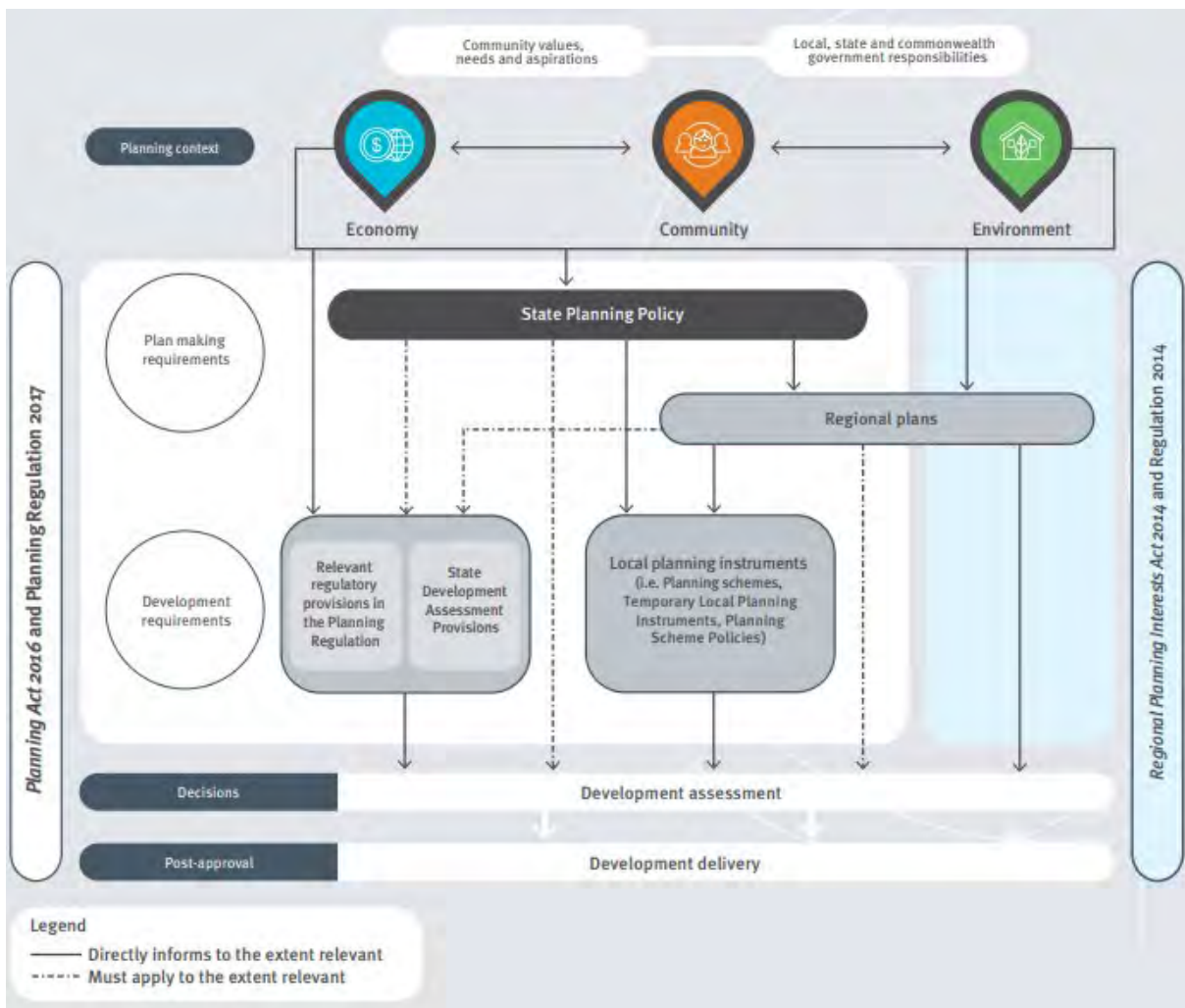
Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
	<i>Transport Infrastructure (Public Marine Facilities) Regulation 2011</i> <i>Transport Infrastructure (Waterways Management) Regulation 2012</i>	under which ports can be managed within an overall strategic framework. Similarly, to establish a regime under which waterways and public marine facilities can be effectively and efficiently managed.		Compliance and enforcement Development assessment Plan making Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	
<i>Transport Operations (Marine Pollution) Act 1995</i>	<i>Transport Operations (Marine Pollution) Regulation 2018</i>	Focus—protect Queensland’s marine and coastal environment by minimising deliberate and negligent discharges of ship-sourced pollutants into coastal water. The Act achieves this primarily by giving effect to annexes of MARPOL that address pollution by oil, noxious liquid substances in bulk, harmful substances in packaged form, sewage and garbage.	Environment (pollution)	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	TMR
<i>Transport Operations (Marine Safety) Act 1994</i>	<i>Transport Operations (Marine Safety) Regulation 2016</i>	Focus—marine safety and related marine operational issues and the operation and activities of ships. The Act seeks to balance its objectives with effectiveness and efficiency on the Queensland maritime industry. It does not generally overlap with the national law that applies to domestic commercial vessel safety.	Safety (marine)	Declaration of pilotage areas Appointment of harbour masters Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	TMR
<i>Transport Operations (Marine Safety—Domestic Commercial Vessel National Law Application) Act 2016</i>	N/A	Focus—applies the Commonwealth domestic commercial vessel national law as a law of the State.	Safety (domestic commercial vessels)	Compliance and enforcement Operational registrations, permissions or limitations	TMR
<i>Transport Operations (Road Use Management) Act 1995</i>	<i>Transport Operations (Road Use Management –</i>	This Act's objectives provide for the effective and efficient management of road use including vehicle use in public places and provides a scheme for managing the use of roads. The Act seeks to	Infrastructure (transport)	Compliance and enforcement Operational registrations, permissions or limitations	TMR

Act	Key subordinate legislation	Focus of the instrument(s)	Primary topic	Management measures	Administering dept
	<i>Road Rules) Regulation 2009</i>	achieve an appropriate balance between safety, and the costs that regulation imposes on road users and the community. The Act provides for road use management strategies, road rules, access management and performance standards for road users.		Standards, guidelines or reporting requirements	
<i>Vegetation Management Act 1999</i>	<i>Vegetation Management Regulation 2012</i>	Focus—to regulate vegetation clearing. The Act provides for the development of a State policy for vegetation management, vegetation management maps and accepted development vegetation clearing code. The scope of the Act defines development that is for a relevant purpose and classes of RE. Vegetation is taken to be a native tree or plant, other than grass or non-woody herbage, a plant within a grassland RE prescribed under a regulation, or a mangrove.	Environment (vegetation)	Declaration of areas of high nature conservation value or vulnerable to land degradation Compliance and enforcement Development assessment Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	DOR
Water Act	<i>Water Regulation 2016</i> <i>Water Plan (Pioneer Valley) 2002</i> Statutory water plans	Focus—sustainable management of Queensland's water resources and quarry material, including water supply and demand management. The Act provides for the planning, allocation and use of water, and the allocation of quarry material and riverine protection. The scope of the Act includes making of activity guidelines, designation of water regions, and establishment of water authorities. Development application made under the <i>Planning Act 2016</i> involving levees, taking or interfering with water, or the removal of quarry material may be required to meet criteria set out in the Act or benefit from additional development rights under the Act.	Water Management	Compliance and enforcement Development assessment Operational registrations, permissions or limitations Standards, guidelines or reporting requirements Announced allocations and entitlements Water licensing	DES Department of Regional Development, Manufacturing and Water
<i>Work Health and Safety Act 2011</i>	<i>Work Health and Safety Regulation 2011</i>	Focus—protecting health and safety of workers and workplaces. The Act relies on the principle that people should be protected from harm to their health, safety and welfare from hazards and risks arising from work, substances or plant.	Safety (major hazard facilities)	Compliance and enforcement Operational registrations, permissions or limitations Standards, guidelines or reporting requirements	Department of Education

15.1.3 Local government

Instrument	Focus of the instrument	Primary topic	Management measures	Local government
WRC Planning Scheme	The WRC Planning Scheme sets out WRC's intention for the future development in the planning scheme area over the next 20 years to 2036. The scheme seeks to advance state and regional policies through more detailed local responses, taken account of the local context. The planning scheme provides for what development should occur, where, when and how development should occur, and what assessment process is required.	Planning and development	Strategic intent Zones and overlays Assessment benchmarks LGIP Planning scheme policies	WRC

15.2 Appendix B: Queensland planning system (State Planning Policy)



15.3 Appendix C: State Planning Policy (State interest and key policy matters)

State interest	Summary of key relevant policy matters
1. Housing supply and diversity	Related values mapped within the study area: nil <ul style="list-style-type: none"> diverse, affordable and comprehensive range of housing options in accessible and well-serviced locations.
2. Liveable communities	Related values mapped within the study area: nil <ul style="list-style-type: none"> a mix of land uses that meet the diverse demographic, social, cultural, economic and lifestyle needs of the community maintain or enhance opportunities for public access and use of the natural environment connected pedestrian, cycling and public transport infrastructure networks.
3. Agriculture	Related values mapped within the study area: important agricultural areas, agricultural land classification class A and B, support agriculture development opportunities in important agricultural areas <ul style="list-style-type: none"> protect agricultural land classification class A and B land fisheries resources (long-term fisheries productivity, sustainability and accessibility) are protected from development protect existing and proposed agricultural land uses from impacts of incompatible uses
4. Development and construction	Related values mapped within the study area: SDAs <ul style="list-style-type: none"> appropriate infrastructure required to support all land uses is planned for and provided SDAs are supported by compatible and complementary land uses and services on surrounding land public benefit outcomes on state-owned land are achieved by appropriately zoning the land.
5. Mining and extractive resources	Related values mapped within the study area: nil <ul style="list-style-type: none"> the importance of areas identified as having valuable minerals, coal, petroleum and gas resources, and areas of mining and resource tenures are considered opportunities for mutually beneficial co-existence between coal, minerals, petroleum and gas resource development operations and other land uses are facilitated.
6. Tourism	Related values mapped within the study area: nil <ul style="list-style-type: none"> existing and potential opportunities, localities or areas appropriate for tourism development are protected sustainable tourism development is facilitated infrastructure to support and enable tourism development is planned
7. Biodiversity	Related values mapped within the study area: MSES – protected areas, wildlife habitat, regulated vegetation, high ecological significance wetlands <ul style="list-style-type: none"> development avoids or minimises adverse impacts on matters of national, state or local interest ecological processes and connectivity are maintained or enhanced by avoiding fragmentation of matters of environmental significance.

State interest	Summary of key relevant policy matters
8. Coastal environment	<p>Related values mapped within the study area: CMD</p> <ul style="list-style-type: none"> coastal processes and coastal resources are protected including in the GBR catchment (through infill development, conserving the natural state of landforms, wetlands and native vegetation in the CMD, maintaining or enhancing the scenic amenity and aesthetic values of important natural coastal landscapes, views and vistas) marine infrastructure avoids adverse impacts on coastal resources and processes reclamation of land under tidal water is avoided other than where related to strategic ports, priority ports or boat harbours in accordance with a statutory land use plan or master plan areas adjoining tidal water is preferably limited to coastal-dependent development public safety and coastal resources are protected or enhanced.
9. Cultural heritage	<p>Related values mapped within the study area: State Heritage Place</p> <ul style="list-style-type: none"> matters of Aboriginal cultural heritage and Torres Strait Islander cultural heritage are appropriately conserved and considered.
10. Water quality	<p>Related values mapped within the study area: water resource catchments</p> <ul style="list-style-type: none"> development facilitates the protection or enhancement of environmental values and the achievement of water quality objectives for Queensland waters development in water resource catchments and water supply buffer areas avoids potential adverse impacts on surface waters and groundwaters.
11. Emissions and hazardous activities	<p>Related values mapped within the study area: nil</p> <ul style="list-style-type: none"> protect sensitive land uses and the natural environment from adverse impacts of emissions from industrial development, major gas, waste and sewerage infrastructure, and sport and recreation activities the health and safety risks to communities and individuals are protected from risks associated with hazardous materials, prescribed hazardous chemicals, dangerous goods, and flammable or combustible substances prescribed hazardous chemicals stored are located to minimise the risk of flood inundation and dispersion people and property are protected from the risk of adverse impacts from previous land uses protect industrial development, major infrastructure, and sport and recreation from encroachment that would compromise their ability to function safely and effectively mitigation of adverse impacts from emissions and hazardous activities natural and built environment, and human health are protected from potential adverse impacts from ASS.
12. Natural hazards, risk and resilience	<p>Related values mapped within the study area: flood hazard area, bushfire prone area, erosion prone area, storm tide inundation area</p> <ul style="list-style-type: none"> development avoids natural hazards areas or otherwise mitigates risk to people and property development in natural hazard areas does not increase risk associated with the hazard public safety and the environment are protected from risks associated with the storage of hazardous materials and their release as a result of a natural hazard development maintains or enhances the protective function of landforms and vegetation that can mitigate risks associated with the natural hazard

State interest	Summary of key relevant policy matters
	<ul style="list-style-type: none"> functionality of community infrastructure is not adversely impacted from a natural hazard event coastal protection work in an erosion prone area is undertaken only as a last resort where coastal erosion or inundation presents an imminent threat to public safety.
13. Energy and water supply	<p>Related values mapped within the study area: nil</p> <ul style="list-style-type: none"> the integrity, and the efficient delivery and functioning of the major electricity infrastructure locations and corridors are protected major electricity infrastructure and electricity substations are protected from encroachment by sensitive land uses land uses and the natural environment are protected from adverse impacts of major electricity infrastructure the development and supply of renewable energy at the regional, local and individual scale is enabled.
14. Infrastructure integration	<p>Related values mapped within the study area: nil</p> <ul style="list-style-type: none"> development achieves a high level of integration with infrastructure planning development is located to enable the cost-effective delivery of state and local infrastructure to service development the ability of infrastructure and associated services to operate safely and efficiently is protected from development.
15. Transport infrastructure	<p>Related values mapped within the study area: state-controlled road, railway corridor</p> <ul style="list-style-type: none"> development is located to enable cost-effective delivery of new transport infrastructure to service development development is not adversely affected environmental emissions generated by transport infrastructure development is compatible with, or supports the most efficient use of, state transport infrastructure the safety and efficiency of state transport infrastructure, corridors and networks are not adversely affected by development.
16. Strategic airports and aviation facilities	<p>Related values mapped within the study area: nil</p> <ul style="list-style-type: none"> the safety, efficiency and operational integrity of strategic airports are protected development does not increase risks to aircraft safety and public safety development is not adversely affected by noise generated by aircraft development supports the economic importance of the strategic airport the functioning of aviation facilities is protected key transport corridors (passenger and freight) linking strategic airports to the broader transport network are identified and protected.
17. Strategic ports	<p>Related values mapped within the study area: strategic ports (see Table 4 for state interest 17 - Strategic ports)</p>

15.4 Appendix D: State Development Assessment Provisions (State codes and purpose)

State code	Purpose statement
State code 1: Development in a state-controlled road environment	<p>The purpose of this code is to protect the safety, function and efficiency of state-controlled roads, future state-controlled roads, road transport infrastructure, active transport infrastructure and public passenger services on state-controlled roads from adverse impacts of development. The code is intended to protect the safety of people using, and living or working near, state-controlled roads.</p> <p>Specifically, this code seeks to ensure development:</p> <ol style="list-style-type: none"> 1. does not increase the likelihood or frequency of accidents, fatalities or serious injury for users of a state-controlled road 2. does not adversely impact the structural integrity or physical condition of state-controlled roads, road transport infrastructure, public passenger transport infrastructure or active transport infrastructure 3. does not adversely impact the function and efficiency of state-controlled roads or future state-controlled roads 4. does not adversely impact the state's ability to plan, construct, maintain, upgrade or operate state-controlled roads, future state-controlled roads or road transport infrastructure 5. does not significantly increase the cost to the state to plan, construct, upgrade or maintain state-controlled roads, future state-controlled roads or road transport infrastructure 6. maintains or improves access to public passenger transport infrastructure or active transport infrastructure 7. does not adversely impact the state's ability to operate public passenger services on state-controlled roads 8. protects community amenity from significant adverse impacts of environmental emissions generated by road transport infrastructure or vehicles using state-controlled roads.
State code 2: Development in a railway environment	<p>The purpose of the code is to protect railway corridors, future railway corridors, rail transport infrastructure and other rail infrastructure from adverse impacts of development. The purpose of this code is also to protect the safety of people using, and living and working near, railways.</p> <p>Specifically, this code seeks to ensure development:</p> <ol style="list-style-type: none"> 1. does not result in an increase in the likelihood or frequency of accidents, fatalities or serious injury for users of a railway 2. does not adversely impact the structural integrity or physical condition of railways, rail transport infrastructure or other rail infrastructure within a railway corridor 3. does not compromise the operating performance of railway corridors 4. does not adversely impact the state's ability to plan, construct, maintain, upgrade or operate railway corridors, future railway corridors and associated rail transport infrastructure or other rail infrastructure 5. does not significantly increase the cost to the state to plan, construct, maintain, upgrade or operate railway corridors, future railway corridors, rail transport infrastructure or other rail infrastructure 6. does not compromise pedestrian or cycle access to public passenger transport infrastructure or active transport infrastructure associated with railways 7. protects the community from significant adverse impacts resulting from environmental emissions generated by a railway.
State code 6: Protection of	The purpose of this code is to:

State code	Purpose statement
state transport networks	<ol style="list-style-type: none"> 1. protect state transport infrastructure, public passenger transport infrastructure, active transport infrastructure and public passenger services from the adverse impacts of development 2. maintain the operating performance of the transport network 3. ensure development enables safe and convenient access to public passenger transport. <p>Specifically, this code seeks to ensure development:</p> <ol style="list-style-type: none"> 1. does not create a safety hazard for users of state transport infrastructure or public passenger services by increasing the likelihood or frequency of a fatality or serious injury 2. does not result in a worsening of the physical condition or operating performance of the state transport network 3. does not compromise the state's ability to cost-effectively construct, operate and maintain state transport infrastructure 4. provides public passenger transport infrastructure to enable development to be serviced by public passenger transport 5. provides safe and direct access to public passenger transport infrastructure or active transport infrastructure, including access by cycling and walking.
State code 7: Maritime safety	<p>The purpose of the code is to protect the safety of people using, and living or working near, navigable waterways.</p> <p>Specifically, this code seeks to ensure the construction and operation of the development does not compromise the:</p> <ol style="list-style-type: none"> 1. viable operation of aids to navigation 2. safe operation of vessels in navigable waterways.
State code 8: Coastal development and tidal works	<p>The purpose of this code is to ensure that development is designed and located to:</p> <ol style="list-style-type: none"> 1. protect life, buildings and infrastructure from the impacts of coastal erosion 2. maintain coastal processes 3. conserve coastal resources 4. maintain appropriate public use of, and access to and along, state coastal land 5. account for the projected impacts of climate change 6. avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 7. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided. <p>In addition to the above, the purpose of this code is to ensure that development involving operational works which is not assessed by local government is designed and located to protect life and property from the impacts of storm tide inundation.</p>
State code 9: GBR wetland protection areas	<p>The purpose of this code is to ensure that development involving high impact earthworks in a wetland protection area:</p> <ol style="list-style-type: none"> 1. is located outside of a wetland 2. does not have an unacceptable impact on wetland environmental values 3. is designed and located to avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 4. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.
State code 10: Taking or	<p>The purpose of this code is to ensure sustainable management of water by ensuring that development:</p>

State code	Purpose statement
interfering with water	<ol style="list-style-type: none"> 1. maintains: <ol style="list-style-type: none"> a. natural ecosystem processes b. riverine environments c. underground water systems d. physical integrity of watercourses 2. does not result in an adverse impact on: <ol style="list-style-type: none"> a. connectivity between underground water and water in a watercourse, lake or spring b. property of others c. the water security of other users and their access to the water resource. 3. minimises the volume of overland flow water taken, consistent with the development 4. minimises the take of contaminated agricultural run-off water 5. in the Queensland Murray Darling Basin, allows for the capture of contaminated agricultural run-off water and release of water when an acceptable water quality is achieved.
State code 11: Removal, destruction or damage of marine plants	<p>The purpose of this code is to ensure that development which involves the removal, destruction or damage of marine plants and fish habitat:</p> <ol style="list-style-type: none"> 1. maintains the extent, distribution, diversity and condition of marine plant communities and protects the ecological functions to which they contribute 2. maintains the health and productivity of fisheries resources and fish habitat 3. minimises impacts on the management, use, development and protection of fisheries resources and fish habitat 4. is designed and located to avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 5. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.
State code 15: Removal of quarry material from a watercourse or lake	<p>The purpose of the code is to provide for the removal of quarry material from a watercourse or lake in a way that ensures the sustainable management of water resources and quarry material and is undertaken in a way to maintain natural environments and processes.</p>
State code 16: Native vegetation clearing	<p>The purpose of this code is to ensure development:</p> <ol style="list-style-type: none"> 1. avoids clearing, or where avoidance is not reasonably possible, minimises clearing to: <ol style="list-style-type: none"> a. conserve vegetation b. avoid land degradation c. avoid the loss of biodiversity d. maintain ecological processes. 2. minimises contributions to greenhouse gas emissions

State code	Purpose statement
	<ol style="list-style-type: none"> 3. for vegetation retention purposes, is undertaken in a manner that retains or regenerates vegetation by sustainably managing the impacts of the clearing on RE, biodiversity and ecological processes over time 4. is consistent with any notice requiring compliance on the land subject to the development application unless a better environmental outcome can be achieved 5. is consistent with vegetation management requirements for particular regulated areas unless a better environmental outcome can be achieved 6. avoids impacts on vegetation and minimises and mitigates impacts on vegetation where avoidance is not possible 7. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided (where appropriate). An offset is not appropriate for acceptable significant residual impacts on a connectivity area unless the clearing is for development that is a coordinated project, natural channel diversion or contaminants removal.
State code 17: Aquaculture	<p>The purpose of this code is to ensure aquaculture industry development and practices are ecologically sustainable. The code ensures that development:</p> <ol style="list-style-type: none"> 1. maintains the health and productivity of fisheries resources, fish habitat and the natural environment 2. maintains commercial, recreational, and Indigenous fishing access 3. manages the health and productivity of aquaculture fisheries resources.
State code 18: Constructing or raising waterway barrier works in fish habitats	<p>The purpose of this code is to ensure that development involving the constructing or raising of waterway barrier works in a fish habitat:</p> <ol style="list-style-type: none"> 1. maintains fish movement and connectivity throughout waterways and within and between fish habitats 2. maintains the health and productivity of fisheries resources and fish habitat 3. maintains the community and fishing sectors' use of the area and access to fisheries resources 4. provides adequate fish passage including a fish way, if necessary 5. avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 6. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.
State code 21: Hazardous chemical facilities	<p>The development is designed and sited, so far as reasonably practicable, to ensure:</p> <ol style="list-style-type: none"> 1. human health and safety, and the built environment are protected from off-site risks resulting from physical or chemical hazards 2. hazardous chemical facilities are protected from: <ol style="list-style-type: none"> a. off-site hazard scenarios at existing hazardous chemical facilities b. natural hazards.
State code 22: Environmentally relevant activities	<p>The purpose of the code is to ensure that ERAs:</p> <ol style="list-style-type: none"> 1. are located and designed to avoid or mitigate environmental harm on environmental values of the natural environment, adjacent sensitive land uses and sensitive receptors 2. are designed and located to avoid impacts or, where the MSES cannot be reasonably avoided, impacts are reasonably minimised and mitigated 3. does not result in a significant residual impact on a MSES unless the significant residual impact is acceptable, and an offset is provided.
State code 23: Wind farms	<p>The purpose of the code is to protect individuals, communities and the environment from adverse impacts resulting from the construction, operation and decommissioning of wind farm development.</p>

State code	Purpose statement
	<p>Wind farms should be appropriately located, sited, designed, constructed and operated to ensure:</p> <ol style="list-style-type: none"> 1. the safety, operational integrity and efficiency of air services and aircraft operations 2. risks to people, property and quality of life are minimised by providing acceptable levels of: a. amenity and acoustic emissions at sensitive land uses; and b. resilience to natural hazards 3. development minimises adverse impacts on the natural environment, vegetation and associated ecological processes 4. development in an area identified by a local government as having high scenic amenity appropriately manages impacts on the character, scenic amenity and landscape values of the locality 5. the safe and efficient operation of transport networks and road infrastructure.

15.5 Appendix E: Regional Plan (Desired regional outcomes)

Title	Desired regional outcomes and principles
1. Sustainability, climate change and natural hazards	<p>The region grows and changes in a sustainable manner generating prosperity, maintaining and enhancing quality of life, minimising the use of resources, providing high levels of environmental protection, reducing greenhouse gas emissions, and increasing resilience to natural hazards and the anticipated effects of climate change.</p> <p>Principles</p> <p>1.1 Sustainability: Decision-making supports ecologically sustainable development.</p> <p>1.2 Climate change: The generation of greenhouse gases is reduced through land-use planning and development design, and long-term climate change impacts are considered in planning decisions.</p> <p>1.3 Natural hazards: The resilience of communities, development, essential infrastructure, natural environments and economic sectors to recognised hazards, including the anticipated effects of climate change, is increased.</p>
2. Regional landscapes	<p>Environmental, economic, social and cultural values of the regional landscape are identified and secured to meet community needs and achieve ecological sustainability.</p> <p>Principles</p> <p>2.1 Regional landscape values: Manage and enhance the values of the regional landscape to optimise their ability to contribute to the region's liveability, lifestyle, health and economy.</p> <p>2.2 Regional landscape areas: Optimise multiple community benefits through coordinated planning, management and investment in regional landscape areas.</p> <p>2.3 Green space network: An integrated green space network caters for a range of community and environmental needs.</p>
3. Environment	<p>A healthy and resilient natural environment supports the region's rich biodiversity and ecosystem services, which contribute to the economic development and social and cultural identity of the region.</p> <p>Principles</p>

Title	Desired regional outcomes and principles
	<p>3.1 Biodiversity: The region's natural assets, biodiversity values and ecological services are protected, managed and enhanced to improve their resilience to the anticipated effects of climate change and other threats.</p> <p>3.2 Water quality, waterway health and wetlands: The ecological health, environmental values and water quality of coastal, surface, ground waters and wetlands are protected.</p> <p>3.3 Coastal environment: Coastal resources are managed while protecting human life and property from the hazards of natural fluctuations in coastal processes.</p> <p>3.4 Air quality and noise: The environment is protected to maintain the health and wellbeing of the community and the natural environment through effective management of air quality and noise.</p>
4. Natural resource management	<p>Regional natural resources and primary production areas continue to provide cultural, social, economic and environmental values to the region, while being protected, managed, enhanced and used sustainably.</p> <p>Principles</p> <p>4.1 Natural resource management: The management and use of natural resources enhance community, economic and landscape values.</p> <p>4.2 Ecosystem-dependent economic resource: Ecosystems are sustainably managed, ensuring their cultural, social, economic and environmental services and values are protected.</p> <p>4.3 Mineral and extractive industries: Mineral, petroleum and extractive resources are managed for current and future use, and their extraction, processing, transport and downstream value-adding continue to contribute to the economy.</p> <p>4.4 Planning and managing agricultural land: The region's agricultural production areas are protected and sustainably managed to ensure their continuing contribution to the economy, and to mitigate the anticipated effects of climate change.</p> <p>4.5 Regional water supply planning: Water, as a valuable and finite regional resource, is planned and managed on a total water cycle basis.</p> <p>4.6 Total water cycle management: Water is recognised as a valuable and finite resource which is managed on a total water cycle basis.</p>
5. Strong communities	<p>The region has vibrant, inclusive, safe, active and healthy communities, where a range of social services are accessible by all, and where unique cultural heritage and diversity is acknowledged, valued and celebrated.</p> <p>Principles</p> <p>5.1 Social planning: Social planning is incorporated into planning processes to manage and respond to changing communities, and support community wellbeing and quality of life.</p> <p>5.2 Addressing social and locational disadvantage: Social and locational disadvantage in communities is recognised and addressed.</p> <p>5.3 Healthy and safe communities: Quality of life is enhanced by offering healthy and safe environments that promote active living and healthy lifestyles and provide accessible health services.</p> <p>5.4 Community engagement, capacity building and identity: Strong, connected and functional communities exist as a result of grassroots community development, engagement and participation, and maintaining and improving a community's sense of shared identity.</p> <p>5.5 Strengthening resource communities: The long-term viability of resource communities is sustained by enhancing liveability, providing diverse housing and employment options and accommodating the needs of the resource sector.</p> <p>5.6 Engaging Aboriginal and Torres Strait Islander people: Traditional Owners and Elders are actively engaged in planning and development processes, and their connectivity with Country is understood, considered and respected.</p>

Title	Desired regional outcomes and principles
	5.7 Aboriginal and Torres Strait Islander social and economic equity: Aboriginal and Torres Strait Islander people have equitable access to opportunities that promote a high standard of living, good economic prospects and general wellbeing.
6. Strong economy	<p>A thriving regional economy that is sustainable, resilient and robust, and advances the prosperity and liveability of communities across the region.</p> <p>Principles</p> <p>6.1 Economic leadership and coordination: Strong economic leadership attracts, coordinates and drives regional economic development, innovation and investment.</p> <p>6.2 Integrated economic, land use and infrastructure planning: Suitable land, infrastructure and facilities are available and managed to enable sustainable economic and employment growth in the region.</p> <p>6.3 Resilient and sustainable economy: The economy grows through increasing levels of human-capital, knowledge-capital and natural-capital and is resilient to external factors through multiple strong industry sectors that provide diverse employment opportunities.</p> <p>6.4 Primary industries: Maintain existing and expand sustainable and economically viable primary industries and diversify opportunities in the region.</p> <p>6.5 Resource sector: Manage mining and extractive resources to maximise economic opportunities and other community benefits, while minimising negative environmental and social impacts for present and future generations.</p> <p>6.6 Tourism: Continue to develop the region's distinctive and sustainable tourist destinations, which offer a diverse range of activities and unique experiences to attract domestic and international visitors.</p>
7. Managing growth	<p>An efficient and sustainable settlement pattern that supports the efficient use and delivery of urban land and infrastructure, housing choice and affordability and well-planned development areas to accommodate further growth.</p> <p>Principles</p> <p>7.1 Efficient use of land: Land and infrastructure are used efficiently, taking into account costs of servicing, projected demand on/from existing urban infrastructure and employment.</p> <p>7.2 Planning for growth: DA Rules and Identified Growth Areas are secured for delivering medium and long-term growth opportunities, and catering for projected demand requires comprehensive planning and infrastructure delivery.</p> <p>7.3 Rural residential development: Rural residential development is planned to ensure efficient delivery of services and infrastructure, preventing further fragmentation of agricultural land, and avoiding loss of areas with biodiversity and landscape values.</p> <p>7.4 Housing choice and affordability: Housing meets the needs of the community, considering all lifecycle stages, varying demands, and economic circumstances.</p>
8. Urban form	<p>The towns and cities of the region are accessible and build on their heritage, character and liveability through designs that respond to the natural environment and the provision of high-quality urban green space.</p> <p>Principles</p> <p>8.1 Urban form: The form of the region's cities and towns responds to local climate, character and identity, and supports compact, accessible, active and healthy communities.</p> <p>8.2 Heritage, arts and cultural development: The region's unique heritage places and experiences are identified, protected and valued, with further opportunities for arts and cultural development provided.</p>

Title	Desired regional outcomes and principles
	<p>8.3 Centres: Regional centres and towns are the focal point for the provision of retail, commercial and community services, economic growth and diversity.</p> <p>8.4 Rural communities: Rural communities benefit from growth and are serviced by appropriate levels of infrastructure and support services.</p>
9. Infrastructure	<p>The region's communities have access to well-planned, coordinated, accessible, sustainable and reliable infrastructure.</p> <p>Principles</p> <p>9.1 Infrastructure planning: Efficient, well-planned infrastructure supports population growth, economic opportunities and service provision in a sustainable manner.</p> <p>9.2 Protecting key sites and corridors: Current and future infrastructure sites and corridors are identified, protected and managed.</p> <p>9.3 Energy: Energy is reliably provided to support growth in an economically and ecologically sustainable manner.</p> <p>9.4 Information and communication technology: All communities in the region are provided with modern, reliable, accessible and affordable information and communication services.</p> <p>9.5 Waste and recycling: The region's waste is minimised, re-used or recycled, and promotes energy recovery.</p> <p>9.6 Sewerage: The provision and management of sewage treatment infrastructure is planned, timed and managed, and is protected from encroachment by incompatible development.</p> <p>9.7 Social infrastructure: Social infrastructure is planned and located, accessible, adaptable and responsive to demographic change.</p>
10. Transport	<p>An integrated and efficient transport system and network that supports and responds to growth consistent with the intended settlement pattern, economic development and community needs.</p> <p>Principles</p> <p>10.1 Integrated transport and land use: Provide highly connected transport networks to facilitate strong links within and between communities and activity centres to enable high levels of accessibility, route and mode choice.</p> <p>10.2 Efficient, accessible and safe transport: An efficient, sustainable and integrated transport system exists for the region that is safe and accessible.</p> <p>10.3 Freight: The efficient and effective movement of freight supports regional growth.</p>

15.6 Appendix F: Guidelines for local government 2021 (State Planning Policy)

State interest	Regional plan land use planning policy alignment
Housing supply and diversity	<p>Regional Policy – Strong communities</p> <ul style="list-style-type: none"> • Principle 5.1.1, Land use policies 5.1.2, 5.1.3, 5.1.4 and 5.1.5 • Principle 5.5.1, Land use policies 5.5.2, 5.5.3, 5.5.4, 5.5.5, 5.5.6, 5.5.7 and 5.5.8. <p>Regional Policy – Managing growth</p> <ul style="list-style-type: none"> • Principle 7.3.1, Land use policies 7.3.2, 7.3.3, 7.3.4, 7.3.5, 7.3.6 and 7.3.7 • Principle 7.4.1, Land use policies 7.4.2, 7.4.3, 7.4.4, 7.4.5, 7.4.6, 7.4.7 and 7.4.8. <p>Regional Policy – Urban form</p> <ul style="list-style-type: none"> • Principle 8.4.1, Land use policies 8.4.2, 8.4.3, 8.4.4, 8.4.5, 8.4.6, 8.4.7, 8.4.8, 8.4.9 and 8.4.10.
Liveable communities	<p>Regional Policy – Regional landscapes</p> <ul style="list-style-type: none"> • Principle 2.1.1, Land use policy 2.1.2. <p>Regional Policy – Strong communities</p> <ul style="list-style-type: none"> • Principle 5.2.1, Land use policies 5.2.2, 5.2.3, 5.2.4 and 5.2.5 • Principle 5.3.1, Land use policies 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.6, 5.3.7 and 5.3.8 • Principle 5.4.1, Land use policies 5.4.2, 5.4.3, 5.4.4, 5.4.5, 5.4.6, 5.4.7, 5.4.8 and 5.4.9. <p>Regional Policy – Urban form</p> <ul style="list-style-type: none"> • Principle 8.1.1, Land use policies 8.1.2, 8.1.3, 8.1.4, 8.1.5, 8.1.6, 8.1.7, 8.1.8, 8.1.9, 8.1.10, 8.1.11 and 8.1.12. <p>Regional Policy – Infrastructure planning</p> <ul style="list-style-type: none"> • Principle 9.4.1, Land use policy 9.4.2 • Principle 9.7.1, Land use policies 9.7.2, 9.7.3, 9.7.4 and 9.7.5.
Agriculture	<p>Regional Policy – Natural resource management</p> <ul style="list-style-type: none"> • Principle 4.1.1, Land use policies 4.1.2 and 4.1.3 • Principle 4.4.1, Land use policies 4.4.2, 4.4.3, 4.4.4, 4.4.5, 4.4.6, 4.4.7, 4.4.8 and 4.4.9. <p>Regional Policy – Strong economy</p> <ul style="list-style-type: none"> • Principle 6.4.1, Land use policies 6.4.2, 6.4.3, 6.4.4, 6.4.5 and 6.4.6.
Development and construction	<p>Regional Policy – Strong economy</p> <ul style="list-style-type: none"> • Principle 6.1.1, Land use policies 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.1.6, 6.1.6, 6.1.7, 6.1.8, 6.1.9, 6.1.10, 6.1.11, 6.1.12 and 6.1.13 • Principle 6.2.1, Land use policies 6.2.3, 6.2.4, 6.2.5, 6.2.6, 6.2.7, 6.2.8 and 6.2.9 • Principle 6.3.1, Land use policies 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.6, 6.3.7, 6.3.8, 6.3.9, 6.3.10, 6.3.11, 6.3.12, 6.3.13 and 6.3.14. <p>Regional Policy – Managing growth</p>

State interest	Regional plan land use planning policy alignment
	<ul style="list-style-type: none"> • Principle 7.1.1, Land use policies 7.1.2, 7.1.3, 7.1.4, 7.1.5, 7.1.6, 7.1.7, 7.1.8, 7.1.9, 7.1.10, 7.1.11 and 7.1.12. Regional Policy – Urban form <ul style="list-style-type: none"> • Principle 8.3.1, Land use policies 8.3.2, 8.3.3, 8.3.4, 8.3.5, 8.3.6, 8.3.7, 8.3.8 and 8.3.9.
Mining and extractive resources	Regional Policy – Natural resource management <ul style="list-style-type: none"> • Principle 4.3.1, Land use policies 4.3.2, 4.3.3, 4.3.4 and 4.3.5. Regional Policy – Strong economy <ul style="list-style-type: none"> • Principle 6.5.1, Land use policies 6.5.2, 6.5.3, 6.5.4, 6.5.5 and 6.5.6.
Tourism	Regional Policy – Strong economy <ul style="list-style-type: none"> • Principle 6.6.2, Land use policies 6.6.2, 6.6.3, 6.6.4, 6.6.5, 6.6.6, 6.6.7, 6.6.8, 6.6.9, 6.6.10, 6.6.11, 6.6.12 and 6.6.13.
Biodiversity	Regional Policy – Sustainability, climate change and natural hazards <ul style="list-style-type: none"> • Principle 1.1.1, Land use policy 1.1.2. Regional Policy – Regional landscapes <ul style="list-style-type: none"> • Principle 2.2.1, Land use policies 2.2.2 and 2.2.3 • Principle 2.3.1, Land use policies 2.3.2, 2.3.3 and 2.3.4. Regional Policy – Environment <ul style="list-style-type: none"> • Principle 3.1.1, Land use policies 3.1.2, 3.1.3 and 3.1.4. Regional Policy – Natural resource management <ul style="list-style-type: none"> • Principle 4.2.1, Land use policies 4.2.2, 4.2.3, 4.2.4, 4.2.5 and 4.2.6.
Coastal environment	Regional Policy – Environment <ul style="list-style-type: none"> • Principle 3.3.1, Land use policies 3.3.2, 3.3.3, 3.3.4, 3.3.5 and 3.3.6.
Cultural heritage	Regional Policy – Strong communities <ul style="list-style-type: none"> • Principle 5.6.1, Land use policies 5.6.2, 5.6.3, 5.6.4, 5.6.5, 5.6.6, 5.6.7, 5.6.8, 5.6.9 and 5.6.10 • Principle 5.7.1, Land use policies 5.7.3, 5.7.4, 5.7.5, 5.7.6 and 5.7.7. Regional Policy – Urban form <ul style="list-style-type: none"> • Principle 8.2.1, Land use policies 8.2.2, 8.2.3, 8.2.4, 8.2.5, 8.2.6, 8.2.7, 8.2.8 and 8.2.9.
Water quality	Regional Policy – Environment <ul style="list-style-type: none"> • Principle 3.2.1, Land use policies 3.2.2, 3.2.3, 3.2.4, 3.2.5 and 3.2.6.
Emissions and hazardous activities	Regional Policy – Sustainability, climate change and natural hazards <ul style="list-style-type: none"> • Principle 1.2.1, Land use policies 1.2.2, 1.2.3, 1.2.4, 1.2.5 and 1.2.6. Regional Policy - Environment

State interest	Regional plan land use planning policy alignment
	<ul style="list-style-type: none"> • Principle 3.4.1, Land use policies 3.4.2, 3.4.3 and 3.4.4. Regional Policy – Infrastructure planning <ul style="list-style-type: none"> • Principle 9.5.1, Land use policies 9.5.2, 9.5.3, 9.5.4 and 9.5.5 • Principle 9.6.1, Land use policies 9.6.2, 9.6.3, 9.6.4, 9.6.5, 9.6.6 and 9.6.7.
Natural hazards, risk and resilience	Regional Policy – Sustainability, climate change and natural hazards <ul style="list-style-type: none"> • Principle 1.3.1, Land use policies 1.3.2, 1.3.3, 1.3.4, 1.3.5 and 1.3.6.
Energy and water supply	Regional Policy – Natural resource management <ul style="list-style-type: none"> • Principle 4.5.1, Land use policies 4.5.2, 4.5.3, 4.5.4, 4.5.5 and 4.5.6 • Principle 4.6.1, Land use policies 4.6.2, 4.6.3, 4.6.4, 4.6.5 and 4.6.6 Regional Policy – Infrastructure planning <ul style="list-style-type: none"> • Principle 9.3.1, Land use policies 9.3.2, 9.3.3, 9.3.4, 9.3.5, 9.3.6 and 9.3.7.
Infrastructure integration	Regional Policy – Managing growth <ul style="list-style-type: none"> • Principle 7.2.1, Land use policies 7.2.2, 7.2.3 and 7.2.4. Regional Policy – Infrastructure planning <ul style="list-style-type: none"> • Principle 9.1.1, Land use policies 9.1.3, 9.1.4, 9.1.5 and 9.1.6 • Principle 9.2.1, Land use policies 9.2.2, 9.2.3 and 9.2.4.
Transport infrastructure	Regional Policy – Transport <ul style="list-style-type: none"> • Principle 10.1.1, Land use policies 10.1.2, 10.1.3, 10.1.4, 10.1.5, 10.1.6, 10.1.7, 10.1.8, 10.1.9, 10.1.10, 10.1.11, 10.1.12 and 10.1.13 • Principle 10.2.1, Land use policies 10.2.2, 10.2.3, 10.2.4, 10.2.5, 10.2.6, 10.2.7, 10.2.8, 10.2.9, 10.2.10 and 10.2.11.
Strategic airports and aviation facilities	Regional Policy – Transport <ul style="list-style-type: none"> • Principle 10.3.1, Land use policies 10.3.2, 10.3.3, 10.3.4 and 10.3.5.
Strategic ports	N/A.

15.7 Appendix G: Whitsunday Regional Planning Scheme (Themes and key considerations)

Theme	Key outcomes
Liveable community and housing	Under this theme, development seeks to: <ul style="list-style-type: none"> • enhance or restore the educational, health, cultural and recreational capacity and resilience of the community and communication infrastructure • support the regional settlement pattern and hierarchy of centres.
Economic growth	Under this theme, development seeks to: <ul style="list-style-type: none"> • protect and enhance the region's wealth creation and employment generating capacities across key sectors.
Environment and heritage	Under this theme, development seeks to: <ul style="list-style-type: none"> • conserve, enhance or restore the cultural heritage and life-supporting capacities of air, ecosystems, soil and water for both present and future generations • protect biological resilience.
Safety and resilience to hazards	Under this theme, development seeks to: <ul style="list-style-type: none"> • protect and enhance the safety of the community, property and infrastructure for present and future generations • enhance community resilience to hazards.
Infrastructure	This strategic outcome seeks that service-supporting capacities of infrastructure are coordinated, efficient and orderly. It also seeks the provision and operation of infrastructure is financially sustainable.

15.8 Appendix H: Whitsunday Regional Planning Scheme (Zone codes and precincts)

Zones	Zone/Precinct intent	Intended uses
Industry Investigation Area Zone	<p>The purpose of the Industry investigation zone is to:</p> <ul style="list-style-type: none"> • identify and protect land that may be suitable for industry activities • ensure that development is designed and coordinated to support compatible industry activities. 	<p>Preferred land uses include:</p> <ul style="list-style-type: none"> • business • entertainment • industry • community • recreation • rural • utility installation activities.
Environmental Management and Conservation Zone	<p>The purpose of the environmental management and conservation zone is to provide for the protection and maintenance of areas identified as supporting significant biological diversity and ecological integrity.</p>	<p>Preferred land uses include recreational activities limited to parks and utility installation where significant impacts on environmental systems and processes are avoided.</p>
Communities Facilities Zone	<p>The purpose of the Community Facilities Zone is to provide for community related activities and facilities whether under public or private ownership.</p>	<p>The predominant form of development within the zone is community activities and other community-oriented uses including:</p> <ul style="list-style-type: none"> • municipal services • public utilities • government installations • hospitals • schools • transport and telecommunications networks • community infrastructure of an artistic, social or cultural nature.
Rural Zone	<p>The purpose of the Rural Zone is to provide for:</p> <ul style="list-style-type: none"> • a wide range of rural uses, including cropping, intensive horticulture and other primary production activities • non-rural uses that are compatible with agriculture • the protection and management of significant natural features, resources, and processes. 	<p>The predominant form of development within the zone is residential accommodation, community use, recreation park and rural activities.</p>

15.9 Appendix I: Whitsunday Regional Planning Scheme (Overlay codes)

Overlay	Purpose and overall outcomes
ASS Overlay Code	<p>The purpose of the ASS Overlay Code is to ensure that the generation, or release, of acid and associated metal contaminants from ASS does not have significant adverse effects on the natural environment, built environment, infrastructure or human health.</p> <p>The purpose of the code is achieved through the following overall outcomes:</p> <ul style="list-style-type: none"> • development ensures that the release of acid and associated metal contaminants into the environment is avoided by either: <ul style="list-style-type: none"> a. not disturbing ASS when excavating or otherwise removing soil or sediment, extracting groundwater or filling land or b. treating and, if required, undertaking ongoing management of any disturbed ASS and drainage waters.
Agricultural Land Overlay Code	<p>The purpose of the Agricultural Land Overlay Code is to ensure that agricultural land is protected from development that may lead to its alienation, fragmentation or diminished productivity.</p> <p>The purpose of the agricultural land overlay code will be achieved through the following overall outcomes:</p> <ul style="list-style-type: none"> a. agricultural land is used for rural activities b. conflict between rural activities and sensitive uses is avoided c. development avoids adverse impacts on agricultural land from land degradation and stormwater runoff and d. the stock route network is protected.
Airport Environs Overlay Code	<p>The purpose of the Airport Environs Overlay Code is to protect the safety, efficiency and operational integrity of the region's airports and associated aviation facilities.</p> <p>The purpose of the Airport Environs Overlay Code is achieved through the following overall outcomes:</p> <ul style="list-style-type: none"> 1. development does not create incompatible intrusions, or compromise aircraft safety in operational airspace 2. development does not adversely affect the functioning of aviation facilities 3. development avoids increasing risk to public safety in public safety areas 4. development is compatible with forecast levels of aircraft noise within the 20 Aircraft Noise Exposure Forecast contour and greater and 5. sensitive land uses and other incompatible activities are appropriately located and designed, to not impact on airport operations.
Bushfire Hazard Overlay Code	<p>The purpose of the Bushfire Hazard Overlay Code is to provide for the assessment of:</p> <ul style="list-style-type: none"> a. the suitability of development in bushfire hazard areas to ensure that risk to life, property, community, economic activity and the environment during bushfire events is minimised b. development that maintains the safety of people and property by not exposing them to an unacceptable risk from bushfire events.

Overlay	Purpose and overall outcomes
Coastal Environmental Overlay Code	<p>The purpose of the Coastal Environmental Overlay Code seeks to ensure that development is designed, constructed and operated to:</p> <ul style="list-style-type: none"> a. protect, conserve, rehabilitate and manage the coast, including its resources and biological diversity b. avoid the social, financial and environmental costs arising from the adverse impacts of coastal hazards, taking into account the predicted effects of climate change c. preferentially use land on the coast for coastal-dependent development and d. ensure development maintains the safety of people and property.
Environmental Significance Overlay Code	<p>The purpose of the Environmental Significance Overlay Code is to ensure that:</p> <ul style="list-style-type: none"> a. matters of environmental significance are protected b. ecological connectivity and habitat extent are maintained or enhanced.
Extractive Resources Overlay Code	<p>The purpose of the Extractive Resources Overlay Code is to protect and maintain the sustainable and viable use of extractive resources within the region by preventing incompatible development and land uses from encroaching on the extractive resource/processing areas, the associated separation areas and transport routes.</p>
Flood Overlay Code	<p>The purpose of the Flood Hazard Overlay Code is to:</p> <ul style="list-style-type: none"> a. provide for the assessment of the suitability of development in the flood hazard overlay area, to ensure that risk to life, property, community, economic activity and the environment during flood events is minimised and b. ensure that development does not increase the potential for flood damage onsite or to other property, both upstream and downstream.
Heritage Overlay Code	<p>The purpose of the Heritage Overlay Code is to ensure development on a heritage place is compatible with the cultural heritage significance of the place outlined in the place card.</p>
Infrastructure Overlay Code	<p>The purpose of the Infrastructure Overlay Code is to ensure that development is compatible with, and does not adversely affect the viability, integrity, operation and maintenance of the following existing and planned infrastructure and facilities with the Whitsunday region:</p> <ul style="list-style-type: none"> a. major roads (state-controlled roads) b. railways c. major electricity infrastructure d. substations e. bulk water supply infrastructure f. gas pipelines g. strategic port h. public passenger transport facilities i. wastewater treatment facilities and j. waste management facilities.

Overlay	Purpose and overall outcomes
Landslide Overlay Code	<p>The purpose of the Landslide Overlay Code is to:</p> <ol style="list-style-type: none"> provide for the assessment of the suitability of development, in an area subject to landslide hazard, to ensure that risk to life, property, community, economic activity and the environment is minimised and ensure that development does not increase the potential damage from landslide events on site or to other property.
Waterways and Wetlands Overlay Code	<p>The purpose of the Waterways and Wetlands Overlay Code is to ensure that:</p> <ol style="list-style-type: none"> matters of environmental significance are protected ecological connectivity and habitat extent are maintained or enhanced wetlands and waterways are protected, maintained or enhanced and development in, or adjacent to, wetlands in a GBR catchment is planned, designed, constructed and operated to prevent the loss, or degradation of, the wetlands and their environmental values.

15.10 Appendix J: Local Government Infrastructure Plan (Future planned infrastructure)

Type	Reference No.	Trunk Infrastructure	Estimated Timing
Sewer Future Infrastructure	S3	Upgrade Bowen Sewer Treatment Plant capacity at Lot 207 RP800719 Elphinstone Street, Bowen, inclusive of a recycled local water system.	2021
Sewer Future Infrastructure	S4	Upgrade Sewer Pump Station 3 capacity to 62L/s @ 57m at Lot 1 RP725974 Dalrymple Street, Bowen (PS3).	2022–26
Sewer Future Infrastructure	S7	Upgrade Sewer Pump Station Z capacity to 92L/s @ 21m (Bowen Z).	2022–26

15.11 Appendix K: Priority Port of Abbot Point Land Use Plan (Precinct details)

Precinct	Intent	Preferred land uses
Port Handling Activities	<p>This area represents land that is strategic to the existing and future operations and development of the port.</p> <p>It provides for the core commercial business of the Port of Abbot Point and is intended to cater for the future extension of these core port activities.</p> <p>Port handling activities located at Abbot Point are far removed from residential communities.</p> <p>The designation includes areas utilised for the loading/unloading, stockpiling, and transfer of commodities. It also includes areas for land access.</p>	<p>Uses that facilitate the expansion, improvement or maintenance of Port Handling Activities are consistent with the intent of this precinct, including:</p> <ul style="list-style-type: none"> • storage of goods or materials (including stockpiles) • ancillary services, warehouses • port related services • transport infrastructure • quarantine waste facilities • maritime facilities, • extractive industry.
Offshore Port Infrastructure	<p>These areas are located offshore and include essential structures or infrastructure for vessels accessing the port and the transfer of materials/goods for shipment.</p> <p>New infrastructure must relate to the key activities being undertaken at the port.</p> <p>The designation allows for infrastructure such as dredged berth pockets and channels, swing basins and navigational aids or equipment that is important for protecting the function, commercial viability and safety of the port.</p> <p>It also allows for access to port infrastructure for maintenance and construction purposes.</p> <p>There is potential at the priority Port of Abbot Point for the development of a MCF through reclamation, which would complement the industrial growth in the APSDA as well provide facilities to support the export of coal from T2 and T3.</p>	<ul style="list-style-type: none"> • shipping – wharfage/docking facilities • tidal works including dredge channels and swing basins • loading/unloading infrastructure and facilities – Geotechnical investigations and surveys • reclamation for port infrastructure • construction and operation of a MCF including any reclamation required – Industry uses on the MCF • temporary site offices and construction laydown areas • disposal of dredged material.
Port related and support designation	<p>Land within this designation is to accommodate activities that have a strong physical, operational or supporting role to the core operations in the Port Handling Activities area.</p> <p>The designation includes activities that contribute to port efficiency by shortening the supply chain or providing logistical benefits.</p> <p>Uses that relate to the expansion of the port are compatible and industrial activities relevant to the function of the port may be appropriate.</p>	<ul style="list-style-type: none"> • storage • industry, processing • extractive industry • related and ancillary uses i.e. office, administration • utilities i.e. warehouses, workshop, transport access.

Precinct	Intent	Preferred land uses
Special management	<p>Land within this designation is generally suitable for limited port associated development that is sensitively designed or of a low intensity and/or impact.</p> <p>Development is neither prohibited nor conferred. Any future development or activities must be consistent with the locational, physical or environmental and cultural attributes of the area.</p>	<p>Uses complementary to the attributes of the land, including for example:</p> <ul style="list-style-type: none"> • light industry • general buffer • park • open space • car park • port related infrastructure • lay down areas • transport access and services • materials transport infrastructure • cultural uses consistent with port operation and security.
Environmental protection	<p>These areas designate land that exhibits recognised ecological and/or cultural heritage values that are to be protected, managed and enhanced. Development or activities that conflict with the conservation of these values is inappropriate.</p> <p>Development that provides access to coastal areas/beaches and other significant natural and cultural features may be acceptable.</p>	<ul style="list-style-type: none"> • environmental and cultural areas • buffer • Traditional Owner access and use.

15.12 Appendix L: Summary of land use planning management measures

Regulatory instruments	DA	Plan making	Other
SPP	Yes	Yes	
SDA Provisions v3.0	Yes		
MIW Regional Plan	Yes	Yes	
WRC Planning Scheme	Yes		
<i>Regional Interests Planning Act 2014</i>	Yes		
<i>Port of Abbot Point Land Use Plan 2010</i>	Yes		
APSDA Development Scheme 2014	Yes		
<i>Great Barrier Reef Marine Park ZONING PLAN 2003</i>			Operational permits

15.12.1 State Planning Policy 2017

Management measures	Value/Impact
State interest statements (higher order intent for plan making and development assessment).	Climate change and natural hazards Cultural heritage Economic Environmental values Hazardous activities and contaminated land Infrastructure OUV Social.
Part E: State interest policies (to guide plan making).	Climate change and natural hazards – impacts of climate change, risk management, and community safety and resilience. Cultural heritage – cultural, natural and built environments of international, national, state and local significance. Economic - economic growth, agriculture, construction, extractive resources, tourism. Environmental values – biodiversity, coastal environment, water quality, ecological processes, MNES, MSES, Matters of Local Environmental Significance. Hazardous activities and contaminated land – emissions, hazardous activities.

Management measures	Value/Impact
	Infrastructure - energy and water supply, infrastructure integration, transport infrastructure, strategic airports and aviation facilities, strategic ports. OUV – GBRWHA. Social - housing supply and diversity, liveable communities, access, safety, amenity.
Part E: Assessment benchmarks (to inform development assessment).	Climate change and natural hazards – safety, risk and resilience, bushfire, flood, landslide, storm tide inundation, and erosion prone areas outside the CMD. Economic – key resource areas, extractive resources, safety. Environmental values – water quality, stormwater management, wastewater, erosion prone areas within a CMD. Infrastructure - safety, emissions and amenity. Social – safety, amenity, emissions, design.

15.12.2 State Development Assessment Provisions – v3.0

Management measures	Value/Impact
State code 1: Development in a state-controlled road environment.	Infrastructure - state transport corridors (if near a state-controlled road or future state-controlled road), road network including safety, performance and maintenance. Social - safety, access, amenity, emissions.
State code 2: Development in a railway environment.	Infrastructure - state transport corridors (if near a railway corridor or future railway corridor), rail network including safety, performance and maintenance. Social - safety, access, amenity, emissions.
State code 5: Development in a state-controlled transport tunnel environment.	Infrastructure - state-controlled transport tunnels for roads/rail including safety, performance and maintenance. Social - safety, access, amenity, emissions.
State code 6: Protection of state transport networks.	Infrastructure - state transport infrastructure including safety, performance and maintenance. Social - safety, access, amenity, emissions.
State code 7: Maritime safety.	Infrastructure - navigable waterways, maritime safety.
State code 8: Coastal development and tidal works.	Climate change and natural hazards - storm tide events, erosion control. Environmental values - CMD, erosion prone areas, coastal processes, coastal protection, water quality, MSES, offsets. Infrastructure - dredging, dredged material, reclamation. OUV – GBRWHA. Social - safety, access, amenity.

Management measures	Value/Impact
State code 9: GBR wetland protection areas.	Environmental values - wetland protection areas, wetland environmental values, land degradation, water quality, MSES, offsets. OUV – GBRWHA.
State code 10: Taking or interfering with water	Environmental values - sustainable water management, taking or interfering with water, land degradation, riverine ecosystems, underground water including coal seam gas water, overland flow water including contaminated agricultural run-off water.
State code 11: Removal, destruction or damage of marine plants.	Environmental values - marine plants, fisheries resources, fish habitats, dredging, dredged material, erosion control, MSES, offsets. OUV – GBRWHA. Economic - commercial fishing and related infrastructure, services and facilities, recreational fishing. Social – access.
State code 12: Development in a declared FHA	Economic - commercial fishing and related infrastructure, services and facilities, aquaculture, recreational fishing. Environmental values - declared FHAs, fisheries resources, fish habitats, fish passage, marine plants, dredging, dredged material, erosion control, water quality, MSES, offsets. OUV – GBRWHA. Social - access, awareness.
State code 14: Queensland heritage.	Cultural heritage - state heritage places.
State code 15: Removal of quarry material from a watercourse or lake.	Environmental values - removal of quarry material, sustainable water resource management, natural ecosystem processes, watercourses and lakes. Infrastructure - safety, physical integrity, operation. Social – access.
State code 16: Native vegetation clearing.	Environmental values - native vegetation clearing, greenhouse gases, land degradation, biodiversity, ecological processes, pest control, water quality, aquatic and terrestrial habitats, MSES, offsets. Social – safety.
State code 17: Aquaculture.	Economic – land-based and tidal aquaculture, commercial fishing and related infrastructure, services and facilities, aquaculture. Environmental values – fisheries resources, fish habitats, biosecurity, marine parks, inland catchments. Social – access.
State code 18: Constructing or raising waterway barrier works in fish habitats.	Economic - commercial fishing and related infrastructure, services and facilities, aquaculture, recreational fishing. Environmental values - waterway barrier works, fisheries resources, fish habitat, fish movement and connectivity, marine plants, pest control, MSES, offsets.
State code 19: Category 3 levees.	Climate change and natural hazards - flooding

Management measures	Value/Impact
	Social – safety.
State code 20: Referable dams.	Infrastructure - design and risk management Social – safety.
State code 21: Hazardous chemical facilities.	Climate change and natural hazards - hazardous materials, natural hazards. Hazardous activities and contaminated land - risk management, hazardous chemicals. Social – safety.
State code 22: Environmentally relevant activities.	Climate change and natural hazards – flooding. Environmental values - emissions, water quality, contaminants, MSES, offsets. Hazardous activities and contaminated land - hazardous materials. Social - safety, amenity.
State code 23: Wind farm development.	Environmental values - emissions, water quality, ecological processes. Infrastructure - access, safety and operations. Social - safety, amenity.
State code 24: Urban design outcomes for significant projects.	Climate change and natural hazards - response to climatic conditions. Environmental values - natural systems and processes. Social - adaptation, innovation, function, design.

15.12.3 Mackay, Isaac and Whitsunday Regional Plan 2012

Management measures	Value/Impact
Regional vision (higher order intent for the region's long-term future).	Climate change and natural hazards Cultural heritage Economic Environmental values Hazardous activities and contaminated land Infrastructure OUV Social.
DRO – Sustainability, climate change and natural hazards.	Climate change and natural hazards – greenhouse gases, impacts, risk management, emissions, resilience. Environmental values – ecologically sustainable development, conserving biological diversity and ecological integrity.

Management measures	Value/Impact
	Social – building design.
DRO – Regional landscapes.	Environmental values – flora and fauna, ecosystems, sustainable management practices, green space network, scenic amenity.
DRO – Environment.	Environmental values – biodiversity, water quality, waterway health, wetlands, coastal processes, emissions. OUV – GBRWHA.
DRO – Natural resource management.	Economic – agriculture, rural industry, extractive industries. Infrastructure – regional water supply.
DRO – Strong communities.	Social – disadvantage, health, safety, access and equity.
DRO – Strong economy.	Economic – primary industries, resource sector, tourism.
DRO – Managing growth.	Social – housing choice and affordability, settlement pattern.
DRO – Urban form.	Social – urban form, arts, cultural development, centres and rural communities.
DRO – Infrastructure.	Infrastructure – key sites and corridors, energy, ICT, waste and recycling, sewerage, social infrastructure.
DRO – Transport.	Infrastructure – efficient, accessible and safe transport networks, stock routes, freight, active transport.

15.12.4 Whitsunday Regional Council Planning Scheme (July 2017) v3.7

Management measures (Based on focused study area)	Value/Impact
Strategic intent (higher order strategic outcome to guide development)	Climate change and natural hazards – risk management Cultural heritage Economic – economic growth, port, industry, tourism, agriculture, extractive resources Environmental values – ecological systems, landscape values, flora and fauna Hazardous activities and contaminated land – risk managements, emissions Infrastructure – airports, road, rail, power generation, water resource catchments Social – liveable communities and housing.
Community facilities zone	Infrastructure – community related activities and facilities, transport, safety and efficiency Social – safety, access, amenity, design.
Environmental management and conservation zone	Cultural heritage – cultural heritage significance Environmental value – biological diversity, ecological integrity and processes, coastal processes, water quality, landscape character, scenic amenity

Management measures (Based on focused study area)	Value/Impact
	Social – community wellbeing.
Industry investigation area zone	Economic – industry, services and infrastructure, SDA, workforce connectivity, buffers to sensitive uses, Infrastructure – urban services, safety and efficiency Social – safety, access, amenity.
Rural zone	Economic - rural activities, buffers to sensitive uses, primary production Environmental values – protect and manage significant natural features, resources and processes.
ASS overlay code	Climate change and natural hazards – ASS Environmental values – natural environment, drainage waters, contaminants Infrastructure – condition, structural integrity Social – built environment, human health.
Agricultural land overlay code	Economic – agricultural land, rural activities, stormwater management, stock routes.
Bushfire hazard overlay code	Climate change and natural hazards – risk management Environmental values – natural processes, function Infrastructure – utilities, transport networks, community infrastructure Social – safety, access.
Coastal environment overlay code	Climate change and natural hazards – Coastal hazards, storm tide inundations Environmental values – Coastal processes, resources and biodiversity, coastal protection, erosion prone areas Infrastructure – utilities, urban services Social – safety, access.
Environmental significance overlay code	Environmental values – biodiversity, ecosystems, habitat, flora and fauna, regulated vegetation, MNES.
Extractive resources overlay code	Economic – extractive resources, separation distances Infrastructure – transport networks Social – safety, amenity.
Flood overlay code	Climate change and natural hazards – risk management Environmental values – natural processes, function Infrastructure – utilities, transport networks, community infrastructure Social – safety, amenity.

Management measures (Based on focused study area)	Value/Impact
Infrastructure overlay code	Infrastructure – existing and planned infrastructure and facilities Social – safety, amenity.
Landslide overlay code	Climate change and natural hazards – risk management Environmental values – natural processes, function Hazardous activities and contaminated land – risk management Infrastructure – utilities, transport networks, community infrastructure Social – safety, amenity.
Waterways and wetlands overlay code	Environmental values – ecological connectivity, habitat, ecological processes, biodiversity, wetlands and waterways, MNES, flora and fauna, regulated vegetation OUV – GBRWHA.
Use and development codes (various)	Economic, Environmental values, Infrastructure, Social: <ul style="list-style-type: none"> - business activities code - caretaker's accommodation code - childcare centre code - dual occupancy code - dwelling house code - extractive industry code - home based business code - industry activities code - market code - multi-unit uses code - relocatable home park and tourist park code - residential care facility and retirement facility code - rural activities code - sales office code - service station code - telecommunications facility code - advertising devices code - construction management code - excavation and filling code - infrastructure code - landscaping code - reconfiguring a lot code - transport and parking code.

15.12.5 *Regional Interests Planning Act 2014*

Management measures	Value/Impact
SCA	Economic – cropping land.

15.12.6 *Port of Abbot Point Land Use Plan 2010*

Management measures	Value/Impact
DEOs - ecological processes (higher order strategic outcome to guide development)	Environment values - natural port environment, areas of high conservation significance, air, water, waste and noise impacts Climate change and natural hazards – climate change
DEOs – economic development (higher order strategic outcome to guide development)	Economic – current/ future port trade and industries Infrastructure – port, road, rail and support services Social – employment opportunities.
DEOs – community wellbeing (higher order strategic outcome to guide development)	Economic – safety and security Environmental values – scenic and sensitive receiving environments Cultural heritage – Indigenous cultural heritage values Social – community and council engagement.
Special management designation (indicative uses and principles to guide development)	Environmental values – best practice management Environmental values – scenic or aesthetic value Climate change and natural hazards – ASS Cultural heritage – Indigenous cultural heritage values
Environmental protection designation (indicative uses and principles to guide development)	Cultural heritage – Indigenous cultural heritage values Environmental values – ecological and scenic values
Port handling designation (indicative uses and principles to guide development)	Economic – current/future port trade and industries Environmental values – best practice management and sensitive environmental area interface Infrastructure – efficient and safe operation.
Offshore port infrastructure designation (indicative uses and principles to guide development)	Environmental values – best practice management Infrastructure – port marine and navigational safety.
Port Related and Support Designation (indicative uses and principles to guide development)	Economic – long term port operations Environmental values – best practice management

Management measures	Value/Impact
	Infrastructure – efficient and safe operations
Development guidelines (non-statutory)	Climate change and natural hazards – climate change Cultural heritage – Indigenous cultural heritage values Environmental values – sustainable building design and visual amenity, best practice management Hazardous activities and contaminated land – minimising impacts Infrastructure – efficient and safe operation, supporting services.

15.12.7 Abbot Point State Development Area Development Scheme 2014

Management measures	Value/Impact
Strategic vision (higher order strategic outcome to guide development)	Economic – industrial and port development Infrastructure – rail, road, linear and utilities.
Overall objectives (higher order strategic outcome to guide development)	Cultural heritage – Indigenous cultural heritage values Economic – industrial and port development Environment values – best practice management of impacts Infrastructure – rail, road, linear and utilities
Environmental management/materials transportation precinct	Environmental values – remnant vegetation, wetlands and waterways Infrastructure – rail, road, linear and utilities
Industry precinct	Economic – significant industrial development
Infrastructure and Corridors Precinct	Economic – current/ future port trade and industries Infrastructure – road, rail, services and utilities, common use opportunities
Port expansion precinct	Economic - industrial and port development Environmental values – areas of high ecological significance.
Port facilities precinct	Economic - industrial and port development Infrastructure – rail and utilities infrastructure
Restricted development precinct	Environmental values – remnant vegetation, wetlands and waterways
SDA-wide assessment criteria	Climate change and natural hazards – flooding and inundation, ASS, potential impacts Cultural heritage – Indigenous cultural heritage values Environmental values – air, water, waste and noise impacts, water quality, best practice management, visual amenity and landscaping

Management measures	Value/Impact
	Hazardous activities and contaminated land – contaminated land Infrastructure – utilities and service, road network efficiency, building design efficiency Social – buffer/interface

15.12.8 *Great Barrier Reef Marine Park ZONING PLAN 2003*

Management measures	Value/Impact
General use zone	Economic – Fishing, aquaculture, research, tourism
Habitat protection zone	Environmental values – Sensitive habitats
Conservation park zone (yellow)	Economic – fishing, limited extractive use
Marine national park zone (green)	Environmental values – sensitive areas
Commonwealth islands zone	Economic – low impact activities Environmental values – island environments

15.13 Appendix M: Ecological database searches Abbot Point

EPBC Act	NC Act
EX – Extinct	V – Vulnerable
V – Vulnerable	E – Endangered
E – Endangered	CR - Critically endangered
CE – Critically endangered	SL – Special least concern
	PE – Extinct in the wild

Species	Common name	EPBC Act	NC Act
<i>Pandion cristatus</i>	Eastern Osprey		SL
<i>Apus pacificus</i>	Fork-Tailed Swift		SL
<i>Hirundapus caudacutus</i>	White-Throated Needletail	V	V
<i>Esacus magnirostris</i>	Beach Stone-Curlew		V
<i>Calyptorhynchus lathami erebus</i>	Glossy Black-Cockatoo (Northern)		V
<i>Charadrius leschenaultii</i>	Greater Sand Plover	V	V
<i>Charadrius mongolus</i>	Lesser Sand Plover	E	E
<i>Charadrius veredus</i>	Oriental Plover		SL
<i>Pluvialis fulva</i>	Pacific Golden Plover		SL
<i>Pluvialis squatarola</i>	Grey Plover		SL
<i>Geophaps scripta scripta</i>	Squatter Pigeon (Southern Subspecies)	V	V
<i>Cuculus optatus</i>	Oriental Cuckoo		SL
<i>Poephila cincta cincta</i>	Black-Throated Finch (White-Rumped Subspecies)	E	E
<i>Fregata ariel</i>	Lesser Frigatebird		SL
<i>Anous stolidus</i>	Common Noddy		SL
<i>Chlidonias leucopterus</i>	White-Winged Black Tern		SL
<i>Gelochelidon nilotica</i>	Gull-Billed Tern		SL
<i>Hydroprogne caspia</i>	Caspian Tern		SL
<i>Onychoprion anaethetus</i>	Bridled Tern		SL
<i>Sterna dougallii</i>	Roseate Tern		SL
<i>Sterna hirundo</i>	Common Tern		SL
<i>Sterna sumatrana</i>	Black-Naped Tern		SL
<i>Sternula albifrons</i>	Little Tern		SL
<i>Thalasseus bergii</i>	Crested Tern		SL
<i>Monarcha melanopsis</i>	Black-Faced Monarch		SL

Species	Common name	EPBC Act	NC Act
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		SL
<i>Symposiachrus trivirgatus</i>	Spectacled Monarch		SL
<i>Lathamus discolor</i>	Swift Parrot	CE	E
<i>Psephotus pulcherrimus</i>	Paradise Parrot	EX	PE
<i>Rhipidura rufifrons</i>	Rufous Fantail		SL
<i>Rostratula australis</i>	Australian Painted Snipe	E	E
<i>Actitis hypoleucos</i>	Common Sandpiper		SL
<i>Arenaria interpres</i>	Ruddy Turnstone		SL
<i>Calidris acuminata</i>	Sharp-Tailed Sandpiper		SL
<i>Calidris alba</i>	Sanderling		SL
<i>Calidris canutus</i>	Red Knot	E	E
<i>Calidris falcinellus</i>	Broad-Billed Sandpiper		SL
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE	CR
<i>Calidris melanotos</i>	Pectoral Sandpiper		SL
<i>Calidris ruficollis</i>	Red-Necked Stint		SL
<i>Calidris tenuirostris</i>	Great Knot	CE	CR
<i>Gallinago hardwickii</i>	Latham's Snipe		SL
<i>Limosa Lapponica baueri</i>	Western Alaskan Bar-Tailed Godwit	V	V
<i>Limosalimosa</i>	Black-Tailed Godwit		SL
<i>Numenius m adagascariensis</i>	Eastern Curlew	CE	E
<i>Numenius minutus</i>	Little Curlew		SL
<i>Numenius phaeopus</i>	Whimbrel		SL
<i>Tringa brevipes</i>	Grey-Tailed Tattler		SL
<i>Tringa glareola</i>	Wood Sandpiper		SL
<i>Tringa incana</i>	Wandering Tattler		SL
<i>Tringa nebularia</i>	Common Greenshank		SL
<i>Tringa stagnatilis</i>	Marsh Sandpiper		SL
<i>Xenus cinereus</i>	Terek Sandpiper		SL
<i>Ninox strenua</i>	Powerful Owl		V
<i>Sula dactylatra</i>	Masked Booby		SL
<i>Sula leucogaster</i>	Brown Booby		SL
<i>Plegadis falcinellus</i>	Glossy Ibis		SL
<i>Tyto novaehollandiae kimberli</i>	Masked Owl (Northern Subspecies)	V	V
<i>Dasyurus hallucatus</i>	Northern Quoll	E	C

15.14 Appendix N: Regional ecosystem descriptions Abbot Point

L – Least concern	O – Of concern
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RE	VM Act Status	Vegetation Category	RE Description
11.1.1	L	Category A or B area that is least concern	<i>Sporobolus virginicus</i> grassland on marine clay plains
11.1.1	L	Category C area that is of least concern	<i>Sporobolus virginicus</i> grassland on marine clay plains
11.1.1/11.1.2b	L/L	Category A or B area that is least concern	<i>Sporobolus virginicus</i> grassland on marine clay plains/Samphire forbland on marine clay plains
11.1.1/11.2.5	L/L	Category A or B area that is least concern	<i>Sporobolus virginicus</i> grassland on marine clay plains/ <i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales
11.1.1/11.2.5	L/L	Category C area that is of least concern	<i>Sporobolus virginicus</i> grassland on marine clay plains/ <i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales
11.1.1/11.3.27x1b	L/L	Category A or B area that is least concern	<i>Sporobolus virginicus</i> grassland on marine clay plains/Freshwater wetlands
11.1.2	L	Category A or B area that is least concern	Samphire forbland on marine clay plains
11.1.2	L	Category C area that is of least concern	Samphire forbland on marine clay plains
11.1.2/11.1.4	L/L	Category A or B area that is least concern	Samphire forbland on marine clay plains/Mangrove low open forest and/or woodland on marine clay plains
11.1.2/11.1.4	L/L	Category C area that is of least concern	Samphire forbland on marine clay plains/Mangrove low open forest and/or woodland on marine clay plains
11.1.2a	L	Category A or B area that is least concern	Samphire forbland on marine clay plains
11.1.2a	L	Category C area that is of least concern	Samphire forbland on marine clay plain

11.1.2a/11.1.2b	L	Category A or B area that is least concern	Samphire forbland on marine clay plains/Samphire forbland on marine clay plains
11.1.2a/11.1.2b	L	Category C area that is of least concern	Samphire forbland on marine clay plains/Samphire forbland on marine clay plains
11.1.2a/11.1.2b/11.1.4	L/L	Category A or B area that is least concern	Samphire forbland on marine clay plains/Samphire forbland on marine clay plains /Mangrove low open forest and/or woodland on marine clay plains
11.1.2a/11.1.3	L/O	Category A or B area containing of concern	Samphire forbland on marine clay plains/Sedgeland on marine clay plains
11.1.2a/11.1.4	L/L	Category A or B area that is least concern	Samphire forbland on marine clay plains/Mangrove low open forest and/or woodland on marine clay plains
11.1.2a/11.1.4	L/L	Category C area that is of least concern	Samphire forbland on marine clay plains/Mangrove low open forest and/or woodland on marine clay plains
11.1.2a/11.1.4c	L/L	Category A or B area that is least concern	Samphire forbland on marine clay plains/Mangrove low open forest and/or woodland on marine clay plains
11.1.2a/11.2.5	L/L	Category A or B area that is least concern	Samphire forbland on marine clay plains/ <i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales
11.1.2b	L	Category A or B area that is least concern	Samphire forbland on marine clay plains
11.1.2b	L	Category C area that is of least concern	Samphire forbland on marine clay plains
11.1.2b/11.1.1	L/L	Category A or B area that is least concern	Samphire forbland on marine clay plains/ <i>Sporobolus virginicus</i> grassland on marine clay plains
11.1.2b/11.1.1	L/L	Category C area that is of least concern	Samphire forbland on marine clay plains/ <i>Sporobolus virginicus</i> grassland on marine clay plains
11.1.2b/11.1.2a	L	Category A or B area that is least concern	Samphire forbland on marine clay plains/Samphire forbland on marine clay plains
11.1.2b/11.1.2a	L	Category C area that is of least concern	Samphire forbland on marine clay plains/Samphire forbland on marine clay plains
11.1.2b/11.1.3	L/O	Category A or B area containing of concern	Samphire forbland on marine clay plains/Sedgeland on marine clay plains

11.1.3	O	Category A or B area containing of concern	Sedgelands on marine clay plains
11.1.4	L	Category A or B area that is least concern	Mangrove low open forest and/or woodland on marine clay plains
11.1.4	L	Category C area that is of least concern	Mangrove low open forest and/or woodland on marine clay plains
11.1.4/11.1.2a	L/L	Category A or B area that is least concern	Mangrove low open forest and/or woodland on marine clay plains/Samphire forbland on marine clay plains
11.1.4a	L	Category A or B area that is least concern	Mangrove low open forest and/or woodland on marine clay plains
11.1.4a	L	Category C area that is of least concern	Mangrove low open forest and/or woodland on marine clay plains
11.1.4b	L	Category A or B area that is least concern	Mangrove low open forest and/or woodland on marine clay plains
11.1.4b	L	Category C area that is of least concern	Mangrove low open forest and/or woodland on marine clay plains
11.1.4c	L	Category A or B area that is least concern	Mangrove low open forest and/or woodland on marine clay plains
11.1.4c	L	Category C area that is of least concern	Mangrove low open forest and/or woodland on marine clay plains
11.12.1	L	Category A or B area that is least concern	<i>Eucalyptus crebra</i> woodland on igneous rocks
11.12.1	L	Category C area that is of least concern	<i>Eucalyptus crebra</i> woodland on igneous rocks
11.12.1/11.12.4	L/L	Category A or B area that is least concern	<i>Eucalyptus crebra</i> woodland on igneous rocks/SEVT and microphyll vine forest on igneous rocks
11.12.1/11.12.4	L/L	Category C area that is of least concern	<i>Eucalyptus crebra</i> woodland on igneous rocks/SEVT and microphyll vine forest on igneous rocks
11.12.1/11.12.9	L/L	Category A or B area that is least concern	<i>Eucalyptus crebra</i> woodland on igneous rocks/ <i>Eucalyptus platyphylla</i> woodland on igneous rocks
11.12.1/11.12.9/11.12.4/11.12.10	L/L/L/O	Category A or B area containing of concern	<i>Eucalyptus crebra</i> woodland on igneous rocks/ <i>Eucalyptus platyphylla</i> woodland on igneous rocks/SEVT and microphyll vine

			forest on igneous rocks/ <i>Corymbia clarksoniana</i> woodland on igneous rocks
11.12.1/11.12.9/11.12.4/11.12.10	L/L/L/O	Category C area containing of concern	<i>Eucalyptus crebra</i> woodland on igneous rocks / <i>Eucalyptus platyphylla</i> woodland on igneous rocks/SEVT and microphyll vine forest on igneous rocks/ <i>Corymbia clarksoniana</i> woodland on igneous rocks
11.12.1/11.3.10/11.3.30/11.3.32	L/L/L/L	Category A or B area that is least concern	<i>Eucalyptus crebra</i> woodland on igneous rocks/ <i>Corymbia clarksoniana</i> woodland on igneous rocks/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.12.1/11.3.10/11.3.30/11.3.32	L/L/L/L	Category C area that is of least concern	<i>Eucalyptus crebra</i> woodland on igneous rocks/ <i>Corymbia clarksoniana</i> woodland on igneous rocks/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.12.1/11.3.30/11.3.32/11.3.33	L/L/L/O	Category A or B area containing of concern	<i>Eucalyptus crebra</i> woodland on igneous rocks/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Eremophila mitchellii</i> open woodland on alluvial plains
11.12.1/11.3.30/11.3.32/11.3.33	L/L/L/O	Category C area containing of concern	<i>Eucalyptus crebra</i> woodland on igneous rocks/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Eremophila mitchellii</i> open woodland on alluvial plains
11.12.1/11.3.32/11.3.10/11.12.9	L/L/L/L	Category A or B area that is least concern	<i>Eucalyptus crebra</i> woodland on igneous rocks/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Eucalyptus brownii</i> woodland on alluvial plains/ <i>Eucalyptus platyphylla</i> woodland on igneous rocks
11.12.1/11.3.32/11.3.10/11.12.9	L/L/L/L	Category C area that is of least concern	<i>Eucalyptus crebra</i> woodland on igneous rocks/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Eucalyptus brownii</i> woodland on alluvial plains/ <i>Eucalyptus platyphylla</i> woodland on igneous rocks
11.12.10	O	Category A or B area containing of concern	<i>Corymbia clarksoniana</i> woodland on igneous rocks
11.12.13	L	Category A or B area that is least concern	<i>Corymbia clarksoniana</i> woodland on igneous rocks

11.12.13	L	Category C area that is of least concern	<i>Corymbia clarksoniana</i> woodland on igneous rocks
11.12.13/11.12.1/11.12.9	L/L/L	Category A or B area that is least concern	<i>Corymbia clarksoniana</i> woodland on igneous rocks/ <i>Eucalyptus crebra</i> woodland on igneous rocks/ <i>Eucalyptus platyphylla</i> woodland on igneous rocks
11.12.13/11.12.1/11.12.9	L/L/L	Category C area that is of least concern	<i>Corymbia clarksoniana</i> woodland on igneous rocks/ <i>Eucalyptus crebra</i> woodland on igneous rocks / <i>Eucalyptus platyphylla</i> woodland on igneous rocks
11.12.13/11.12.4	L/L	Category A or B area that is least concern	<i>Corymbia clarksoniana</i> woodland on igneous rocks/SEVT and microphyll vine forest on igneous rocks
11.12.13/11.12.4	L/L	Category C area that is of least concern	<i>Corymbia clarksoniana</i> woodland on igneous rocks/SEVT and microphyll vine forest on igneous rocks
11.12.16/11.12.1	O/L	Category A or B area containing of concern	Mixed low woodland to shrubland on igneous rocks. Coastal hills/ <i>Eucalyptus crebra</i> woodland on igneous rocks
11.12.16x1	O	Category A or B area containing of concern	Mixed low woodland to shrubland on igneous rocks. Coastal hills
11.12.16x1/11.12.4	O/L	Category A or B area containing of concern	Mixed low woodland to shrubland on igneous rocks. Coastal hills /SEVT and microphyll vine forest on igneous rocks
11.12.4	L	Category A or B area that is least concern	SEVT and microphyll vine forest on igneous rocks
11.12.4	L	Category C area that is of least concern	SEVT and microphyll vine forest on igneous rocks
11.12.4a	L	Category A or B area that is least concern	SEVT and microphyll vine forest on igneous rocks
11.12.4a	L	Category C area that is of least concern	SEVT and microphyll vine forest on igneous rocks
11.12.7	L	Category A or B area that is least concern	<i>Eucalyptus crebra</i> woodland with patches of SEVT on igneous rocks (boulder-strewn hillsides)
11.12.7	L	Category C area that is of least concern	<i>Eucalyptus crebra</i> woodland with patches of SEVT on igneous rocks (boulder-strewn hillsides)
11.12.7/11.12.4	L/L	Category A or B area that is least concern	<i>Eucalyptus crebra</i> woodland with patches of SEVT on igneous rocks (boulder-strewn hillsides)/SEVT and microphyll vine forest on igneous rocks

11.12.7/11.12.4	L/L	Category C area that is of least concern	<i>Eucalyptus crebra</i> woodland with patches of SEVT on igneous rocks (boulder-strewn hillsides)/SEVT and microphyll vine forest on igneous rocks
11.12.9	L	Category A or B area that is least concern	<i>Eucalyptus platyphylla</i> woodland on igneous rocks
11.12.9	L	Category C area that is of least concern	<i>Eucalyptus platyphylla</i> woodland on igneous rocks
11.12.9/11.3.30/11.3.32	L/L/L	Category A or B area that is least concern	<i>Eucalyptus platyphylla</i> woodland on igneous rocks/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.12.9/11.3.30/11.3.32	L/L/L	Category A or B area that is least concern and S20AH	<i>Eucalyptus platyphylla</i> woodland on igneous rocks/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.12.9/11.3.30/11.3.32	L/L/L	Category C area that is of least concern	<i>Eucalyptus platyphylla</i> woodland on igneous rocks/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains / <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.2.2	O	Category A or B area containing of concern	Complex of <i>Ipomoea pes-caprae</i> subsp. <i>brasiliensis</i> and <i>Spinifex sericeus</i> and <i>Casuarina equisetifolia</i> low woodland and herbland on fore dunes
11.2.2/11.2.5	O/L	Category A or B area containing of concern	Complex of <i>Ipomoea pes-caprae</i> subsp. <i>brasiliensis</i> and <i>Spinifex sericeus</i> and <i>Casuarina equisetifolia</i> low woodland and herbland on fore dunes/ <i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales
11.2.3	O	Category A or B area containing of concern	Microphyll vine forest (beach scrub) on sandy beach ridges and dune swales
11.2.3	O	Category C area containing of concern	Microphyll vine forest (beach scrub) on sandy beach ridges and dune swales
11.2.3/11.2.1	O/O	Category A or B area containing of concern	Microphyll vine forest (beach scrub) on sandy beach ridges and dune swales/ <i>Corymbia tessellaris</i> woodland on flat coastal dunes
11.2.3/11.2.5	O/L	Category A or B area containing of concern	Microphyll vine forest (beach scrub) on sandy beach ridges and dune swales/ <i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales

11.2.5	L	Category A or B area that is least concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales
11.2.5	L	Category C area that is of least concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales
11.2.5/11.1.1	L/L	Category A or B area that is least concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales/ <i>Sporobolus virginicus</i> grassland on marine clay plains
11.2.5/11.1.2a	L/L	Category A or B area that is least concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales/Samphire forbland on marine clay plains
11.2.5/11.2.2	L/O	Category A or B area containing of concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales/Complex of <i>Ipomoea pes-caprae</i> subsp. <i>brasiliensis</i> and <i>Spinifex sericeus</i> and <i>Casuarina equisetifolia</i> low woodland and herbland on fore dunes
11.2.5/11.2.3	L/O	Category A or B area containing of concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales/Microphyll vine forest (beach scrub) on sandy beach ridges and dune swales
11.2.5/11.2.3	L/O	Category C area containing of concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales/Microphyll vine forest (beach scrub) on sandy beach ridges and dune swales
11.2.5/11.2.3/11.2.2	L/O/O	Category A or B area containing of concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales/Microphyll vine forest (beach scrub) on sandy beach ridges and dune swales/Complex of <i>Ipomoea pes-caprae</i> subsp. <i>brasiliensis</i> and <i>Spinifex sericeus</i> and <i>Casuarina equisetifolia</i> low woodland and herbland on fore dunes
11.2.5/11.2.3/11.2.2	L/O/O	Category C area containing of concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales /Microphyll vine forest (beach scrub) on sandy beach ridges and dune swales/Complex of <i>Ipomoea pes-caprae</i> subsp. <i>brasiliensis</i> and <i>Spinifex sericeus</i> and <i>Casuarina equisetifolia</i> low woodland and herbland on fore dunes
11.2.5/11.3.12	L/L	Category A or B area that is least concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales / <i>Melaleuca viridiflora</i> , <i>Myristica argentea</i> +/- <i>Melaleuca dealbata</i> woodland on alluvial plains
11.2.5/11.3.13	L/O	Category A or B area containing of concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales / <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.2.5/11.3.31/11.3.12/11.3.13	L/L/L/O	Category A or B area containing of concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales / <i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. grassland on alluvial

			plains/ <i>Melaleuca viridiflora</i> , <i>Myristica argentea</i> +/- <i>Melaleuca dealbata</i> woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.2.5/11.3.31/11.3.12/11.3.13	L/L/L/O	Category C area containing of concern	<i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales / <i>Ophiuros exaltatus</i> , <i>Dichanthium spp.</i> grassland on alluvial plains/ <i>Melaleuca viridiflora</i> , <i>Myristica argentea</i> +/- <i>Melaleuca dealbata</i> woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.10/11.3.30/11.3.32	L/L/L	Category A or B area that is least concern	<i>Eucalyptus brownii</i> woodland on alluvial plains/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.3.10/11.3.30/11.3.32	L/L/L	Category C area that is of least concern	<i>Eucalyptus brownii</i> woodland on alluvial plains/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.3.12/11.2.5/11.1.4	L/L/L	Category A or B area that is least concern	<i>Melaleuca viridiflora</i> , <i>Myristica argentea</i> +/- <i>Melaleuca dealbata</i> woodland on alluvial plains / <i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales / Mangrove low open forest and/or woodland on marine clay plains
11.3.12/11.2.5/11.1.4	L/L/L	Category C area that is of least concern	<i>Melaleuca viridiflora</i> , <i>Myristica argentea</i> +/- <i>Melaleuca dealbata</i> woodland on alluvial plains / <i>Corymbia-Melaleuca</i> woodland complex of beach ridges and swales/Mangrove low open forest and/or woodland on marine clay plains
11.3.12/11.3.32/11.3.34/11.3.13	L/L/O/O	Category A or B area containing of concern	<i>Melaleuca viridiflora</i> , <i>Myristica argentea</i> +/- <i>Melaleuca dealbata</i> woodland on alluvial plains / <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Acacia tephрина</i> woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.12/11.3.32/11.3.34/11.3.13	L/L/O/O	Category C area containing of concern	<i>Melaleuca viridiflora</i> , <i>Myristica argentea</i> +/- <i>Melaleuca dealbata</i> woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Acacia tephрина</i> woodland on alluvial plains / <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.13	O	Category A or B area containing of concern	<i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.25	L	Category A or B area that is least concern	<i>Eucalyptus tereticornis</i> or <i>Eucalyptus camaldulensis</i> woodland fringing drainage lines

11.3.25	L	Category C area that is of least concern	<i>Eucalyptus tereticornis</i> or <i>Eucalyptus camaldulensis</i> woodland fringing drainage lines
11.3.25b	L	Category A or B area that is least concern	<i>Eucalyptus tereticornis</i> or <i>Eucalyptus camaldulensis</i> woodland fringing drainage lines
11.3.25b	L	Category C area that is of least concern	<i>Eucalyptus tereticornis</i> or <i>Eucalyptus camaldulensis</i> woodland fringing drainage lines
11.3.25b/11.3.27x1b	L/L	Category A or B area that is least concern	<i>Eucalyptus tereticornis</i> or <i>Eucalyptus camaldulensis</i> woodland fringing drainage lines / Freshwater wetlands
11.3.25b/11.3.27x1b	L/L	Category C area that is of least concern	<i>Eucalyptus tereticornis</i> or <i>Eucalyptus camaldulensis</i> woodland fringing drainage lines / Freshwater wetlands
11.3.25f	L	Category A or B area that is least concern	<i>Eucalyptus tereticornis</i> or <i>Eucalyptus camaldulensis</i> woodland fringing drainage lines
11.3.25f	L	Category C area that is of least concern	<i>Eucalyptus tereticornis</i> or <i>Eucalyptus camaldulensis</i> woodland fringing drainage lines
11.3.27x1a	L	Category A or B area that is least concern	Freshwater wetlands
11.3.27x1a	L	Category C area that is of least concern	Freshwater wetlands
11.3.27x1a/11.3.27x1b	L	Category A or B area that is least concern	Freshwater wetlands
11.3.27x1b	L	Category A or B area that is least concern	Freshwater wetlands
11.3.27x1b	L	Category C area that is of least concern	Freshwater wetlands
11.3.27x1b/11.3.12	L/L	Category A or B area that is least concern	Freshwater wetlands/ <i>Melaleuca viridiflora</i> , <i>Myristica argentea</i> +/- <i>Melaleuca dealbata</i> woodland on alluvial plains
11.3.27x1c	L	Category A or B area that is least concern	Freshwater wetlands
11.3.29a	L	Category A or B area that is least concern	<i>Eucalyptus crebra</i> , <i>Eucalyptus exserta</i> , <i>Melaleuca</i> spp. woodland on alluvial plains
11.3.29a	L	Category C area that is of least concern	<i>Eucalyptus crebra</i> , <i>Eucalyptus exserta</i> , <i>Melaleuca</i> spp. woodland on alluvial plains

11.3.29a/11.3.32	L/L	Category A or B area that is least concern	<i>Eucalyptus crebra</i> , <i>Eucalyptus exserta</i> , <i>Melaleuca spp.</i> woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.3.29a/11.3.32	L/L	Category C area that is of least concern	<i>Eucalyptus crebra</i> , <i>Eucalyptus exserta</i> , <i>Melaleuca spp.</i> woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.3.29a/11.3.35	L/L	Category A or B area that is least concern	<i>Eucalyptus crebra</i> , <i>Eucalyptus exserta</i> , <i>Melaleuca spp.</i> woodland on alluvial plains/ <i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains
11.3.29a/11.3.35	L/L	Category C area that is of least concern	<i>Eucalyptus crebra</i> , <i>Eucalyptus exserta</i> , <i>Melaleuca spp.</i> woodland on alluvial plains/ <i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains
11.3.30/11.3.32	L/L	Category A or B area that is least concern	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.3.30/11.3.32	L/L	Category C area that is of least concern	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains / <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.3.30/11.3.32/11.3.13	L/L/O	Category A or B area containing of concern	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains / <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/Grevillea striata open woodland on coastal alluvial plains
11.3.30/11.3.32/11.3.33/11.3.34	L/L/O/O	Category A or B area containing of concern	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains / <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Eremophila mitchellii</i> open woodland on alluvial plains/ <i>Acacia tephрина</i> woodland on alluvial plains
11.3.30/11.3.32/11.3.33/11.3.34	L/L/O/O	Category C area containing of concern	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains / <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains / <i>Eremophila mitchellii</i> open woodland on alluvial plains / <i>Acacia tephрина</i> woodland on alluvial plains
11.3.30/11.3.35/11.3.13	L/L/O	Category A or B area containing of concern	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains / <i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains/Grevillea striata open woodland on coastal alluvial plains
11.3.30/11.3.35/11.3.13	L/L/O	Category C area containing of concern	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains/Grevillea striata open woodland on coastal alluvial plains

11.3.31	L	Category A or B area that is least concern	<i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. grassland on alluvial plains
11.3.31	L	Category C area that is of least concern	<i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. grassland on alluvial plains
11.3.31/11.3.34	L/O	Category A or B area containing of concern	<i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. grassland on alluvial plains/ <i>Acacia tephрина</i> woodland on alluvial plains
11.3.31/11.3.7/11.3.13	L/L/O	Category A or B area containing of concern	<i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. grassland on alluvial plains/ <i>Corymbia</i> spp. open woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.31/11.3.7/11.3.13	L/L/O	Category C area containing of concern	<i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. grassland on alluvial plains/ <i>Corymbia</i> spp. open woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.32	L	Category A or B area that is least concern	<i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.3.32	L	Category C area that is of least concern	<i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.3.32/11.12.1/11.3.10/11.12.9	L/L/L/L	Category A or B area that is least concern	<i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Eucalyptus crebra</i> woodland on igneous rocks/ <i>Eucalyptus brownii</i> woodland on alluvial plains/ <i>Eucalyptus platyphylla</i> woodland on igneous rocks
11.3.32/11.12.1/11.3.10/11.12.9	L/L/L/L	Category C area that is of least concern	<i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Eucalyptus crebra</i> woodland on igneous rocks/ <i>Eucalyptus brownii</i> woodland on alluvial plains/ <i>Eucalyptus platyphylla</i> woodland on igneous rocks
11.3.32/11.3.30/11.3.33	L/L/O	Category A or B area containing of concern	<i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Eremophila mitchellii</i> open woodland on alluvial plains
11.3.32/11.3.30/11.3.33	L/L/O	Category C area containing of concern	<i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Eremophila mitchellii</i> open woodland on alluvial plains
11.3.32/11.3.33/11.3.30	L/O/L	Category A or B area containing of concern	<i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Eremophila mitchellii</i> open woodland on alluvial plains/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains

11.3.34	O	Category A or B area containing of concern	<i>Acacia tephрина</i> woodland on alluvial plains
11.3.34	O	Category C area containing of concern	<i>Acacia tephрина</i> woodland on alluvial plains
11.3.34/11.3.32/11.3.33/11.3.13	O/L/O/O	Category A or B area containing of concern	<i>Acacia tephрина</i> woodland on alluvial plains / <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Eremophila mitchellii</i> open woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.34/11.3.32/11.3.33/11.3.13	O/L/O/O	Category C area containing of concern	<i>Acacia tephрина</i> woodland on alluvial plains / <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains / <i>Eremophila mitchellii</i> open woodland on alluvial plains / <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.35	L	Category A or B area that is least concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains
11.3.35	L	Category C area that is of least concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains
11.3.4	O	Category A or B area containing of concern	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plains
11.3.4	O	Category C area containing of concern	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plains
11.3.7	L	Category A or B area that is least concern	<i>Corymbia spp.</i> open woodland on alluvial plains
11.3.7	L	Category C area that is of least concern	<i>Corymbia spp.</i> open woodland on alluvial plains
11.3.7/11.3.13	L/O	Category A or B area containing of concern	<i>Corymbia spp.</i> open woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.7/11.3.13	L/O	Category C area containing of concern	<i>Corymbia spp.</i> open woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.7/11.3.13/11.3.12/11.3.31	L/O/L/L	Category A or B area containing of concern	<i>Corymbia spp.</i> open woodland on alluvial plains <i>Grevillea striata</i> open woodland on coastal alluvial plains/ <i>Melaleuca viridiflora</i> , <i>Myristica argentea</i> +/- <i>Melaleuca dealbata</i> woodland on alluvial plains/ <i>Ophiuros exaltatus</i> , <i>Dichanthium spp.</i> grassland on alluvial plains

11.3.7/11.3.13/11.3.12/11.3.31	L/O/L/L	Category C area containing of concern	<i>Corymbia spp.</i> open woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains/ <i>Melaleuca viridiflora</i> , <i>Myristica argentea</i> +/- <i>Melaleuca dealbata</i> woodland on alluvial plains/ <i>Ophiuros exaltatus</i> , <i>Dichanthium spp.</i> grassland on alluvial plains
11.3.7/11.3.27x1b	L/L	Category C area that is of least concern	<i>Corymbia spp.</i> open woodland on alluvial plains /Freshwater wetlands
11.3.7/11.3.30/11.3.35/11.3.13	L/L/L/O	Category A or B area containing of concern	<i>Corymbia spp.</i> open woodland on alluvial plains/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains/ <i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.7/11.3.30/11.3.35/11.3.13	L/L/L/O	Category C area containing of concern	<i>Corymbia spp.</i> open woodland on alluvial plains / <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains / <i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains / <i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.7/11.3.31/11.3.30	L/L/L	Category A or B area that is least concern	<i>Corymbia spp.</i> open woodland on alluvial plains / <i>Ophiuros exaltatus</i> , <i>Dichanthium spp.</i> grassland on alluvial plains / <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains
11.3.7/11.3.31/11.3.30	L/L/L	Category C area that is of least concern	<i>Corymbia spp.</i> open woodland on alluvial plains / <i>Ophiuros exaltatus</i> , <i>Dichanthium spp.</i> grassland on alluvial plains / <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains
11.3.7/11.3.9	L/L	Category A or B area that is least concern	<i>Corymbia spp.</i> open woodland on alluvial plains / <i>Eucalyptus platyphylla</i> , <i>Corymbia spp.</i> woodland on alluvial plains
11.3.7/11.3.9	L/L	Category C area that is of least concern	<i>Corymbia spp.</i> open woodland on alluvial plains / <i>Eucalyptus platyphylla</i> , <i>Corymbia spp.</i> woodland on alluvial plains
11.3.7/11.3.9/11.3.13/11.3.30	L/L/O/L	Category A or B area containing of concern	<i>Corymbia spp.</i> open woodland on alluvial plains / <i>Eucalyptus platyphylla</i> , <i>Corymbia spp.</i> woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains
11.3.7/11.3.9/11.3.13/11.3.30	L/L/O/L	Category C area containing of concern	<i>Corymbia spp.</i> open woodland on alluvial plains/ <i>Eucalyptus platyphylla</i> , <i>Corymbia spp.</i> woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains / <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains
11.3.7/11.3.9/11.3.34	L/L/O	Category A or B area containing of concern	<i>Corymbia spp.</i> open woodland on alluvial plains/ <i>Grevillea striata</i> open woodland on coastal alluvial plains <i>Eucalyptus platyphylla</i> ,

			<i>Corymbia</i> spp. woodland on alluvial plains / <i>Acacia tephрина</i> woodland on alluvial plains
11.3.7/11.3.9/11.3.34	L/L/O	Category C area containing of concern	<i>Corymbia</i> spp. open woodland on alluvial plains/ <i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains/ <i>Acacia tephрина</i> woodland on alluvial plains
11.3.7/11.3.9/11.3.4	L/L/O	Category A or B area containing of concern	<i>Corymbia</i> spp. open woodland on alluvial plains/ <i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains/ <i>Acacia tephрина</i> woodland on alluvial plains
11.3.7/11.3.9/11.3.4	L/L/O	Category C area containing of concern	<i>Corymbia</i> spp. open woodland on alluvial plains/ <i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains/ <i>Acacia tephрина</i> woodland on alluvial plains
11.3.9	L	Category A or B area that is least concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains
11.3.9	L	Category C area that is of least concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains
11.3.9/11.3.30	L/L	Category A or B area that is least concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains/ <i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains
11.3.9/11.3.33/11.3.32/11.3.12	L/O/L/L	Category A or B area containing of concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains / <i>Eremophila mitchellii</i> open woodland on alluvial plains/ <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Melaleuca viridiflora</i> , <i>Myristica argentea</i> +/- <i>Melaleuca dealbata</i> woodland on alluvial plains
11.3.9/11.3.33/11.3.32/11.3.12	L/O/L/L	Category C area containing of concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains/ <i>Eremophila mitchellii</i> open woodland on alluvial plains / <i>Allocasuarina luehmannii</i> low open woodland on alluvial plains/ <i>Melaleuca viridiflora</i> , <i>Myristica argentea</i> +/- <i>Melaleuca dealbata</i> woodland on alluvial plains
11.3.9/11.3.7	L/L	Category A or B area that is least concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains / <i>Corymbia</i> spp. open woodland on alluvial plains
11.3.9/11.3.7	L/L	Category C area that is of least concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains <i>Corymbia</i> spp. open woodland on alluvial plains
11.3.9/11.3.7/11.3.10/11.3.25	L/L/L/L	Category A or B area that is least concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains / <i>Corymbia</i> spp. open woodland on alluvial plains/ <i>Eucalyptus brownii</i>

			woodland on alluvial plains / <i>Eucalyptus tereticornis</i> or <i>Eucalyptus camaldulensis</i> woodland fringing drainage lines
11.3.9/11.3.7/11.3.10/11.3.25	L/L/L/L	Category C area that is of least concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains/ <i>Corymbia</i> spp. open woodland on alluvial plains/ <i>Eucalyptus brownii</i> woodland on alluvial plains/ <i>Eucalyptus tereticornis</i> or <i>Eucalyptus camaldulensis</i> woodland fringing drainage lines
8.1.1	L	Category A or B area that is least concern	Mangrove closed forest to open shrubland of marine clay plains and estuaries
8.12.11a	L	Category A or B area that is least concern	Semi-evergreen microphyll vine thicket +/- <i>Araucaria cunninghamii</i> on islands and coastal headlands on Mesozoic to Proterozoic igneous rocks and Tertiary volcanics
8.12.13a	O	Category A or B area containing of concern	Tussock grassland, or <i>Xanthorrhoea latifolia</i> shrubland, including areas recently colonised by <i>Timonius timon</i> var. <i>timon</i> shrubland, on slopes of islands and headlands, on Mesozoic to Proterozoic igneous rocks and Tertiary acid to intermediate volcanics
8.2.9/11.2.3/11.1.1	O/O/L	Category A or B area containing of concern	Tussock grassland on coastal dunes/Microphyll vine forest (beach scrub) on sandy beach ridges and dune swales/ <i>Sporobolus virginicus</i> grassland on marine clay plains

15.15 Appendix O: Species profile Abbot Point

15.15.1.1 Avifauna

15.15.1.1.1 *Calidris canutus* (Red Knot)

The Red Knot is a migratory species that is listed as endangered under the EPBC Act and the NC Act. Although the Red Knot is not a globally threatened species, Australian populations have shown a significant decline.³⁶⁹ The Red Knot breeds in the northern hemisphere and then migrates to Australasia for winter.³⁷⁰ During its non-breeding season, the species mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours.³⁷¹ The Red Knot can sometimes occur in shallow pools on exposed rock platforms or coral reefs.³⁷² The species often forage near edge of water on intertidal mudflats or sandflats exposed by low tide.³⁷³ Commonly, the Red Knot will roost on sandy beaches, spits and islets, mudflats and in shallow saline ponds of saltworks.³⁷⁴

15.15.1.1.2 *Calidris ferruginea* (Curlew Sandpiper)

The Curlew Sandpiper is migratory shorebird that is listed as critically endangered under the EPBC Act and the NC Act. The species occur largely around coasts and in smaller numbers in inland areas.³⁷⁵ The Curlew Sandpiper are commonly found on intertidal mudflats in sheltered coastal areas.³⁷⁶ In Queensland, there are scattered records of the species in the Gulf of Carpentaria and widespread records along the coast south of Cairns.³⁷⁷ The Curlew Sandpiper does not breed in Australia, but instead breed in the northern hemisphere and migrate south for winter.³⁷⁸

15.15.1.1.3 *Calidris tenuirostris* (Great Knot)

The Great Knot is listed as critically endangered under the EPBC Act and the NC Act. The species has been recorded around the entirety of the Australian coastline with the greatest numbers found in northern Western Australia and the Northern Territory.³⁷⁹ In Queensland, the Great Knot is known to inhabit the Broad Sound-Shoalwater Bay area and the Mackay and Moreton Bay region.³⁸⁰ The Great Knot prefers sheltered coastal habitats with large intertidal mudflats or sandflats.³⁸¹ The species is also occasionally found on exposed reefs, rock platforms, shorelines with mangrove vegetation, ponds in saltworks, coastal swamps, and non-tidal lagoons.³⁸² The Great Knot typically roosts in large groups often at the waters' edge or in shallow water

³⁶⁹ Minton, C. (2002). *Personal communication*. Australasian Wader Studies Group.

³⁷⁰ Threatened Species Scientific Committee. (2016). *Conservation Advice Calidris canutus Red knot*. Available at [855 - Conservation Advice Calidris canutus- Red knot - approved 5 May 2016 \(environment.gov.au\)](#).

³⁷¹ Higgins, P. and Davies, S. (1996). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons*. Melbourne, Victoria: Oxford University Press; Department of Agriculture, Water and the Environment. (n.d). *Calidris canutus – Red Knot*, Knot Species Profile and Threats Database. Available at [Calidris canutus — Red Knot, Knot \(environment.gov.au\)](#).

³⁷² Higgins, P. and Davies, S. (1996). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons*. Melbourne, Victoria: Oxford University Press; Department of Agriculture, Water and the Environment. (n.d). *Calidris canutus – Red Knot*, Knot Species Profile and Threats Database. Available at [Calidris canutus — Red Knot, Knot \(environment.gov.au\)](#).

³⁷³ Threatened Species Scientific Committee. (2016). *Conservation Advice Calidris canutus Red knot*. Available at [855 - Conservation Advice Calidris canutus- Red knot - approved 5 May 2016 \(environment.gov.au\)](#); Department of Agriculture, Water and the Environment. (n.d). *Calidris canutus – Red Knot*, Knot Species Profile and Threats Database. Available at [Calidris canutus — Red Knot, Knot \(environment.gov.au\)](#).

³⁷⁴ Department of Agriculture, Water and the Environment. (n.d). *Calidris canutus – Red Knot, Knot Species Profile and Threats Database*. Available at [Calidris canutus — Red Knot, Knot \(environment.gov.au\)](#); Higgins, P. and Davies, S. (1996). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons*. Melbourne, Victoria: Oxford University Press.

³⁷⁵ Department of Agriculture, Water and the Environment. *Calidris ferruginea* Species Profile and Threats Database. Retrieved from [Calidris ferruginea — Curlew Sandpiper \(environment.gov.au\)](#).

³⁷⁶ Higgins, P., and Davies, S. (1996). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons*. Melbourne, Victoria: Oxford University Press.

³⁷⁷ Department of Environment. (2015). *Conservation Advice Calidris ferruginea curlew sandpiper*. Retrieved from [Conservation Advice Calidris ferruginea curlew sandpiper \(environment.gov.au\)](#).

³⁷⁸ Department of Environment. (2015). *Conservation Advice Calidris ferruginea curlew sandpiper*. Retrieved from [Conservation Advice Calidris ferruginea curlew sandpiper \(environment.gov.au\)](#).

³⁷⁹ Garnett, S., Szabo, J. and Dutson, G. (2011). *The Action Plan for Australian Birds 2010*. CSIRO Publishing. <http://birdsindanger.net/taxatable>.

³⁸⁰ Threatened Species Scientific Committee. (2016). *Conservation Advice Calidris tenuirostris great knot*. Retrieved from [862 - Conservation Advice Calidris tenuirostris Great knot - 5 May 2016 \(environment.gov.au\)](#).

³⁸¹ Department of Agriculture, Water and the Environment. (n.d.). *Calidris tenuirostris – Great Knot* Species Profile and Threats Database. [Calidris tenuirostris — Great Knot \(environment.gov.au\)](#).

³⁸² Department of Agriculture, Water and the Environment. (n.d.). *Calidris tenuirostris – Great Knot* Species Profile and Threats Database. [Calidris tenuirostris — Great Knot \(environment.gov.au\)](#).

that is close to feeding grounds.³⁸³ The species breeds in the northern hemisphere and migrates south along the East Asian-Australasian Flyway for winter.³⁸⁴

15.15.1.1.4 *Neochima ruficauda ruficauda* (Star Finch (Eastern) Star Finch (Southern))

Both the Star Finch (Eastern) and Star Finch (Southern) are sedentary species listed under the EPBC Act and NC Act as endangered. Although there are limited records, the Star Finch (eastern) is known to occur in Central Queensland.³⁸⁵ The area of occupancy and the occurrence of the Star Finch (eastern) is suspected to be declining however this is difficult to determine owing to the lack of accepted record.³⁸⁶ The main cause of the decline is due to habitat degradation as a result of overgrazing and trampling by livestock.³⁸⁷ The Star Finch (eastern) occurs mainly in grasslands and grassy woodlands located near bodies of fresh water and in cleared or suburban areas.³⁸⁸

15.15.1.1.5 *Numenius madagascariensis* (Eastern Curlew, Far Eastern Curlew)

The Eastern and Far Eastern Curlew are listed as critically endangered and endangered under the EPBC Act and the NC Act, respectively. The species are Australia's largest shorebird and long-haul flyer.³⁸⁹ In Australia, the population predominately have a coastal distribution and are found in all states.³⁹⁰ The species breed in the Northern Hemisphere and migrate to Australia during the winter.³⁹¹ The Eastern Curlew commonly inhabit sheltered coasts such as estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats.³⁹²

15.15.1.1.6 *Poephila cincta cincta* (Southern Black Throated Finch)

The Black-throated Finch (southern) is listed as endangered under the EPBC Act and NC Act. The species inhabits open woodlands and forests across a range of *Eucalyptus*, *Corymbima*, *Acacia* and *Melaleuca*.³⁹³ The habitat requirements of the species are water, grass seeds and trees for nesting.³⁹⁴ The species occurs predominately in coastal northern and central Queensland.³⁹⁵

15.15.1.1.7 *Turnix olivii* (Buff-breasted Button-quail)

The Buff-breasted Button-quail is an endangered species under both the EPBC Act and the NC Act. The species is endemic to Australia and typically occurs in north-eastern Queensland.³⁹⁶ Although records of the occurrence and occupancy of the species are limited, it is suspected that the species has continued to decline.³⁹⁷ The Buff-breasted Button-quail commonly occurs in patches of short and sparse grassland, on a

³⁸³ Department of Agriculture, Water and the Environment. (n.d.). *Calidris tenuirostris* – Great Knot Species Profile and Threats Database. [Calidris tenuirostris — Great Knot \(environment.gov.au\)](http://environment.gov.au).

³⁸⁴ Threatened Species Scientific Committee. (2016). Conservation Advice *Calidris tenuirostris* great knot. [862 - Conservation Advice Calidris tenuirostris Great knot - 5 May 2016 \(environment.gov.au\)](http://environment.gov.au).

³⁸⁵ Department of Agriculture, Water and the Environment. (n.d.). *Neochima ruficauda ruficauda* – Star Finch (eastern), Star Finch (southern) Species Profile and Threats Database (n.d.). [Neochmia ruficauda ruficauda — Star Finch \(eastern\), Star Finch \(southern\) \(environment.gov.au\)](http://environment.gov.au); Department of the Environment, Water, Heritage and the Arts. (2008). Approved Conservation Advice for *Neochmia ruficauda ruficauda* (Star Finch (eastern)). [26027 - Approved Conservation Advice for Neochmia ruficauda ruficauda \(Star Finch \(eastern\)\) \(environment.gov.au\)](http://environment.gov.au).

³⁸⁶ Garnett, S., and Crowley, G. (2000). *The Action Plan for Australian Birds 2000*. Canberra, ACT: Environment Australia and Birds Australia. <http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html>.

³⁸⁷ Garnett, S., and Crowley, G. (2000). *The Action Plan for Australian Birds 2000*. Canberra, ACT: Environment Australia and Birds Australia. <http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html>.

³⁸⁸ Department of Agriculture, Water and the Environment. (n.d.). *Neochmia ruficauda ruficauda* – Star Finch (eastern), Star Finch (southern) Species Profile and Threats Database. [Neochmia ruficauda ruficauda — Star Finch \(eastern\), Star Finch \(southern\) \(environment.gov.au\)](http://environment.gov.au).

³⁸⁹ Department of Agriculture, Water and the Environment. (n.d.). *Numenius madagascariensis* – Eastern Curlew, Far Eastern Curlew Species Profile and Threats Database. Retrieved from [Numenius madagascariensis — Eastern Curlew, Far Eastern Curlew \(environment.gov.au\)](http://environment.gov.au).

³⁹⁰ Department of Environment. (2015). Conservation Advice *Numenius madagascariensis*. [Conservation Advice Numenius madagascariensis eastern curlew \(environment.gov.au\)](http://environment.gov.au).

³⁹¹ Department of Environment. (2015). Conservation Advice *Numenius madagascariensis*. [Conservation Advice Numenius madagascariensis eastern curlew \(environment.gov.au\)](http://environment.gov.au).

³⁹² Department of Environment. (2015). Conservation Advice *Numenius madagascariensis*. [Conservation Advice Numenius madagascariensis eastern curlew \(environment.gov.au\)](http://environment.gov.au).

³⁹³ Department of Agriculture, Water and the Environment. (n.d.). *Poephila cincta cincta* – Southern Black-throated Finch Species Profile and Threats Database. [Poephila cincta cincta — Southern Black-throated Finch \(environment.gov.au\)](http://environment.gov.au).

³⁹⁴ Department of Agriculture, Water and the Environment. (n.d.). *Poephila cincta cincta* – Southern Black-throated Finch Species Profile and Threats Database. [Poephila cincta cincta — Southern Black-throated Finch \(environment.gov.au\)](http://environment.gov.au).

³⁹⁵ Threatened Species Scientific Committee. (2005). *Commonwealth Listing Advice on Southern Black-throated Finch (Poephila cincta cincta)*. Southern Black-throated Finch (Poephila cincta cincta) | Department of Agriculture, Water and the Environment.

³⁹⁶ Garnett, S., and Crowley, G. (2000). *The Action Plan for Australian Birds 2000*. Canberra, ACT: Environment Australia and Birds Australia. <http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html>.

³⁹⁷ Garnett, S., and Crowley, G. (2000). *The Action Plan for Australian Birds 2000*. Canberra, ACT: Environment Australia and Birds Australia. <http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html>.

terrain of small stones, and sometimes in open glades amongst *Melaleuca*, *Acacia*, *Alphitonia* or *Tristania* and in rainforest or open *Eucalyptus* woodland.³⁹⁸

15.15.1.2 Mammals

15.15.1.2.1 *Dasyurus hallucatus* (Northern Quoll)

The Northern Quoll is listed as endangered under the EPBC Act but as of 'Least Concern' under the NC Act. The species is known to occur across Queensland, Northern Territory and Western Australia.³⁹⁹ In Queensland, the species extends along the coast and is mostly prevalent in central coast and Northern Queensland.⁴⁰⁰ The species is highly fragmented across Queensland and there have been reductions in the species' distribution.⁴⁰¹ Majority of these reductions can be attributed the large presence of cane toads in Queensland, habitat loss and predation following fire.⁴⁰² The Northern Quoll occupies a diverse range of habitats, including rocky areas, eucalypt forests and woodlands, rainforests, sandy lowlands and beaches, shrublands, grasslands and desert.⁴⁰³ Additionally, the species is known to occupy non-rocky, lowland habitats such as beach scrub communities.⁴⁰⁴

15.15.1.3 Marine

15.15.1.3.1 *Balaenoptera musculus* (Blue Whale)

The Blue Whale is listed as endangered under the EPBC Act. In Australian waters, Blue Whale sightings are widespread and occur around the continent at various times of the year.⁴⁰⁵ The Blue Whale is commonly found at higher latitudes and migrates to lower latitudes for feeding, breeding, and calving during summer.⁴⁰⁶

³⁹⁸ Garnett, S., and Crowley, G. (2000). *The Action Plan for Australian Birds 2000*. Canberra, ACT: Environment Australia and Birds Australia. <http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html>; Department of Agriculture, Water and the Environment. (n.d.). *Turnix olivii* – Buff-breasted Button-quail Species Profile and Threats Database. [Turnix olivii — Buff-breasted Button-quail \(environment.gov.au\)](#).

³⁹⁹ Department of Agriculture, Water and the Environment.(n.d). *Dasyurus hallucatus* – Northern Quoll, Digul [Gogo-Yimidar], Wijingadda [Dambimangari], Wimini [Martu] Species Profile and Threats Database. [Dasyurus hallucatus — Northern Quoll, Digul \[Gogo-Yimidar\], Wijingadda \[Dambimangari\], Wimini \[Martu\] \(environment.gov.au\)](#).

⁴⁰⁰ Department of Agriculture, Water and the Environment.(n.d). *Dasyurus hallucatus* – Northern Quoll, Digul [Gogo-Yimidar], Wijingadda [Dambimangari], Wimini [Martu] Species Profile and Threats Database. [Dasyurus hallucatus — Northern Quoll, Digul \[Gogo-Yimidar\], Wijingadda \[Dambimangari\], Wimini \[Martu\] \(environment.gov.au\)](#).

⁴⁰¹ Woinarski, J., Oakwood, M., Winter, J., Burnett, S., Milne, D., Foster, P., Myles, H., and Holmes, B. (2008). Surviving the toads: patterns of persistence of the northern quoll *Dasyurus hallucatus* in Queensland. *Report submitted to the Natural Heritage Trust Strategic Reserve Program*.

⁴⁰² Threatened Species Scientific Committee. (2005). *Commonwealth Listing Advice on Northern Quoll (Dasyurus hallucatus)*. [Northern Quoll \(Dasyurus hallucatus\) | Department of Agriculture, Water and the Environment](#).

⁴⁰³ Threatened Species Scientific Committee. (2005). *Commonwealth Listing Advice on Northern Quoll (Dasyurus hallucatus)*. [Northern Quoll \(Dasyurus hallucatus\) | Department of Agriculture, Water and the Environment](#).

⁴⁰⁴ Department of Agriculture, Water and the Environment (n.d). *Dasyurus hallucatus* – Northern Quoll, Digul [Gogo-Yimidar], Wijingadda [Dambimangari], Wimini [Martu] Species Profile and Threats Database. [Dasyurus hallucatus — Northern Quoll, Digul \[Gogo-Yimidar\], Wijingadda \[Dambimangari\], Wimini \[Martu\] \(environment.gov.au\)](#).

⁴⁰⁵ Department of the Environment and Heritage. (2005). *Australian National Guidelines for Whale and Dolphin Watching*. <http://www.environment.gov.au/resource/australian-national-guidelines-whale-and-dolphin-watching-2005>.

⁴⁰⁶ Department of Agriculture, Water and the Environment. (n.d). *Balaenoptera musculus* – Blue Whale Species Profile and Threats Database. [Balaenoptera musculus — Blue Whale \(environment.gov.au\)](#).

15.16 Appendix P: Impacts and Threats

Environmental Value	Potential Impact/Threat	Ongoing impact	One-off impact	Current monitoring program
Topography, soils and geology				
Soil	Indirect impact on soils through soil erosion from clearing of vegetation, earthworks and stockpiling, and stormwater runoff during operation.	✓		No
PASS	Direct disturbance of PASS during construction and/or operational activities.	✓	✓	As required through an environmental approval to manage possible future on-going impacts.
Terrestrial environment				
Vegetation communities	Direct clearing of remnant vegetation in unprotected areas, particularly for residential or industrial coastal development, resulting in reduction of extent and condition of remnant vegetation communities, particularly those of conservation significance.	✓		No
	Indirect impacts to remnant vegetation from stormwater runoff from increased built up areas. This results in changed localised conditions (that is, elevated nutrients, changed hydrological regime), and potentially decline in geographic extent and relative health of remnant vegetation communities, particularly those of conservation significance	✓		No
	Increased edge effects from construction of new roads and pedestrian tracks outside the APSDA, leading to increased pressures such as pests and weeds ingress into remnant vegetation communities.	✓		Land Management of Weeds by NQBP
	Increased visitations by local community and potentially tourists using newly formed tracks or ad hoc tracks and along watercourse banks, leading to increased pressures such as pests and weeds ingress into remnant vegetation communities.	✓		Land Management of Weeds by NQBP
Threatened flora and fauna	Direct clearing of fauna habitat, primarily for residential development or industrial use leading to reduction of specific species habitat, in some cases to below population sustainability level and resulting in decline/loss of species from localised area.	✓		No
	Ongoing indirect impacts from increased residential and industrial activity (that is, increased noise, light and human activity), resulting in disturbance and potentially displacement of individuals of threatened fauna species, and in some cases displacement of whole populations.	✓		No
	Potential for souveniring of some flora species of conservation significance, particularly epiphytic species in rainforest remnant vegetation.	✓		No
	Direct mortality and/or injury to terrestrial fauna individuals as a result of new/expanded traffic routes and therefore increased vehicle movements.	✓		No

Environmental Value	Potential Impact/Threat	Ongoing impact	One-off impact	Current monitoring program
	Increased edge effects and/or direct loss of important foraging/roosting habitat for shorebirds due to encroachment of industrial development and port expansion.	✓		No
	Disruption to shorebird species from recreational vehicles driving through important habitat (that is, along beaches). Increase in other recreational activities such as windsurfing and jet skis in close proximity to important habitats.	✓		No
	Disruption to shorebird species from uncontrolled anthropogenic related access (including by dogs and horses) to important habitat, including habitat used for nesting.	✓		No
	Reduced intertidal fauna habitat condition and/or quality from increased levels of waste materials from pollution and declining in water quality from stormwater run-off.	✓		No
	Disruption to intertidal fauna behaviour and/or life-cycle due to Increased potential for human interaction resulting from expansion in industrial and residential development including expansion of the port. This can be directly linked to increases in noise, vibration and light.	✓		No
	Direct mortality and/or injury to intertidal fauna from Increased boating activity including recreational, commercial and tourism boating.	✓		No
	Direct impact and loss from port activities such as reclamation resulting in complete loss of intertidal areas and associated habitat values	✓		No
Biosecurity				
Weeds and pest species	Introduction or spread of pest and weed species, resulting in reduced condition and/or quality of marine vegetation communities and/or fauna habitat	✓		Land Management of Weeds by NQBP
Aquatic ecosystems - freshwater				
Surface water quality	Indirect changes in surface water quality, or surface water quality degradation, as a result of increased turbidity, sedimentation, increased salinity, increased nutrient levels and the release of pesticides and chemicals into the environment.	✓		DES water quality data by the Department of Science, Information Technology and Innovation I
Hydrology	Indirect alterations to freshwater hydrology and changes to inflows as a result of construction activities, dredging or dredge spoil disposal.	✓		No
	Offshore disposal of dredge spoil resulting in changed topography of the seafloor and therefore hydrology	✓		Monitoring under the Long-term Maintenance Dredging Management Plan 2018–2043 NQBP.
Water quality	Indirect sedimentation and turbidity as a result of dredge plumes and vegetation clearing leading to topsoil runoff into waterways.	✓		Ambient Water Quality Monitoring Program

Environmental Value	Potential Impact/Threat	Ongoing impact	One-off impact	Current monitoring program
	Impacts to water quality from stormwater runoff that contains heavy metals, organics and other contaminants from port activities and surrounding urban, industrial and agricultural areas	✓		Ambient Water Quality Monitoring Program
PASS	Changes in groundwater levels can indirectly expose PASS which, once activated, can be transported through surface or ground water sources.	✓		Ambient Water Quality Monitoring Program
	Environmental harm from ASS present in dredge spoil	✓		Monitoring under the <i>Long-term Maintenance Dredging Management Plan 2018–2043</i> .
Pollution	Accidental release of contaminants, such as fuels and chemicals, into adjacent wetland ecosystems or surface water bodies. Indirect impacts from the release of contaminants or turbid water pose a risk to aquatic habitats and water quality.	✓	✓	Ambient Water Quality Monitoring Program
Groundwater	Groundwater impacts as a result of significant earthworks, contamination or overuse during dry periods. Indirect degradation of groundwater sources can impact on streamflow, springs and groundwater dependent ecosystems.	✓		DES Water Quality Data Monitoring
	Disruption of the hydraulic connection between surface water and groundwater and changes in the groundwater levels or quantities within local aquifers.	✓		No
Wetlands	Indirect impacts to wetlands from stormwater runoff	✓		<i>Reef 2050 Integrated Monitoring and Reporting Program Strategy</i>
	Extensive clearing for cultivation or residential development upstream or immediately adjacent wetland, resulting in changes to hydrological regime and potentially declining health / dieback of wetland floral species and communities.	✓	✓	No
	Construction of waterway barriers, resulting in changed wetland hydrological regime and potentially declining health/dieback of riverine and freshwater wetland communities.	✓	✓	No
	Low-level impacts from fishing, recreation and grazing to wetlands.	✓		No
	Invasion of pasture species from surrounding cultivation into wetland communities' habitat.	✓		No
	Indirect impacts to wetlands from stormwater runoff	✓		<i>Reef 2050 Integrated Monitoring and Reporting Program Strategy</i> .
Aquatic ecosystems – marine and estuarine				
Water quality	Indirect sedimentation and turbidity as a result of dredge plumes and vegetation clearing leading to topsoil runoff into waterways.	✓		<i>Reef 2050 Integrated Monitoring and</i>

Environmental Value	Potential Impact/Threat	Ongoing impact	One-off impact	Current monitoring program
				<i>Reporting Program Strategy</i>
	Direct deposition of dust (including coal dust) onto the marine environment causing increased turbidity, smothering of marine communities/species and transport of contaminants.	✓		<i>Reef 2050 Integrated Monitoring and Reporting Program Strategy</i>
	Impacts to water quality from stormwater runoff that contains heavy metals, organics and other contaminants from port activities and surrounding urban, industrial and agricultural areas	✓		<i>Reef 2050 Integrated Monitoring and Reporting Program Strategy</i>
	Environmental harm from ASS present in dredge spoil	✓		Monitoring under the <i>Long-term Maintenance Dredging Management Plan 2018–2043</i>
Coastal processes	Any structure that is placed in the marine environment has the potential to indirectly change currents and waves, which in turn affects the movement of sediment in the marine environment ⁴⁰⁷ .	✓		<i>Reef 2050 Integrated Monitoring and Reporting Program Strategy</i>
	Offshore disposal of dredge spoil resulting in changed topography of the seafloor and therefore hydrology	✓		Monitoring under the <i>Long-term Maintenance Dredging Management Plan 2018–2043</i> NQBP.
Mangroves and intertidal flora	Reduced extent, condition and/or quality of mangrove and intertidal flora communities due to indirect edge effects caused by clearance of vegetation in adjacent or nearby areas.	✓		No
	Damage to mangrove seedlings and other intertidal flora species from increased anthropogenic visitation in mangrove communities and intertidal areas.	✓		No
	Suspended sediment from dredge plumes accumulate in sensitive areas including beaches and intertidal areas, potentially impacting light penetration and thereby affecting germination rates and the relative health of existing intertidal flora populations.	✓		No
	Changes to coastal processes resulting in erosion and accretion of sediments, thereby potentially impacting the nature and extent of germination and development of some flora communities.	✓		No
	Potential for inadvertent clearing of mangrove, saltmarsh and other intertidal communities as a result of increased coastal development activities in the study area. It is noted that the Caley		✓	No

⁴⁰⁷ GHD. (2012). *Abbot Point Cumulative Impact Assessment: Coastal processes and Hydrodynamics Technical Report, August 2012, Abbot Point Working Group.* (Confidential).

Environmental Value	Potential Impact/Threat	Ongoing impact	One-off impact	Current monitoring program
	Valley and Cape Upstart wetland areas, and most other mangroves in the study area, are largely protected from direct impacts such as planned clearance, however inadvertent clearance is still a limited risk.			
	Changes in localised conditions and potential loss of habitat due to increased aquaculture development, resulting in relative health decline/dieback and therefore reduction in extent of mangrove communities and other intertidal flora species. It is noted that only some dieback of mangroves has occurred, but this is due to isolated flooding.	✓		No
	Increased coastal development, including urban, tourism and infrastructure, resulting in the physical removal of mangroves, changes to localised hydrological regime and potential loss of connectivity between communities.	✓		No
	Increased coastal development may potentially result in pollution and decreased water quality, increased levels of nutrients, pesticides and sediments from urban and agricultural development in upper catchments, which in turn may indirectly impact mangrove ecosystems in the lower catchments.	✓		No
	Climatic change resulting in SLR and increased storm intensity and frequency has the potential to alter mangrove ecosystems in terms of relative distribution, health and species composition.	✓		No
	Direct impact and loss from port activities such as reclamation resulting in complete loss of intertidal areas and associated habitat values		✓	No
	Increased coastal development or development in upstream catchments, resulting in increased stormwater discharges at point locations, potentially impacting important intertidal faunal species such as the Grapsid crabs. These crabs help process leaf litter and aerate soils in mangrove communities and reported decline of their populations in some mangrove communities within the study area there has been likely linked to stormwater discharge.	✓		No
Intertidal fauna				
Seagrass	Reduction in light penetration to seagrass beds as a result of increased turbidity during dredging works/release of tailwater, resulting in reduced growth rates and dieback of the seagrass communities.		✓	NQBP and TropWater Long-term Seagrass Monitoring Program
	Increase in localised turbidity plumes from placement of rock armour revetment walls at ports terminals and/or from seepage of turbid water through the reclamation wall, resulting in dieback of seagrass beds in localised areas.	✓	✓	NQBP and TropWater Long-term Seagrass Monitoring Program
	Operational impacts such as surface water runoff, chemical spills, increased dust deposition resulting in impact to water quality/nutrient levels and therefore impeding seagrass growth in nearby areas.	✓		NQBP and TropWater Long-term Seagrass Monitoring Program
	Increased coastal development resulting in increased nutrient, sediment and pesticide loads from residential runoff, resulting in seagrass meadow habitat loss and modification.	✓		NQBP and TropWater Long-term Seagrass Monitoring Program

Environmental Value	Potential Impact/Threat	Ongoing impact	One-off impact	Current monitoring program
	Increased storm intensity and frequency as a result of climate change, resulting in seagrass dieback and reduced time between these events for regeneration.	✓		NQBP and TropWater Long-term Seagrass Monitoring Program
	Rising sea surface temperatures and SLR, sometimes to temperatures above the tolerance threshold of seagrass, resulting in 'burning' and degradation of seagrass meadows, and in some case, seagrass meadows dieback.	✓		NQBP and TropWater Long-term Seagrass Monitoring Program
	Increased nutrient, sediment and pesticide loads from land-based sources/runoff from catchment leading declining water quality and therefore reduced natural resilience of reefs to these disturbances.	✓		NQBP and TropWater Long-term Seagrass Monitoring Program
	Direct impact and loss from port activities such as reclamation resulting in complete loss of intertidal areas and associated habitat values	✓	✓	NQBP and TropWater Long-term Seagrass Monitoring Program
Coral reefs	Indirect impacts on coral reefs from capital and maintenance dredging resulting in physical damage /dieback of corals.	✓	✓	NQBP and TropWater Coral Monitoring Survey
	Sustained high turbidity and sediment deposition after a cyclone or flood event, resulting in damage or dieback of corals.		✓	NQBP and TropWater Coral Monitoring Survey
	Reduced recovery time of coral reefs from climatic events such as cyclones or floods as a result in climate change (i.e. increased in frequency of events).	✓		NQBP and TropWater Coral Monitoring Survey
	Increased nutrient, sediment and pesticide loads from land-based sources/runoff from catchment leading to reduced natural resilience of coral reefs to these disturbances.	✓		NQBP and TropWater Coral Monitoring Survey
	Increased ocean acidification from anthropogenic CO ₂ emissions resulting in a decline in corals and other reef organisms appropriately producing calcium carbonate skeletons and shells, which in turn reduced resilience of these organisms.	✓		NQBP and TropWater Coral Monitoring Survey
Fish	Mortality and/or injury as a result of becoming trapped within the reclamation area of a new ports precinct.	✓	✓	No
	Increase in localised turbidity plumes from placement of rock armouring resulting in reduced habitat areas for fish.	✓	✓	No
	Operational impacts such as surface water runoff, chemical spills and increase in dust deposition, resulting in reduced water quality, which in turns impacts fish communities inhabiting these areas.	✓		No
	Degradation and/or contamination of water quality from operational waste, which in turn impacts fish communities inhabiting these areas.	✓		No

Environmental Value	Potential Impact/Threat	Ongoing impact	One-off impact	Current monitoring program
	Reduction in breeding/feeding habitat due to increased sedimentation and decreased water quality from dredge plumes.		✓	
	Direct impact and loss from port activities such as reclamation resulting in complete loss of intertidal areas and associated habitat values	✓	✓	
	Port linear infrastructure, upgrades, maintenance, dredging and land reclamation resulting in direct loss or impact to marine plant and waterways that provide fish passage	✓		No
Megafauna	Increased edge effects from encroachment by residential/industrial development on important nesting habitat for marine turtles, resulting in disruption to nesting behaviour.	✓		Ambient water quality monitoring program by NQBP and TropWater and Queensland Parks and Wildlife Service and Mackay District Turtle Watch Association
	Direct mortality and/or injury as a result of vessel strike and/or dredging activity on marine megafauna individuals.	✓		DES StrandNet Wildlife stranding database.
	Increase in noise and vibration as a result of ports activities including shipping movements, resulting in disruption to behaviour, migratory routes and lifecycle of megafauna species.	✓		No
	Mortality and/or injury as a result of becoming trapped within ports reclamation area when under construction.		✓	DES StrandNet Wildlife stranding database.
	Increase in lighting from ports activities, resulting in disruption to behaviour/lifecycle of marine megafauna species.	✓		No
	Increase in lighting from ports activities, resulting in disruption to turtle hatchlings' ability to disperse to coastal waters after hatching.	✓		Ambient water quality monitoring program by NQBP, TropWater and Queensland Parks and Wildlife Service and Mackay District Turtle Watch Association
Estuarine and marine flora and fauna	Increase in dust and other air quality pollutants affecting adjacent marine vegetation communities as a result of ports and other coastal industrial activities, reducing the condition and quality of these species/communities.	✓		No
	Increased edge effects on adjacent marine vegetation communities and/or fauna habitat as a result of encroachment from residential and industrial coastal development, thereby reducing the condition and/or quality of these species/communities.	✓		No

Environmental Value	Potential Impact/Threat	Ongoing impact	One-off impact	Current monitoring program
	Direct mortality and/or injury to marine fauna from increased vessel strikes	✓		DES StrandNet Wildlife stranding database.
	Increase in noise, vibration and light from ports and other coastal industries, resulting in disruption to behaviour/lifecycle of marine fauna.	✓		No
	Direct impact and loss from port activities such as reclamation resulting in complete loss of intertidal areas and associated habitat values	✓		No
Migratory shorebirds and waterbird habitat	Temporary displacement of migratory birds during reclamation activities at port, including increased noise, light and dust deposition.		✓	No
	Ongoing operational impacts such as increased noise, light and dust deposition, resulting in displacement of migratory and shorebirds from nearby habitat.	✓		No
	Indirect impacts on a habitat of migratory birds and shorebirds from stormwater runoff.	✓		No
	Indirect impact from encroachment of residential development and increased cultivation in adjacent or nearby areas to habitat, resulting in displacement of migratory and shorebirds.	✓		No
	Indirect impact from recreational fisheries or boating activities in habitat that supports migratory bird species or shorebirds.	✓		Qfish fisheries catch data.
	Construction of barriers due to development, resulting in changed hydrological regime and potentially declining health and reduction of migratory shorebird habitat resulting in displacement of migratory shorebirds	✓		No
Coastal resources	Climate change resulting in increased coastal water temperatures increase: <ul style="list-style-type: none"> the risk of coral bleaching and rising concentrations of carbon dioxide; and ocean acidification which affects the health of many marine species including plankton, molluscs, shellfish and corals. 	✓		Ambient Coral Monitoring Program
	Growing populations and development along the coast increases the vulnerability of coastal areas to SLR as the inland migration of wetlands can be blocked and changes in sediment delivery to coastal areas can accelerate erosion	✓		No
	Coastal areas are vulnerable to increases in intensity of storm surge and heavy precipitation. Storm surges can destroy habitat and heavier rainfall in coastal areas could increase runoff and flooding which threatens the health and quality of coastal waters	✓		No
Dust	Increased dust deposition on plants, fauna and water environments, particularly in the adjacent wetland as a result of earthworks, clearing and grubbing, disturbance of the soil and coal dust from existing facilities and rail operations Some impacts of fine coal dust on biota would include: ⁴⁰⁸			No

Environmental Value	Potential Impact/Threat	Ongoing impact	One-off impact	Current monitoring program
	<ul style="list-style-type: none"> changed physiochemical characteristic of marine and freshwater habitats smothering of benthic communities; and increased turbidity causing reduced light penetration for corals and seagrasses.⁴⁰⁹. 			
	Nuisance impacts of dust settling on houses, vehicles etc. within nearby residences and communities.	✓		No
Health	Airborne dust and coal dust particles may cause increased respiratory illnesses in human populations located within the study area.	✓		No
Visual amenity	Dust in the atmosphere (producing haze) reduces natural scenic amenity of the study area.	✓		No
Noise	Increased noise generated from construction and operational activities at the port and other industrial areas, resulting in changed behaviours in some fauna species and potentially impacting fauna lifecycles. At high risk of impacts is migratory shorebirds within adjacent wetlands.	✓		No
	Increased noise generated from construction and operational activities at the port and other industrial areas impacting on nearby residences and communities.	✓		No
	Noise pollution at a regional scale, as a result of construction and shipping noise, has the potential to impact wildlife behaviour.	✓		No
Underwater noise	Underwater noise and vibration impacts on marine fauna, particularly marine megafauna, such as behavioural or physiological changes resulting from offshore development and dredging.	✓		No
Visual impact footprint	Intensification of existing port activities and larger footprint increasing visual impact on nearby sensitive receptors.	✓		No
Vegetation screening	Clearing of vegetation which currently screens existing port operations from viewers.	✓	✓	No
Shipping activities	Increase in shipping activities in the GBRWHA impacting scenic experience of tourist cruise ships and recreational boat users.	✓		No

15.17 Appendix Q: Vessel calls

Vessel calls at the priority Port of Abbot Point in 8 to 22 July 2021

Name	LOA	Summer Draft	Gross Registered Tonnes	DWT	Beam	Class
Tai Chang	230	14.9	50,697	93,296	38.04	Neo-Panamax
Celebes Clover	299.99	18.43	107054	210,036	50	VLOC
Star Luna	228.99	14.3	43,168	82,687	32.29	Panamax
Cic Paola	291.97	18.2	93,735	179,998	45	Capesize
Azul Sinfonia	291.98	18.24	92,756	181,605	45	Capesize
Glory First	224.98	14.45	40,937	77,157	32.28	Panamax
Double Fortune	234.98	14.47	50,617	95,790	38	Neo-Panamax
Bumblebee	189.99	12.57	31,250	55,628	32.3	Supramax
Elena	224.86	14.43	42,647	82,356	32.26	Panamax
Pacifist	291.98	18.24	92,752	181,458	45	Capesize
Great Progress	199.9	13.3	36,353	63,377	32.31	Supramax
Nian Feng Hai	291.95	18.2	91,205	177,878	45.05	Capesize
Battersea	290.51	17.82	89,510	169,391	45.06	Capesize
CL Dalian	229	14.47	44,138	81,700	32.3	Panamax
Mini	255.26	14.5	63,993	114,563	43.06	Neo-Panamax
Venus Horizon	234.98	14.45	50,647	95,755	38	Neo-Panamax
Blue Wave	229	14.2	47,984	87,340	36.84	Neo-Panamax
Ermione	190	12.84	31,532	56,557	32.30	Supramax
Yasa Eagle	229	14.52	44,557	81,525	32.30	Panamax
Average	245.23	15.40	60,291	114,110	38.28	Capesize
Median	230	14.47	50,617	92,296	38.00	Neo-Panamax

Name	DWT	LOA	Beam	Summer Draft
Handysize	15 - 35,000	130 - 150	–	–
Handymax	35 - 50,000	150 - 200	–	–
Supramax	50 - 65,000	Up to 199	–	–
Panamax	65 - 80,000	Up to 275	Up to 32.2	Up to 12.04
Neo-Panamax	80 - 120,000	Up to 366	Up to 49	Up to 15.2
Capesize	120 - 180,000	Unlimited	Unlimited	Unlimited
VLOC	>180,000	Unlimited	Unlimited	Unlimited

