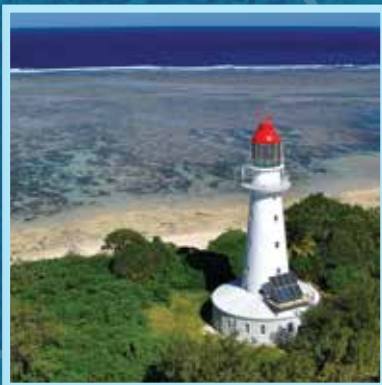


NORTH-EAST SHIPPING MANAGEMENT PLAN



North-East Shipping Management Group
October 2014

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Glossary of Acronyms

AIS	Automatic Identification System
AHS	Australian Hydrographic Service
AMSA	Australian Maritime Safety Authority
APM	Associated Protective Measure
APR	Automated Position Reporting (via INMARSAT C)
ATSB	Australian Transport Safety Bureau
AtoN	aid to navigation
Agriculture	Australian Government Department of Agriculture
BWM Convention	<i>International Convention for the Control and Management of Ships' Ballast Water and Sediments</i>
DGPS	Differential Global Positioning System
DNV	Det Norske Veritas
DSA	Designated Shipping Area
DWT	deadweight tonnes
ECDIS	Electronic Chart Display and Information System
Environment	Australian Government Department of the Environment
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ETC	emergency towage capability
ETV	emergency towage vessel
GBR	Great Barrier Reef
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
HNS	harmful and noxious substance
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IHO	International Hydrographic Organization
IMO	International Maritime Organization
Industry	Australian Government Department of Industry
Infrastructure	Australian Government Department of Infrastructure and Regional Development
IWRAP MK2	IALA Waterways Risk Assessment Programme Mark 2

MNES	matters of national environmental significance
MO	Marine Order
MOU	memorandum of understanding
MSQ	Maritime Safety Queensland
NESMG	North-East Shipping Management Group
OUV	Outstanding Universal Value
PSSA	Particularly Sensitive Sea Area
PSC	port State control
REEFREP	Mandatory Ship Reporting System in the Great Barrier Reef and Torres Strait
REEFVTS	Vessel Traffic Service in the Great Barrier Reef and Torres Strait
RHM	Regional Harbour Master
RIS	Regulation Impact Statement
SOLAS	<i>International Convention for the Safety of Life at Sea</i>
STCW	<i>International Convention on Standards of Training, Certification and Watchkeeping for Seafarers</i>
STM	Sea Traffic Management
TOS	Traffic organisation service
UNCLOS	United Nations Convention on the Law of the Sea of 10 December 1982
UKCM	under keel clearance management
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VTS	Vessel Traffic Service
WSMG	Water Space Management Group
MARPOL	International Convention for the Prevention of Pollution From Ships

Transmittal to Deputy Prime Minister Truss

The Hon. Warren Truss MP
Deputy Prime Minister
Minister for Infrastructure and Regional Development

Dear Deputy Prime Minister

I am pleased to present the North-East Shipping Management Plan (the plan).

The plan identifies existing, new and strengthened management measures to ensure shipping within the Great Barrier Reef, Torres Strait and Coral Sea continues to be conducted to the highest standards possible.

It will also inform the Reef 2050 Long Term Sustainability Plan for the Great Barrier Reef World Heritage Area, an over-arching framework to guide protection and management of the Great Barrier Reef World Heritage Area from 2015 to 2050 being developed by the Australian and Queensland governments.

The measures and initiatives in the plan were developed over two years and involved a two-month public submission process and consultations with other Australian and state government officials as well as peak shipping and environmental representative bodies.

The development of the plan has been overseen by the North-East Shipping Management Group (the group) comprising senior representatives from the Australian Maritime Safety Authority; Department of Infrastructure and Regional Development; Great Barrier Reef Marine Park Authority; Department of the Environment; Department of Agriculture; Department of Industry; and Maritime Safety Queensland.

The group has made every effort to work closely with industry and key interest groups to ensure the measures are as practical as possible with strong and genuine net benefits to all of the users of Australia's maritime domain. The group will also continue to oversee the work programme and consult with stakeholders to ensure action items remain relevant and appropriate.

All of the members of the North-East Shipping Management Group have indicated they would be pleased to offer technical briefings or advice to you or other ministers on any aspects of the proposed actions contained in the plan.

I wish to record the group's appreciation for the input of the many organisations and agencies which made submissions about the plan.

Yours sincerely



Chief Executive Officer
Australian Maritime Safety Authority

Foreword

The ocean waters of north-eastern Australia are unquestionably one of the most important natural areas of Australia.

Shipping is a key use of this area, and is expected to grow into the future.

As an international industry, shipping is subject to a comprehensive regulatory regime which must take into account community expectations and international standards.

The broader Australian community has an expectation that shipping is managed without incident or adverse environmental effects. National coordination and leadership is therefore critical in developing and implementing integrated approaches to address common objectives.

Our approach to managing the challenges of shipping growth will directly influence the future condition of the marine environments of these areas, safety of seafarers and coastal communities.

The North-East Shipping Management Plan aims to give Australians confidence in how the growth of shipping area is managed concomitant with growth in commodity flows and associated infrastructure such as ports. It outlines measures currently in place to manage the safety of shipping in the sensitive marine environments of Australia's north-east region and proposes options and action to further minimise the environmental impacts of these activities and related risks to the Outstanding Universal Value and integrity of the Great Barrier Reef World Heritage Area in the years to come.

The development of this plan provides an excellent opportunity for the resources sector, and other industries that rely on sea freight, to look at current and proposed shipping management arrangements and also to play our part in ensuring that that mineral and energy-related shipping continues to be conducted in a safe and environmentally sound manner. The plan will also inform the development of the Reef 2050 Long Term Sustainability Plan for the Great Barrier Reef World Heritage Area due to be submitted to the World Heritage Committee in 2015.

It is our hope that the North-East Shipping Management Plan will increase community awareness and understanding of Australia's shipping management regime and assist decision-makers to determine priorities and management decisions that improve safety and environmental outcomes.

A work programme summarises the proposed actions to be taken over the coming years to improve the safety of shipping and protection of the marine environment in the north-east region.

Implementation and monitoring will be guided by the North-East Shipping Management Group, related working groups and key stakeholders.



Mick Kinley
Chair

North-East Shipping Management Group

Executive summary

Australia's economy relies heavily upon shipping. The export of bulk cargoes in particular has grown considerably over the last decade, driven by demand from Asia. The exploitation of further coal and natural gas deposits in eastern Australia will see a gradual increase in international vessels visiting ports and transiting the environmentally sensitive waters north-east of Australia (Great Barrier Reef, Torres Strait and the Coral Sea) over the coming decades.

Australia's north-east marine environment is recognised for its unique physical, ecological and heritage values and rich marine biodiversity that include a diverse array of marine species, such as cetaceans, turtles and dugongs. It is afforded protection under various national and international instruments. For example, the Great Barrier Reef is recognised as an iconic World Heritage property by UNESCO and both the Great Barrier Reef and Torres Strait have been designated as a Particularly Sensitive Sea Area by the International Maritime Organization.

Australia's State Party Report on the state of conservation of the Great Barrier Reef World Heritage Area (Australia)¹ released on 31 January 2014 notes that the management system in place to protect the Outstanding Universal Value (OUV) and integrity of the Great Barrier Reef is one of the most rigorous and modern in the world and activities such as shipping are carefully managed to minimise environmental impact and to conserve the environment.

While there were almost 11,000 ship movements monitored by the Vessel Traffic Service in the Great Barrier Reef and Torres Strait without significant incident for the fiscal year 2012-13, continued growth in shipping activity through these sensitive regions can bring an increased risk of incidents and potential for ship-sourced pollution and damage if not managed appropriately.

To ensure protection of the environment has the highest priority, including preservation of the OUV and integrity of the World Heritage property, cooperation between government agencies and industry in the planning and implementation of safety control measures for shipping is essential. To this end, the North-East Shipping Management Group was formed to review shipping trends and develop and oversee implementation of an integrated approach to shipping management in the region.

Australia already has extensive and stringent navigation and pollution prevention controls in place throughout the north-east region to prevent incidents such as groundings and collisions. These include:

- high quality electronic navigation charts and aids to navigation
- pilotage requirements
- two way routes and other ship routing measures
- vessel traffic services that monitor ship movements and intervene if shipping moves beyond defined limits such as designated shipping areas
- emergency response assets and arrangements including emergency towage assets and oil spill response equipment.

¹ *State Party Report on the state of conservation of the Great Barrier Reef World Heritage Area (Australia)*, Commonwealth of Australia, 2014

To get objective data to evaluate the effectiveness of navigation and ship safety measures for current and forecast traffic levels (to 2032), an assessment of ship incident risk was commissioned for the region in 2012. This work found that the existing measures in place have a significant effect in reducing risk of shipping incidents and, while the traffic densities forecast in the region will never approach those experienced in busy waterways such as the Malacca Straits and English Channel, there are additional measures which can be taken now and in the future to further reduce risks of incidents. These measures are outlined in the work programme contained at the end of this document and include:

- further areas for consideration of pilotage requirements as traffic levels warrant
- increased resources for port State control inspections and further focus on areas related to navigational risk (such as fatigue, passage planning and navigational equipment)
- additional protections for the Coral Sea afforded by international instruments such as ship reporting and routing requirements
- using emerging ship tracking technology to provide early alerting of ship breakdowns including a 'traffic organisation service' to minimise collision risk
- working with industry to introduce ahead of international timelines the need for ships trading to ports in the region to be equipped with Electronic Chart Display and Information Systems (ECDIS) and bunker oil tanks fitted in protective locations.

Even when operated safely, and in accordance with all legal requirements, shipping may still have an impact on the environment from operational and other routine impacts such as exhaust gas emissions and anchoring. The cumulative effect of these impacts may accumulate in time or interact with other impacts to place additional pressures on an already stressed environment.

The North-East Shipping Management Group is committed to undertaking further work to improve assessment of the actual and potential ecological impacts from shipping so that appropriate management strategies can then be put in place. To this end, the work programme contains actions to investigate and mitigate the risk of collisions with marine fauna, the effects of noise, vessel wake, and associated cumulative impacts on the ecology of the region.

Should a shipping incident occur, it is critical that appropriate systems are in place to respond to pollution or environmental damage that results from such incidents. The National Plan for Maritime Environmental Emergencies has recently been reviewed and the north-east region arrangements are already benefiting from the implementation of recommendations from that review.

The role of the North-East Shipping Management Group, in overseeing implementation of this plan and regularly reviewing the potential impacts from shipping, will continue to ensure the North-East Shipping Management Plan remains a long-term road map for minimising impacts from shipping in the region.

1. Introduction

Much of the prosperity of the communities in central and north Queensland, as well as the Australian economy, is based on the mining and agriculture industry, whose products by necessity must travel through Queensland's ports.

Access to Queensland ports requires ships to travel through environmentally sensitive areas such as the Great Barrier Reef, Torres Strait and the Coral Sea. As such, it is essential for the survival of regional communities and the Australian economy that these shipping routes remain open and available to shipping on an equitable and sustainable basis.

Commensurate with an effective and competitive freight movement are the timely assessment, review and management of safety and environmental risks to ensure the outstanding values of this unique and sensitive area are protected now and in perpetuity.

The North-East Shipping Management Plan has been developed by the North-East Shipping Management Group (NESMG) with input from interested stakeholder groups. The group comprises senior representatives from the following agencies:

- Australian Maritime Safety Authority (AMSA)
- Great Barrier Reef Marine Park Authority (GBRMPA)
- Maritime Safety Queensland (MSQ)
- Department of Infrastructure and Regional Development (Infrastructure)
- Department of the Environment (Environment)
- Department of Industry (Industry)
- Department of Agriculture (Agriculture).

The plan takes into consideration a quantitative risk assessment by Det Norske Veritas (DNV)² of existing control measures and a range of possible future risk mitigation options.

1.1 Aim

The plan has two main aims:

1. To describe measures currently in place to manage the safety of shipping in the sensitive marine environments of Australia's north-east region and propose additional protective measures to further minimise the environmental impacts of these activities in the short, medium and long term.
2. To inform the *Great Barrier Reef Region Strategic Assessment and the Reef 2050 Great Barrier Reef Long-term Sustainability Plan* of the current and proposed measures in place to mitigate known and potential impacts of shipping affecting the Outstanding Universal Value and integrity of the Great Barrier Reef World Heritage Area and other Matters of National Environmental Significance.

² Det Norske Veritas, North East Shipping Risk Assessment, report to the Australian Maritime Safety Authority, 22 February 2013. Det Norske Veritas is an independent foundation with the purpose of safeguarding life, property and the environment. Its history goes back to 1864, when the foundation was established in Norway to inspect and evaluate the technical condition of Norwegian merchant vessels. Since then, its core competence has been to identify, assess and advise on managing risk.

1.2 Scope

The focus of the plan is upon improving safety and environmental outcomes for SOLAS class³ commercial trading ship activity in Australia's north-east region.

The geographic area of the plan recognises the connectivity and consequential risks of three regions, namely the Torres Strait, Coral Sea and Great Barrier Reef, as well as acknowledging the importance of improved shipping management in contiguous Papua New Guinea waters. Figure 1 shows the geographic area covered by the plan.

The plan includes a work programme detailing current commitments; new protective management measures; and measures to be kept under review.

The NESMG will oversee the progress of implementing the work programme. However, lead agencies are responsible for progressing related policy decisions commensurate with the initiatives contained within the plan.

As a living document, the plan will be subject to regular review and amendment by the NESMG and consultation with stakeholders as new information becomes available.

The relative risks of shipping related activity are also informed by peer reviewed scientific research and the ongoing implementation of actions arising from the Great Barrier Reef Anchorage report,⁴ relevant Commonwealth marine plans, the GBRMPA strategic assessment, and projects assessment reports under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Great Barrier Reef Marine Park Act 1975* (GBRMP Act) and state government assessment processes.

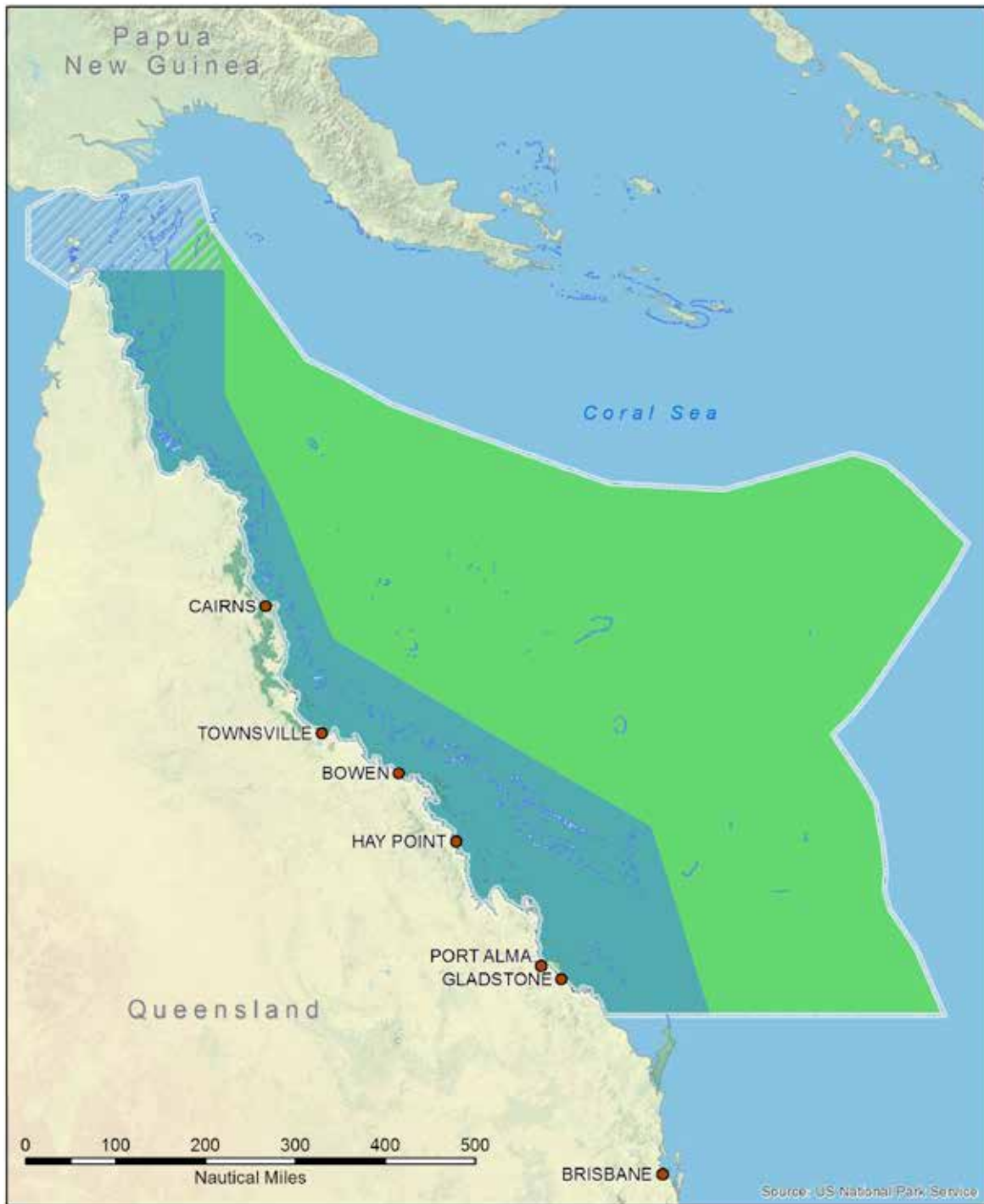
Other matters that influence the risk profile of shipping in Australian waters, including matters that affect the growth and complexity in the regulatory environment in which shipping operates, will be progressed under a National Shipping Management Plan.

The predicted increase in shipping activity in the region is closely associated with coastal and port developments but this plan does not consider or examine the environmental impact of these developments. These issues are being separately addressed by the comprehensive strategic assessment for the Great Barrier Reef World Heritage Area.

³ SOLAS class vessels in this Plan are considered to be ships regulated under the International Convention for the Safety of Life at Sea, 1974, and its Protocol of 1988.

⁴ GHD 2013, ship anchorage management in the Great Barrier Reef World Heritage Area, Great Barrier Reef Marine Park Authority, Townsville.

Figure 1: Geographic extent of the North-East Shipping Management Plan



Legend

- North East Shipping Management Plan Boundary
- Coral Sea Commonwealth Marine Reserve
- GBR World Heritage Area
- Torres Strait PSSA



1.3 Background

Over many years, the waters off north-east Australia have been afforded the highest protections in the world through application of a range of international, national and state measures, laws and standards. This plan acknowledges and builds on these measures and earlier reviews of shipping management undertaken by government agencies over the last decade (See Annex 5).

1.3.1 World Heritage Committee decisions

In June 2011, the World Heritage Committee (the Committee) expressed concern about the approval of liquefied natural gas processing and port facilities on Curtis Island (off Gladstone, Queensland), within the boundary of the GBRWHA. The Committee requested that Australia undertake a comprehensive strategic assessment of the property and invite a monitoring mission to examine the state of conservation and contribute to the strategic assessment process.

The Committee requested that Australia:

“...undertake a comprehensive strategic assessment of the entire property, identifying planned and potential future development that could impact the Outstanding Universal Value to enable a long-term plan for sustainable development that will protect the Outstanding Universal Value of the property.”⁵

The joint mission of the UNESCO⁶ World Heritage Centre and International Union for Conservation of Nature (IUCN), which took place in March 2012, concluded that the Great Barrier Reef continued to demonstrate the Outstanding Universal Values (OUV) for which it was inscribed on the World Heritage List in 1981. However, the mission also noted that the condition of parts of the Great Barrier Reef ecosystem, most notably the inshore areas south of Cooktown, had declined since the time of inscription. Climate change, catchment runoff, coastal development, ports and shipping and direct extractive use were identified as the most important threats to the long-term conservation of the property.

The mission acknowledged strong evidence of competent and effective leadership in relation to management of shipping at both national and state levels, and noted the active role Australia has taken in pursuing international regulation of shipping activities through the use of international instruments such as IMO’s PSSA scheme. In addition, the mission noted that a number of specific impacts of shipping required increased attention, including:

- the regulation of shipping traffic including ‘boat parks’ where numbers of large ships wait at anchor for cargo
- the provision of compulsory and voluntary ship reporting and pilotage
- emergency and pollution response preparedness
- assurance of ship safety
- threats from invasive species imported in ballast waters.

⁵ (WHC Decision 35 COM 7B.10 2011).

⁶ United Nations Educational, Scientific and Cultural Organization.

In conclusion, the monitoring mission recommended that Australia:

“Develop a fully integrated approach to the planning, regulation and management of ports and shipping activity affecting the property, including via Shipping Policy for the property, the proposed Ports Strategy of Queensland, and individual Port Plans, that will ensure that ports and shipping activity does not negatively impact the OUV, including the integrity of the property, and meets the highest international standards in its planning, regulation, assessment and operation.”

In its decisions, the committee has requested that Australia undertake a range of measures to ensure that the OUV of the property is not compromised and has specifically urged Australia to:

“establish the Outstanding Universal Value of the property as a clearly defined and central element within the protection and management system for the property, and to include an explicit assessment of Outstanding Universal Value within future Great Barrier Reef Outlook Reports.”⁷

Australia’s 2013 State Party Report⁸ provided information on the status of the preparation of this plan, an important component of Australia’s response to the mission’s recommendation to develop a fully integrated approach to shipping activity affecting the GBRWHA.

Australia’s 2014 State Party Report⁹ released on 31 January 2014 further noted that the management system in place to protect the OUV and integrity of the GBR is one of the most rigorous and modern in the world and activities such as shipping are carefully managed to minimise environmental impact and to conserve the environment.

1.4 Related initiatives

In addition to this plan, a number of other initiatives have been progressed to plan for the strategic management of the region (Figure 2).

Figure 2: Relationship of the North-East Shipping Plan to other plans and strategies



⁷ WHC Decision 36 COM 7B.8 2012

⁸ *State Party Report on the State of Conservation of the Great Barrier Reef World Heritage Area (Australia)*, Property Id N154, In Response to the World Heritage Committee Decision(WHC 36 Com 7b.8), 1 February 2013; www.abc.net.au/radionational/linkableblob/4519524/data/government-response-to-heritage-decision-data.pdf

⁹ Commonwealth of Australia, 2014, *State Party Report on the state of conservation of the Great Barrier Reef World Heritage Area (Australia)*.

1.4.1 Great Barrier Reef World Heritage Area strategic assessment

To ensure optimum management of the GBR now and into the future, the Australian Government, in conjunction with the Queensland Government and the Great Barrier Reef Marine Park Authority, is undertaking a comprehensive strategic assessment of the Great Barrier Reef World Heritage Area (GBRWHA) and adjacent coastal zone.

The strategic assessment focuses on the direct, indirect and cumulative impacts on matters of national environmental significance as defined by the EPBC Act and is integral to responding to the decisions of the World Heritage Committee. The assessment will evaluate the effectiveness of current planning and management arrangements to protect matters of national environmental significance including the Great Barrier Reef as a designated World Heritage property. Where necessary, it will make recommendations to improve arrangements to build ecosystem resilience in the face of changing climate and expanding economic development.

Initial findings of the strategic assessment have identified declining water quality, extreme weather events, ocean acidification, rising sea temperature and outbreaks of crown-of-thorns starfish as key threats to the reef.

This plan will complement the comprehensive strategic assessment of the Great Barrier Reef. It is intended that implementation and review of the plan will align with the outcomes of the comprehensive strategic assessment and assist in planning for long-term sustainability of shipping in the region.

1.4.2 Reef 2050—Long-Term Sustainability Plan

The comprehensive strategic assessment will help Australia develop a long-term plan for the sustainable development of the property. The Reef 2050—Long-Term Sustainability Plan will draw together the findings of the strategic assessment to set out the protection and management requirements for the GBRWHA to 2050.

Reef 2050 will be guided by an outcome framework that sets clear and measurable targets for protection of the property's OUV and identifies adaptive management actions needed to ensure a resilient, healthy and functioning Reef. The framework will enable the Australian and Queensland governments to monitor and review the management effectiveness of these actions to ensure they continue to achieve net environmental benefits.

It is being jointly developed by the Queensland and Australian governments and will be completed for consideration by the World Heritage Committee in 2015.

1.4.3 Queensland Ports strategy

In conjunction with these planning initiatives, the Queensland Government developed a Great Barrier Reef Ports Strategy, which articulates the government's vision for port development and management of impacts associated with increased shipping in the GBRWHA. The result of this work was used to prepare the Queensland Government's *Queensland Ports Strategy*¹⁰ which proposes to concentrate port development within five Priority Port Development Areas (PPDAs) in Queensland by prohibiting dredging for the development of new or expansion of existing port facilities until 2022 and introduce a statutory requirement for port master planning.

¹⁰ www.dsdp.qld.gov.au/resources/plan/queensland-ports-strategy.pdf

2. Special measures to protect the north-east region

Australia's north-east marine environment is recognised for its unique physical, ecological and heritage values and rich marine biodiversity.

Annex 1 provides a summary of the natural, Indigenous and heritage values of the region - values which have been well documented.

In recognition of these values, the area is afforded special protection under various national laws and international conventions. These include:

- establishment of the GBR as a Marine Park in 1975
- inscription of the GBR on the World Heritage List in 1981 for its Outstanding Universal Value for all 4 natural heritage criteria¹¹
- declaration of the GBR by the IMO as the world's first PSSA in 1990
- declaration of the Torres Strait as a PSSA by the IMO in 2005
- Designated Shipping Areas prescribed as part of the 2004 rezoning of the Great Barrier Reef Marine Park
- proclamation of the Coral Sea Commonwealth Marine Reserve in November 2012.



¹¹ A property is considered to be of Outstanding Universal Value if it meets one or more of ten criteria (four natural and six cultural). A property, listed under the natural criteria must also meet the conditions of integrity and have an adequate system of protection and management to safeguard its future. The term Outstanding Universal Value is defined as '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'. More information on Outstanding Universal Value can be found on the Department of the Environment website www.environment.gov.au/topics/heritage/heritage-places/world-heritage-list/gbr/world-heritage-values

3. Management responsibilities

There are a wide range of international bodies, treaties and conventions, Australian government agencies and legislation which govern the safety and protection of the north-east region from the effects of shipping.

3.1 International conventions

3.1.1 World Heritage Convention

The Convention Concerning the Protection of the World Cultural and Natural Heritage – World Heritage Convention aims to promote cooperation among nations to protect and preserve listed World Heritage properties around the world for current and future generations.

The World Heritage Convention is a multilateral environmental agreement with 198 signatories that links together, in a single document, the concepts of nature conservation and the preservation of cultural properties. The Convention recognizes the way in which people interact with nature, and the need to preserve the balance between the two.

The prestige that comes from being a State Party to the Convention and having properties inscribed on the World Heritage List often serves as a catalyst to raising awareness for heritage preservation.

The States Parties to the Convention are encouraged to integrate the protection of the cultural and natural heritage into regional planning programmes, undertake scientific and technical conservation research and adopt measures which give this heritage a function in the day-to-day life of the community.

As a State Party to the World Heritage Convention, Australia has an obligation to ‘ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage situated on its territory.’

The World Heritage Convention is governed by the World Heritage Committee, which meets annually and consists of 21 elected members. The committee is supported by a small secretariat at the World Heritage Centre, which is part of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) based in Paris, France.

The Department of the Environment is the Australian Government agency responsible for reporting to the World Heritage Committee and for coordinating the Australian Government’s response to decisions by the Convention about conservation of Australia’s World Heritage properties, including the Great Barrier Reef World Heritage Area.

One of the objectives of the *Great Barrier Reef Marine Park Act (1975)* is to assist in meeting Australia’s international responsibilities in relation to the environment and protection of world heritage (especially Australia’s responsibilities under the World Heritage Convention).

3.1.2 Maritime conventions and instruments

Australian maritime safety and pollution prevention legislation is almost entirely based on instruments that are adopted and kept up to date under the auspices of the International Maritime Organization (IMO).

The main maritime related conventions applicable to managing shipping in Australia's north-east region include:

- United Nations Convention on the Law of the Sea (UNCLOS)
- International Convention for the Prevention of Pollution from Ships (MARPOL)
- International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (INTERVENTION)
- International Convention for the Safety of Life at Sea (SOLAS)
- Standards of Training and Certification of Watchkeepers (STCW)
- Maritime Labour Convention (MLC).



3.2 International responsibility for maritime-related conventions

3.2.1 International Maritime Organization (IMO)

The IMO is a United Nations specialised agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships. Its main task is to develop and maintain a comprehensive regulatory framework for international shipping that covers safety and environmental concerns, legal matters, technical cooperation, maritime security and the efficiency of shipping.

The IMO is extremely important to Australia and is the only forum where Australia can seek to influence the design, operations and standards of foreign-flagged ships before they enter Australian waters. Australia is a key player in the IMO, having served on its governing Council for more than 40 years.

Australia follows a policy of attending all IMO meetings where important matters need to be introduced or the matters to be discussed would or could have a significant effect on Australia's maritime trade or industry or its regulatory regime. As such, AMSA actively consults with industry on new proposals, amendments to existing instruments, emerging issues and trends.

In addition, the technical committees, the Maritime Safety Committee (MSC) and the Marine Environment Protection Committee (MEPC) are often attended by industry and government representatives.

3.3 Regulatory responsibilities of Australian and Queensland Governments

The management of shipping and application of the international instruments at a domestic level is a shared responsibility amongst Australian and Queensland Government agencies, with some private entity management over some of the port areas.

3.3.1 Australian Maritime Safety Authority (AMSA)

AMSA is a statutory authority established under the *Australian Maritime Safety Authority Act 1990 (Cth)*. Its principal functions are:

- promoting maritime safety and protection of the marine environment
- preventing and combating ship-sourced pollution in the marine environment
- providing infrastructure to support safe navigation in Australian waters
- providing a national search and rescue service to the maritime and aviation sectors.

AMSA is largely a self-funded government agency as it delivers ship safety and regulatory services on a cost recovery basis through charges to the shipping industry, primarily through levy funding and fee-for-service sources. The levies and cost recovery systems are reviewed regularly to take account of changes in structure or underlying activities, shipping volumes and the impact on levy rates, including as part of any new management measures developed under this plan.

3.3.2 Maritime Safety Queensland (MSQ)

MSQ is a branch of the Queensland Department of Transport and Main Roads.

It is responsible for:

- improving maritime safety for shipping and small craft through regulation and education
- minimising vessel-sourced waste and responding to marine pollution
- providing essential maritime services such as vessel traffic services and aids to navigation
- regulating port pilotage
- encouraging and supporting innovation in the maritime industry.

The *Transport Operations (Marine Safety) Act 1994 (Qld)* applies to ships including smaller commercial ships, fishing vessels, recreational and pleasure craft.

From 1 July 2013, responsibility for regulating the safety of all commercial ships (including small vessels) came under Commonwealth jurisdiction. The *Marine Safety (Domestic Commercial Vessel) National Law Act 2012* provides for national regulation of the domestic commercial vessel industry in Australia by establishing the National Marine Safety Regulator (i.e. AMSA) and establishing a national law for domestic commercial vessel safety.

3.3.3 Great Barrier Reef Marine Park Authority (GBRMPA)

GBRMPA is the Australian Government agency responsible for managing the Great Barrier Reef Marine Park. GBRMPA works towards the marine park's long-term protection and ecological sustainability as well as the understanding and enjoyment of the marine park for all Australians and the international community.

The *Great Barrier Reef Marine Park Act 1975 (Cth)* established the marine park and provides for its multiple use, control, care and development by GBRMPA.

3.3.4 Department of Infrastructure and Regional Development (Infrastructure)

Infrastructure contributes to the prosperity of the economy and the wellbeing of all Australians by supporting and enhancing our maritime industry. The department supports an efficient, safe and environmentally friendly maritime transport system, including an effective regulatory framework for shipping and environmental and safety regulations.

It has policy responsibility for the Australian Government's maritime safety legislation, including the *Navigation Act 2012 (Cth)*, the *Marine Safety (Domestic Commercial Vessel) National Law Act 2012 (Cth)*, and the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cth)*.

Domestic legislation applies to vessels on interstate and intrastate voyages.

It implements Australia's obligations under international maritime conventions into domestic legislation.

3.3.5 Department of the Environment (Environment)

The Department of the Environment administers Australia's central piece of environmental legislation, the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act).

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, Commonwealth Reserves and heritage places. Commonwealth decisions under the EPBC Act are guided by the principles of ecologically sustainable development including through the conservation and ecologically sustainable use of Australia's biodiversity.

Under the Act, the Commonwealth Minister for the Environment must take account of the precautionary principle when making a decision including whether to approve the taking of an action. The EPBC Act defines the precautionary principle as 'that lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage'.¹²

Waters surrounding Australia's coastlines are protected from wastes and pollution dumped at sea by the *Environment Protection (Sea Dumping) Act 1981 (Cth)*. The Act regulates the loading and dumping of waste at sea. It fulfils Australia's international obligations under the London Protocol to prevent marine pollution by dumping of wastes and other matter. Within the waters of the Great Barrier Reef Marine Park, the GBRMPA has the delegation to issue Sea Dumping permissions.

3.3.6 Department of Agriculture (Agriculture)

The Department of Agriculture develops and implements policies that ensure Australia's agricultural, fisheries, food and forestry industries remain competitive, profitable and sustainable. Agriculture is responsible for the administration of the *Quarantine Act 1908 (Cth)* and monitors, assesses and manages the quarantine risks associated with vessels, crew, marine pests and ballast water for all international vessels arriving in Australia.

3.3.7 Department of Industry (Industry)

The Department of Industry was established on 18 September 2013. It consolidates the Australian Government's efforts to drive economic growth, productivity and competitiveness by bringing together industry, energy, resources, science and skills.

Its interest in the north-east region relates to the sustainable supply of energy as well as promoting strong economic growth through the development of resources and energy projects in Queensland.

3.3.8 Australian Transport Safety Bureau (ATSB)

The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport. As an independent statutory authority, it undertakes 'no blame' safety investigations to establish the causes of accidents and incidents.

A list of key legislative instruments relating to the management of shipping is at Annex 2.

¹² EPBC Act, part 16, s. 391.

4. Shipping activity in the north-east region

4.1 Shipping traffic

Shipping provides the most cost-effective method of bulk transport over any great distance, transporting over 90 per cent of the world's trade.¹³ It is also indispensable in a sustainable future global economy as it is the most environmentally sound mode of mass transport, both in terms of energy efficiency and the prevention of pollution.¹⁴

Australia, as an island nation and one that possesses enormous mineral and agricultural wealth, derives most of its income from goods which are exported by ships. The geographical spread of Australia's global trade partners and the large average size of many shipments mean that Australia's key navigation routes are not heavily used by world standards.¹⁵ On any given day, vessel tracking data shows there are around 40-50 ships on active voyages throughout the GBR (Figure 3).¹⁶ In comparison, a ship arrives or leaves Singapore every two to three minutes and, at any one time, there are about 1000 vessels in the Singapore port.¹⁷

While over 4000 vessels berthed at north-east regional ports in 2012-13 (see section 4.3), there were in fact far greater numbers of vessels operating within the region during this time. In 2012-13, 10,700 large commercial ship movements were reported to have occurred in the region in addition to the operation of 83,000 privately registered recreational vessels and 485 commercial trawlers. These numbers reinforce the need for sound protective measures and management of the waterways and ports of the north-east region.



¹³ www.imo.org/KnowledgeCentre/ShipsAndShippingFactsAndFigures/TheRoleandImportanceofInternationalShipping/Documents/International%20Shipping%20-%20Facts%20and%20Figures.pdf

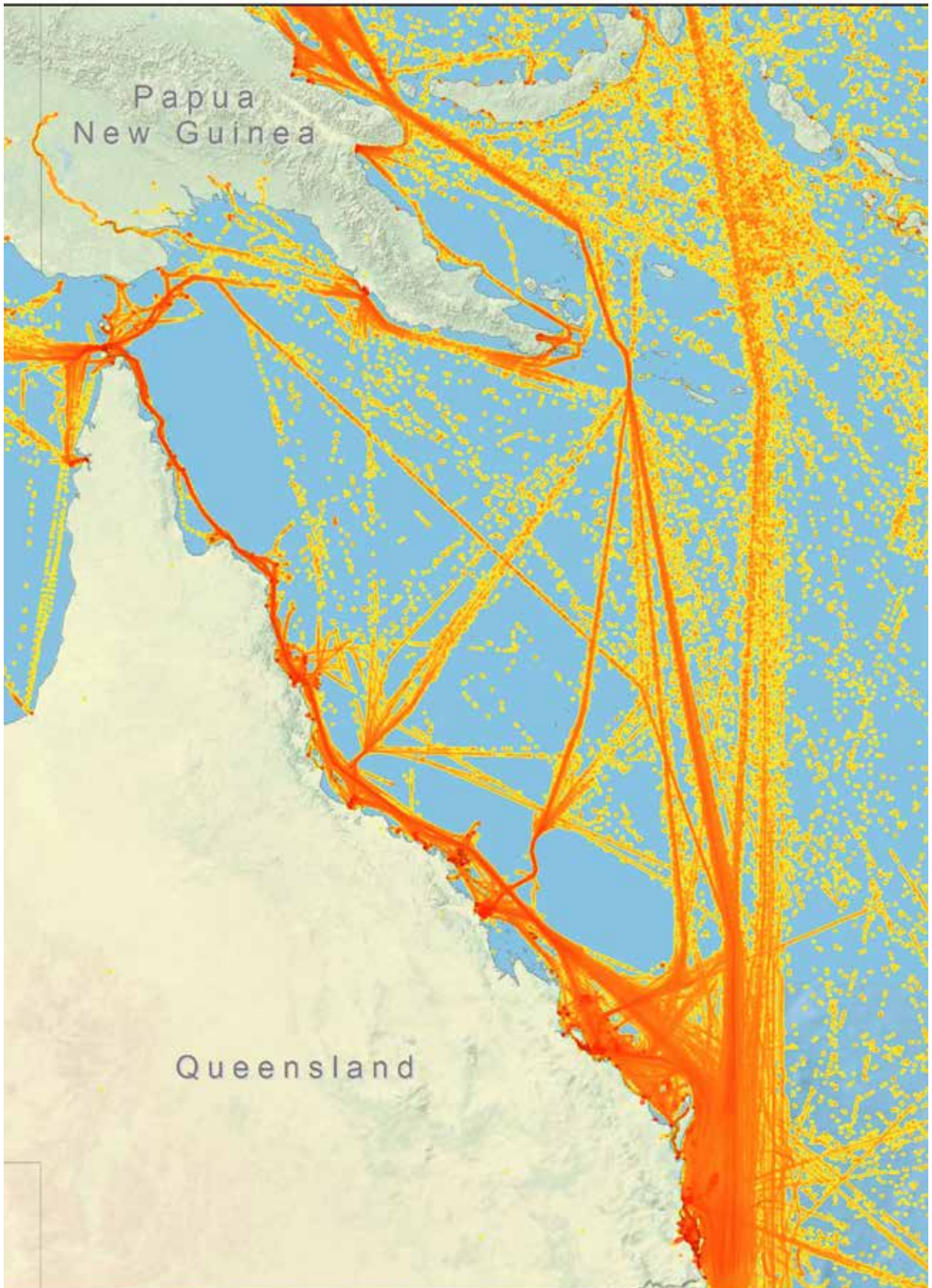
¹⁴ International Maritime Organization, *A concept of a Sustainable Marine Transportation System*, www.imo.org/MediaCentre/HotTopics/SMD/Pages/default.aspx

¹⁵ <http://people.hofstra.edu/geotrans/eng/ch1en/appl1en/maritimerroutes.html>

¹⁶ Sourced from ReefVTS data from July 2012 to June 2013. Includes vessels on active voyages over a 24 hour period.

¹⁷ MPA Singapore, 2014, *Other facts you may not know*: www.mpa.gov.sg/sites/maritime_singapore/what_is_maritime_singapore/other_facts_you_may_not_know.page

Figure 3: Density of regional shipping traffic (June 2014)



4.2 International shipping routes

There are four main international shipping entry and exit points to Australia's north-east region (Figure 4):¹⁸

- a) **Torres Strait** (Arafura Sea)—is generally shallow and contains numerous uncharted shoals that are hazards to navigation
- b) **Jomard Passage** (Papua New Guinea)—is most common for Capesize and Panamax vessels due to draft restrictions through the Torres Strait. Destinations reached via Jomard passage include: China, Taiwan, Korea, Japan, Hong Kong, Eastern Russia and Papua New Guinea
- c) **Pacific**—is used by traffic that is eastbound across the Pacific Ocean. Destinations include: North and South America (both east and west coast) and New Zealand
- d) **Southbound**—is used for transits to Europe, which are normally undertaken by Capesize vessels.

As a party to the United Nations Convention on the Law of the Sea (UNCLOS), and related maritime and marine environment treaties regarding the freedoms and rights of navigation, Australia is not able to require ships to use alternative shipping routes or ban certain types of ships or cargoes from the region. The IMO is the only recognised administration for considering any new routing measures.

4.3 Shipping routes within the north-east region

Within the north-east region there are three major shipping routes:

4.3.1 Torres Strait

The Torres Strait is an area of limited depth and complex tidal streams and transit is subject to stringent tidal constraints for large ships. It has a draught restriction of 12.2 metres currently but is the most direct route from south Asia and India to eastern Australia. Additional navigation demands arise from the operation of numerous local fishing and recreational craft in the area.

4.3.2 Inner Route

The Inner Route runs parallel to the Queensland coast and lies between Cape York in the north and Gladstone in the south. It is well charted and marked with aids to navigation.

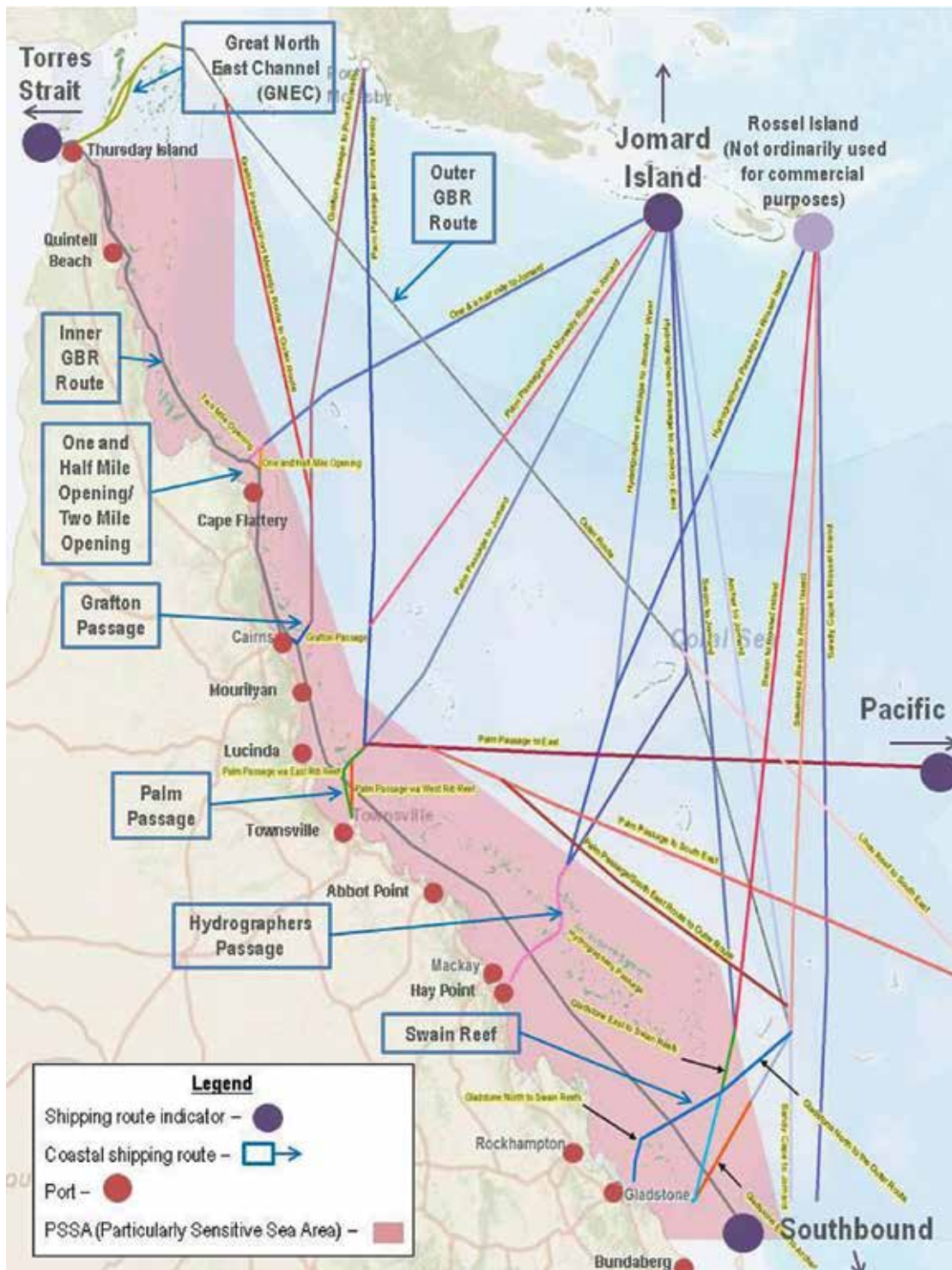
Although sheltered from swell, the region is subject to strong trade winds, occasional cyclones and complex tidal streams. Ships encounter limited water depths, reduced visibility in the wet season and narrow restricted shipping lanes in certain parts of the GBR. A vessel suffering total propulsion or power failure on the Inner Route is able to anchor and await assistance. Passage through the Inner Route from the Cairns to Torres Strait sector involves navigation within confined waters for a period of approximately 40 hours.

Vessels transiting the Inner Route fall into several categories:

- international (SOLAS class) vessels that transit the region but do not visit Australian ports
- trading vessels visiting Australian ports
- Australian-flagged overseas-trading vessels
- Australian coastal-trading vessels, fishing and tourist vessels
- international and Australian non-commercial traffic (e.g. private yachts, motor cruisers and naval vessels).

¹⁸ Braemar Seascope March 2013, North Queensland Ship Traffic Growth Study, Supplementary Report.

Figure 4: North-east shipping routes



4.3.3 Outer Route

The Outer Route begins at the eastern limit of the Torres Strait (the Great North East Channel), continues southwards through the Coral Sea and re-joins the Queensland coast near Sandy Cape (south of Gladstone).

The Outer Route experiences south-east trade winds and heavy seas for nine months of the year. A vessel suffering major propulsion or power failure in the Coral Sea may be many hundreds of nautical miles from assistance. Anchoring is often impractical due to the depth of the offshore waters as well as the steep drop-offs associated with the outer edge of the barrier reef. This increases the risk of drifting on to one of the Coral Sea reefs or the outer edge of the GBR before assistance is able to arrive.

In the 1980s, the Australian Hydrographic Office observed that many tankers bound for south-eastern Australian ports were using an uncharted route through the Coral Sea in preference to the Inner Route of the GBR. The route was surveyed and charted to international standards in 1997 to encourage a greater number of vessels, particularly oil tankers, to use the Outer Route.

Tankers have since taken up use of the Outer Route voluntarily to avoid the risk of a major spill within the GBR. It is now virtually unknown for tankers, either loaded or in ballast, to use the Inner Route, with the exception of ships carrying refined products supplying Queensland coastal ports.

4.3.4 Passages to ports within the GBR

There were a total of 2910 ships and 11417 voyages through the Reef in 2013-14.¹⁹ The majority of ships enter and leave the Torres Strait and GBR ports via six main passages (Table 1):

- Great North East Channel (Torres Strait)
- Grafton Passage (near Cairns)
- Palm Passage (near Townsville)
- Hydrographers Passage (near Mackay)
- Capricorn Channel (near Gladstone)
- Curtis Channels (near Gladstone).

Table 1: Ship traffic through the passages of the Great Barrier Reef

Ship traffic by passage	2013-14	
	No. of ships	No. of voyages
Great North East Channel	642	1293
Prince of Wales Channel	1446	3674
Inner Route – Cape York to Cairne	928	2843
Hydrographers Passage	764	1620
Grafton Passage	129	246
Palm Passage	537	103
Whitsunday area	21	31

¹⁹ Number of ships can be totalled to provide summary statistics. However, vessel traffic statistics by region have higher totals as most vessels typically pass through multiple regions during their transit.

4.4 Current shipping activity

In the first decade of this century, Australia's resources sector significantly expanded, driven by demand from industrialising Asian economies and high global commodity prices. During this time, the value of Australia's mineral and energy exports increased at an average annual rate of approximately 10 per cent, and its total value as a percentage of the value of all Australian exports increased from 37 to 60 per cent.

Australia is currently the world's largest exporter of coal (metallurgical and thermal) with Queensland supplying more than 75 per cent of Australia's metallurgical resources. Australian coal exports increased from 195 million tonnes (2000-01) to 284 million tonnes (2010-11).²⁰ The Queensland commodity market, which is dominated by coal trades, is expected to represent about 81.8 per cent of total trade by 2015.²¹ Coal exports will therefore be the biggest driver of shipping through the north-east region including the Coral Sea where northbound coal ships from other east coast coal ports traverse.

The table below (table 2), which is sourced from data compiled by Ports Australia, shows the total number of vessel arrivals at north-east regional ports total throughput and principal commodities in 2012-13. Of the 4440 arrivals, over 87 per cent berth at the 4 major ports in the region: Gladstone, Hay Point, Cairns and Townsville.

Table 2: Vessel arrivals at port (2012-13)

Port	Cargo type	Principle commodities	Vessel arrivals at port	Throughput ('000 tonnes)
Abbot Point	Dry bulk	Coal	201	17,744
Cairns	Mixed	General cargo, tourism	706	1055
Cape Flattery	Dry bulk	General cargo, mineral sands	31	1678
Gladstone	Mixed	Coal, LNG, bauxite, aluminium	1579	85,293
Hay Point	Dry bulk	Coal	883	96,540
Lucinda	Dry bulk	Sugar	1	4
Mackay	Mixed	Sugar and sugar products, grain and petroleum	209	3,269
Mourilyan	Dry bulk	Sugar	19	533
Port Alma	Dry bulk	Chemicals	108	349
Townsville	Mixed	Minerals, sugar, general cargo	692	12,105

Commodities shipped through the Great Barrier Reef region include metal ores, coal, bauxite, liquefied natural gas, sugar, timber, oil, chemicals, live cattle and general cargo.

²⁰ Bureau of Resources and Energy Economics July 2012, Australian bulk commodity exports and infrastructure – Outlook to 2025.

²¹ Braemar Seascope March 2013, North Queensland Ship Traffic Growth Study.



4.5 Future shipping activity

There have been various forecasts of shipping activity in the north-east region made in recent years, all of which predict a growth trend in shipping activity for the next 20 years.²²

To provide updated information and forecasts for this plan, AMSA commissioned Braemar Seascope to undertake the 'North Queensland Ship Traffic Growth Study' which is published along with this report. This work was completed in March 2013 and, taking into account both coal and shipping market trends, forecasts around 2450 coal ship sailings in 2020.

Some industry associations consulted during the development of this plan believe that this forecasted increase is optimistic given fluctuations in shipping numbers, underlying weakening of trade demand and variability in market factors. In addition, a number of port development projects have been postponed or have little probability of being realised. Further the Queensland Government has agreed to facilitate staged, incremental expansion of port and terminal capacity to meet emerging demand in line with long-term plans at each of the five Priority Port Development Areas. These are the Port of Abbot Point, Port of Brisbane, Port of Gladstone, Port of Hay Point and Port of Mackay and Port of Townsville.²³ As such, for planning purposes, it will be important to regularly review information on port developments and shipping activity, particularly in times of economic uncertainty.

²² See for example, *Boom Goes the Reef* (Greenpeace March 2012) and Great Barrier Reef Shipping: Review of Environmental Implications (PGM Environment December 2012)

²³ www.dsdip.qld.gov.au/resources/plan/queensland-ports-strategy.pdf

4.5.1 Coal

By 2025, the Bureau of Resources and Energy Economics (BREE) predicts that Australian exports of thermal coal will be between 267 and 383 million tonnes and exports of metallurgical coal will reach between 260 and 306 million tonnes.²⁴ In Queensland alone, predicted exports for thermal coal are expected to be between 79 and 185 million tonnes by 2025 and for metallurgical coal between 226 and 262 million tonnes.²⁵

Braemar Seascope predicts an 83 per cent increase in coal exports by 2025 to around 270 million tonnes with a corresponding 58 per cent increase in projected shipping levels. The lower growth in ship numbers compared to coal volumes is expected as a result of larger average ship size being able to lift more coal per ship.

4.5.2 Liquefied natural gas (LNG)

Significant increases in production capacity over the next ten years means that Australia is likely to be the world's second largest exporter of liquefied natural gas (after Qatar) by 2020. Around \$56 billion of capital expenditure has been confirmed across three LNG projects in Gladstone and Curtis Island with operational start dates from 2014-15. Australian LNG exports are likely to triple over the next 5 years with actual output expected to grow by around 250 per cent up until 2018.²⁶

Natural gas is one of the safest commodities transported as it is shipped in fully refrigerated liquefied form at low pressure using insulated double hulled ships.²⁷ Braemar Seascope forecasted staggered growth to LNG traffic as facilities in Gladstone come on stream, peaking at 500 ships per year in 2020. However, this traffic level assumes these facilities have sufficient feedstock and markets to run at capacity.

4.6 Ship type and size

There are various types and sizes of commercial ships that trade in the region. Ninety per cent of the cargo tonnage transported through the north-east region is coal, which is carried by bulk carriers. The main types of ships encountered in the region are:

- **Bulk Carriers** - highly efficient vessels that typically transport commodities such as grain, coal and minerals. They are characterised by huge hatch covers that can be rolled or lifted away to reveal cavernous holds. The four main industry standards of bulk carriers are:
 - Handy-size—up to 39,999 deadweight tonnes (DWT)
 - Handymax and Supramax—40,000 to 64,000 DWT
 - Panamax—60,000 to 99,999 DWT
 - Capesize—more than 100,000 DWT
- **Tankers** - designed to transport liquids in bulk, with the major types being the oil tanker, chemical tanker and gas carriers. Gas carrier includes generally smaller LPG tankers serving domestic markets and will include LNG tankers serving export markets
- **Containerships** - cargo ships that carry their load in the familiar truck-size containers 'Twenty Foot Equivalent Units' or TEUs.

²⁴ Bureau of Resources and Energy Economics July 2012, Australian bulk commodity exports and infrastructure – outlook to 2025

²⁵ Bureau of Resources and Energy Economics July 2012, Australian bulk commodity exports and infrastructure – outlook to 2025.

²⁶ Deloitte Access Economics June 2012, Advancing Australia – Harnessing our comparative energy advantage, Australian Petroleum Production and Exploration Association Limited.

²⁷ See 'Shipping Arrow LNG Plan – Safety of LNG Ships and Shipping', www.arrowenergy.com.au/__data/assets/pdf_file/0006/2697/87309_Arrow_Energy_LNG_Project_-_LNG_Shipping_Information.pdf.

4.7 Vessel size growth

Another consideration in predicting vessel traffic is the trend to the construction of larger vessels. This allows for the transport of a higher volume of cargo per vessel. If trade increases in terms of volume exported there is not necessarily a commensurate increase in the number of vessels due to these vessels having a larger DWT (deadweight tonnes) or carrying capacity.

The average growth in vessel size through to 2025, based on an analysis of the current world fleet, trends in vessel sizes, new builds, and ships likely to be scrapped, is shown in Table 3.

Table 3: Vessel size growth trends to 2025²⁸

	2011	2012	2013	2014	2015	2020	2025
Capesize (dwt)	181,706	185,070	186,752	187,344	187,683	189,701	192,201
Panamax (dwt)	76,880	77,894	77,981	77,856	77,925	78,000	78,000
Supra/Handymax (dwt)	52,247	52,298	52,579	52,827	52,966	53,816	54,816
Handysize (dwt)	27,961	28,294	28,775	29,054	29,200	30,025	31,025

The size of bulk carriers will not affect transit through the GBR. Palm Passage and Capricorn and Curtis Channels are deep, while Hydrographers Passage has a limiting depth at chart datum of 25.7 (+/- 1.4 metres).

An increase of approximately 10,000 DWT to Capesize vessels will increase the draught by approximately 1 metre. However, the deepest draught ship to leave a Queensland port has been a coal carrier from Hay Point in January 2014. At 18.47 metres, this particular vessel would be able to access the main passages in the reef but may still be limited by the available water depths in the ports.

Torres Strait will always be limited to ships of draught less than around 13 metres and therefore never suitable for Capesize bulk carriers which may have a loaded draught around 18 metres.

²⁸ Braemar Seascope March 2013, *North Queensland Ship Traffic Growth Study, Supplementary Report*.

5. Assessments of the environmental impacts of shipping

5.1 Scientific and expert assessments

The relative severity or likelihood of environmental impacts to the natural and socio-economic values of the region are regularly risk assessed as part of the review and enhancement of existing mitigation measures or introduction of new measures. Many of the actions in the work programme are directly aimed at addressing risk and uncertainty to prevent the occurrence of any incident that could damage the environment.

Key assessments of shipping impacts in the region that have been conducted through formal government inquiries, scientific and expert reports include:

- Great Barrier Reef Shipping: Review of Environmental Implications²⁹
- Great Barrier Reef Outlook Report³⁰
- Great Barrier Reef World Heritage Area Anchorage Study³¹
- Commonwealth marine bioregional profile for the East Marine Region³²
- Various project assessments under the EPBC Act and state assessments
- Great Barrier Reef Strategic Assessment.

In addition, the collective knowledge and experience of the 500 members of the Marine Environment Protection Committee (MEPC) of the IMO helps to ensure that the best available information, knowledge and data is used to understand, and keep under review, the impacts of shipping on the environment.

5.2 Stakeholder perceptions of threats to the reef

Ongoing social and economic research on the perceived threats to the Great Barrier Reef³³ has identified that while Australians perceive climate change and pollution (from land and from sea) as the biggest threats to the reef, older Australians and those who have visited the reef are more aware of the impact of shipping on the GBR's health. Research conducted by James Cook University and CSIRO³⁴ showed that coastal residents perceived shipping as one of the top three most serious threats to the GBR while national surveys conducted in 2013 indicated that shipping represented 9 per cent of the total perception of threats to the reef.

29 PGM Environment Pty Ltd, 2012, *Great Barrier Reef Shipping: Review of Environmental Implications*, see www.environment.gov.au/system/files/pages/884f8778-caa4-4bd9-b370-318518827db6/files/23qrc-doc3.pdf.

30 Great Barrier Reef Outlook Report 2009, see <http://elibrary.gbrmpa.gov.au/jspui/handle/11017/199>. The 2014 edition of the Great Barrier Reef Outlook Report is currently being prepared.

31 GHD 2013, Ship anchorage management in the Great Barrier Reef World Heritage Area, Great Barrier Reef Marine Park Authority, Townsville

32 www.environment.gov.au/resource/north-marine-bioregional-plan-bioregional-profile-description-ecosystems-conservation

33 Green Pulse Report, 2013, see www.csiro.au/Organisation-Structure/Flagships/Wealth-from-Oceans-Flagship/ORCA/GBRsurvey.aspx

34 CSIRO, SELTMP: Social and Economic Long Term Monitoring Programme, SELTMP Ports & Shipping Working Group Workshop, Townsville, 27 March 2014.

5.3 Known and potential environmental impacts of shipping

According to the 2009 Great Barrier Reef Outlook Report by GBRMPA,³⁵ the major threats to the Great Barrier Reef region have been identified as climate change; continued declining water quality from catchment runoff; loss of coastal habitats from coastal development; and impacts from fishing, illegal fishing and poaching. As a highly regulated activity, the 2009 Outlook Report identifies the impacts from routine shipping operations (operational impacts) as negligible but that there exists a likelihood of a major accident (involving a grounding or collision) or establishment of an invasive species with increased growth in shipping traffic.³⁶

5.3.1 Grounding and collision incidents

While rare, incidents can have a harmful effect on the local environment through:

- cargo or oil spills resulting from loss of hull integrity
- disturbance to seabed and supported biodiversity due to hull impact
- resulting direct contact with anti-fouling paint
- resulting social and cultural impacts
- resulting altered aesthetic value.

5.3.2 Operational impacts

While less obvious, routine operations of shipping also impact upon the environment in various ways:

- disturbance to seabed and supported biodiversity—from wake or propeller and anchoring
- emissions—exhaust gas from machinery, sewage and grey water, biocidal leachate from anti-fouling hull paint systems
- marine pest introduction from ballast water discharge or hull biofouling
- faunal injury or death through ship strike
- interference with species behaviour including through noise and light
- altered aesthetic value
- release of pollutants/wastes (routine/accidental/illegal).

Table 4 from the Great Barrier Reef Region Strategic Assessment outlines the drivers, activities and potential direct use impacts affecting the region's values.

35 Great Barrier Reef Outlook Report 2009, see <http://elibrary.gbrmpa.gov.au/jspui/handle/11017/199>

36 Great Barrier Reef Outlook Report 2009, see <http://elibrary.gbrmpa.gov.au/jspui/handle/11017/199>

Table 4: List of direct drivers, activities, impacts and risks in the GBRWHA

Direct drivers, activities, impacts and risks		Broad categories used in the assessment are shown (on left), however impacts may fall into more than one category. * indicates impact is likely to be the result of a variety of activities.																	
Impacts	Risk to Region's values	Direct driver										Activities in the Region							
		Activities in the catchment					Activities in the Region												
		Biodiversity values	Geomorphological features	Indigenous heritage values	Historic heritage values	Climate change	Agriculture	Aquaculture	Urban development	Industrial development	Port activities	Traditional use	Tourism	Fishing — commercial	Fishing — recreational	Recreation	Shipping	Defence activities	Research activities
Climate change	Altered ocean currents	●	●	●	●	●													
	Cyclone activity	●	●	●	●	●													
	Increased sea temperature	●	●	●	●	●													
	Ocean acidification	●	●	●	●	●													
Catchment run-off	Rising sea level	●	●	●	●	●													
	Increased freshwater inflow	●	●	●	●	●	●	●	●	●									
	Nutrients from catchment run-off	●	●	●	●	●	●	●	●	●									
	Outbreak of crown-of-thorns starfish	●	●	●	●	●	●	●	●	●				●	●				
	Pesticides from catchment run-off	●	●	●	●	●	●	●	●	●									
Degradation of coastal ecosystems	Sediments from catchment run-off	●	●	●	●	●	●	●	●	●									
	Urban and industrial discharge	●	●	●	●	●	●	●	●	●									
	Acid sulphate soils	●	●	●	●	●	●	●	●	●									
	Artificial barriers to flow	●	●	●	●	●	●	●	●	●									
	Atmospheric pollution	●	●	●	●	●	●	●	●	●									
	Coastal reclamation	●	●	●	●	●	●	●	●	●			●	●	●	●			
	Light impacts (artificial)	●	●	●	●	●	●	●	●	●									
	Modifying supporting terrestrial habitats	●	●	●	●	●	●	●	●	●			●	●	●	●			
Direct use	Dredging	●	●	●	●	●	●	●	●	●									
	Dumping and resuspension of dredge material	●	●	●	●	●	●	●	●	●									
	Exotic species and diseases*	●	●	●	●	●	●	●	●	●			●	●	●	●			
	Extraction — death of discarded species	●	●	●	●	●	●	●	●	●				●	●	●			●
	Extraction — fishing in spawning aggregations	●	●	●	●	●	●	●	●	●				●	●	●			●
	Extraction — herbivores	●	●	●	●	●	●	●	●	●			●	●	●	●			●
	Extraction — lower order predators	●	●	●	●	●	●	●	●	●			●	●	●	●			●
	Extraction — lower trophic orders	●	●	●	●	●	●	●	●	●			●	●	●	●			●
	Extraction — top order predators	●	●	●	●	●	●	●	●	●			●	●	●	●			●
	Illegal fishing and poaching	●	●	●	●	●	●	●	●	●				●	●	●			●
	Marine debris*	●	●	●	●	●	●	●	●	●			●	●	●	●			●
	Noise pollution	●	●	●	●	●	●	●	●	●			●	●	●	●		●	●
	Outbreak of disease*	●	●	●	●	●	●	●	●	●			●	●	●	●			●
	Outbreak or bloom of other species*	●	●	●	●	●	●	●	●	●			●	●	●	●			●
	Physical damage — fishing	●	●	●	●	●	●	●	●	●				●	●	●			●
	Physical damage — other	●	●	●	●	●	●	●	●	●			●	●	●	●		●	●
	Physical damage — ship grounding	●	●	●	●	●	●	●	●	●			●	●	●	●		●	●
	Spill — large chemical	●	●	●	●	●	●	●	●	●			●	●	●	●			●
	Spill — large oil	●	●	●	●	●	●	●	●	●			●	●	●	●			●
	Spill — small chemical or oil	●	●	●	●	●	●	●	●	●			●	●	●	●			●
Vessel strike on wildlife	●	●	●	●	●	●	●	●	●			●	●	●	●		●	●	
Waste discharge from vessels	●	●	●	●	●	●	●	●	●			●	●	●	●		●	●	
Wildlife disturbance	●	●	●	●	●	●	●	●	●			●	●	●	●		●	●	

Sourced from Great Barrier Reef Marine Park Authority, 2013, *Great Barrier Reef Region Strategic Assessment*, Programme Report, Draft for public comment, page 71
www.gbrmpa.gov.au/_data/assets/pdf_file/0009/95526/GBRRegion-StrategicAssessmentDraftProgrammeReport.pdf

5.4 Potential secondary (consequential) and cumulative impacts of shipping

There is increasing evidence the reef's resilience is being lost, although the extent of that loss varies considerably between different species and habitats and between localities.³⁷ This loss of resilience cannot be attributed to any single cause, but may be the result of cumulative impacts, many of which are human in origin. Critically, managing cumulative impacts needs to be improved and mechanisms developed which will deliver net environmental benefits across the region.

Cumulative impacts result from individually minor but collectively significant threats taking place over a period of time, or the incremental impact of past, present, and reasonably foreseeable future threats. Activities which leave a 'footprint' (physical damage, persistent pollutants) have a high potential for cumulative impacts.

Currently very little is known about the consequential or cumulative impacts of shipping in the region due to the inherent difficulties of designing scientifically valid studies that take account of the enormous spatial and temporal variability in the benthic environments that occur throughout the area of the plan.³⁸

Some cumulative shipping impacts arise because of synergistic effects. For example, vessel collision rates can be expected to increase faster than the simple rate of increase in vessel numbers, because the likelihood of collision is related to the number of passing or overtaking manoeuvres which increases in a squared relationship to vessel numbers.

At the scale of the GBR ecosystem, most habitats or species groups have the capacity to recover from disturbance or ongoing pressures. However, as a consequence of the legacy of past actions in adjoining catchments, expansion in human activities as well as natural pressures, there is increasing concern over additional risks that shipping activity may be placing on EPBC listed matters of national environmental significance, including consequential and cumulative impacts on the Outstanding Universal Value and integrity of the GBRWHA.

For example, it is well recognised that one of the greatest threats to the GBR is catchment-sourced pollutant discharges. When these are combined with shipping-sourced discharges, critical pollutant concentration thresholds maybe reached over larger areas of the reef. Likewise, cumulative effects of other stressors (climate change, pollution and acidification) may exacerbate the effects of, and retard recovery from, a spill, grounding or antifouling pollutant exposure. For example, reduced rates of coral recruitment have been observed in a grounding site exposed to chemical pollution. This has been highlighted in the report of the 2012 joint mission of the UNESCO World Heritage Centre and International Union for Conservation of Nature.

³⁷ GBRMPA, 2009, Outlook Report

³⁸ See, eg, Andrew NL, Mapstone BD (1987) 'Sampling and the description of spatial pattern in marine ecology', *Oceanogr .Mar Biol A Rev* 25:39-90.

5.5 Potential risks of shipping to OUV and MNES

Given that this plan will inform the comprehensive strategic assessment of the Great Barrier Reef of the pressures of shipping and the management arrangements to deal with such impacts, including cumulative impacts, the Department of the Environment, guided by the Statement of Outstanding Universal Value (OUV) adopted by the World Heritage Committee in 2012, has undertaken a preliminary analysis of potential impacts on the GBRWHA.

The Department of Environment's Environment Protection and Biodiversity Conservation Act Referral Guidelines explain the concept of Outstanding Universal Value, detail the attributes under each criterion and provide guidance on the types of actions that may have a significant impact.³⁹

Examples of the current key attributes that contribute to the Outstanding Universal Value of the Great Barrier Reef World Heritage Area are identified in the Statement of Outstanding Universal Value. Annex 6 contains a full list of attributes relevant to the Outstanding Universal Value of the Great Barrier Reef.

Matters of national environmental significance (MNES) relevant to the GBRWHA are recognised as World Heritage properties; the Great Barrier Reef Marine Park; national heritage places; Commonwealth marine areas; listed migratory species; listed threatened species and ecological communities; and wetlands of international significance.

Table 5 provides examples of the potential existing and emergent shipping-related risks that may impact upon MNES, Outstanding Universal Value of the GBRWHA and protection of the GBR environment as a whole.

It is important to note that the examples describe potential and known impacts of shipping without taking account of the management effectiveness of current regulatory arrangements. The means by which potential impacts to the attributes identified for each OUV criterion are addressed through management arrangements and related mitigation measures are described in the following sections.

Further work is needed to identify and understand the potential consequential and cumulative impacts from shipping as a direct use of the GBRWHA and region covered by this plan as well as how those impacts may affect OUV and MNES.

³⁹ Draft EPBC Act referral guidelines for the Outstanding Universal Value of the Great Barrier Reef World Heritage Area | Department of the Environment www.environment.gov.au/resource/epbc-act-referral-guidelines-outstanding-universal-value-great-barrier-reef-world-heritage

Table 5: Examples of known and potential shipping impacts on matters of national environmental significance (MNES) and Outstanding Universal Value (OUV)

Known (generic) impacts of shipping on reef environments	Potential impacts on MNES	Examples of Outstanding Universal Value attributes⁴⁰ potentially affected
Grounding:		
Scarring of a reef causing structural damage.	Direct impact on benthic habitats and supported biodiversity	(vii) Azure waters Coral assemblages of hard and soft corals Reef fish diversity
Benthic biota slow to recover if hull has remnant coating of antifouling agents	Direct impact on geomorphology (i.e. seagrass banks, reef structure)	(viii) Old massive corals
	Temporary degradation of water quality through the generation of sediment plumes	(ix) Coral reefs, sand banks and coral cays Halimeda banks
	Disruption to water clarity effecting aesthetic values (underwater scenery)	(x) Lagoon floor
Wake and propeller effects:		
Erosion of shorelines and cays	Interference with species behaviour from habitat fragmentation	(vii) Nesting turtles Coral assemblages of hard and soft corals
Dislodgement of coral outcrops	Disruptions to water quality (clarity and turbidity) and aesthetic values	(x) Species of whales Marine turtles Dugongs
Bow waves and plumes disrupt tour operations such as snorkelling	Potential impacts to corals and sea turtle critical behaviours (foraging at sea, selection of nesting sites and passage of hatchlings from the beach to sea)	
Marine fauna strike	Direct impact on protected species causing injury or death (for example, cetaceans, dugongs and turtles)	

40 For a full list of attributes relevant to the Outstanding Universal Value of the Great Barrier Reef see Annex 6

Known (generic) impacts of shipping on reef environments	Potential impacts on MNES	Examples of Outstanding Universal Value attributes⁴⁰ potentially affected
Anchoring:		
<p>Anchor drag</p> <p>Altered aesthetic values to the seascape from large number of ships at anchor in busy ports</p> <p>Emission of antifouling biocides and exhaust emissions</p> <p>With anchorage times similar or greater than transit and loading times, some impacts are exacerbated by anchoring while others are reduced in anchorage areas.</p>	<p>Disruptions to aesthetic values (Unparalleled aerial panorama of seascapes, scenic vistas)</p> <p>Chronic disturbance of sensitive benthic habitats can alter foraging behaviour of dependent species or reduce available feeding grounds.</p>	<p>(vii) Superlative natural beauty above the water Nesting turtles</p> <p>(x) Lagoon floor Dugong Species of dolphins</p>
Oil and chemical spills from vessel groundings or collisions:		
<p>Killing of sea birds or other marine fauna in vulnerable life stages</p> <p>Larger spills may persist for years depending on the amount and type of oil spilt and disrupt ecological and chemical processes killing mangroves or sessile fauna.</p> <p>Socio-economic impacts for users of the area (such as tainting of fish) due to the perceived damage from the spill.</p>	<p>Direct impact on protected species, especially seabirds</p> <p>Direct impact to the quality of the marine environment and indirectly to supported biodiversity</p> <p>Disruptions to the ecological and chemical processes</p> <p>Indirect impacts to foraging habitat or prey of listed species</p> <p>Disruption to water clarity effecting aesthetic values (underwater scenery)</p>	<p>(vii) Superlative natural beauty below the water Azure waters Annual coral spawning Fish spawning aggregation</p> <p>(ix) Connectivity</p> <p>(x) Diversity and complexity of the ecosystem Mangroves Seabirds Dugong Marine turtles Green turtle breeding</p>

Known (generic) impacts of shipping on reef environments	Potential impacts on MNES	Examples of Outstanding Universal Value attributes⁴⁰ potentially affected
<p>Smothering and poisoning of affected coral and near-shore habitats</p> <p>A shipping incident may have a major impact on the sustainability and economic development of Torres Strait islanders in the region, who are heavily dependent on marine resources for income and food.</p>		
<p>Persistent or chronic release of waste, air emissions and other pollutants:</p>		
<p>Release of sewage can elevate nitrogen and phosphorus levels inhibit coral growth and resilience.</p>	<p>Direct impact on protected species.</p> <p>Chemicals, metals and other toxic pollutants may bio-</p>	<p>(vii)</p> <p>Azure waters</p> <p>Annual coral spawning</p> <p>Fish spawning aggregations</p>
<p>Marine fauna can mistake plastics for food or become trapped</p>	<p>accumulate in the tissue of long-lived species such as cetaceans, dugongs and turtles.</p>	<p>(x)</p> <p>Coral genera</p> <p>Diversity and complexity of the ecosystem</p>
<p>Antifouling formulations may release copper and a variety of other biocides into the water and kill fouling organisms.⁴¹</p>	<p>Potential injury or death to protected species from the ingestion of debris such as plastics.</p>	<p>Species of dolphins</p> <p>Marine turtles</p> <p>Dugongs</p> <p>Seabirds</p>
<p>International shipping was estimated to have contributed about 2.7 per cent to the global emissions of carbon dioxide.⁴²</p>	<p>Disruptions to the ecological and chemical processes</p> <p>Disruption to water clarity effecting aesthetic values (underwater scenery)</p>	

41 Data presented in PGM Environment's report *Great Barrier Reef Shipping: Review of Environmental Implications* (December 2012) indicates that daily discharges of copper from antifouling paints on large bulk carriers could reach 0.8 kg to 3.0 kg per vessel (i.e. 2-3 times higher for 'fresh' coatings less than 100 days old, and up to 2.5 times higher in water temperatures more typical of the GBR).

42 www.imo.org/KnowledgeCentre/InformationResourcesOnCurrentTopics/AirPollutionandGreenhouseGasEmissionsfromInternationalShipping/Pages/default.aspx

Known (generic) impacts of shipping on reef environments	Potential impacts on MNES	Examples of Outstanding Universal Value attributes ⁴⁰ potentially affected
Invasive marine pests:		
Introduced marine pests translocated through ballast water or biofouling can outcompete or displace native species and reduce biodiversity.	Impacts can flow through trophic cascades and alter natural ecological processes. Potential to introduce pathogens that can impact upon the marine environment Economic impacts to vessels through fouled water intakes, hulls or propellers.	(x) Diversity and complexity of the ecosystem
Ship collisions with marine fauna:		
Ship strikes involving large vessels and cetaceans may result in death or serious injury. The level of risk depends on whale density, behaviour, time of year, vessel density and vessel speed. Incidences may go unnoticed or unreported due to the size of vessels, a lack of awareness or concerns regarding penalties. Habitat and ship routeing modelling show the potential for ship strikes in mid shelf inter-reefal areas off Gladstone and Mackay.	Direct impact on protected species causing injury or death (for example, cetaceans, dugongs and turtles)	(vii) Migrating whales (x) Humpback whale calving Species of dolphins Species of whales Marine turtles Dugong

Known (generic) impacts of shipping on reef environments	Potential impacts on MNES	Examples of Outstanding Universal Value attributes ⁴⁰ potentially affected
<p>Underwater noise:</p> <p>Sound is known to play a key role in communication, navigation, orientation, feeding and the detection of predators of marine mammals⁴³ but the long-term and cumulative effects of noise have been relatively understudied.⁴⁴</p>	<p>Potential to modify the behaviour of protected species (particularly cetaceans) through attraction or avoidance</p> <p>Potential to interrupt cetacean's use of sonar , masking communications causing separation or displacement</p> <p>Potential to acoustically mask predators or prey</p> <p>Noise may also impact on fish species communicating during spawning and territorial fights, or when competing for food or being attacked by a predator, with possible consequences for ecosystem function and flow on commercial and recreational impacts.</p> <p>Shipping noise may inhibit coral reef formation and colonisation where ambient underwater sound is an important orientation and settlement cue for marine invertebrate larvae.</p>	<p>(vii) Migrating whales Nesting turtles</p> <p>(x) Dugong Humpback whale calving Species of whales Species of dolphins Marine turtles</p>

⁴³ Submission from Environmental Defenders Office

⁴⁴ However, note current research by James Cook University's Centre for Sustainable Tropical Fisheries and Aquaculture on understanding and managing impacts of noise on marine biodiversity, see www.jcu.edu.au/research/JCU_124820.html

Known (generic) impacts of shipping on reef environments	Potential impacts on MNES	Examples of Outstanding Universal Value attributes ⁴⁰ potentially affected
Light pollution:		
<p>Light pollution close to turtle nesting beaches or rookeries may cause alterations to critical behaviours such as foraging at sea, selection of nesting sites and passage of hatchlings from the beach to sea.</p> <p>Lighting can disorientate flying birds and disrupt their ability to forage at sea or to prepare for migration</p>	<p>Potential impacts to sea turtle critical behaviours (foraging at sea, selection of nesting sites and passage of hatchlings from the beach to sea)</p> <p>Potential impacts to seabirds / migratory birds critical behaviours (foraging at sea, disorientation of migratory flights at night).</p> <p>Indirectly impact on protected species by altering prey species behaviour (for example squid may school around lights which can alter the behaviour of dolphins targeting this prey).</p>	<p>(vii) Nesting turtles</p> <p>(x) Seabirds Species of dolphins Species of turtles</p>
Altered aesthetic value:		
<p>Ships at anchor may influence aesthetics depending on people's perception, the proximity of anchorages to viewpoints on land and to residential communities, the visibility from tourist vessels and aircraft in transit, and the level of use.</p>	<p>Disruptions to aesthetic values (Unparalleled aerial panorama of seascapes, scenic vistas).</p>	<p>(vii) Superlative natural beauty above the water</p>

6. Risk assessments of shipping activity and incidents

6.1 Periodic and ongoing assessments

Modern maritime regulatory practice requires that decisions should be based on evidence and any uncertainty should as far as possible be quantified.

Some examples of risk research related to the management of Australia's north-east region currently being commissioned or conducted by AMSA include:

- development of a conceptual framework which integrates risk at the individual ship level with risk due to vessel traffic densities and environmental factors and possible consequences, such as harm caused by pollution to coastal features, socio-economic and ecological values
- the use of statistical methods and a range of interdisciplinary skills (e.g. mathematics, spatial statistics, oceanography etc.) to quantify the various risk elements of ship-specific risk exposure with varying vessel traffic densities and related environmental parameters for incident types of specific interest to AMSA
- quantification of environmental sensitivities using interval-based scoring by a range of experts to address uncertainties to better quantify ecological values of coastal areas. This work has delivered a methodology that can be applied to other coastal areas and across Australia during a response to an oil or chemical spill to ensure consistent valuation of environmental assets with the highest possible level of certainty
- human factors research to address the weaknesses in humans, such as rules, procedures, or equipment
- various navigational and port State control risk assessments and tools (see sections below).

The input of key stakeholder representatives will continue to be a critical part of assessing and reviewing the veracity of the tools and methodologies.

6.2 North-east shipping risk assessment

To meet the specific objectives of this plan, AMSA engaged Det Norske Veritas Australia Pty Ltd (DNV) to estimate the risk of shipping incidents, mainly due to collisions and groundings, in the Great Barrier Reef, Torres Strait and Coral Sea region. DNV had carried out similar work in 2001 for the Great Barrier Reef and Torres Strait. That work was pivotal in having the Torres Strait declared a Particularly Sensitive Sea Area by the IMO.

The current risk assessment produced results presented as the likelihood of the following shipping incidents occurring in a year for specific areas in the region:

- ship/ship collision
- powered grounding (groundings that occur when the ship is able to navigate safely, yet goes aground due to factors such as navigational errors, negligence or mechanical failure)
- drift grounding (groundings that occur when a ship is unable to navigate safely or as intended, such as due to mechanical failure affecting propulsion)
- structural failure/foundering (when a vessel sinks below the surface of the water).

The assessment also considered the likelihood of these incidents resulting in an oil spill.

The study considered shipping traffic at 2011-12 levels (based upon actual traffic data) as the base case, as well as forecast traffic levels for the years 2020 (1.7 times 2012 traffic levels) and 2032 (2.6 times 2012 traffic levels). Different additional risk reduction measures for each of these traffic levels made up the 13 cases in the final report.

The traffic forecasts used were those in the report commissioned by the Abbot Point Working Group, *Great Barrier Reef Shipping: Review of Environmental Implications*, PGM Environment, December 2012 as being considered the most robust available at the time. It is important to note however that forecast traffic levels are now lower than originally predicted.

The major benefit of this risk assessment is the ability to compare risk results for different scenarios, rather than just absolute risk. The risk reduction measures considered in the modelling included:

- extending the coastal pilotage areas
- extending the coastal VTS
- additional emergency towing capability
- traffic organisation service (a service that could potentially be provided by REEFVTS) in specific passages
- 100 per cent carriage and effective use of ECDIS
- 100 per cent fleet penetration of bunker tanks in protective locations (as a measure to reduce likelihood of oil spill only).

6.2.1 General findings

While the incidence of large commercial vessel groundings is very low,⁴⁵ current risk mitigation measures in the region reduce incident risk by around 38 per cent. The current Vessel Traffic Service already covers the area where it provides most benefit.

On the basis of the risk modelling results, DNV concluded the following order of effectiveness of possible risk reduction options as traffic levels increase:

- extension of the pilotage geographical area and/or measures to improve the effectiveness of pilotage such as fatigue management for current traffic and forecast future traffic
- port State control (PSC)—an effective PSC regime deters shipping companies from operating substandard shipping in the region and can detect deficiencies in shipping equipment or working practices which could increase navigational risk
- Electronic Chart Display and Information System (ECDIS)—when combined with high quality and up-to-date electronic charts, ECDIS provides strong navigational support through ship position monitoring and alarms if the ship exceeds pre-defined safety boundaries
- all ships in the area required to have bunker fuel oil tanks in protected locations (reduces risk of oil spill following an incident)
- traffic organisation service in Torres Strait and Hydrographers Passage
- additional emergency towage capability which may be achieved by contracts with existing emergency towage providers, by greater awareness and utilisation of tows of opportunity, by the provision of additional towage capability or by other means (the study only took into account the dedicated emergency towage vessel *Pacific Responder* previously employed by AMSA to patrol north of Cairns).⁴⁶

Details of the 13 cases and their results can be found in Annex 3. Key limitations of the modelling and results for specific measures are referred to in the following sections.

⁴⁵ See also Table 5: Ships and voyages reporting to REEFVTS

⁴⁶ On 8 July 2014, the new build Emergency Towage Vessel *Coral Knight* replaced the *Pacific Responder* in Cairns. The *Coral Knight* will be replaced by a second new build vessel in 2016.

7. Protective measures – **ship safety**

The DNV risk assessment demonstrated that the design and operational aspects of ships that provide the most protection for the region are those that lead to a reduction in the likelihood of groundings, collisions or structural failures. Standards for these areas relate to navigation equipment, safe navigation operations, crew competency, crew fitness for duty, machinery and equipment reliability, fire safety, and emergency towage arrangements. This section describes the key measures currently in place to enable the safe operation of ships and proposes future actions to further improve protection in the north-east region.



7.1 Ship safety standards

The *International Convention for the Safety of Life at Sea, 1974* (SOLAS), and its Protocol of 1988, contains the standards for safe construction and operation of ships. These standards are under constant review by the IMO and have been significantly enhanced since the convention was originally made in 1974.

An average ship's lifespan is considered at between 20 to 30 years. As older ships are scrapped at the end of their useful life they are replaced by newer ships constructed to higher standards, particularly concerning fire protection, fire detection and fire extinction, damage stability and machinery. Shipboard navigation equipment standards are contained in Chapter V of SOLAS and have undergone a revolutionary change in recent years in requiring carriage of Electronic Chart Display and Information Systems.

The use of advanced technology on ships and ongoing development of vessel traffic services in the GBR region has demonstrated strong benefits and outcomes in safety management of commercial vessels.

To ensure that safety standards continue to improve, the IMO held a two-day symposium of the future of ship safety in June 2013 to examine how 'ships of the future...meet clear goals and functional requirements to fulfil the safety and, increasingly, the environmental expectations of Society.'⁴⁷ This symposium made recommendations to the IMO's Maritime Safety Committee that included better use of risk-based methodologies in developing regulations and considered how to promote a safety culture across the shipping industry.

The breakdowns of the bulk carriers *Ocean Emperor* (2010) and *ID Integrity* (2012) in the Coral Sea, as well as on-the-ground experience with taking disabled bulk carrier under tow, have highlighted the need to examine standards relating to machinery reliability (including redundancy, fuel quality and maintenance) and emergency towing arrangements for ships other than tankers. Potential areas of work through the IMO include 'get home' machinery arrangements for bulk carriers, emergency towing arrangements for bulk carriers (as are currently required for tankers) and maintenance and fuel standards.

Standards intended to minimise the impact on the environment in case of an incident are generally contained in the International Convention for the Prevention of Pollution from Ships (MARPOL). These include, for example, requiring oil tankers to have double skinned hulls around cargo tanks and prescriptive standards for maximum tank sizes. A major risk reduction measure which is required for ships constructed after August 2010 is that bunker fuel oil tanks for cargo ships are also contained within a double skin. This means that ships will not be able to carry fuel in tanks that includes the shell plating, such as was the case with the *Shen Neng 1* grounding incident in 2010.

Actions:

- AMSA to continue to work through the IMO to seek improvement to standards that impact upon ship propulsion reliability and redundancy and emergency towing arrangements

⁴⁷ www.imo.org/About/Events/FSS/Documents/Symposium%20Programme%20final.pdf



7.2 Electronic Chart Display and Information Systems (ECDIS)

An Electronic Chart Display and Information System (ECDIS) is a computer-based navigation system that can be used as an alternative to paper nautical charts. It constitutes one of the greatest changes in shipboard navigation since the introduction of radar.

ECDIS is more than the simple display of chart-like images on a computer screen. Information in ECDIS is continuously analysed and compared with a ship's position, intended course and its manoeuvring characteristics. ECDIS also provides alerts and prompts for planned course alterations and allows safety contours and safety depths to be set to clearly indicate 'no-go' areas.

The DNV risk assessment report confirmed the importance of ECDIS in its ability to support ship navigation officers through ship position monitoring and alarms which indicate when a ship exceeds pre-defined safety boundaries.

The undeniable safety benefit of navigating with ECDIS led to the IMO mandating carriage of the systems from 1 July 2012. By 2018, certain classes of SOLAS vessels engaged on international voyages will be required to carry ECDIS. While many ships are already navigating with ECDIS, Australia is keen to encourage industry to adopt the technology earlier than 2018 where possible. Some industry associations have reported that ship vetting and freight chartering arrangements companies exercise a preference for vessels fitted with ECDIS and appropriately trained navigators in their submissions for the development of this plan.

Actions:

- AMSA to encourage users of shipping to ports in the region to employ ships fitted with ECDIS (and appropriately trained navigators) prior to mandatory implementation by 2018. This includes encouraging the uptake of ECDIS through publication of an annual report card by ship vetting companies.

7.3 Crew competency and the human element

The fault trees in the DNV risk assessment for collision and powered groundings are largely driven by human factor issues. Any improvement in human performance and vigilance will reduce the risk of those incidents.

Crew competency standards have recently been subject to a major review that culminated in the 2010 amendments to the *International Convention on the Standards of Training, Certification and Watchkeeping for Seafarers, 1978* (STCW), known as the 'Manila Amendments'. The amendments maintain training standards in line with new technological and operational requirements that require new shipboard competencies. They took effect internationally on 1 January 2012, with a five-year transition period until 2017. The amendments introduce new requirements for:

- fitness for duty
- the *Maritime Labour Convention, 2006* (MLC, 2006)
- grades of certificates of competence for Able Seamen in both deck and engine
- refresher training
- mandatory security training
- additional medical standards
- bridge team management
- ECDIS training.



Similar to other transport modes, the human element is at the root of most preventable casualties in the maritime field. Most accidents can be attributed to issues beyond shipboard failures and single person errors which interact to influence or lead to system failures. To understand system failures in shipping, AMSA is conducting a series of research projects aimed at placing increased emphasis on the contribution of the human element with the aim of enhancing human performance to improve seafarer and ship safety and to contribute to IMO 'model courses' and relevant standards development at the IMO.

Fatigue has been a causal factor in several significant incidents in the region. While the maritime industry currently relies upon a simple 'hours of work or rest' approach to managing fatigue, many safety-critical industries have moved away from prescriptive regulations to more goal-based systems, such as the deployment of Fatigue Risk Management Systems (FRMS). FRMS is a collection of guidelines that attempt to prevent and deal with the negative effects of fatigue and sleep loss. The aviation industry has well-developed FRMS in place incorporating regulation, enforcement, awareness campaigns, training and guidance.

While the maritime industry trails other industries in this field, coastal pilots in Australia have already implemented a similar approach with risk-based fatigue management systems. Evaluation of the effectiveness of such systems has highlighted a number of issues, including acceptance of the systems by industry. Australia, led by AMSA, will endeavour to introduce an FRMS approach for the shipping industry by working through the IMO.

Most jurisdictions, including Australia, have developed sound accident investigation and analysis systems that focus on human elements. However, given the very low number of maritime accidents, very little data is available to allow an understanding of safety issues surrounding shipping. There is, however, a realisation that systemic analysis of minor incidents and near miss data can yield reliable information that can be used to improve safety. AMSA is currently working on improving incident and near miss reporting to ensure important information is captured to allow safety improvements and recommendations to be made reliably.

Actions:

- AMSA to conduct a series of research projects focused on the contribution of the human element to shipping incidents. The research will involve working with industry to improve incident and near miss reporting from ships.
- AMSA to work through the IMO to introduce a Fatigue Risk Management System (FRMS) approach to the global shipping industry.

7.4 Port State control – ensuring compliance with standards

Port State control (PSC) is the internationally accepted mechanism of inspecting foreign-flagged ships that arrive in Australian ports to ensure they are in a seaworthy condition and are constructed, maintained and operated in accordance with a range of international safety and environmental protection conventions and standards.

Australia has one of the most rigorous PSC regimes in the world. This deters most charterers from bringing substandard ships from the world's fleet into Australian ports. Ships found to have major deficiencies are detained in port until those defects are addressed. Australia is a signatory and active member of both the Indian Ocean Memorandum of Understanding on Port State Control (IOMOU) and Asia Pacific Memorandum of Understanding on Port State Control (Tokyo MOU). These agreements provide for information and intelligence sharing with neighbouring countries and members of the IOMOU and Tokyo MOU on shipping risks. The DNV risk assessment report found that PSC is a significant risk reduction measure.

AMSA's PSC inspection regime is risk-based. A ship becomes eligible for inspection every six months.⁴⁸ Selection of a ship for inspection depends on a number of factors including ship type, age and inspection history. In 2013, about 7 per cent of eligible ships were deemed to be higher risk, of which 93 per cent were inspected, some more than once in the year. Overall, AMSA inspects, on one or more occasions, about 57 per cent of eligible foreign ships which visit Australian ports in a year.

The average age of foreign-flagged ships visiting Australia has shown a steady decline in recent years as newer ships take up operation. The average age of foreign-flagged ships which visited north Queensland in 2013 was 7.6 years (compared to 8.6 years in 2012). This corresponded favourably to the reduction in ship detentions at north Queensland ports, totalling 44 in 2013, down from 47 in 2012. Due to a number of factors, including Australia's port State control regime and ship vetting practiced by many users of shipping, the average age of foreign-flagged ships calling at Australian ports is significantly lower than the worldwide average. A summary of PSC inspections conducted in 2013 at ports in the GBR is shown in table 6 below:

Table 6: Summary of PSC inspections conducted in 2013 at ports in the GBR

Port	Inspections in 2012	Deficiencies	Detentions
Abbot Point	6	2	0
Cairns	24	124	6
Cape Flattery	2	10	1
Gladstone	133	389	9
Hay Point	230	504	15
Lucinda	3	8	0
Mackay	49	86	2
Mourilyan	9	31	1
Port Alma	5	27	1
Townsville	133	334	12
TOTAL	594	1515	47

48 AMSA may reduce this period based on calculated risk factors.



The most common cause of deficiencies in 2013 concerns breaches of fire safety measures. Similarly, the most common cause of detentions is related to failures under the International Safety Management (ISM) Code. Underlying reasons for failures under the ISM Code included issues with charting and navigation, hours of rest, and maintenance shortcomings especially for fire safety and life-saving equipment.

To accommodate changes in the shipping profile, and continue to react to emerging issues such as human factors and new navigational technologies, AMSA is increasing its capacity to undertake PSC and other ship and cargo safety inspections. This programme commenced in 2011 with the phased addition of 14 new specialist marine surveyor positions nationally over the following five years. Three of these personnel were to be based in ports in the north-east region. The first was placed in Townsville in 2012 with an additional marine surveyor located in Gladstone in 2014 with a further Marine Surveyor position in Mackay, subject to shipping growth expectations being met and consideration of the risk profile of visiting ships. AMSA can also use other Queensland surveyor resources to assist in inspections on an as- needs basis. The increase in marine surveyors will not only respond to increases in shipping activity, but also focus on high risk areas such as cargo safety and human factors, and those areas identified under the Tokyo MOU's Concentrated Inspection Campaigns.

To further minimise the risk of substandard ships transiting the international passage of the Torres Strait, AMSA will expand its technical cooperation work with neighbouring countries in the provision of PSC training. A particular area of focus will be assisting maritime officials in Papua New Guinea.

Over the last five years, there has been considerable turnover in the fleet of foreign ships visiting Australia, with the replacement ships being newer. The overall average risk of detention of these ships has been declining steadily, as ship age is a major contributor to the statistical risk of detention. AMSA takes these trends into account when selecting ships for inspection.

Within the north-east region specifically, PSC inspections should be targeted at the risks specific to the region. This should mean additional focus on navigation safety, fatigue, and machinery reliability matters. AMSA is continuing research on risk assessment in order to better identify ships that may pose a higher risk to the region. This includes analysis of ship age by industry sector (minerals, oil and gas, agriculture, container cargoes, etc.).

While the principal compliance mechanism used under Australia's port State control regime has been detention of ships, including the publishing of details of detentions so that industry and the public has transparency for this information, the *Navigation Act 2012*, which came into effect on 1 July 2013, contains a directions power in relation to ships. This power helps to ensure high quality ships continue to operate in the region as it may be used to direct ships that pose a threat to the region, due to a poor compliance history, to not enter an Australian port or Australian waters.

Actions:

- AMSA to ensure that only high quality ships, operated by competent crews, are permitted to trade in the region by stringently enforcing standards in compliance with IMO guidelines for port State control.
- AMSA to progressively increase the number of marine surveyors at ports in the north-east region to ensure it has the capability to conduct an effective programme of ship inspections and related compliance actions to take account of increasing shipping activity.
- AMSA to continue its research on risk profiling of vessels in Australian waters and vessels calling at Australian ports to better identify ship types that may pose a higher risk to the north-east region.
- AMSA to continue its technical cooperation on maritime standards and technologies with neighbouring countries and particularly with Papua New Guinea to ensure ships and crews operate to the highest international ship safety standards.
- AMSA to develop and publish clear guidance on the criteria it will use to decide whether ships may be directed not to enter Australian ports or waters.

7.5 Ship vetting

The users of shipping have a responsibility for the ships they employ, to ensure that those ships pose minimal risk to safety and the environment. Ship vetting is an industry practice used to risk assess a ship intended for the carriage of a particular cargo or loading at a terminal.

Ship charterers and terminal operators can ‘vet’ a nominated ship before deciding to use it or accept it for loading. Ship vetting can be carried out using publically available information, such as that available on the ‘Equasis’ website, or carried out by commercial entities that have developed sophisticated systems for this task. Ship vetting can also involve ship inspections, such as those undertaken as a part of the Oil Companies International Marine Forum’s Ship Inspection Report Programme.⁴⁹ The more comprehensive the vetting process, the more reliable it is as a risk management tool.

Employment of effective ship vetting by those using shipping will directly reduce the risk posed by shipping to the north-east region. Importantly, it can prevent risk arriving in the region rather than requiring that risk to be mitigated once in the region, and should be employed by all users of shipping to the region.

As ship vetting methods develop and become more sophisticated, users of shipping will have the ability to assess the quality of ships they employ beyond basic compliance with minimum international standards. The recently introduced ship direction powers in the *Navigation Act 2012* has promoted information on ship detentions to be incorporated into industry vetting assessments to reduce the likelihood of ships with poor records being chartered.

Organisations already exist that provide evidence publically available, that ships and their operators seek to maintain higher standards—the Green Award Foundation⁵⁰ is one such example. The opportunity exists for ports in the north-east region to provide incentives for ships that obtain accreditation such as that offered by Green Awards, and for charterers to use shipping that goes beyond basic compliance with minimum international standards.

Actions:

- Industry to actively vet all shipping that trades in the north-east region to ensure that only high quality ships, operated by competent crews are engaged.
- Port authorities to consider becoming ‘Green Award’ incentive providers.

⁴⁹ See www.ocimf.com/SIRE/introduction

⁵⁰ www.greenaward.org/greenaward/26-foundation.html

8. Protective measures – navigation safety

While closely linked to ship safety, the potential for incidents to occur in the region stems largely from the navigational complexity of the area. This section discusses the measures in place to assist ships to safely navigate the environmentally sensitive waters of Australia's north-east region and identifies strengthened measures to improve current management arrangements.

8.1 Navigational charting

Up-to-date navigational charts, either paper or electronic, are essential for safe navigation in the GBR, Torres Strait and Coral Sea region.

Australia's official navigational charts and other nautical publications are provided by the Australian Hydrographic Service (AHS). The AHS is part of the Royal Australian Navy and is responsible for conducting hydrographic surveys to meet international marine navigation requirements under SOLAS and the *Navigation Act 2012*.

8.1.1 Charting of the north-east region

Adequate and up-to-date paper and electronic charts for the entire GBR, Torres Strait and Coral Sea region have been prepared by the AHS and are available to all ships. There are however two areas within the region that have been identified as areas which require improved charting:

- the south-western approaches to Torres Strait requires upgrading to a more modern standard
- the McDermott Bank area in the Coral Sea requires resurvey and the production of larger scale charts.

Actions:

- AMSA to work with Australian Hydrographic Service (AHS) to identify areas of the north-east region that will benefit from improved hydrography and oceanographic observations. Input to 'Hydroscheme' (the Australian Hydrographic Services' two year rolling charting and surveying programme) will be a way to ensure such areas are formally identified.

8.2 Navigation risk assessment tools

The risk assessment work carried out by DNV for this report covered a large geographic area that also assessed oil spill risk. There are other risk assessment tools that can be used for navigation safety planning on a smaller scale. In keeping with its aim of harmonising and improving aids to navigation globally, the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) has released two generic risk assessment models that could be used in any waterway.

The first model, termed Ports and Waterways Safety Assessment (PAWSA), was developed by the United States Coast Guard in the late 1990s. It is a qualitative model that gathers expert opinion and converts it into risk ratings for existing and new ship safety and marine pollution protective measures.

In 2004, AMSA has used the PAWSA model to risk assess its proposal to extend the PSSA from the GBR to include Torres Strait along with the associated protective measure of pilotage. In 2009, it was used to risk assess the waters of central Queensland, including the ports of Hay Point and Abbot Point.

The second model, termed IWRAP Mk2, (IALA Waterways Risk Assessment Programme) is a software application that computes the frequencies of collisions and groundings in a given waterway. It uses a series of mathematical equations involving the geometric patterns of shipping and causation factors. In particular, it models the relationship between traffic geometry hazards to navigation.

These decision-making tools provide relevant agencies with a robust management framework in which to make strategic long-term management decisions for the safety of navigation and protection of the marine environment.

Actions:

- MSQ, port authorities and AMSA to continue using risk assessment tools to assess risk due to ship traffic growth and port development, particularly in growth areas such as Abbot Point, Hay Point and Gladstone.





8.3 Ship routeing systems

The purpose of ship routeing is to improve the safety of navigation in converging or dense traffic areas or where freedom of ship movement is inhibited by restricted sea-room, obstructions, limited depths or unfavourable meteorological conditions. The general intent of routeing measures is to keep ships separate from each other, or navigation obstructions, therefore reducing the risk of collision or grounding.

Routeing systems that could be established in the north-east region include two-way routes, areas to be avoided and no anchoring areas. AMSA, in conjunction with other members of the North-East Shipping Management Group, industry and the community, is currently considering the most appropriate ship routeing systems to be implemented.

AMSA, in consultation with other parties, has prepared a proposal to the IMO to establish a two-way route in the GBR and Torres Strait (Figure 5). The proposed route extends from the western end of the Torres Strait, through Prince of Wales Channel, the GBR Inner Route, and terminates at the southern boundary of the GBR Marine Park. This will complement the current IMO adopted two-way route in the Great North East Channel at the eastern end of the Torres Strait and reduce collision risk along the route. It will also encourage ships to follow a defined path through the reef resulting in a smaller footprint of activity, which, in turn should reduce the risk of any potential environmental impacts.

Actions:

- NESMG to examine the safety benefits of measures that have the effect of encouraging ships to only transit the five main passages of the Great Barrier Reef (rather than all of the minor passages).

Figure 5: Proposal to establish a two-way shipping route in the GBR and Torres Strait



Legend

- Original Two-way Route
- Two-way Route Extension
- Great Barrier Reef Marine Park





8.4 Cooperation with Papua New Guinea on risk mitigation measures

While not a part of Australia's north-east region, it is clear from an analysis of traffic in the region that much of Australia's coal cargoes are transiting through the waters of Papua New Guinea (PNG) on the way to Asian markets.

Apart from coastal shipping and small passenger services, the traffic in PNG waters is mainly general/container cargo vessels and bulk carriers for petroleum, mineral and log exports. International shipping has grown to service PNG's growing resources sector and there are now approximately 3000 voyages per year and 300 voyage rotations between PNG, the Australian east coast ports and Asia which provide over 100,000 TEU container capacity.⁵¹ This is in addition to free or subsidised passenger and freight services in remote and disadvantaged communities (such as Western Province) operated by government agency, provincial and non-government organisations.

Moreover, care should be taken to ensure that the problem of vessels congregating in a safe anchorage is not transferred to another location. Ships drifting into other areas, such as the Coral Sea can potentially increase risk in areas; ships anchoring at distance from ports may make emergency response more difficult; while vessels anchoring or drifting in shipping channels may impact upon the safe navigation of other vessels using the shipping fairways.

AMSA is working closely with the National Maritime Safety Authority (NMSA) of Papua New Guinea to support their efforts to improve the safety of navigation and environment protection and address projected shipping growth in PNG waters. A particular area of focus for PNG is entrance to the Jomard Passage, where about 20 ships transit each day via converging shipping routes in highly sensitive and navigationally complex waterways.

Other measures to protect shipping in the waters off PNG include establishing four coastal monitoring stations equipped with radar, CCTV and Automatic Identification System (AIS), and improving the network of aids to navigation.

Actions:

- If adopted by the IMO in May 2014, AMSA to work with the Australian Hydrographic Service (AHS) and promulgate the establishment of a two-way route from the western end of the Torres Strait to the southern boundary of the GBR Marine Park.
- AMSA to monitor increases in shipping movements associated with developments in PNG, particularly Western Provinces, and implications from the changes to trading routes to vessel traffic transiting Jomard Passage.

⁵¹ Government of Papua New Guinea, 2013, National Transport Strategy, Vol. 1 – Strategy Summary, p. 11

8.5 Aids to navigation

Aids to navigation are central to ensuring safe navigation in Australian waters. One of AMSA's primary responsibilities is to provide a national network of marine aids to navigation and navigational systems, consistent with international guidelines (Figure 6).

To this end, AMSA manages some 500 aids to navigation at approximately 390 sites. The network comprises a mix of fixed and floating aids, visual and electronic aids, and a coastal Vessel Traffic Service (VTS) in the GBR and Torres Strait. Some 40 per cent of AMSA's aids to navigation are located in the GBR and Torres Strait region, reflecting the navigational complexity and environmental sensitivity of the area. Meteorological-ocean sensors have also been installed in the shipping route in the Torres Strait to provide accurate data on tidal heights, tide streams and wave heights, supporting tools such as the under keel clearance management (UKCM) system.

AMSA maintains a network of 16 Differential Global Positioning System (DGPS) stations around Australia's coastline, of which 7 are located in Queensland. For now, GPS remains the only global navigation satellite system widely used by merchant shipping. As GPS receivers are carried on all vessels to which SOLAS Chapter V applies, AMSA will continue to provide its DGPS service for the medium term.

AMSA also has an obligation to maintain the heritage values of Australia's lighthouses and artefacts.

The North Reef Lighthouse (Figure 7) located 120 kilometres off Gladstone is a vital aid to navigation for ships transiting the GBR region. A major refurbishment of the lighthouse was completed in 2011, which included the installation of AIS and VHF communications infrastructure.

AMSA's aids to navigation network is continually monitored and reviewed to maintain and improve its effectiveness and efficiency.

In recognition of the importance of delivering an effective national service, AMSA has developed the Navigational Services in Australian Waters 2010-25 strategy.⁵² The primary objective of the plan is to:

- enhance the environmental safety and sustainability of the aids to navigation network
- develop and implement the e-navigation concept, in particular the shore-based aspects
- further efficiencies in the maintenance of AMSA's network by entering into a new service provider contract from July 2014
- introducing an under keel clearance management system in the Torres Strait.

Actions:

- Establish a memorandum of understanding between AMSA and the GBRMPA to ensure that repairs to aids to navigation within the Great Barrier Reef Marine Park can be undertaken with minimal delays and increased awareness of potential risks.

⁵² See <http://web.amsa.gov.au/shipping-related/navigation-safety/aids-to-navigation-section-policy-and-planning-aton7>

Figure 6: Aids to navigation in the north-east region

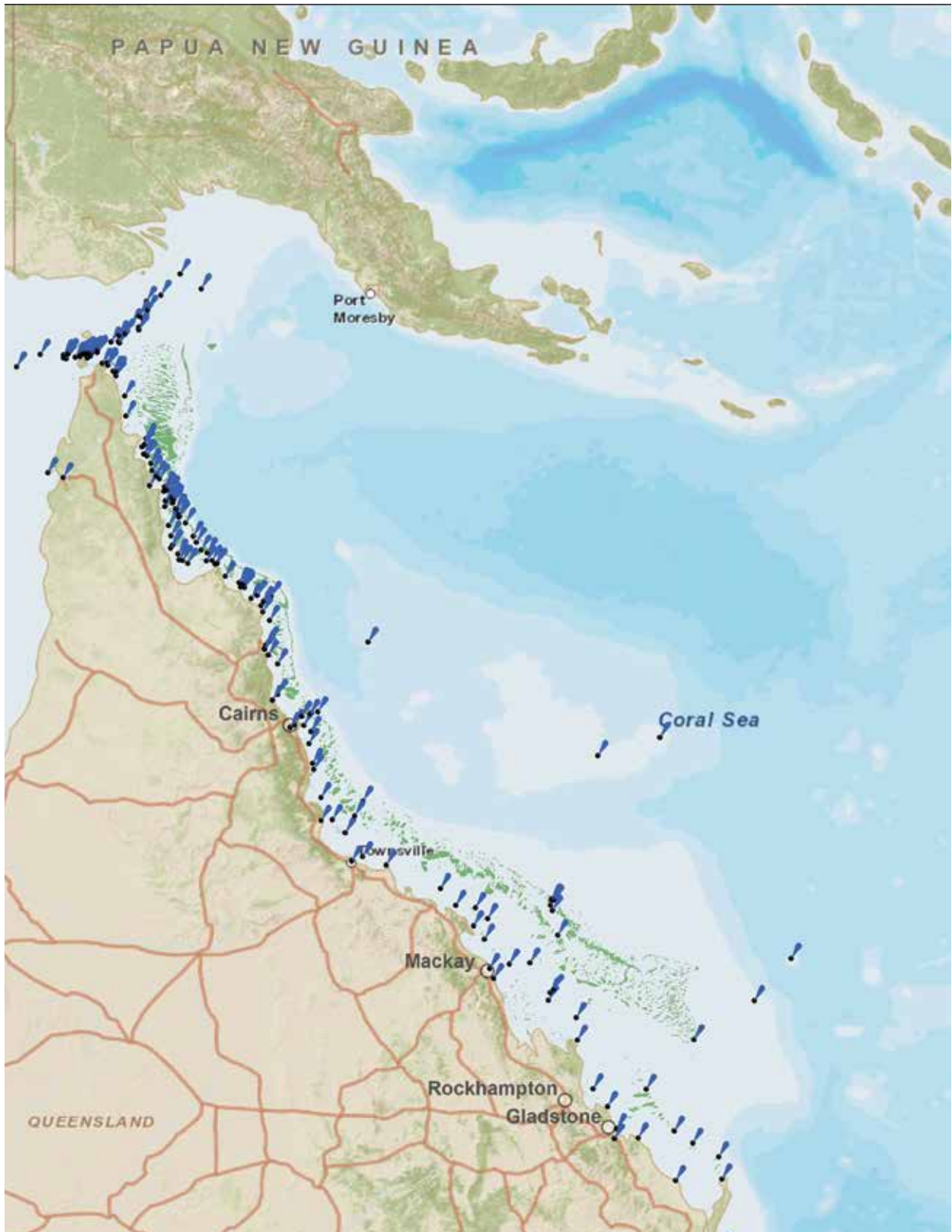


Figure 7: North Reef lighthouse



8.5.1 Automatic Identification Systems (AIS)

AIS is a ship and shore-based broadcast system that continuously exchanges data (such as identity, position, course, speed and ship characteristics) with other ships and shore-based facilities fitted with the system. While originally intended for collision avoidance, it is now also used as a sensor to provide ship tracking information to vessel traffic services and for maritime domain awareness.

AMSA and MSQ have established a number of AIS land base stations through the GBR and Torres Strait and is giving high priority to expanding this shore infrastructure. A number of additional AIS base stations have already been established throughout the region at locations of high risk and high traffic volume and to provide coverage for the 2010 southern extension of the VTS (see below). The area around Swains Reef at the southern end of the GBR is a current priority for enhancing AIS shore coverage and AMSA is currently investigating technical issues around installing a structure to support this infrastructure in such a remote location and transmitting the data back to shore.

AIS is based upon VHF radio to carry data and is therefore very limited in range (generally to line of sight). Satellite-based detection of AIS signals from ships and transmitting this information back to land is a rapidly developing technology and ideally suited to the vast area of the north-east region and relatively low density of traffic experienced in the area.

AMSA has trialled the use of ship tracking data and is now acquiring the data for ship tracking purposes. While the quality and timeliness of the data is improving as satellite availability increases, AMSA is investigating how this data can be used in future for vessel traffic services in the region and active monitoring of ships in the Coral Sea where early detection of ship breakdowns is essential. This includes the wider use of AIS by a wider range of vessel types to help reduce collisions between commercial vessels and small fishing or recreational vessels. However, given the limited functionality of AIS Class B units, it is currently not mandated by the IMO.

Actions:

- AMSA to keep under review the requirement to fit Class B AIS on all non-SOLAS commercial vessels.

8.6 Reef Vessel Traffic Services (REEFVTS)

The Great Barrier Reef and Torres Strait Vessel Traffic Service (REEFVTS) is a coastal VTS introduced by the Australian and Queensland Governments in 2004 to improve the safety and efficiency of vessel traffic in the region. REEFVTS is jointly managed by Maritime Safety Queensland and AMSA and operates under its own strategic plan and governance arrangements, including a quality management system. The REEFVTS designated area extends from Torres Strait and the Great North East Channel to the waters of the GBR from Cape York to the southern boundary of the GBR Marine Park.

REEFVTS provides essential and timely information to ships to assist their on-board decision making process by maintaining a traffic image of ships transiting the area and interacting with individual ships to provide information such as reports on position, identity and intentions of other traffic and weather, hazards, and other factors that may influence a ship's transit.

REEFVTS consists of five components:

1. **A mandatory ship reporting system (REEFREP):** provides the requirement for ships to identify themselves and their intended passage through the region. This information enables a ship's transit to be monitored through the GBR and Torres Strait. Ships are required to provide pre-entry position reports, entry reports, route plan reports and final reports.
2. **Monitoring capabilities:** REEFVTS utilises three sensor technologies to identify and monitor the transit of individual ships. The sensor inputs are Radar, Automatic Identification System (AIS) and Automated Position Reporting (APR) via Inmarsat C. The information from these sensors is integrated to provide a single traffic image.
3. **Decision-support tools:** REEFVTS uses a suite of decision-support tools to monitor the transit of individual ships and assist on-board decision making. This may include situations where a ship deviates from a recommended route, fails to alter course at a waypoint or is in danger of running aground. These tools are incorporated into the REEFVTS integrated surface picture.
4. **Communication capabilities:** The language used to communicate with REEFVTS is English, using the IMO's Standard Marine Communication Phrases. The means of communication with REEFVTS are Inmarsat C, VHF marine radio and telephone, facsimile or email. Depending on a ship's position, REEFVTS can be contacted on VHF channels 11 or 14 (Radio call sign REEFVTS) 24 hours a day.
5. **Services to shipping:** REEFVTS provides a number of services to ships, including shipping traffic information, marine safety information and navigation assistance.

All ships of 50 metres or more in length and all oil tankers, liquefied gas carriers and chemical tankers regardless of length are required to supply REEFVTS a route plan, reports on pre-entry, entry and exit, as well as reports on any route deviation, defects and intermediate positioning. Reports are sent to REEFVTS by Inmarsat C satellite or on the VHF working channels.

REEFVTS currently monitors about 11,000 ship voyages annually in the GBR and Torres Strait. The number of ship voyages reporting to the REEFVTS has increased over the last 10 years by around 1-2 per cent per annum as shown in table 7.

Table 7: Ships, voyages reporting to REEFVTS and incidence of groundings

Financial year	No. of ships	No. of voyages	No. of groundings
2002-03	1723	7005	1
2003-04	1856	7143	
2004-05	2008	7532	2
2005-06	1951	7541	
2006-07	2005	7720	
2007-08	2056	7780	
2008-09	2122	7660	1
2009-10	2319	8259	
2010-11	2263	8132	
2011-12*	2743	10,879	
2012-13	2831	10,994	

Since its establishment in 2004, REEFVTS has had an impressive record of contributing to the reduction of incidents in the region. The effectiveness of REEFVTS as a risk reduction measure was demonstrated by the results of the DNV risk assessment. Given this effectiveness, DNV was also asked to assess the risk reduction benefits in extending VTS coverage to the Coral Sea. In response to this the DNV report noted that:

“...a Vessel Traffic Service (VTS) is an effective risk control. In the study area, however, VTS support has already been extended to cover the areas where most risk benefit is obtained. Further extending the area of VTS support is not predicted to provide a significant risk reduction.”

However, a number of potential options for enhancing the capabilities of REEFVTS to meet increased shipping in the region have been identified including:

- splitting REEFVTS into sectors (e.g. north/south) with dedicated resources focusing on each sector, particularly as traffic and therefore workload for system operators increases
- providing proactive traffic management services in areas where warranted by traffic density and risk assessment. This includes a ‘Traffic organisation service’ which the DNV risk assessment concluded could be a significant risk mitigation measure for future traffic levels in constricted passages such as Hydrographers Passage
- assisting the broader implementation of sea traffic management. This will need to be undertaken in accordance with international legal requirements as the technology develops
- managing the risks of incidents as a result of communication barriers or difficulties with crews who speak English as a second language and the importance of ensuring measures that assess whether or not the regulatory requirements for shipping are being followed.

Actions:

- AMSA to investigate how ship tracking technology can be better used for vessel traffic services in the region and early alerting of developing incidents in the Coral Sea.
- AMSA and MSQ to continue to monitor technical advances in VTS systems, sensors and communications to ensure REEFVTS continues to provide a high quality service that meets the needs of mariners.
- AMSA and MSQ to consider the need to separate REEFVTS operations into two separate VTS centres (north and south).
- As traffic levels increase, AMSA and MSQ to consider the need for REEFVTS to increase its area of coverage to monitor ship movements in the Coral Sea.



8.7 Port Vessel Traffic Services (Port VTS)

Port VTS is the principal tool by which Queensland Regional Harbour Masters (RHM) manage the movement of ships approaching, departing and operating within pilotage areas.

All ships 50 metres in length and over arriving at, moving within, or departing from a pilotage area must provide notification of the movement to the RHM via a Port VTS. In some ports there are also additional requirements for smaller vessel to report to the Port VTS.

Port VTS centres are located in Cairns, Townsville, Hay Point, Gladstone and Brisbane. These centres serve ports within their region and are manned by qualified Vessel Traffic Service Officers (VTSOs), under the management of the Manager (Vessel Traffic Management) and the RHM.

Ships are not permitted to move within the pilotage area unless satisfactory two-way communications are maintained with the VTS centre.

The operation of Port VTS is one of several important protective safety measure employed in Queensland Ports to assist with safe navigation and protection of the marine environment.

8.8 Under keel clearance management

The waters of the Torres Strait are restricted in depth to around 12 metres with tidal ranges in the order of two metres. AMSA's under keel clearance management (UKCM) system became operational in 2011 (Figure 8). The system assists coastal pilots with the accurate planning and monitoring of a ship's under keel clearance when transiting the Prince of Wales Channel in the Torres Strait. The UKCM is particularly valuable as the Torres Strait experiences complex tidal patterns and strong tidal streams (up to eight knots).

The UKCM system is web-based and uses ship information, hydrodynamic modelling and environmental data to predict the under keel clearance that a ship will have at any point in time when transiting the UKCM area. Use of the system is recommended for vessels with a draught of nine metres or more.

AMSA continues to gain experience and build knowledge of the system. Future developments include the introduction of a system of chart overlays that will redefine how UKCM information is displayed.

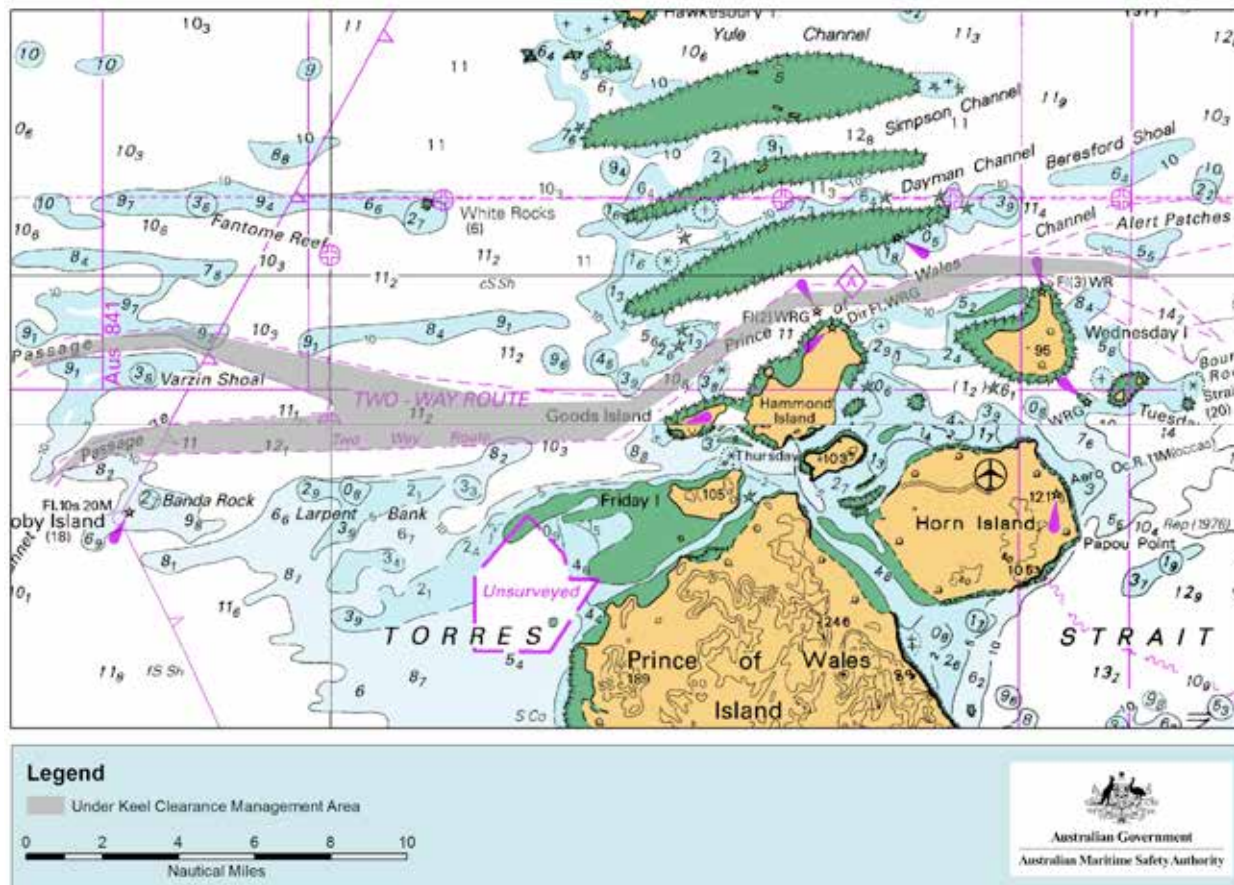
Competency-based training for coastal pilots using the system is being delivered via AMSA's e-learning portal prior to the UKCM becoming mandatory in 2013. Other options for future development include:

- amending the current deep draught regime by removing the 10 per cent requirement for vessels with a draught greater than 11.9 metres
- reviewing the current draught limit while continuing to require a minimum underwater keel clearance
- reviewing the effectiveness of the UKCM system for applicability in other areas.

Actions:

- AMSA, in conjunction with shipping interests and pilotage providers, to review the effectiveness of the UKCM system and make appropriate improvements, including reviewing the current deep draught regime and possibility for its extension to other areas.
- AMSA to introduce a system of navigational chart overlays that will define how UKCM information is displayed.

Figure 8: Extent of under keel clearance management system in the Torres Strait



8.9 Pilotage

While coastal pilotage and port pilotage share many common risks and requirements, each presents with its own unique challenges. For coastal pilotage these include:

- the length a GBR coastal pilot can be engaged on board a ship, which can range from 12 to 48 hours under pilotage conditions
- a ship's need to meet the basic accommodation, meal and hygiene requirements of the pilot
- managing fatigue, complacency and inattention
- operating without the assistance of readily available emergency infrastructure and facilities which exist during port pilotage
- potential increases in costs for shipowners and operators associated with extending the time a pilot is on board or where two pilots are required to manage fatigue issues.

8.9.1 Port pilotage

Maritime Safety Queensland (MSQ) regulates pilotage services in all ports within the GBR. Ships of 50 metres or more which proceed within a Queensland pilotage area must either carry a licensed marine pilot or be under the command of a master who holds a pilotage exemption certificate for the area.

Some pilotage areas have selected zones where vessels less than 50 metres in length are required to engage the services of a licensed marine pilot. These conditions may apply to ship movements in specific locations within the pilotage areas, namely marinas and channels with restrictive depths or widths.

8.9.2 Coastal pilotage

Coastal pilotage has been compulsory within the Great Barrier Reef since 1991 and the Australian pilotage regime came into existence for the Torres Strait - Great North East Channel in 2006. Ships over 70 metres in length, loaded chemical and oil tankers, and loaded liquefied gas carriers are required to embark a licensed coastal pilot when transiting the following regulated areas:

- Inner Route (Cape York to Cairns)
- Great North East Channel
- Hydrographers Passage
- the Whitsundays (includes Whitsunday Passage, Whitsunday Group of Island and the Lindeman Group of Islands).

To ensure pilotage in the region is as effective as possible, AMSA regulates coastal pilotage, pilotage providers and pilots under Marine Order 54 (Coastal pilotage) (MO54) and associated Marine Notices and Pilot Advisory Notices.

Following the last grounding involving a ship under pilotage in 2009, AMSA invited the Australian Transport Safety Bureau (ATSB) to undertake an investigation into possible systemic safety issues affecting the safe operation of coastal pilots in the region. As a result of this investigation, the ATSB report was released in October 2012.⁵³ The report identified that MO54 could be further amended to clarify the responsibilities and accountabilities of pilotage providers associated with managing all safety risks relevant to pilotage operations, including the act of pilotage itself.

⁵³ The full ATSB report, as well as the status of the safety recommendations and AMSA's responses can be found on the ATSB's website. www.atsb.gov.au/publications/investigation_reports/2010/mair/282-mi-2010-011.aspx

The report also identified issues relating to pilot training, fatigue management, risk event reporting, the 'check pilot' process, and the utilisation of coastal vessel traffic services. AMSA has already taken significant steps to address these safety issues. These challenges, and the risks they present, are to be managed closely by the pilot and the master. The unique nature of coastal pilotage calls for effective master/pilot exchange.

While the ATSB investigation was under way, on 1 July 2011, a revised version of MO54 was introduced to strengthen the capacity of AMSA to deal with procedural breaches which have the potential to impact on ship safety. The new provisions allow for:

- a demerit point system for breaches
- increased focus on safety management and fatigue systems
- strengthened training requirements and the use of bridge simulators for training
- enhanced auditing arrangements for pilotage providers improved pilot launch standards.

A post implementation review of MO54 is underway. The review aims to:

- implement recent changes to the *Navigation Act 2012*, including the key definition of 'pilot providers'
- improve readability and provide greater clarity
- address findings from the ATSB report into Queensland coastal pilotage.

The DNV risk assessment report considered pilotage as an effective risk reduction measure for powered groundings and collisions. Even with pilotage in place, DNV's risk model assessed the north Inner Route of the Great Barrier Reef as the area of highest risk of powered groundings. This reinforces the need to ensure that pilotage in the region is as effective as possible and that agreed recommendations from the ATSB report are implemented in a timely manner. While objective evidence indicates that fatigue is being managed effectively, the difference between cases 9 and 1 in the DNV report is intended to show the effect of fatigue risks if not managed appropriately.

The cases in the DNV report where the effectiveness of pilotage is considered for current traffic and pilotage areas and future extension of pilotage requirements and growth in traffic suggests that:

- all actions should be taken to ensure that pilot effectiveness is not degraded by fatigue or any other issues
- the incidence of large vessel groundings is extremely low. Grounding and collision risks are still lower in the southern Inner Route areas than in the current northern Inner Route area where pilotage is already in place, and taking that effect into account
- using the traffic projections assumed for the DNV report, by 2032 powered groundings/collision risks would be above current risk levels experienced in the northern Inner Route and in southern parts of the Inner Route. Pilotage is an effective measure in reducing that risk, however the northern Inner Route will remain the highest risk area
- the area at highest risk that does not currently have pilotage in place is the upper middle Inner Route, which extends from Cairns to Townsville. The model assumes that growing traffic from Abbot Point will enter and exit the GBR via Palm Passage off Townsville.

Taking these findings into account, AMSA proposes the following actions:

- liaising with pilotage providers and industry to develop passage plans for GBR waters south of the current mandatory pilotage areas as well as training and licensing requirements for pilots to allow for voluntary pilotage in these areas
- working through the IMO to have pilotage recommended in these areas by virtue of risk factors such as ship type, crew experience and prior record of detentions for safety breaches
- as traffic levels and risk warrants, seek to have pilotage made mandatory. Current risk projections suggest that the region from Cairns to Abbot Point will benefit from this around 2020.

8.9.3 Pilotage passage plans

The Queensland Coastal Passage Plan (QCPP)⁵⁴ is produced and issued by AMSA as a guide to the conduct of pilotage in Queensland coastal areas.

The QCPP has been developed primarily for the benefit of masters and mates of ships transiting any of the coastal pilotage areas of the north-east region, including Torres Strait, the Great North East Channel, the Inner Route of the GBR and Hydrographers Passage. The plan seeks to improve pre-pilotage communication between the pilots, pilotage providers and the ships they service. The QCPP also helps prepare ships for the transit of coastal pilotage areas by ensuring voyage plans, waypoints and other planning considerations are completed in a standardised manner.

AMSA encourages all masters transiting any of the pilotage areas to consider the information contained in the QCPP when preparing associated passage plans.

The QCPP will continue to evolve in consultation with licenced coastal pilots, pilotage stakeholders and industry.

Actions:

- NESMG and pilotage providers to implement recommendations of the ATSB report into Queensland coastal pilotage.
- Taking into account predictions of traffic density, existing aids to navigation and risk, AMSA and MSQ to investigate the benefits of mandatory pilotage for the areas of the upper middle Inner Route of the GBR by 2020.
- AMSA to work with pilotage providers to consider the implications of voluntary pilotage in the southern area of the GBR.

⁵⁴ www.amsa.gov.au/forms-and-publications/Publications/AMSA125-QCPP_Booklet.pdf

9. Protective measures – environment protection

This section describes the key measures in place to protect the environment from the effects of shipping in the north-east region, and proposes additional strengthened measures to improve management arrangements.

9.1 Anchorages

Three out of five of Queensland's major ports have designated offshore anchorages to cater for ships that arrive at the port before a berth is available or before loading is scheduled. The major bulk ports, such as Hay Point, often have large numbers of ships at anchor. These are not simple 'queues', where vessels are loaded in the order that they arrive, but result from variations in commodity supply rates (including infrastructure, weather and workforce issues), transport logistics, stockpiling and blending, port infrastructure, and market forces.

Many of the impacts associated with routine shipping may be exacerbated in anchorages. The process of anchoring vessels while they wait for loading greatly extends the stay of vessels in some GBR ports. For example, transit through the GBR for Dalrymple Bay Coal Terminal (DBCT) vessels is typically less than half a day, and loading times are typically one to two days. If these vessels arrived directly at a loading berth their total per-call time in the GBR region would be approximately three days. The need to wait at anchor for appropriate cargo mixes or berthing facilities can extend this 'minimum duration' significantly.

The 'Ship Anchorage Management in the Great Barrier Reef World Heritage Area' study conducted in 2013 assessed the overall risk from ship anchoring in the five major ports of the GBR.⁵⁵ The study was commissioned to support best practice environmental management of ship anchoring in the GBR and will inform future policy and planning outcomes, including assessments under the *Great Barrier Reef Marine Park Act (1975)*, the *Environment Protection and Biodiversity Conservation Act (1999)*, the comprehensive strategic assessment of the Great Barrier Reef, regional sustainability planning, and this plan. Management options to avoid, mitigate, offset or manage the impacts associated with anchorage sites were identified and included objectives to manage existing anchorages with the aim of protecting environmental values; optimise use of existing anchorages; and minimise environmental impacts from future anchorages and anchorage relocations.

Specific recommendations of the study include the development of environmental guidelines that aim to reduce the potential and realised impacts from ship anchoring; improved environmental condition monitoring and reporting to enable adaptive management; implementation of an environmental inspection and audit programme for ships at anchor; optimising the use of existing anchorages by designating environmentally sensitive anchorage points at all ports; and considering options to minimise the need for further anchorages, such as the use of vessel arrival systems.

⁵⁵ www.environment.gov.au/system/files/resources/90046a79-7b10-4e6a-a279-f4fdb3f1055b/files/gbr-anchorage-management.pdf

By managing the number of ships seeking to enter a port and anchor, many potential impacts will be significantly reduced. However, the whole of supply chain management involves a number of stakeholders, including the exporter (mine), port authorities, third party owners of port infrastructure, ship owners and buyers. The arrangements at each port may differ due to circumstances, terminal management, commodity mix, ship numbers and geography. Therefore, control measures should take account of the operational arrangements and logistics that affect and control land and sea freight resource commodity transportation.

Action:

- The North-East Water Space Management Working Group (NESM- WG) to contribute to the development of a ship anchorage management study and implement proposed management strategies associated with offshore ship anchorages in the GBR World Heritage Area. The study to consider aesthetics in its review of anchorage assessments.
- AMSA and MSQ to provide vessel traffic organisation services where warranted by future traffic density and risk.

9.2 Accidental and operational discharges of oils and waste

9.2.1 Standards

The *International Convention for the Prevention of Pollution From Ships, 1973* (MARPOL) currently in force in 152 countries (including Australia), applies to over 99 per cent of the world merchant shipping fleet. The provisions of the convention are applied in Commonwealth and Queensland legislation and actively enforced in the GBR and Torres Strait region by AMSA and MSQ.

The convention has separate technical annexes dealing with preventing pollution by oil, chemicals, harmful substances in packaged forms, sewage, garbage, and air emissions.

MARPOL provides special protection for the GBR and Torres Strait. Under MARPOL, there is a complete prohibition on discharging more than 12 nautical miles from the 'nearest land', which is the area seaward of the outer reef. This includes:

- any form of tank washings from oil tankers
- residues of chemicals designated as category X or Y and under IMO requirements sewage that has not been treated through an approved sewage treatment plant
- food wastes and cargo residues from all ships.

MARPOL regulations dealing with prevention of pollution by oil include provisions for oil tankers to have double hulls; protective location of ballast tanks on oil tankers (so as to minimise loss of fuel oil in the event of grounding); and a requirement for all ships to have special pollution prevention equipment on board. This equipment includes an oily water separator that will monitor the level of oil in waste water while it is being discharged from a ship, and will trigger an alarm or shut down the operation when the oil content exceeds permitted levels.

Ships are required to have emergency response plans, to undergo regular surveys to ensure all equipment is functional, and to maintain a record book with details of all discharges and oil pumping operations. They must also have detailed garbage management plans and record books. For the discharge of sewage, ships are required to be equipped with a standard discharge connection and a holding tank, an approved sewage treatment plant or an approved sewage processing and disinfecting system.

There are currently no controls placed on grey water discharges by MARPOL or Australian legislation, although many ships treat grey water in their sewage treatment plants. While a number of large passenger vessels are fitted with advanced water treatment facilities, this is a significant issue that AMSA is working through the IMO to address.

Air pollution regulations include technical standards for diesel engines and shipboard incinerators, energy efficiency, fuel oil quality standards and requirements for fuel oil suppliers.

The IMO has amended MARPOL to require ships built after August 2010 to be constructed with bunker fuel tanks in protected locations. This means that these new ships will not carry fuel oil in double bottom tanks or adjacent to side shell plating where grounding or collision damage is most likely to result in an oil spill. The risk assessment work carried out by DNV and experience with incidents such as the grounding of *Shen Neng 1* indicate that this will reduce the risk of bunker fuel spills from such ships significantly.

Other environment protection measures introduced through MARPOL in recent years that relate to ship design include:

- progressive reductions in Nitrogen Oxide or NO_x emissions from marine engines, with a 20 per cent reduction applied from 1 January 2011
- progressive reduction in the sulphur content of ships fuel, with a 22 per cent reduction applied from 1 January 2012, with a further 85 per cent reduction from 2020
- tighter controls for sewage discharge for systems installed on ships from 1 January 2016.

9.2.2 Waste facilities

Waste from ships can include oil and oily substances, sewage, cargo hold slops containing noxious liquid substances, garbage, ozone depleting substances, exhaust gas cleaning system residues, and ballast tank sediments.

Because ships are not allowed to discharge wastes within the Great Barrier Reef, shore reception facilities have been made available for the disposal of wastes. Nevertheless, while industry has reported to AMSA that they comply with MARPOL waste disposal requirements, encouraging the use and improvement of adequate waste facilities within ports (in line with guidelines and information provided by the IMO) should be a matter of priority.

Ports currently have the ability to charge for port services such as sewage and garbage disposal. AMSA will also continue to provide information and advice to shipping, port and waste management industries on the requirements of available waste reception facilities. In addition, AMSA maintains a [waste facilities database](#) and periodically undertakes gap analyses for waste reception facilities for individual ports.

Australian Quarantine and Inspection Service (AQIS) requirements generally preclude the ability to recycle waste from ships. Consideration should also be given to developing means to recycle ships' waste rather than the current method of deep bury or incineration.

There are currently no controls placed on grey water discharges by MARPOL or Australian legislation, although many ships treat grey water in their sewage treatment plants. While a number of large passenger vessels are fitted with advanced water treatment facilities, this is a significant issue that AMSA is working through the IMO to address.

9.2.3 Air pollution

International shipping contributes around three per cent to the global emissions of carbon dioxide.

In 2009, the first Outlook Report for the Great Barrier Reef identified climate change as a key factor in reducing the resilience of the Great Barrier Reef. It stated that almost all of the biodiversity of the Great Barrier Reef would be affected by climate change with coral reef ecosystems the most vulnerable. The main associated impacts would be coral bleaching from increased sea temperatures and lower rates of calcification due to ocean acidification.

While ships are universally recognized as the most fuel-efficient mode of bulk cargo transportation, the IMO has consistently looking to optimize fuel consumption. In 2011, the IMO adopted mandatory technical and operational energy efficiency measures which relate to the design of energy efficient ships and their operation. This will complement proposed market-based measures which are under development by the Member States of the IMO.

Australia is a strong supporter of progress to reduce greenhouse gas emissions from shipping and will continue to work within the IMO to support the implementation of effective measures. The new technical and operational energy efficiency measures for ships entered into force in Australia on 1 January 2013, with tighter efficiency measures being phased in during 2015, 2020 and 2025.

Other recent measures to reduce air pollution from ships include the Energy Efficiency Design Index, which applies to new ship builds, and the Ship Energy Efficiency Management Plan, which is mandatory for both new and existing ships. In 2014, a proposal for a global data collection system for maritime transport covering fuel consumption, CO₂ emissions and energy efficiency will be discussed at the IMO and work on the third IMO Greenhouse Gas study will commence.

9.2.4 Enforcement

All MARPOL standards are strictly applied and compliance checked during port State control inspections—any ship that does not meet the applicable standards may be detained until the situation is rectified. For the master of a ship discharging in contravention of the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, which implements MARPOL, penalties are up to \$A17 million for the shipowner and \$A3.4 million for the ship's master.

The records of discharges that are required to be kept under the annexes of the MARPOL Convention are also carefully checked during port State control inspections for compliance with discharge requirements and inconsistencies. Prosecutions for garbage discharges in particular have been successfully carried out on the basis of these records.⁵⁶

⁵⁶ www.amsa.gov.au/environment/legislation-and-prevention/prosecutions/

AMSA is currently trialling detection of oil spills by satellites using synthetic aperture radar. One of the areas of the trial is in the Great Barrier Reef region. Once complete, the effectiveness of this trial will be reviewed and AMSA will assess the viability of implementing the system permanently in Australia, so that it will continue to act as a deterrent for would-be polluters.

Actions:

- GBRMPA and AMSA to explore options at the IMO for the development of grey water discharge standards.
- AMSA to investigate options to encourage ship charterers in the region to engage ships constructed with bunker fuel tanks in protected locations (built after August 2010) and the means to mandate this requirement for ships calling at GBR ports.
- AMSA to continue to work with government agencies and Queensland port authorities to encourage the improvement and use of waste facilities in line with IMO guidelines and information.
- AMSA to implement regular satellite oil spill detection in the region to act as a deterrent for would-be polluters.





9.3 Particularly Sensitive Sea Areas (PSSA)

A Particularly Sensitive Sea Area (PSSA) is defined by the IMO as an area that needs special protection because of its ecological, socio-economic or scientific significance or which may be vulnerable to damage as a result of international maritime activities.

The IMO declared the GBR and Torres Strait as PSSAs in 1990 and 2005 respectively. When an area is approved as a PSSA, internationally agreed measures may be used to manage shipping in that area beyond what would normally be permitted under international law. For the north-east region of Australia these measures include:

- pilotage requirements
- ship routing measures (i.e. two-way routes, areas to be avoided)
- shipping fairways
- ship reporting requirements and Vessel Traffic Services (VTS).

9.3.1 Associated Protective Measures

While a PSSA can in itself signal to mariners that an area has recognised ecological, socio-economic or scientific attributes (when the designated area has been identified on charts and Notices to Mariners), the current guidelines provide that the designation of an area as a PSSA must identify at least one measure with an identified legal basis that can be adopted by IMO to prevent, reduce or eliminate risks from international shipping activities.⁵⁷ If approved by IMO, an area designated as a PSSA can have one or more IMO-adopted measures for ships to follow. The possible measures may include ship routing or reporting measures, discharge restrictions, operational criteria and prohibited activities.

An application to IMO for a PSSA needs to demonstrate how the selected measure/s provides protection from the threats posed by the international shipping activities occurring in and around the area. If the protective measure is not available under an IMO instrument, the proposal needs to provide the legal basis and/or the steps that the proposing member government has taken (or will take) to have the protective measure approved and adopted by IMO pursuant to an identified legal basis. The application should also show how the area is being protected by domestic measures.

Any Associated Protective Measure (APM) is to be implemented in accordance with international law as reflected in the United Nations Convention on the Law of the Sea (UNCLOS). Information regarding such measures is required to be disseminated broadly to mariners operating in the designated area. Table 8 compares APMs implemented around the world to what is implemented in the GBR and Torre Strait.

Table 8: Comparison of PSSA shipping management measures

	Area to be avoided/designated area or routes /deep water route	Ship reporting	No anchoring areas	Special requirements for tankers/ hazardous cargo	Traffic separation	VTS	Pilotage	Oily waste discharge restrictions	Sewage discharge restrictions	Garbage discharge restrictions	Air emission controls	Ballast water discharge restrictions
GBR/TS	x	x	x	x	x	x	x	x	x	x		x
Sabana-Camagüey Archipelago	x									x		
Malpelo Island	x											
Florida Keys	x		x								x	
Wadden Sea	x			x	x	x		x		x	x	
Paracas National Reserve				x	x				x	x		
Western European Waters	x	x		x	x	x		x			x	
Canary Islands	x			x	x							
Galapagos Archipelago	x	x										
Baltic Sea	x	x			x	x		x	x	x	x	
Papahānaumokuākea Marine National Monument	x	x	x							x		

⁵⁷ International Maritime Organization, 2007, *PSSA – Particularly Sensitive Sea Areas*, Compilation of official guidance documents and PSSAs adopted since 1990.

9.3.2 Strengthened measures

The Great Barrier Reef and Torres Strait PSSAs have been in place since 1990 and 2005 respectively.

In addition to the Associated Protective Measures under the PSSA, shipping traffic is confined to pilotage areas and Designated Shipping Areas in the Great Barrier Reef region (Figure 9). The boundaries of the Designated Shipping Areas of the Great Barrier Reef Marine Park are proclaimed under Section 59 of the *Great Barrier Reef Marine Park Act 1975* and described in in Part 10 of Schedule 1 of the *Great Barrier Reef Zoning Plan 2003*.

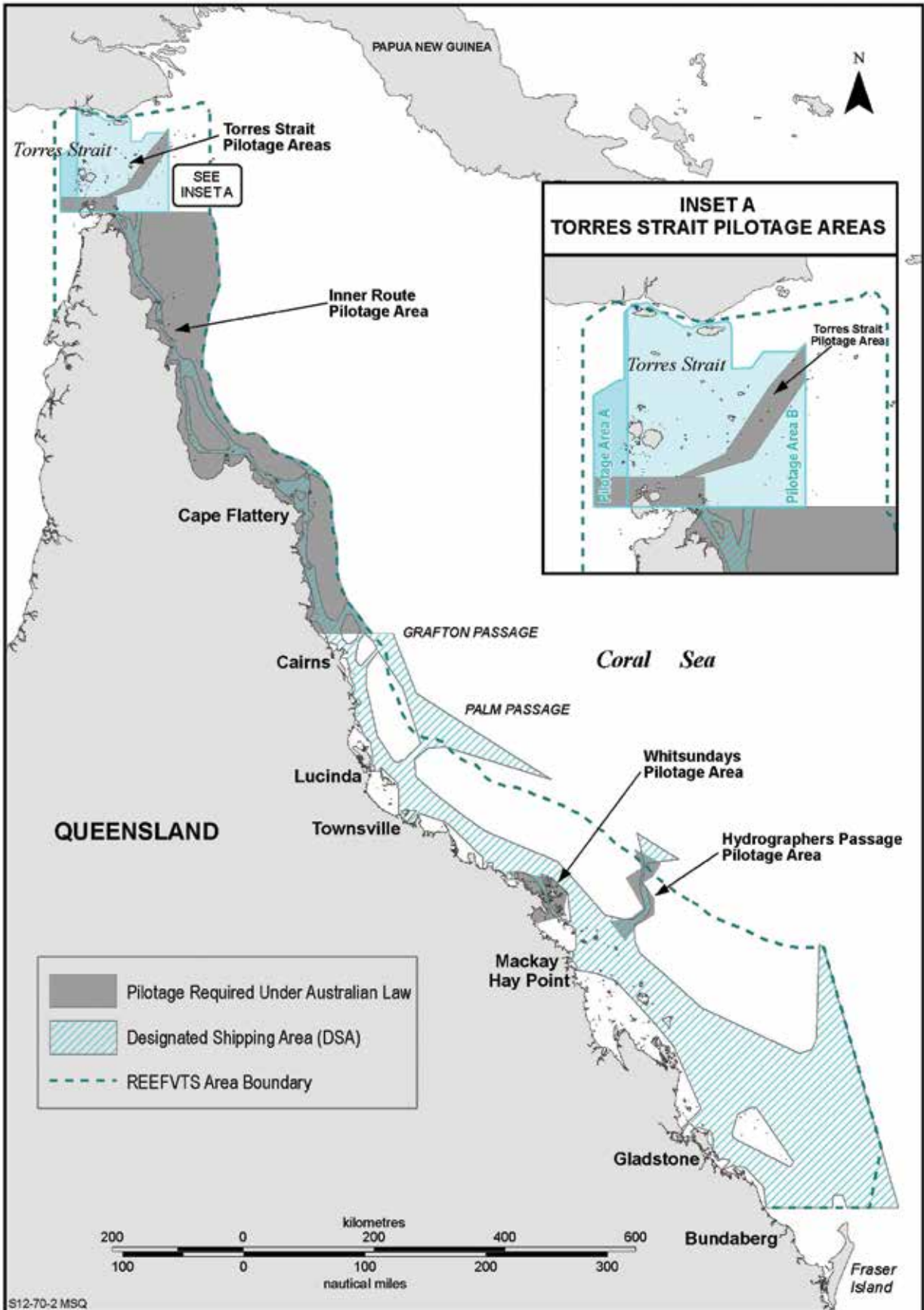
While the 2013 North-East Shipping Risk Assessment by DNV showed that the associated protective measures in place are highly effective, with the forecast future increase in shipping it is prudent to consider if further measures are needed.

Many of the actions stemming from this plan may be considered as associated protective measures for the area and these should be advised to the IMO as required. For example, the GBR and Torres Strait PSSA may benefit from:

- additional ship routing measures, for example fairways and traffic separation (refer to section 8.3)
- additional traffic management measures provided through enhancements to REEFVTS such as introduction of a traffic organisation service for certain areas (refer to section 8.6)
- additional cargo reporting requirements (refer to section 10.2)
- anchorage areas and 'no anchorage' areas (refer to section 9.1).



Figure 9: Designated shipping areas and pilotage areas within the region



9.3.3 Proposal for a new PSSA in the south-western Coral Sea

The 2012 DNV North-East Shipping Risk Assessment concluded that drift and powered groundings are the two dominant accident type contributors for the Coral Sea area. The deep water areas adjacent to the GBR in the Outer Route/Coral Sea are of particular concern as anchoring can be problematic for a drifting vessel in such deep water areas, and it will generally take some time for emergency towage assets to arrive on site. Recent experience responding to incidents in the Coral Sea area has confirmed this risk. Increasing shipping traffic in this area not only involves shipping using Queensland ports, but shipping transiting the Coral Sea en route between Asian and Australian east coast ports.

In view of the environmental sensitivity in this region and the increasing risk from international shipping activity, AMSA is developing an application for a PSSA for the south-western Coral Sea (adjacent to the existing Great Barrier Reef PSSA) for consideration by IMO in 2014. The proposed region falls within Australia's EEZ.

Designation of a PSSA in this region would deliver international recognition of its ecological values and environmental sensitivity. The boundaries of the PSSA would take into account the areas of high shipping traffic and a large portion of the Coral Sea Commonwealth Marine Reserve, which has Multiple Use, Habitat Protection, Conservation Park and General Use zones within this area.

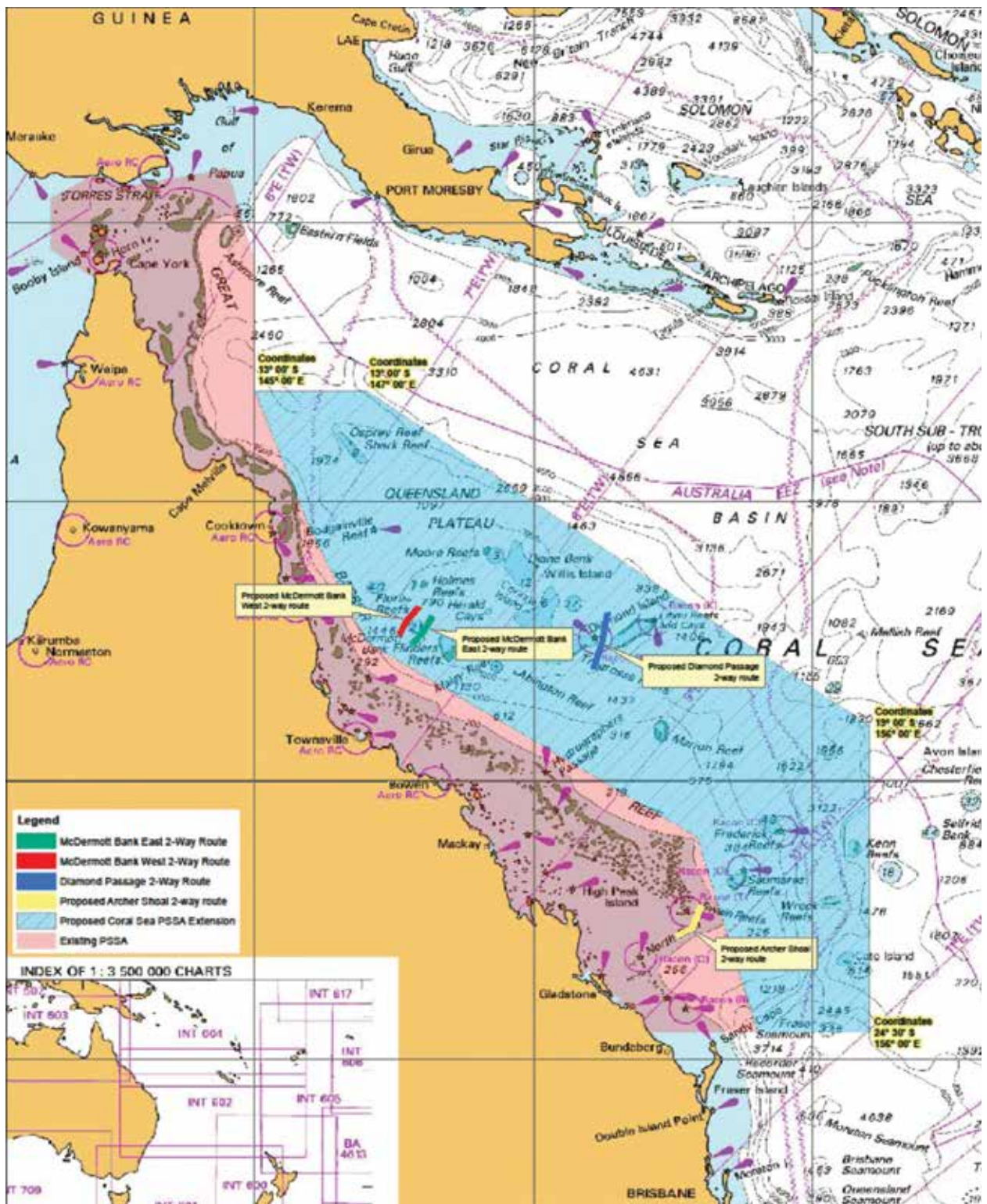
It is proposed that the PSSA submission cover the area and include the protective measures indicated in the chartlet (Figure 10). Initial APMs to be proposed include ship routing measures at:

- McDermott Bank West
- McDermott Bank East
- Diamond Passage
- Archer Shoal.

Action:

- NESMG to consider the need for further Associated Protective Measures in the Great Barrier Reef and Torres Strait PSSA.
- If approved by the Australian Government, AMSA to progress an IMO submission to extend the eastern boundary of the existing Great Barrier Reef/Torres Strait PSSA to include an area of the south-west Coral Sea.

Figure 10: Map Showing proposed extension to the PSSA in the Coral Sea



9.4 Biosecurity

Australia's biosecurity system protects our unique environment and agricultural sector from unwanted pests and diseases, supporting our reputation as a safe and reliable trading nation. This has significant economic, environmental and community benefits for all Australians.

The introduction of marine pests can come in a variety of ways but the most common are through ballast water, or as biofouling on the surfaces of vessel hulls or equipment.

Introduced marine pests can cause widespread and irreversible harm to the local marine environment. Impacts can flow through trophic cascades and may have the potential to alter natural ecological processes underpinning matters of national environmental significance (MNES) (see case study).

Box 1: Case study – Cost of eradication of an invasive marine species in Australian waters

The introduction of exotic black striped mussel (*Mytilopsis sallei*) in Darwin Harbour in 1999 had the potential to impact on the local pearling industry—then valued at AUD\$225 million per year—and impose significant ongoing costs on shipping and other industries (National Taskforce report, 1999). Eradication of the black striped mussel was estimated to cost over \$2.2 million. Invasive strains of *Caulerpa* (a type of seaweed) have established in a number of locations around Australia (Schaffelke et al, 2002), where it outcompetes native seagrasses, macroalga and sessile invertebrate organisms, and significantly reduces biodiversity.

Estimates of eradication cost for an incursion into Australia range between \$860,000 and \$263 million. Factors such as the size of the initially observed infestation area, water currents, depth of habitat, and whether the organism is solitary or colony-forming have the greatest impact on cost and likelihood of a successful response. The large area traversed by Great Barrier Reefshipping, stronger water flows between reefs, and where depths are greater than 15 metres all predispose the GBR region to higher costs. Emergency response arrangements, including cost-sharing arrangements, for responding to biosecurity incidents that primarily impact the environment and/or social amenity where the response is for the public good are set out in the National Environmental Biosecurity Response Agreement (NEBRA). It includes marine pest incidents. The National Environmental Biosecurity Response Agreement (NEBRA) stipulates a cap on emergency response expenditure of \$5 million dollars, with additional funds available subject to ministerial approval.

Eradication of marine pests can have high environmental and social costs too. The eradication of the black striped mussel from Darwin Harbour in 1999 relied upon copper sulphate and chlorine which killed all living organisms in the affected marinas.

To protect our marine environment and industries, the Australian and state/territory governments, along with marine industries and marine scientists, are implementing Australia's National System for the Prevention and Management of Marine Pest Incursions (the National System) through the Marine Pest Sectoral Committee.

The National System aims to prevent new marine pests arriving, guide responses when a new pest does arrive, and minimise the spread and impact of pests already established in Australia. The National System is a suite of measures aimed at:

- preventing marine pests from arriving in Australian waters or spreading to new areas
- providing a coordinated emergency response should a new pest arrive in Australian waters
- controlling and managing marine pests already here, where eradication is not feasible.

9.4.1 Ballast water management

Ballast water carried on board ships to maintain stability and safety at sea is recognised as a major contributor to the spread of exotic marine pests around the world. It has been estimated that 10,000 different species are being moved globally in ballast water tanks each day.⁵⁸ Marine pests have been introduced into Australian waters and spread to other locations through the discharge of ballast water⁵⁹ and there is the potential for further spread of these—as well as the introduction of species still exotic to Australia—to the Great Barrier Reef.

Current national ballast water requirements aim to minimise the introduction of pests of concern into Australian territorial waters (extending to 12 nautical miles from the coastline). The requirements only cover the importation of ballast water from foreign ports. Ships already in Australia and moving Australian-sourced ballast water to another domestic port are not subject to ballast water management requirements, with the exception of those ships intending to discharge ballast water in Victoria.

High risk ballast water is defined as ‘all salt water from ports and coastal waters outside Australia’s territorial sea’.⁶⁰ Internationally sourced ballast water is managed by the Australian Government’s Department of Agriculture and must be exchanged in deep ocean, outside the 12 nautical mile limit, prior to arrival in Australian ports or waters. Vessels are required to either manage high risk ballast water by exchange, retain high risk ballast water on board or use fresh potable water that has been municipally sourced. This also applies to any towed vessel with the capacity to hold ballast. The Department of Agriculture officers undertake ballast water management verifications prior to arrival and on board as part of the pratique or first port inspection.

The *International Convention for the Control and Management of Ships’ Ballast Water and Sediments, 2004* (BWM Convention) aims to minimise the spread of marine pests via ships’ ballast water. Australia signed the BWM Convention, subject to ratification, in May 2005, and it will enter into force when it has been ratified by 30 countries representing 35 per cent of gross world tonnage. The BWM Convention will phase out the use of ballast water exchange and will require the use of onboard ballast water treatment systems.

The Biosecurity Bill 2014 is currently being developed and will include a section on ballast water which will allow Australia to implement the BWM Convention. The Biosecurity Bill 2014 will replace the current *Quarantine Act 1908* and will underpin a more modern and responsive biosecurity system.

9.4.2 Biofouling management

Agriculture currently does not have any legislated authority over the management of biofouling. However, new management arrangements are currently being considered.

Agriculture works with the IMO and the local maritime industry to manage the biosecurity risk from biofouling. Agriculture recommends that industry sectors refer to the best practice biofouling management guidelines available from the Department of Agriculture’s Marine Pests’ website.

Agriculture is currently proposing new arrangements for the management of biofouling on overseas ships entering Australian waters. A biofouling Regulation Impact Statement (RIS) was prepared during 2011-12. It considers the costs of different biofouling management options. A preferred management option has been identified and the RIS is now being updated to meet new regulatory requirements.

58 Low T. (ed) 2003, *Ballast Invaders: the Problem and Response*, prepared for Invasive Species Council.

59 Centre for International Economics 2009, *Cost Recovery Impact Statement of Ballast Water Management Arrangements*, Canberra.

60 www.daff.gov.au/biosecurity/avm/vessels/quarantine-concerns/ballast/australian-ballast-water-management-requirements

Advice about in-water cleaning in Australian waters is provided by the Anti-fouling and in-water cleaning guidelines.⁶¹ The guidelines state that vessels should be removed from the water for cleaning, in preference to in-water operations. However, in some cases the guidelines accept in-water cleaning as a potential management option for removing biofouling, providing the risks are appropriately managed. This does not mean that all in-water cleaning proposals will be allowed. Owners and operators wishing to in-water clean should contact the relevant authority for further advice.

In-water cleaning in the Great Barrier Reef Marine Park is not allowed unless an exceptional circumstances permit has been issued by the Great Barrier Marine Park Authority.

9.4.3 Monitoring

In 1995, the CSIRO – Centre for Research on Introduced Marine Pests (CRIMP) and the Australian Association of Port and Marine Authorities (AAPMA) used a standardised approach to survey 35 port locations around Australia. The survey provided information on the marine pest status of 35 port locations around Australia. However, the baseline data from these surveys is now well over 10 years old.

A National Monitoring Strategy (NMS) was agreed by the Marine and Coastal Committee (MACC) and endorsed by the Natural Resource Management Ministerial Council in 2006.

One of the objectives of the NMS is to provide up-to-date port survey data, enabling the detection of pest species at high risk locations throughout Australia. The focus is to detect new pest incursions or changes in populations of existing pests as well as provide information to assist in emergency response or pest management activities.

The Australian marine pest monitoring manual describes the processes and standards for marine pest monitoring in the Australian context.

A companion document, the Australian marine pest monitoring guidelines, describes the rationale for the approach to the routine collection of monitoring data and how this data will be used to inform decision making in the Australian context.

There are 18 agreed National Monitoring Network (NMN) locations under the National Monitoring Strategy. These are Darwin, Port Hedland, Dampier, Fremantle, Adelaide, Portland, Melbourne, Hobart, Port Kembla, Botany Bay, Sydney, Newcastle, Brisbane, Bundaberg, Gladstone, Dalrymple Bay, Townsville, and Cairns. The NMN locations are to be monitored biennially, with data valid for three years.

Each jurisdiction is responsible for implementing monitoring within waters under their control, including funding of these activities. As a shared responsibility, jurisdictions may consider recovering monitoring costs from a range of relevant stakeholders.

In Queensland, monitoring has only been undertaken at Skardon River (2008 and 2011), a non-NMN location. This was funded by the Australian Fisheries Management Authority as part of an agreement to use the site for the disposal of illegal entry vessels. Monitoring at agreed NMN locations in Queensland is imperative to provide new port baseline data and inform marine pest policies and activities.

Actions:

- The Department of Agriculture to conduct a review and strategic analysis in to invasive marine pests

61 www.daff.gov.au/animal-plant-health/pests-diseases-weeds/marine-pests/draft-anti-fouling-and-inwater-cleaning-guidelines

9.5 Ship collisions with marine fauna

The IMO endorsed measures for reducing the threat of ship collisions with marine fauna include vessel navigation modification such as precautionary areas, areas-to-be-avoided, separation zones and related routing measures.⁶² Establishing time and area specific vessel speed restrictions may also minimise the likelihood of lethality of a strike should it occur.

Although some of the routing measures have been adopted in the Great Barrier Reef, none of these have been specifically applied for this purpose.⁶³ However, given that shipping in the Great Barrier Reef Marine Park is determined by designated shipping areas and geographical factors, re-routing or shipping avoidance measures to avoid whale and cetacean habitat may not always be possible.

Observations from the front of cruise liners showed that at speeds greater than 13 knots, whales frequently surfaced closer to the ship's midline and ship's bow in contrast to surfacing patterns for speeds less than 13 knots. Reducing vessel speeds may have economic impacts particularly for certain types of ships and this would need further investigation. For example, reducing speed in a whale habitat (at high risk times) under a voyage plan may be an option for certain bulk cargo ships sailing to ports in Asia that are not time sensitive given transit times are approximately 20 days.⁶⁴

The Department of the Environment is in the process of developing a National Ship Strike Strategy for cetaceans. The overarching goal of the strategy is to minimise the risk of vessel strikes and the impacts they may have on human safety, property and marine megafaunal populations. Objectives of the strategy include:

- data collection to understand the scale of the problem in Australian waters
- data analysis involving a risk assessment and analysis of existing databases
- development of reporting procedures which are more assessable and efficient
- development of mitigation measures
- engagement with industry using a partnership approach towards information gathering and mitigation.

The implementation of appropriate mitigation measures will be undertaken with relevant stakeholders including the shipping industry.

The measures considered are expected to be broad ranging - from broad scale and voluntary to targeted and enforceable. The strategy acknowledges that maritime safety and economic impacts would need to be considered when developing mitigation measures. Measures may include:

- speed restrictions
- re-routing old vessel lanes
- implementing no-go zones
- timing restrictions
- marine fauna observers
- development of new technologies including passive acoustics, predictive modelling and real time data sharing.

⁶² Silber GK, Vanderlaan ASM, Arceredillo AT, Johnson LJ, Taggart CT, Brown M, Bettridge S and Sagarminaga R, 2012), 'The role of the International Maritime Organization in reducing vessel threat to whales: Process, options, action and effectiveness' in *Marine Policy* 36, pp 1221-1233

⁶³ Most recent IMO guidance on this topic can be found at www.imo.org/blast/blastDataHelper.asp?data_id=26244&filename=674.pdf

⁶⁴ See, eg, Vanderlaan & Taggart (2007) [IFAW submission]

It would be beneficial for the National Ship Strike Strategy and this plan to be aligned in the identification of risks and control measures to minimise the impact of wildlife collisions. Currently data on vessel-cetacean collisions is kept by the relevant state, GBRMPA, or the Australian Marine Mammal Centre.

Under-reporting of ship strikes is believed to be high and therefore a key aim of the National Ship Strike Strategy is to encourage and improve reporting procedures. A National Vessel Strike database is currently being developed by the Australian Marine Mammal Centre, whereby information on all vessel strike incidences, as well as vessel collisions on all species of marine megafauna can be reported, stored and retrieved.

Actions:

- The Department of Environment to prepare the National Ship Strike Strategy with relevant government and non-government stakeholders.
- The Department of Environment to work with industry and relevant agencies to improve ship-cetacean collision reporting procedures and establish a national portal to hold this data.
- The Department of the Environment and GBRMPA to keep under review modelling and assessments of whale and ship collision risk in the north-east region. In conjunction with IMO guidelines, the results would be used to design and implement appropriate safeguards such as speed limits and high alert areas.

9.6 Interference with species behaviour

9.6.1 Noise

There is evidence that shipping noise may inhibit coral reef formation and colonisation where ambient underwater sound is an important orientation and settlement cue for marine invertebrate larvae. Noise may also impact on fish species communicating during spawning and territorial fights, or when competing for food or being attacked by a predator, with possible consequences for ecosystem function and flow on commercial and recreational impacts. However, actual impacts on species behaviour from underwater noise in the region are not clearly understood and further information is needed.

The United Nations Environment Programme has urged that effective management of anthropogenic noise in the marine environment should be regarded as a priority for action at the national and regional level.⁶⁵ In addition, the IMO is expected to approve new guidelines for reduction of underwater noise from commercial shipping to address the adverse effects of marine life.

Any measures to reduce collision risk should also reduce noise impacts by keeping migratory marine species (particularly whales) and ships apart. It is also possible that pilots and pilotage providers may be utilised to observe marine mammals and take action as appropriate.

⁶⁵ UNEP, 2012, Scientific Synthesis on the Impacts of Underwater Noise on Marine and Coastal Biodiversity and Habitats; unep/cbd/sbstta/16/inf/12 - Convention on Biological Diversity.

It would be beneficial to instigate research into ambient and shipping-related noise in the GBR region including an assessment of the potential for reduced scope for communication amongst GBR whales and other migratory marine species, and collision risk and collision rates where high density shipping movements co-occur with high density whales movements. Information obtained from data on vulnerable areas for ship collision or research on noise or cumulative impacts can be used to inform further routeing measures or identify the need for additional Associated Protective Measures.

Actions:

- GBRMPA and AMSA to keep under review opportunities to conduct research into noise monitoring tools and methods and implications for ship noise mitigation strategies.

9.6.2 Wake and propeller effects

Ship propellers effectively pump water astern of the ship so that the reactive force pushes the ship forward. In shallow waters with a sandy or muddy seabed the propeller effect can pump sand and mud from the seabed thereby increasing turbidity and temporary degradation of water quality. This may have flow on effects on seagrass biodiversity which are a primary habitat and food source for green turtles and dugongs, and sensitive to elevated levels of turbidity.

For much of the region, there are no speed restrictions in place in the main shipping channels because ships must be given the ability to maintain a certain speed so that the Captain and pilot can maintain control of the vessel. In some pilotage areas however, ships pilots are provided with instructions in relation to speed and wash with a view to minimising environmental damage.

In recent years, some stakeholders have reported bow waves and extensive sediment plumes behind large, fully laden vessels navigating through particular areas of the Reef and Torres Strait at low tide. The potential impact on the environmental values of the GBR and flow-on effects to reef users is yet unconfirmed.

Based on these experiences, AMSA has instigated research to investigate the issue of wash on and around Islands in the Great North East Channel (Torres Strait) to identify areas where ship speed or wake has an impact on coastal erosion.

Other research is also needed to identify particular areas where cetacean strike or propeller wash and turbidity has occurred from ships travelling in close proximity to sensitive or prime coastal habitats and effective controls.

Actions:

- AMSA to determine how the shape and energy of waves generated by passing ships influence coastal erosion in the Torres Strait.
- GBRMPA, Environment and AMSA to keep under review research into the potential environmental and socio-economic impacts of wake and sediment plumes from ships transiting the reef.

9.6.3 Hull leachate effects

Two case studies of ship groundings in the GBR—the *Bunga Teratai Satu* (2000) and *Shen Neng I* (2010)—highlight the issues associated with hull leachates/antifoulant released during a grounding.

Box 2: Case study - Container ship *Bunga Teratai Satu*

In November 2000, the Malaysian-flagged container ship *Bunga Teratai Satu* ran aground on Sudbury Reef, south-east of Cairns. The ATSB investigation into the grounding found that the significant act that resulted in the grounding was the inattention of the mate on watch, who was distracted by a telephone call.

Damage to the reef included physical removal of the reef structure from the ship's impact zone (a point source approximately 1500 m²) and contamination by tributyltin-based anti-fouling paint dislodged from the hull. The ship's owners undertook work to remediate the damage caused to the reef, in accordance with criteria provided by GBRMPA. The joint-agency response to the Sudbury Reef grounding incident demonstrated world's best practice approaches to minimise risk to the GBR and facilitate natural recovery of damaged areas. Interactions between management agencies and the owners of the ship were characterised by strong cooperation and goodwill.

The three month clean-up was fully funded by the ship's owners. It saw the removal of over 40 kilograms of paint pieces, 62 tonnes of contaminated rubble and 400 tonnes of contaminated sand. Overall, the clean-up was effective in reducing the amount of area affected by tributyltin and, as such, the anti-fouling paint was unlikely to have a significant impact on fish and adult coral in the area.

The incident was an example of a successful clean-up operation, mainly due to timely and adequate funding from the shipowners.

It prompted the *2001 Review of Ship Safety and Pollution Prevention Measures in the Great Barrier Reef*. Key recommendations from this review included:

- establishing a Vessel Traffic Service
- full uptake of ECDIS on board ships
- pilotage in the Torres Strait.

Box 3: Case Study - The grounding of *Shen Neng 1*

In April 2010, the loaded bulk carrier *Shen Neng 1* ran aground on Douglas Shoal in the Great Barrier Reef, some 50 nautical miles north-east of Gladstone. The location was outside the then REEFVTS reporting area.

The subsequent ATSB investigation found that the grounding occurred because of issues relating to the vessel's fatigue management system, its safety management system (passage planning), and with bridge warning systems (in relation to underwater dangers).

The grounding of the *Shen Neng 1* created a large physical impact on Douglas Shoal despite only releasing a small amount of oil pollution. It is estimated that 115,000 m² of the shoal was severely damaged or completely destroyed. Patchy or moderate damage also occurred over much of the rest of the 400,000 m² that the ship covered during the incident.

Contamination of sediments by tributyltin, a highly toxic component of anti-fouling paint, was distributed over a wide area and severe. Strong mixing over the shoal indicates that the effects of this contamination may have spread widely, well beyond the area of direct contact with the ship's hull.

Following the incident, AMSA released a report entitled *Improving Safe Navigation in the Great Barrier Reef* (April 2010). The report highlighted that Vessel Traffic Service (VTS) provides a cost effective mechanism and proven track record of mitigating the risk of groundings. It recommended that REEFVTS coverage be extended to the southern boundary of the Great Barrier Reef Marine Park. Australia was granted IMO approval to extend the mandatory ship reporting requirements (REEFREP) to the southern boundary of the Marine Park. The changes came into force on 1 July 2011.

AMSA also installed seven new light buoys and a new fixed aid to navigation (AtoN) structure in the GBR and Torres Strait. Three of the new buoys are installed off Gladstone including at Douglas Shoal, the site of the *Shen Neng 1* grounding.

The *Navigation Act 1912* was also amended to include an offence for operating a vessel in a manner that causes pollution or damage and increased penalties for failure to report an incident by a ship in the GBR Marine Park. Additionally, penalties under the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* were increased for the discharge of oil, or oil residues, by ships in Australian waters to \$11 million for an aggravated offence. However, rehabilitation and remediation of Douglas Shoal has not occurred due to lack of funding.

There is no contingency fund that covers the required work and the matter is now the subject of Federal Court proceedings against the owners of *Shen Neng 1*. The delay in remediation is not appropriate from an environmental perspective and improved arrangements to allow prompt action in such circumstances are necessary.

The primary lesson from these experiences is the importance of a strong cooperation between shipowners and the management agencies in the response, assessment and rehabilitation of damage caused by the grounding of ships even where no loss of oil has occurred.

Actions:

- GBRMPA to instigate research into ship-sourced copper leaching from antifouling paints at GBR port anchorage sites to determine if this is an identifiable risk to the values of the GBR.
- GBRMPA to instigate research into the restoration of habitats affected by shipping incidents (e.g. coral and seagrass restoration, eradication of marine pests, halt impacts from biocides).
- GBRMPA and AMSA to explore mechanisms to fund high priority restoration and rehabilitation of reef habitats (and the removal of antifoulant paints) immediately following a ship grounding.

9.6.4 Light

While the low density of ships in transit are not expected to cause chronic light disturbance to marine life, light pollution from ships may be significant when ships are loading at terminals or at anchor.

Implementation of proposed management strategies associated with offshore ship anchorages in the GBRWHA can consider lighting at anchorages where it is identified as having a potential impact.

9.7 Altered aesthetic value

Altered aesthetic value of the Great Barrier Reef is an attribute it's OUV. While a subjective matter, several stakeholders have identified congregation of ships at anchorages as the most visible impact on the aesthetics of the region.

The aesthetic values of the ports of Townsville, Hay Point and Gladstone risk being impacted on from high anchorage use, a point of concern for many stakeholders due to the numbers of ships, proximity to busy urban areas or density of human observers (residents or visitors). This reinforces the need for an effective strategy to manage anchorages in the GBRWHA.

9.8 Indigenous heritage values

Initial consultations with Torres Strait communities has shown the need to better engage with Indigenous communities on shipping management issues to gain a greater understanding of shipping impacts on those communities and their role in emergency response arrangements.

Ongoing consultation with the local community is also an important element of shipping management, particularly the role of the local community during a response to an incident such as an oil spill.

Actions:

- NESMG to enhance their engagement with Indigenous communities in the Torres Strait on search and rescue, maritime safety and pollution response arrangements including through the GBRMPA-led Indigenous Partnership Group and Indigenous Reef Advisory Committees.

9.9 Cumulative impacts

Cumulative and multiple impacts affecting the reef are particularly challenging to predict and determine. In general, there is limited research available on the cumulative impacts of shipping.

As identified earlier in the plan, further work is needed to identify and understand the potential consequential and cumulative impacts from shipping and how those impacts may affect MNES and OUV.

Currently very little is known about the consequential or cumulative impacts of shipping in the region. The GBRMPA has undertaken to develop a policy to provide a transparent, consistent and systematic approach to assessing cumulative impacts across jurisdictions from activities within and adjacent to the region. This policy will ensure cumulative impacts, including those from shipping, are appropriately considered in regulatory processes and provide greater certainty about assessment requirements for development activities.⁶⁶ This policy, together with the development of an outcomes-based framework to guide decision-making in the region, should assist with the identification and assessment of cumulative impacts on the OUV of the GBRWHA and other values of the north-east region.

Actions:

- GBRMPA and the Department of Environment to undertake further research and investigate appropriate measures to manage cumulative impacts from shipping in the GBR.
- GBRMPA and NESMG to actively contribute to the development of the Department of Environment's cumulative impacts policy and evaluate any implications for ship management measures in the GBR.

⁶⁶ See Great Barrier Reef Strategic Assessment – In Brief, 2014, www.gbrmpa.gov.au/__data/assets/pdf_file/0007/97234/GBR-Region-Strategic-Assessment-In-Brief.pdf

10. Protective measures – **preparedness, prevention and response**

This section outlines the measures in place to prepare and respond to a maritime incident in the event that one should occur, or has the potential to occur, and proposes future actions to further improve current management arrangements in the region.

10.1 National Plan

AMSA manages Australia's National Plan for Maritime Environmental Emergencies (the National Plan). The National Plan provides a framework for responding promptly to marine pollution incidents and maritime casualties by designating responsibilities to competent national and local authorities.

The National Plan holds a wide range of response equipment at all major ports, including Cairns, Mackay, Townsville and Brisbane. Equipment provided by AMSA is generally targeted at larger spills (Tier 2 and 3). This is complemented by equipment held by port authorities for Tier 1 spills, individual oil and chemical companies, and by the Australian Marine Oil Spill Centre (AMOSOC) stockpile in Geelong. Equipment can be rapidly deployed to the scene of a spill.

Under the National Plan, AMSA has appointed a Maritime Emergency Response Commander (MERCOC) to act on behalf of the authority during a shipping casualty. The MERCOC is responsible for the management of responses to shipping incidents in Commonwealth waters, with intervention powers to take such measures as may be necessary to prevent, mitigate or eliminate a risk of significant pollution. This includes the power to direct a port to release a tug to provide emergency assistance to a vessel at risk, or designate a place of refuge for a ship in emergency situations that present a risk of significant pollution.

10.1.1 National Plan Review

In September 2012, the Transport and Infrastructure Senior Officials Committee agreed to new governance arrangements to oversee the National Plan. The new arrangements provide for a broader range of government and industry stakeholders to provide input into decisions affecting the arrangements, including the shipping industry and ports, offshore exploration and production and salvage industries.

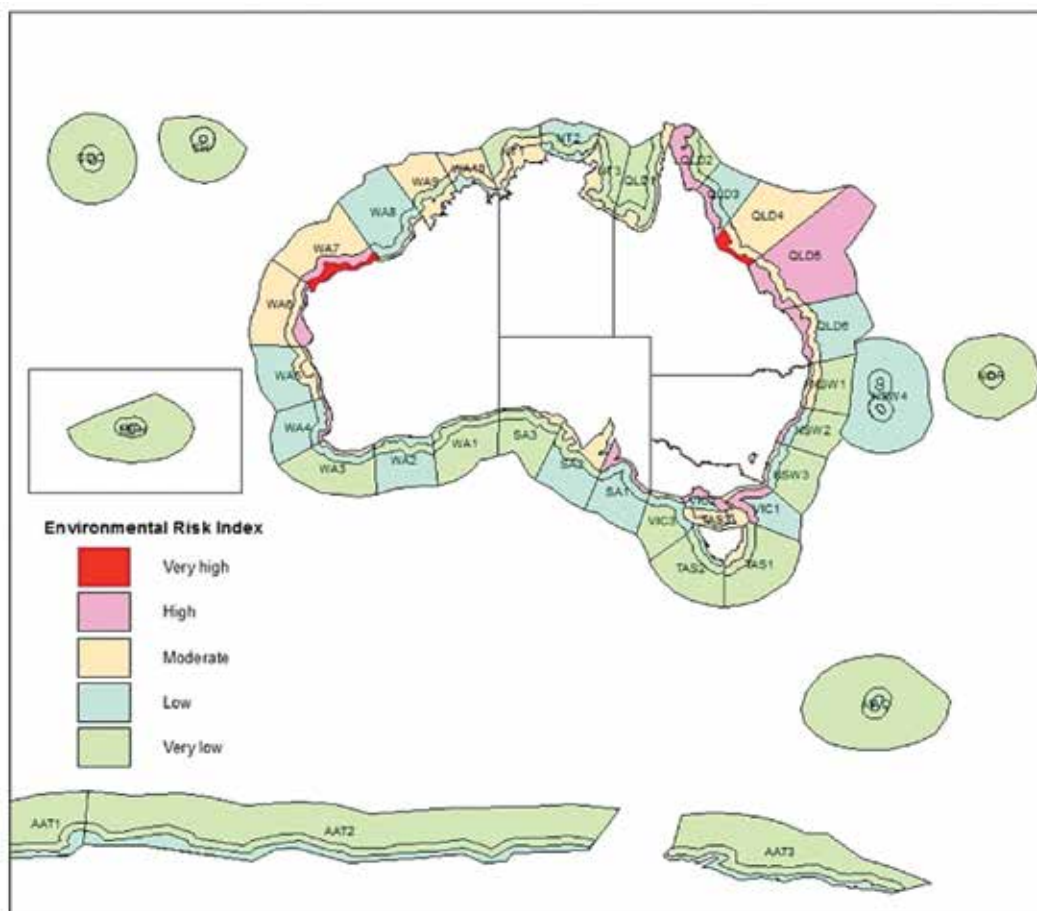
A key outcome of the review was for a new comprehensive National Plan to provide overall prevention, preparedness, response and recovery arrangements for marine pollution. The new National Plan, which came into effect in March 2014, maintains the existing arrangements for contingency planning at the state, territory and industry level. Other outcomes include:

- the Australian Government, through AMSA, to establish a Marine Incident Emergency Committee with responsibility for coordinating preparedness and response arrangements within the Commonwealth jurisdiction (including shipping and offshore facilities)
- development of a new Commonwealth marine pollution contingency plan
- review and update of the National Plan Research, Development and Technology Strategy
- assessment of the adequacy of existing arrangements for the delivery of environment and scientific advice within incident management systems in all Australian jurisdictions
- audits by all states and the Northern Territory on the obligations contained in the *International Convention on Oil Pollution Preparedness, Response and Co-operation 1990* and the Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances 2000
- a substantial programme of equipment replacement and refurbishment.

10.1.2 National Plan stockpiles

In 2011, DNV was engaged to assess the risk of pollution from marine oil spills in Australian ports and waters. The report considered areas that combine high shipping activity with high environmental sensitivity, to establish high risk regions. These environmental risk areas are shown in Figure 11.

Figure 11: Environmental risk index from the 2011 DNV study



Taking into consideration the findings of the DNV report, the location and composition of pollution response equipment was recently reviewed by AMSA. In the north-east region, while Townsville remains the ideal location for the national stockpile, the stockpile has been significantly upgraded to take into account increased risks in central Queensland coal ports and ongoing risks in the northern Great Barrier Reef.

The importance of Townsville as the location for the national stockpile within the north-east region was recognised for the following reasons:

- it services the mid-north GBR and Torres Strait
- it is strategically placed for road transport to north and south Queensland (Bruce Highway) and the Northern Territory (via Flinders and National Highways)
- a large regional airport and major RAAF base meets air transport requirements
- it provides adequate response times to other adjacent areas and regions including:
 - o 4 hours to Cairns
 - o 5 hours to Mackay
 - o 10 hours to Gladstone
 - o 30 hours to Darwin.

The stockpile also includes wildlife rescue and rehabilitation kits. The kits are a containerised system consisting of cleaning stations with piped water and temperature controls. Contents include everything from general equipment such as cleaning agents, animal cages and treatment boxes to a large range of veterinary supplies (Figures 12 & 13). One kit is located at Townsville to respond to incidents in the north-east region.

Actions:

- AMSA, MSQ and GBRMPA to complete the programme of oil spill response equipment and refurbishment, including implementing arrangements to monitor the operational readiness of control agencies, including audit and reporting arrangements.
- AMSA, Torres Strait Regional Authority, PNG National Maritime Safety Authority and MSQ to review the adequacy of the marine incident management and oil spill response arrangements in the Torres Strait and regularly exercise those arrangements.

Figure 12: Wildlife cleaning facility



Figure 13: New oiled wildlife response unit that is being purchased for the Townsville stockpile (photo courtesy of Bill Dwyer)



10.1.3 Queensland Coastal Contingency Action Plan

The Queensland Coastal Contingency Action Plan (QCCAP) outlines the state's prevention, preparation, response and recovery arrangements for pollution events that impact on, or are likely to have an impact on, Queensland coastal waters, and waters of the GBRWHA and the Torres Strait region.

The QCCAP supports the National Plan, linking directly to the National Marine Spill Contingency Plan and the National Marine Chemical Spill Contingency Plan.

QCCAP is also a hazard specific plan for marine pollution incidents under Queensland's state disaster management arrangements, and outlines how Queensland manages the risks associated with transporting oil and chemicals at sea.

Under Queensland's disaster management arrangements, Maritime Safety Queensland (MSQ) is responsible for preparing and managing the response to a marine pollution incident.

The arrangements for first-strike response to ship-sourced pollution incidents that occur within Queensland ports are clearly defined in Oil Pollution First-Strike Response Deeds between individual port authorities and the Queensland Government acting through Maritime Safety Queensland. Under the terms of the deeds individual port authorities are responsible for:

- monitoring oil transfer operations
- providing adequately trained personnel and equipment for the first-strike response to oil spills
- storing and maintaining first-strike response equipment within ports.

These responsibilities complement MSQ's related responsibilities which include:

- developing oil spill contingency plans for ports
- training nominated response personnel
- conducting exercises to refine and test response arrangements
- performing regular audits of response capacity within ports.

At the local level, all Queensland ports are equipped with a small stockpile of first-strike oil spill response equipment. This equipment is owned by individual port authorities and oil companies and is not generally available for use outside of port limits. In addition, there are stockpiles of first-strike response equipment at MSQ marine operations bases on the Gold and Sunshine Coasts and with other agencies at Port Douglas. Minor stocks of equipment, mainly oil adsorbents, are also located in Queensland Government owned boat harbours at Manly, Tin Can Bay, Urangan, Rosslyn Bay and Bowen.

Regional stockpiles of oil spill response equipment are located at six strategic locations along the Queensland Coast including Brisbane (Pinkenba), Gladstone, Mackay, Townsville, Cairns and Thursday Island in the Torres Strait. In addition, AMSA maintains two larger stockpiles of National Plan oil spill response equipment located in Brisbane and Townsville, as outlined above.

In the last ten years rangers and other emergency response personnel from communities in the Torres Strait were trained in oil spill response under QCAAP. However there is a need to update this training, identify any gaps, and exercise the new response arrangements within this region. The DNV report conducted for this plan provides the modelling of shipping incidents to assist with planning for pollution response.

Many local governments and Queensland Government agencies have standing offer arrangements with local suppliers for the provision of goods and services. These arrangements can be utilised to support a marine pollution incident response through the disaster management network.

Actions:

- AMSA, Torres Strait Regional Authority, PNG National Maritime Safety Authority and MSQ to review the adequacy of the marine incident management and oil spill response arrangements in the Torres Strait and regularly exercise those arrangements.

10.2 Managing hazardous and noxious substances

Ships carrying hazardous and noxious substances (HNS) in bulk are subject to the strictest construction requirements under SOLAS and MARPOL to ensure that cargo is not released operationally or in the event of an incident—the more hazardous the cargo, the higher the standards of containment and survivability for the ship.

Packaged dangerous goods are subject to the stringent requirements of the International Maritime Dangerous Goods Code mandated under SOLAS, to ensure that packaging and stowage is as safe as possible.

AMSA has had two assessments carried out previously for the risks of both containerised and bulk HNS:

- the 2000 National Plan Review Risk Assessment highlighted that containerised goods represented the most likely source of HNS incidents. These incidents are characterised by the need to assess and contain the release of the hazardous substances on board a vessel where possible
- the 2006 Bulk Liquids Risk Assessment specifically addressed the loss of bulk liquids into the marine environment. The risk assessment concluded that Australia could expect a HNS incident involving bulk liquids once every 18 months (although Australian experience does not support this). These incidents are characterised by the need to halt the flow from the vessel and manage pollution outside the vessel, either in the marine environment or atmosphere.

Australia has in the past experienced incidents involving HNS releases, both from containers and bulk cargo. Incidents that occur outside Australia have demonstrated the need for HNS specific response capabilities to be available. As part of upgrading the National Plan for Maritime Environmental Emergencies, AMSA, with support from the states, Northern Territory and industry, has proposed the development of a national HNS response capability based on a tiered system, consisting of:

- Level 1: small on board spill/incident requiring remote advice with limited or no on-site attendance
- Level 2: medium or significant spill/incident requiring full on-site attendance
- Level 3: major spill/incident requiring state, interstate and national resources.

Within the jurisdictions of the states and Northern Territory, the operational response for hazardous material releases in many cases falls to the fire service. Operations are conducted in a manner similar to land-based HAZMAT (hazardous materials and items) response.⁶⁷

Nationally, a Level 1 capability exists through technical expertise within AMSA and an agreement between AMSA and Fire and Rescue NSW for the provision of a 24/7 information and advice service.

A limited number of states, including Queensland, have the capability to place response HAZMAT teams on board vessels within the three nautical mile coastal waters.

AMSA is also considering the need to amend reporting requirements throughout the potentially expanded South-Western Coral Sea PSSA to accommodate ships carrying hazardous and noxious substances based on similar reporting requirements from PSSAs around the world.⁶⁸

This Associated Protective Measure could also be considered for the GBR World Heritage Area under the current PSSA declaration.

Further work will be carried out with industry on a trial basis to assess how quickly this information could be obtained following an incident. The outcome of this trial will determine how much information on cargo should be mandatorily reported.

Further research is also required on types of cargo being transported through the region and their potential impacts to the GBR. For example hazardous cargoes, such as herbicides including diuron may require specific response strategies. Additionally, cargoes that aren't defined as hazardous, such as sugar and coal would have specific impacts on coral and appropriate response strategies to a cargo spill following an incident are required.

Actions:

- GBRMPA and MSQ to identify response strategies for cargoes that pose a specific risk to the environmental values of the region.
- AMSA to assess the availability of HNS cargo information currently available from ships in the region in the event of an incident. If necessary, AMSA to seek to amend the requirement of the mandatory ship reporting system REEFREP to require all ships to which REEFREP applies to report further details of the carriage of HNS.

⁶⁷ Hazardous materials are generally considered to be anything that, when produced, stored, moved, used or otherwise dealt with without adequate safeguards to prevent it from escaping, may cause injury or death or damage to life, property or the environment.

⁶⁸ These include Western European PSSA—requires reports from single hull tankers carrying heavy grades of fuel oil; Canary Islands PSSA—requires reports from tankers of 600 DWT and above carrying heavy grades of fuel oil, bitumen and coal tar; the Straits of Bonifacio PSSA—requires all ships of 300 gross tonnage and above to report details of petroleum products, dangerous or pollution substances; and Galapagos PSSA—requires all tankers carrying hazardous material to report the type, quantity and IMO classification.



10.2.1 Training and resourcing

The National Plan Review emphasised the importance of rigorous, relevant and regular training in order to ensure that trained personnel are available to respond to an oil spill in Australian waters.

AMSA has funded the delivery of an expanded and fully accredited training programme for Incident Managers. AMSA also plans to deliver operational training in support of the National Response Team during 2013-14 with the aim of maintaining an adequate pool of highly trained incident response personnel.

The Queensland Government also delivers pollution response training for Queensland Government and port personnel.

Actions:

- AMSA to continue to implement a fully accredited competency based national training programme with broad stakeholder representation that targets response to oil spills in sensitive areas as well as response and understanding of chemical spills and the need to take into account environmental values during response operations.
- MSQ, port authorities and AMSA are to ensure they have an adequate number of appropriately trained response personnel that are available to respond to a marine incident.

ETV Vessel



10.3 Emergency towage vessels

The National Maritime Emergency Response Arrangements (NMERA) were established under an Intergovernmental Agreement (IGA) between the Commonwealth and state/NT governments and intended to provide access to emergency towage capability (ETC) and arrangements to access and use that capability around the Australian coast. Under these arrangements, several emergency towage vessels (ETV) are stationed at strategic locations around Australia's coastline. The ETVs provide a minimum level of emergency towage capability to deal with significant, or potentially significant, threats to Australia's marine environment. Emergency towage is considered to be an initial response to assist incapacitated ships when in danger of grounding, sinking or suffering from some other peril of the sea.

The DNV risk assessment identified emergency towage capability as particularly effective in deep water offshore areas such as the outer regions of the Great Barrier Reef where anchoring is problematic for a drifting vessel.

AMSA's emergency towage capability consists of a three-tiered approach:

Level 1

Under contract to AMSA, a dedicated chartered ETV provides emergency towage and first response capability in the PSSA of the GBR and Torres Strait (north of Cairns/Mourilyan).

While the ETV's main role is to provide first response capability during a shipping incident, it also provides assistance during other maritime and search and rescue incidents, as well as maintenance to Australia's aids to navigation network.

Level 2

The availability of emergency towage capability for the remaining areas is delivered by eight ocean-going towage vessels located around Australia's coastline. These vessels are manned with appropriately trained crews that normally undertake existing port operations. The vessels are contracted by AMSA to be available when required in the event of an incident.

Level 3

The third level of response comprises 'vessels of opportunity'. These are suitable vessels that are in the area at the time of the incident and can be used if necessary to supplement, or substitute in the absence of level one or two vessels.

Level 3 emergency towage capacity has proven to be very important in responding to actual incidents in the north-east region. It is important that ports in the region keep emergency towage capability as a requirement for tugs that service the ports and that commercial arrangements do not preclude the use of these tugs in emergency. These requirements are outlined in the responsibilities of the states in the IGA.

Box 4: Case study - The breakdown of the *Ocean Emperor*

On 26 July 2010 at 2:00 am, a fully loaded bulk carrier *Ocean Emperor*, broke down in the Coral Sea, north-east of Bougainville Reef. This followed a series of earlier breakdowns and erratic movements by the ship. The ship was some 38 nautical miles (71 kilometres) offshore and drifting towards the Great Barrier Reef. AMSA was tasked to respond on the basis that repairs to the engine could not be carried out without shore assistance.

Initially, tug *PB Karori* remained in company of the ship to ensure response capacity was available to cover the risk associated with the drift towards Bougainville Reef.

AMSA and MSQ monitored the situation and prepared for a potential pollution response.

On 27 July, AMSA's ETV *Pacific Responder* attached a towing line to the *Ocean Emperor* with the assistance of tug *Wonga* and a harbour tug, to tow the vessel toward a safe anchorage in the Cairns harbour area. With the help of MSQ and GBRMPA, a proposed action plan was developed to safely tow the vessel to safe anchorage to facilitate main engine repairs.

The vessel arrived into the safe anchorage off Cairns around noon on 31 July 2010, where the engine repairs were successfully completed.

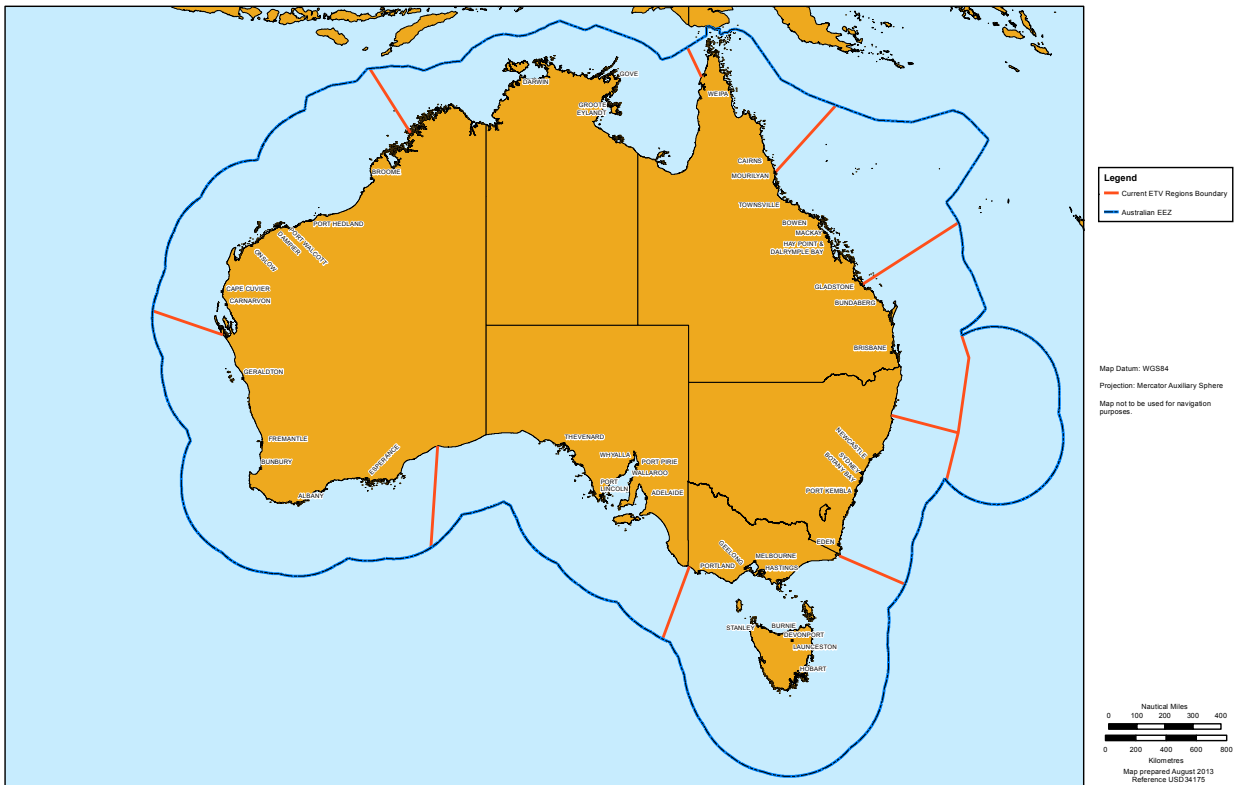
During 2013 AMSA released a tender to the market to increase its Level 2 emergency towage capability with the result that a new ETV will replace the *Pacific Responder* effective from 1 July 2014. The previous arrangements provided for coverage of 8 regions (see Figure 14) and this has now been increased to 10 regions, which includes an additional region for the GBR and Coral Sea. The additional capability aims to reduce the response time for incidents in the region. AMSA is responsible for monitoring the effectiveness of this capability through audits and exercises.

Actions:

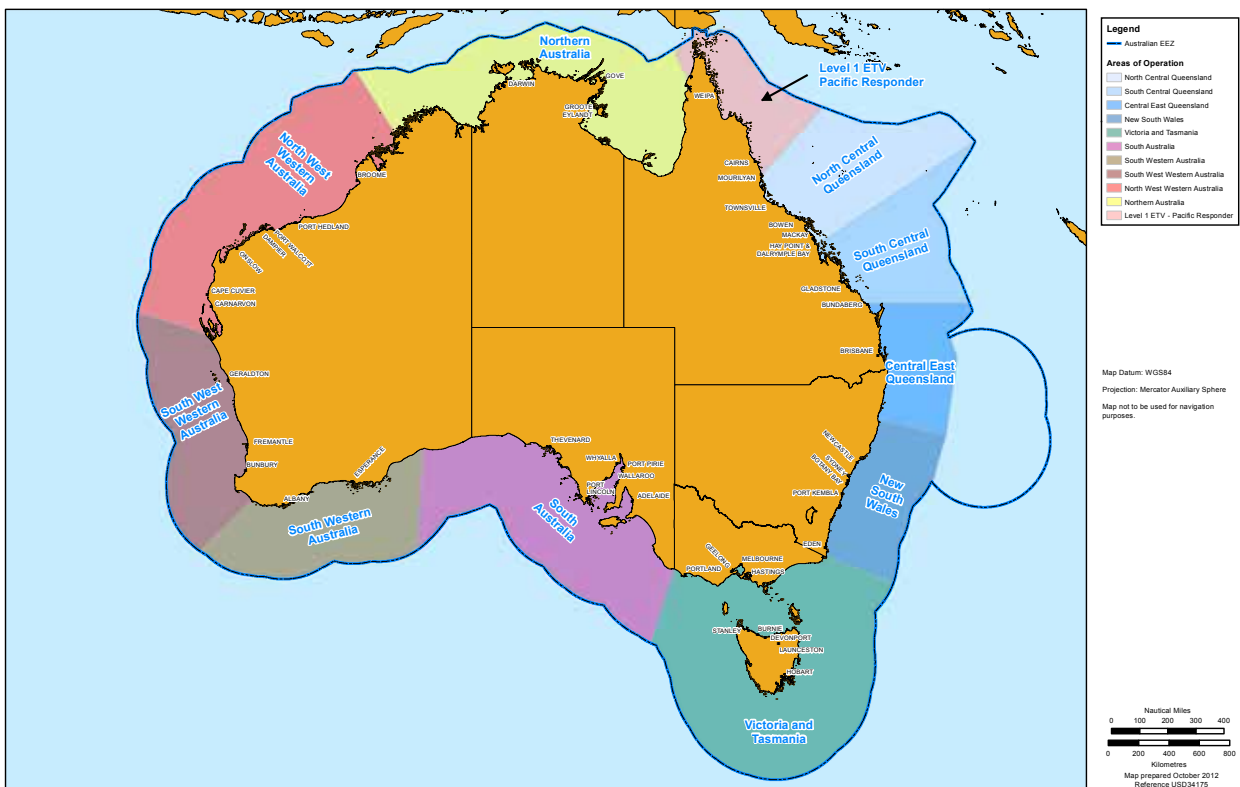
- AMSA to maintain ETV Level 1 capability for the region and continue to monitor the effectiveness of renewed contracts for emergency towage capability including an additional region for the north-east.
- Port authorities to maintain harbour towage capacity (that has emergency towage capability) which can be accessed in an emergency.

Figure 14: Current and proposed regional coverage of the emergency towage vessels (ETVs)

Boundaries of current ETV/ETC Regions



Level 2 emergency towage capability request for tender



11. Recovery of costs of a maritime incident

The costs of maritime incidents in Australian waters are met by those responsible through various domestic and international arrangements.

11.1 Recovery of costs for oil pollution damage

The *International Convention on Civil Liability for Bunker Oil Pollution Damage 2001* provides for owners of ships over 1000 gross tons to be strictly liable for fuel oil spills and requires them to carry compulsory insurance to cover any pollution damage following such spills. The convention is known as the Bunkers Convention and is modelled on the Civil Liability Convention. The main difference is that the Bunkers Convention does not have its own limits of liability. Instead, it requires insurance to be maintained to limits specified in a separate instrument—the *Convention on the Limitation of Liability for Maritime Claims* (LLMC). The limit of liability depends on the size of the vessel (see further discussion, below).

The cost of oil spills from oil tankers are covered by a widely accepted international insurance regime involving two international conventions. The *International Convention on Civil Liability for Oil Pollution Damage 1992* requires owners of tankers that spill oil to be liable regardless of whether they were actually at fault. As a result, claimants can receive compensation without the need for lengthy and costly litigation.

The Civil Liability Convention places an obligation on tanker owners to maintain insurance or other financial security specifically to cover pollution damage, and to carry on board each tanker a certificate attesting to the fact that such cover is in force. The amount of cover required depends on the size of the tanker and can be up to a maximum of approximately \$A170 million, depending on exchange rates.

The other convention that forms part of the compensation regime for oil tankers is the *International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage*, known as the Fund Convention. Supplementary compensation may be available under the Fund Convention where the compensation limits of the Civil Liability Convention are exceeded or where the tanker owner cannot be identified, is uninsured or insolvent.

Payments of compensation under the Fund Convention are financed by contributions levied on private companies or other entities that receive, by sea, an annual quantity of more than 150,000 tonnes of crude and/or heavy fuel oil. All major Australian oil companies contribute to the scheme. Additional compensation available under the Fund Convention is approximately \$A1.2 billion.

In summary, the total compensation available under both the Civil Liability and the Fund Conventions is up to approximately \$A1.4 billion.

11.2 Protection and Indemnity insurance

The majority of commercial vessels carry comprehensive general insurance coverage through Protection and Indemnity (P&I Clubs). P&I Clubs cover a wide range of liabilities including personal injury to crew, passengers and others on board, cargo loss and damage, oil pollution, wreck removal, and damage to wharves and jetties. In some cases, the shipowners involved in incidents have successfully limited their liability for the damages created through the application of the LLMC, which has prevented full recovery of costs.

11.3 Recovery of costs for non-pollution damage

While there is no equivalent specific compensation regime for non-pollution environmental damage arising from, for example, physical damage to a reef following a ship grounding, recovery of such costs can still be pursued through vessel insurers, generally P&I Clubs.

The LLMC has historically been focussed on personal injury and property damage and not environmental impacts on ecological resources. The application of the LLMC to bunker spills and/or ship grounding impacts can severely limit compensation payable to well below the actual damage incurred.

While the Bunkers Convention (currently) explicitly refers to LLMC as the source of liability limits for bunker spills, there is no equivalent compensation regime for the non-pollution environmental damages from ship groundings. Nevertheless, the liability limits of LLMC are often applied to ship groundings, and again this can severely limit compensation payable to well below the actual damages suffered.

Recent advances at IMO have seen a 51 per cent increase of the current LLMC liability limits. The new limits will enter into force internationally on 8 June 2015.

Box 5: Case Study - Clean-up costs and rehabilitation

The limitations under LLMC were borne out by the oil spill from the MV *Pacific Adventurer* off Brisbane in 2009, which incurred a clean-up cost of around AUD\$32 million. However, the ship's liability limit under LLMC, at 18,391 gross tonnage, was only AUD\$17.5 million.

The AUD\$32 million clean-up bill for the *Pacific Adventurer* spill did not include estimates of loss of ecosystem services; monetary value of environmental damage; cost to recover lost cargo or shipping containers; and the costs of environmental rehabilitation and ongoing monitoring. While the shipowner also voluntarily contributed an additional \$7.5 million to the clean-up costs through a civil fund (still less than the total clean-up costs), the total actual damages from that incident are likely to be significantly more than AUD\$32 million.

Similarly, when the MV *Shen Neng 1* (36,575 gross tonnage) grounded off Gladstone in 2010, the liability limit under LLMC was AUD\$22 million. This is significantly less than the cost of remediating the site to its pre-grounding condition, which has been estimated to cost significantly more.

Experience in Australia has shown that when government agencies respond to marine incidents and incur costs, recovery of these costs from the insurers can take years to occur. Insurers will also routinely query most claims and have the final say as to whether these claims will be accepted.

The Australian Government agreed in the 2013-14 Budget that AMSA can use funds accumulated from the Protection of the Sea Levy to establish a \$10 million reserve and secure a line of credit of \$40 million to allow immediate access to funds for pollution response. This is in accordance with the 'polluter or potential polluter pays' principle and the international regime of strict but limited liability for pollution damage".⁶⁹

It is important that immediate access to funds for restitution of non-pollution damage to coral reefs is secured in case of future groundings within the GBR. This would ensure that action could be taken to remove anti-fouling paint residues as soon as possible after an incident so limiting their impact.

Actions:

- AMSA to maintain a pollution response reserve of \$10 million and line of credit of \$40 million to ensure immediate access to funds in the event of a marine pollution incident.
- GBRMPA and AMSA to investigate means of securing funding for restitution of non-pollution damage to coral reefs following a ship incident.

⁶⁹ The National Plan makes the distinction between preparedness as based on 'potential polluter pays' and response & recovery being based on 'polluter pays'.

12. Consultation and engagement

To ensure the success of this and future plans, it is imperative that government agencies, industry and other relevant stakeholders continue to work together to protect the sensitive marine environment of the north-east region from the effects of shipping.

This section outlines the initiatives currently in place to bring stakeholders together and proposes future options to improve the planning and consultation processes for north-east regional shipping.

12.1 North-East Shipping Management Group

The North-East Shipping Management Group (NESMG) is tasked with the development and implementation of measures to continually enhance maritime safety in the sensitive marine environments of Australia's north-east region. The group comprises senior representatives from the following agencies:

- Australian Maritime Safety Authority (AMSA)
- Great Barrier Reef Marine Park Authority (GBRMPA)
- Maritime Safety Queensland (MSQ)
- The Australian Government Department of Infrastructure and Regional Development (Infrastructure)
- The Australian Government Department of the Environment (Environment)
- The Australian Government Department of Industry (Industry)
- The Australian Government Department of Agriculture (Agriculture).

The NESMG is responsible for the development and implementation of this plan and ensure consultation with stakeholders.

12.2 Water Space Management Working Group

The NESMG has established a dedicated working group for water space management issues. With a focus on the safety of shipping, the working group's aim is to facilitate the efficient coordination of diverse maritime activities and uses of water space within the GBR, Torres Strait and the Coral Sea.

The group's participants include representatives from:

- Australian Hydrographic Office
- Maritime Safety Queensland
- Great Barrier Reef Marine Park Authority
- Association of Marine Park Tourism Operators
- Shipping Australia
- Coastal Pilotage Providers
- Queensland Ports
- North Queensland Bulk Ports
- Marine Ecosystem Policy Advisers P/L
- Department of the Environment
- other industry members and industry organisations.

12.3 Ongoing consultative arrangements

It is important that the best available knowledge is implemented in the sensitive environments covered by the plan. All industry stakeholders need to be prepared to contribute their own specific efforts and bear the associated costs in managing the risks in shipping to meet community expectations. To this end, the work of the NESMG will continue and will need to be informed by consultations with the broader community, Indigenous groups, environmental non-government organisations and peak representative industry and shipping associations. By doing so, it will foster an integrated approach for long-term coordinated planning of future port capacity, supply chain and transport corridors.

Actions:

- NESMG to keep under review the outcomes of related planning assessments under development to ensure integrated and coordinated planning around future port capacity, supply chain and transport corridors.
- NESMG to establish a North-East Shipping Management Consultative Group consisting of industry, regulators and environmental groups to provide input to further development of the work programme.
- NESMG to work with industry to initiate a follow up study of shipping growth as a consequence of increased commodity exports from central Queensland ports and keep under review shipping trends to inform adaptive management strategies.
- GBRMPA and AMSA to work with CSIRO social and economic long-term monitoring programme to identify social perceptions of shipping and implement appropriate public education campaigns as needed.

13. Work programme

The work programme lists the actions identified in the plan to address the protective measures that are key to ensuring ship safety; navigation safety; environment protection and preparedness and response to a maritime incident; and stakeholder engagement.

The status of the project is shown as:

- Current commitment(s) - actions that the NESMG member agencies have committed to (at least in principle) and which are underpinned by a series of projects or tasks.
- New protective measure(s) - actions that are in the defining or implementation phase and have started (or are due to start) in the next few years.
- Measures or initiatives that need to be kept under review – actions that are under consideration and which may not be currently resourced.

The duration of the commitment, project or activity is categorised into:

- ongoing
- short term (< 1 year)
- medium term (1-2 years)
- long term (2+ years).

An implementation plan will be developed by the individual lead agencies and the North-East Shipping Management Group (NESMG) to implement and monitor activities identified in the work programme.

As the governance body, progress of the actions will be reported to the NESMG at agreed regular intervals and made public through appropriate fora and liaison mechanisms.

Each agency is to fund and implement their priority actions under the work programme. Industry will be encouraged to meet its obligations under the plan.

Any Australian Government proposals that may result in regulatory burden for industry will be subject to the usual government processes, including public consultation as appropriate, referral to the Office of Best Practice Regulation for assessment and final Australian Government approval.

Work plan of the North-East Shipping Management Plan

Ship safety protective measures

No.	Action	Lead	Duration	Status	Plan reference (section)
Ship safety standards					
1	AMSA to continue to work through the IMO to seek improvement to standards that impact upon ship propulsion reliability and redundancy and emergency towing arrangements.	AMSA	Ongoing	Current commitment	7.1
Electronic Chart Display and Information Systems (ECDIS)					
2	AMSA to encourage users of shipping to ports in the region to employ ships fitted with ECDIS (and appropriately trained navigators) prior to mandatory implementation by 2018. This includes encouraging the uptake of ECDIS through publication of an annual report card by ship vetting companies.	AMSA	Medium term	New protective measure in the implementation phase	7.2
Crew competency and the human element					
3	AMSA to conduct a series of research projects focused on the contribution of the human element to shipping incidents. The research will involve working with industry to improve incident and near miss reporting from ships.	AMSA	Medium term	New protective measure in the implementation phase	7.3
4	AMSA to work through the IMO to introduce a Fatigue Risk Management System (FRMS) approach to the global shipping industry.	AMSA	Short term	New protective measure in the defining phase	7.3
Port State control					
5	AMSA to ensure that only high quality ships, operated by competent crews, are permitted to trade in the region by stringently enforcing standards in compliance with IMO guidelines for port State control.	AMSA	Ongoing	Current commitment	7.4
6	AMSA to progressively increase the number of marine surveyors at ports in the north-east region to ensure it has the capability to conduct an effective programme of ship inspections and related compliance actions to take account of increasing shipping activity.	AMSA	Ongoing	Current commitment	7.4
7	AMSA to continue its research on risk profiling of vessels in Australian waters and vessels calling at Australian ports to better identify ship types that may pose a higher risk to the north-east region.	AMSA	Ongoing	Current commitment	7.4
8	AMSA to develop and publish clear guidance on the criteria it will use to decide whether ships may be directed not to enter Australian ports or waters.	AMSA	Short term	Under consideration	7.4
Technical cooperation					
9	AMSA to continue its technical cooperation on maritime standards and technologies with neighbouring countries and particularly with Papua New Guinea to ensure ships and crews operate to the highest international ship safety standards.	AMSA	Ongoing	Current commitment	7.4
Ship vetting					
10	Industry to actively vet all shipping that trades in the north-east region to ensure that only high quality ships, operated by competent crews are engaged.	Industry bodies	Ongoing	Current commitment	7.5
11	Port authorities to consider becoming 'Green Award' incentive providers.	Industry bodies	Short term	Under consideration	7.5

Navigation safety protective measures

No.	Action	Lead	Duration	Status	Plan reference (section)
Charting of the north-east region					
12	AMSA to work with Australian Hydrographic Service (AHS) to identify areas of the north-east region that will benefit from improved hydrography and oceanographic observations. Input to 'Hydroscheme' (the Australian Hydrographic Services' two year rolling charting and surveying programme) will ensure such areas are formally identified.	AHS	Ongoing	Current commitment	8.1
Navigation risk assessment tools					
13	MSQ, port authorities and AMSA to continue using risk assessment tools to assess risk due to ship traffic growth and port development, particularly in growth areas such as Abbot Point, Hay Point and Gladstone.	MSQ	Ongoing	Current commitment	8.2
Ship routing systems					
14	NESMG to examine the safety benefits of measures that have the effect of encouraging ships to only transit the five main passages of the Great Barrier Reef (rather than all of the minor passages).	NESMG	Short term	Under consideration	8.3
15	If adopted by the IMO, AMSA to work with the Australian Hydrographic Service (AHS) and promulgate the establishment of a two-way route from the western end of the Torres Strait to the southern boundary of the GBR Marine Park.	AHS	Short term	New protective measure in the implementation phase	8.4
16	AMSA to monitor increases in shipping movements associated with developments in PNG, particularly Western Provinces, and implications from the changes to trading routes to vessel traffic transiting Jomard Passage.	AMSA	Medium term	Under consideration	8.4
Aids to navigation					
17	Establish a memorandum of understanding between AMSA and GBRMPA to ensure that repairs to aids to navigation within the Great Barrier Reef Marine Park can be undertaken with minimal delays and increased awareness of potential risks.	AMSA	Short term	New protective measure in the implementation phase	8.4
Automatic Identification Systems (AIS)					
18	AMSA to keep under review the requirement to fit Class B AIS on all non-SOLAS commercial vessels.	AMSA	Short term	Under consideration	8.5

No.	Action	Lead	Duration	Status	Plan reference (section)
REEFVTS					
19	AMSA to investigate how ship tracking technology can be better used for vessel traffic services in the region and early alerting of developing incidents in the Coral Sea.	AMSA	Medium term	New protective measure in defining phase	8.6
20	AMSA and MSQ to continue to monitor technical advances in VTS systems, sensors and communications to ensure REEFVTS continues to provide a high quality service that meets the needs of mariners.	AMSA	Ongoing	Current commitment	8.6
21	AMSA and MSQ to consider the need to separate REEFVTS operations into two separate VTS centres (north and south).	AMSA	Medium term	Under consideration	8.6
22	As traffic levels increase, AMSA and MSQ to consider the need for REEFVTS to increase its area of coverage to monitor ship movements in the Coral Sea.	AMSA	Medium term	Under consideration	8.6
Under keel clearance management (UKCM)					
23	AMSA, in conjunction with shipping interests and pilotage providers, to review the effectiveness of the UKCM system and make appropriate improvements, including reviewing the current deep draught regime and consider its extension to other areas.	AMSA	Short term	Current commitment	8.8
24	AMSA to introduce a system of navigational chart overlays that will define how UKCM information is displayed.	AMSA	Medium term	Under consideration	8.8
Pilotage					
25	NESMG and pilotage providers to progress implementation of recommendations of the ATSB report into Queensland coastal pilotage.	NESMG	Ongoing	Current commitment	8.9
26	Taking into account predictions of traffic density, existing aids to navigation and risk, AMSA and MSQ to investigate the benefits of mandatory pilotage for the areas of the upper middle Inner Route of the GBR by 2020.	AMSA	Long term	New protective measure in the defining phase	8.9
27	AMSA to work with pilotage providers to consider the implications of voluntary pilotage in the southern area of the GBR.	AMSA	Short term	Under consideration	8.9

Environment protection measures

No.	Action	Lead	Duration	Status	Plan reference (section)
Anchorage					
28	The North-East Water Space Management Working Group (NESM-WG) to contribute to the development of a ship anchorage management study and implement proposed management strategies associated with offshore ship anchorages in the GBR World Heritage Area. The study to consider aesthetics in its review of anchorage assessments.	NESM-WG	Short term	New protective measure	9.1
29	AMSA and MSQ to provide vessel traffic organisation services where warranted by future traffic density and risk.	AMSA	Medium term	Under consideration	9.1
Pollution and discharges					
30	GBRMPA and AMSA to explore options at the IMO for the development of grey water discharge standards.	GBRMPA	Medium term	Under consideration	9.2
31	AMSA to investigate options to encourage ship charterers in the region to engage ships constructed with bunker fuel tanks in protected locations (built after August 2010) and the means to mandate this requirement for ships calling at GBR ports.	AMSA	Medium term	Under consideration	9.2
32	AMSA to continue to work with government agencies and Queensland port authorities to encourage the improvement and use of waste facilities in line with IMO guidelines and information.	AMSA	Ongoing	Current commitment	9.2
33	AMSA to implement regular satellite oil spill detection in the region to act as a deterrent for would-be polluters.	AMSA	Short term	New protective measure in the implementation phase	9.2
Particularly Sensitive Sea Area					
34	NESMG to consider the need for further Associated Protective Measures in the Great Barrier Reef and Torres Strait PSSA.	NESMG	Short term	Under consideration	9.3
35	If approved by the Australian Government, AMSA to progress an IMO submission to extend the eastern boundary of the existing Great Barrier Reef/Torres Strait PSSA to include an area of the south-west Coral Sea.	AMSA	Short term	New protective measure in the implementation phase	9.3
Invasive marine pests					
36	The Department of Agriculture to conduct a review and strategic analysis of invasive marine pests	Agriculture	Short term	Under consideration	9.4
Ship collisions with marine fauna					
37	The Department of Environment to finalise the National Ship Strike Strategy with relevant government and non-government stakeholders.	Environment	Medium term	New protective measure in the implementation phase	9.5
38	The Department of Environment to work with industry and relevant agencies to improve ship-cetacean collision reporting procedures and establish a national portal to hold this data.	Environment	Medium term	Under consideration	9.5

No.	Action	Lead	Duration	Status	Plan reference (section)
Ship collisions with marine fauna (continued)					
39	The Department of the Environment and GBRMPA to keep under review modelling and assessments of whale and ship collision risk in the north-east region. In conjunction with IMO guidelines, the results would be used to design and implement appropriate safeguards such as speed limits and high alert areas.	Environment	Short term	New protective measure in the defining phase	9.5
Interference with species behaviour					
40	GBRMPA and AMSA to keep under review opportunities to conduct research into noise monitoring tools and methods and implications for ship noise mitigation strategies.	GBRMPA	Medium term	Under consideration	9.6
41	AMSA to investigate if the shape and energy of waves generated by passing ships influence coastal erosion in the Torres Strait.	AMSA	Short term	Under consideration	9.6
42	GBRMPA, Environment and AMSA to keep under review research into the potential environmental and socio-economic impacts of wake and sediment plumes from ships transiting the GBR.	GBRMPA	Short term	Under consideration	9.6
43	GBRMPA to instigate research into ship-sourced copper leaching from antifouling paints at GBR port anchorage sites to determine if this is an identifiable risk to the values of the GBR.	GBRMPA	Medium term	Under consideration	9.6
44	GBRMPA to instigate research into the restoration of habitats affected by shipping incidents (e.g. coral and seagrass restoration, eradication of marine pests, halt impacts from biocides).	GBRMPA	Long term	Under consideration	9.6
45	GBRMPA and AMSA to explore mechanisms to fund high priority restoration and rehabilitation of reef habitats (and the removal of antifoulant paints) immediately following a ship grounding.	GBRMPA	Medium term	Under consideration	9.6
Safeguarding Indigenous and heritage values					
46	NESMG to enhance their engagement with Indigenous communities in the Torres Strait on search and rescue, maritime safety and pollution response arrangements including through the GBRMPA-led Indigenous Partnership Group and Indigenous Reef Advisory Committees.	NESMG	Ongoing	New protective measure in the defining phase	9.8
Cumulative impact policy					
47	GBRMPA and the Department of Environment to undertake further research and investigate appropriate measures to manage cumulative impacts from shipping in the GBR.	Environment	Medium term	New protective measure in the defining phase	9.9
48	GBRMPA and the NESMG to actively contribute to the development of the Department of Environment's cumulative impacts policy and evaluate any implications for ship management measures in the GBR.	GBRMPA	Short term	Under consideration	9.9

Preparedness and response protective measures

No.	Action	Lead	Duration	Status	Plan reference (section)
National Plan					
49	AMSA, MSQ and GBRMPA to complete the programme of oil spill response equipment and refurbishment, including implementing arrangements to monitor the operational readiness of control agencies, including audit and reporting arrangements.	AMSA	Ongoing	Current commitment	10.1
Queensland Coastal Contingency Action Plan					
50	AMSA, Torres Strait Regional Authority, PNG National Maritime Safety Authority and MSQ to review the adequacy of the marine incident management and oil spill response arrangements in the Torres Strait and regularly exercise those arrangements.	AMSA	Short term	New protective measure in the defining phase	10.1
Managing hazardous and noxious substances					
51	GBRMPA and MSQ to identify response strategies for cargoes that pose a specific risk to the environmental values of the region.	GBRMPA	Ongoing	Current commitment	10.2
52	AMSA to assess the availability of HNS cargo information currently available from ships in the region in the event of an incident. If necessary, AMSA to seek to amend the requirement of the mandatory ship reporting system REEFREP to require all ships to which REEFREP applies to report further details of the carriage of HNS.	AMSA	Medium term	Under consideration	10.2
Training and resourcing					
53	AMSA to continue to implement a fully accredited competency-based national training programme with broad stakeholder representation that targets response to oil spills in sensitive areas as well as response and understanding of chemical spills and the need to take into account environmental values during response operations.	AMSA	Ongoing	Current commitment	10.2
54	MSQ, port authorities and AMSA are to ensure they have an adequate number of appropriately trained response personnel that are available to respond to a marine incident.	MSQ	Ongoing	Current commitment	10.2
Emergency Towage Vessels (ETV)					
55	AMSA to maintain ETV Level 1 capability for the region and continue to monitor the effectiveness of renewed contracts for emergency towage capability including an additional region for the north-east.	AMSA	Ongoing	Current commitment	10.3
56	Port authorities to maintain harbour towage capacity that has emergency towage capability which can be accessed in an emergency.	Ports	Ongoing	Current commitment	10.3
Recovery of costs from a maritime incident					
57	AMSA to maintain a pollution response reserve of \$10 million and line of credit of \$40 million to ensure immediate access to funds in the event of a marine pollution incident.	AMSA	Ongoing	Current commitment	11.3
58	GBRMPA and AMSA to investigate means of securing funding for restitution of non-pollution damage to coral reefs following a ship incident.	GBRMPA	Medium term	Under consideration	11.3

Stakeholder engagement

No.	Action	Lead	Duration	Status	Plan reference (section)
Strategic planning					
59	NESMG to keep under review the outcomes of related planning assessments under development to ensure integrated and coordinated planning around future port capacity, supply chain and transport corridors.	NESMG	Ongoing	New protective measure in the implementation phase	12.3
Industry and interest group consultation					
60	NESMG to establish a North-East Shipping Management Consultative Group consisting of industry, regulators and environmental groups to provide input to further develop the work plan.	NESMG	Medium term	New protective measure in the defining phase	12.3
61	NESMG to work with industry to initiate a follow up study of shipping growth as a consequence of increased commodity exports from central Queensland ports and keep under review shipping trends to inform adaptive management strategies.	NESMG	Long term	New protective measure in the implementation phase	12.3
62	The Water Space Management Working Group (WSM-WG) will continue as a consultative body for users of the waters in the South West Coral Sea, Great Barrier Reef and Torres Strait.	WSM-WG	Ongoing	Current commitment	12.3
Community consultation					
63	GBRMPA and AMSA to work with CSIRO social and economic long-term monitoring programme to identify social perceptions of shipping and implement appropriate public education campaigns as needed.	GBRMPA	Short term	Under consideration	12.3

Annex 1: Key geographical, ecological and cultural features of the region

14.1 Great Barrier Reef

The Great Barrier Reef World Heritage Area is one of the world's largest World Heritage properties. It comprises some 1050 islands and 2900 reefs extending 2000 kilometres along the north-east coast of Queensland.

It is one of the most complex and diverse ecosystems in the world, providing habitat for many unique forms of marine life. There are an estimated 1625 species of fish and more than 300 species of hard, reef-building corals. The diversity of life forms, in particular the endemic species, makes it an area of enormous ecological importance.

More than 30 species of marine mammals are found in the GBR including dolphins, whales and dugongs. The northern GBR region is the most important dugong location within the GBR Marine Park and one of the most important locations around Australia. The GBR is also home to six species of marine turtle that are all listed as threatened. Numerous migratory bird species also use the GBR throughout their lifecycle, all of which are protected under the EPBC Act.

14.2 Torres Strait

The Torres Strait links the Coral Sea in the east to the Arafura Sea in the west and comprises more than 100 islands in the region. Permanent settlements exist on 17 islands which are part of the state of Queensland.

Like the GBR, the Torres Strait region is one of high ecological importance. It provides habitat for an array of listed marine species. This region supports some of the largest populations of dugongs and turtles known to exist in the world. Its marine resources provide local island communities with essential food. The sea area is characterised by shallow, navigationally complex waters. The Torres Strait was declared a PSSA by the IMO in 2005.

There are two climate regimes in the straits—the 'wet' season, with north-west monsoonal rain and winds (from November to April), and the 'dry' season with south-east trade winds from May to October. Tidal heights and currents are difficult to predict, with currents flowing as a single layer superimposed by residual currents which reverse direction. Sea depths range from 6 to 12 metres with some passages being only 2 to 3 kilometres wide.⁷⁰

⁷⁰ Great Barrier Reef Shipping Management Group 2001, *Great Barrier Reef and Torres Strait Shipping Impact Study*, p. 11.

14.3 Coral Sea

The Coral Sea extends from the north-east coast of Queensland in the west and is bound by New Caledonia and the Solomon Islands in the east and Papua New Guinea in the north.

This plan refers to parts of the Coral Sea (within Australia's EEZ) which cover approximately 990,000 km² of Australian waters east of the GBR Marine Park.

It provides an important habitat for humpback whales, sharks, marine turtles and seabirds. The reefs, atolls and islands form an important link between the genetic diversity of the South Pacific and the GBR.

There are a number of historic shipwrecks and World War II naval battle sites that contribute to the cultural heritage of the region.

The Coral Sea Commonwealth Marine Reserve was proclaimed in November 2012. It provides additional protection for many species listed as endangered or vulnerable under Commonwealth legislation or international agreements, including the endangered loggerhead and leatherback turtles and the critically endangered Herald petrel. The reserve also supports the world's only confirmed spawning aggregation of black marlin.

Shipping passage is allowed in all zones within the Coral Sea Commonwealth Marine Reserve, however some restrictions to ballast water exchange may apply on a case-by-case basis in sensitive areas.

14.4 Indigenous and cultural values

The region covered by the plan is important in the historic and contemporary culture of the groups of the coastal areas of north-east Australia. The contemporary use of, and association with, the marine park plays an important role in the maintenance of Aboriginal and Torres Strait Islander culture and there is a strong spiritual connection with the ocean and its inhabitants.

Many Aboriginal and Torres Strait Island people undertake traditional use of marine resource activities to provide traditional food, practice their living maritime culture, and to educate younger generations about traditional and cultural rules and protocols. In the GBR these activities are managed under both Federal and Queensland legislation and policies including Traditional Use of Marine Resource Agreements (TUMRAs) and Indigenous Land Use Agreements (ILUAs). These currently cover some 30 per cent of the GBR inshore area, and support Traditional Owners to maintain cultural connections with their sea country.

Annex 2: List of key legislative instruments

Commonwealth Instruments

Navigation Act 2012

- The primary legislative means for the Australian Government to regulate international ship and seafarer safety, shipping aspects of protecting the marine environment and the actions of seafarers in Australian waters. It also gives effect to the relevant international conventions to which Australia is a signatory.

Great Barrier Reef Marine Park Act 1975

- Applies to all persons (including foreigners) and vessels (including foreign flagged ships) whether or not they are within the Australian coastal sea.
- Provides for a statutory planning regime, including the *Great Barrier Reef Marine Park Zoning Plan 2004* which aims to regulate and prohibit use of, and entry into, particular regions of the marine park.
- Implements a major permit system to control activities identified in the Plans of Management, such as tourism, moorings, and sea dumping. This allows for extensive regulation of shipping and boating promoting safety and protection of the environment.

Environment Protection and Biodiversity Conservation Act 1999

- The Director of National Parks, a corporation established under the Act, has the function of managing Commonwealth reserves, including the recently proclaimed Coral Sea Commonwealth Marine Reserve.
- Of the eight matters of national environmental significance to which the EPBC Act applies, six are directly relevant to the north-east region:
 - o threatened species
 - o migratory species
 - o Great Barrier Reef Marine Park
 - o World Heritage Areas
 - o National Heritage Properties
 - o Commonwealth Marine Areas.

Quarantine Act 1908

- The Act provides the legislative basis for human, plant and animal quarantine activities in Australia. It provides a national approach to the protection of Australia's international borders from incursions by exotic pests and diseases.

Queensland instruments

- The two primary pieces of legislation administered and enforced by Maritime Safety Queensland are:
 - o the *Transport Operations (Marine Safety) Act 1994* (TOMSA)
 - o the *Transport Operations (Marine Pollution) Act 1995* (TOMPA).
- Maritime Safety Queensland is also responsible for delivery a range of services on behalf of the national regulator (the Australian Maritime Safety Authority) under the *Marine Safety (Domestic Commercial Vessel) National Law Act 2012*.

Annex 3: DNV Risk Assessment

16.1 Description of cases

Case No.	Case description
1	The current situation. Traffic data for 2011-12. Risk controls currently applied. Also called the Base Case.
0	Hypothetical case formed by assuming the traffic data for 2011-12 and removing the main risk controls (no VTS, no pilotage, no emergency towing vessel, no enhanced aids to navigation (AtoN)).
2	Traffic estimated for the year 2020. Risk controls currently applied (2011-12).
3	Traffic estimated for the year 2032. Risk controls currently applied (2011-12).
4	Traffic data for 2011-12. Risk controls as applied today (2012) plus ECDIS carriage and use (using Australian Hydrographic Service authorised Electronic Navigational Chart) by all ships throughout the study area.
5	Traffic data for 2011-12. Risk controls as applied today (2012) plus pilotage extended southwards to cover the coastal region inside the GBR (and the Inner Route). No degradation of pilot performance due to fatigue (denoted as 'non-degraded pilotage').
6	Traffic estimated for the year 2020. Risk controls as applied today (2012) plus pilotage extended southwards to cover the entire coastal region. No degradation of pilot performance due to fatigue (denoted as 'non-degraded pilotage').
7	Traffic estimated for the year 2032. Risk controls as applied today (2012) plus pilotage extended southwards to cover the entire coastal region. No degradation of pilot performance due to fatigue (denoted as 'non-degraded pilotage').
8	Traffic data for 2011-12. Risk controls as applied today (2012) plus VTS extended to cover the entire Exclusive Economic Zone (EEZ).
9	Traffic data for 2011-12. Risk controls as applied today (2012) plus two pilots assigned to each ship on the Northern Inner Route (thus mostly removing the pilot fatigue factor due to the long Inner Route transit (see Appendix 3)).
10	Traffic estimated for the year 2020. Risk controls as applied today (2012) plus an additional emergency towing vessel located at Townsville.
11	Traffic estimated for the year 2020. Risk controls as applied today (2012) plus a traffic organisation service (TOS) operating in Torres Straits and Hydrographers Passage.
12	Traffic estimated for the year 2020. Risk controls as applied today (2012) plus double hull protection of bunker oil fuel tanks for all ships.

16.2 Summary of risk model results for cases 0 to 12

Case	Case description	Total accident frequency (/year)				Return period (years)	Spilling frequency (/ year)			Return period (years)	Oil spill risk (tonnes/year)		
		Total	Collision	Powered grounding	Drift grounding		Total	Cargo	Bunker		Total	Cargo	Bunker
0	Base Case without today's risk controls	2.84	0.0922	1.1340	1.4340	0.4	0.1793	0.0375	0.1418	5.6	658	422	236
1	Base Case	1.76	0.0570	0.6053	0.9413	0.6	0.1115	0.0236	0.0879	9.0	418	268	150
2	Today's risk controls + traffic in 2020	3.33	0.1968	1.0830	1.7340	0.3	0.2118	0.0454	0.1664	4.7	803	516	287
3	Today's risk controls + traffic in 2032	4.52	0.3766	1.3960	2.3010	0.2	0.2884	0.0625	0.2259	3.5	1100	707	393
4	Base Case + ECDIS	1.62	0.0570	0.4676	0.9413	0.6	0.1028	0.0218	0.0810	9.7	386	247	139
5	Base Case + extended and non-degraded pilotage	1.54	0.0352	0.4035	0.9413	0.7	0.0973	0.0206	0.0767	10.3	369	236	133
6	2020 Case + extended and non-degraded pilotage	2.88	0.1196	0.7135	1.7340	0.3	0.1834	0.0393	0.1441	5.5	705	453	252
7	2032 Case + extended and non-degraded pilotage	3.88	0.2248	0.9104	2.3010	0.3	0.2477	0.0536	0.1941	4.0	962	618	344
8	Base Case + extended VTS	1.76	0.0567	0.6053	0.9413	0.6	0.1115	0.0236	0.0879	9.0	418	268	150
9	Base Case + non-degraded pilotage on Inner Route	1.63	0.0522	0.4861	0.9413	0.6	0.1036	0.0219	0.0817	9.7	389	247	142
10	2020 Case + ETV at Townsville	2.66	0.1968	1.0830	1.0670	0.4	0.1701	0.0370	0.1331	5.9	676	446	230
11	2020 Case + TOS in HP and TS	3.29	0.1602	1.0830	1.7340	0.3	0.2089	0.0443	0.1646	4.8	786	502	284
12	2020 Case + 100% bunker tank protection	3.33	0.1968	1.0830	1.7340	0.3	0.1494	0.0454	0.1040	6.7	773	516	257

Annex 4: Chronology of key protection measures in the north-east region

The table below provides a summary of the major responses to improve ship safety in the north-east region since 1990.

Year	Incidents, decisions or responses
1990	The Great Barrier Reef Marine Park designated as one of the world's first Particularly Sensitive Sea Areas (PSSA).
1991	Introduction of a compulsory pilotage regime in the northern part of the GBR Inner Route (from Cape York to Cairns) as an associated protective measure under the PSSA declaration.
1996	Australia submits a proposal for a mandatory ship reporting system in the region to IMO.
1997	Australia's mandatory ship reporting system for the Great Barrier Reef and Torres Strait (REEFREP) comes into effect. REEFREP is operated jointly by AMSA and MSQ from the REEFCENTRE in Townsville, Queensland.
2002	Enhancement of REEFREP and its upgrading to a coastal Vessel Traffic Service.
2003	Release of the Great Barrier Reef and Torres Strait Shipping Management Plan 2003-05.
2004	The IMO noted that REEFREP had enhanced the services provided by the Great Barrier Reef and Torres Strait coastal Vessel Traffic Service (REEFVTS).
2004	Designated shipping areas and general use zones introduced under the <i>Great Barrier Reef Marine Park Zoning Plan 2003</i> .
2005	Declaration by the IMO of Torres Strait as a PSSA.
2005	Release of the Coastal Pilotage Regulation Review (McCoy Review).
2006	Under the Torres Strait PSSA, the IMO approved a number of protective measures including an extension of the system of pilotage to the Torres Strait to that applied in the Great Barrier Reef since 1991.
2006	Implementation of the National Maritime Emergency Response Arrangements, including a dedicated Emergency Towing Vessel <i>Pacific Responder</i> .
2008	Mandatory requirement under SOLAS to carry an Automatic Identification System on board vessels.
2008	Review of the delivery of coastal pilotage services in Great Barrier Reef and Torres Strait.
2010	Improving Safe Navigation in the Great Barrier Reef – review.
2011	Extension from 1 July 2011 of the REEFVTS area to the southern boundary of the GBR Marine Park.

Source: GBRMPA, AMSA, ATSB

Annex 5: Previous shipping reviews in the north-east region

Review	Purpose of review	Outcomes
<p>2001</p> <p>Review of Great Barrier Reef Ship Safety & Pollution Prevention Measures</p>	<p>Develop strategies to address:</p> <ul style="list-style-type: none"> • extension of the compulsory pilotage area in the GBR • introduction of technological developments to track and monitor shipping operations • enhancement of ship routing, traffic management and emergency response arrangements • constraining certain ship types from operating in or near the GBR • improving legislative powers of intervention, enforcement and penalties. 	<p>GBR & Torres Strait Shipping Impact Study – identified the economic value and impacts of shipping in the region and provided input into the development of the Shipping Management Plan.</p> <p>GBR & Torres Strait Shipping Management Plan – improved the environmental protection of the GBR and Torres Strait region by developing practicable and efficient systems to promote the safe and environmentally responsible operation of vessels and reduce the risk of a shipping incident.</p> <p>Outcomes of the Shipping Management Plan 2003-2005 were:</p> <ul style="list-style-type: none"> • strategic planning for continued shipping services throughout the region and minimised adverse impacts on the Great Barrier Reef and Torres Strait from shipping activities • minimisation of the risk of a shipping incident leading to loss of life or pollution of or damage to the environment • reduction in the amount of operational discharges from shipping entering the Great Barrier Reef or Torres Strait • efficient and effective response to a shipping incident and/or a major pollution incident • minimising the risk of introducing exotic organisms. <p>REEFVTS – submission of amendments to introduce a Coastal VTS in GBR & Torres Strait.</p>

Review	Purpose of review	Outcomes
<p>2005</p> <p>Coastal Pilotage Regulation Review (McCoy Review)</p>	<p>Independent review of coastal pilotage regulations in the GBR and Torres Strait to assess:</p> <ul style="list-style-type: none"> • the effectiveness of initiatives to strengthen safety regulation • the extent to which coastal pilots and pilot providers effectively use printed and electronic information provided by AMSA • whether commercial pressures are impacting on compliance with safety regulation or the ability of the industry to recruit suitably qualified persons into the Australian coastal pilotage industry. 	<p>The report found that the robust and sound safety regulatory systems mean that the effects of competition are not reducing safety outcomes.</p>
<p>2008</p> <p>Review of the delivery of Coastal Pilotage Services in Great Barrier Reef & Torres Strait</p>	<ul style="list-style-type: none"> • Identify, evaluate and advise on options for delivering coastal pilotage services in the GBR and Torres Strait • Identify and assess the risks for each option and any associated regulatory changes that may be required 	<ul style="list-style-type: none"> • Revision of Marine Order Part 54 and strengthening procedural regulation, primarily through improving the system of safety reporting by pilotage providers, and underpinned by a rigorous auditing regime • Implementation of an under keel clearance management (UKCM) system
<p>2010</p> <p>Improving Safe Navigation in the Great Barrier Reef</p>	<ul style="list-style-type: none"> • Extend the coverage of REEFVTS to the southern boundary of the GBR. • Strengthen regulatory arrangements • Enhancing navigational aids in the GBR • Developing a range of whole of government management options 	<p>Summary of recent actions and planned activities for the projected increase in vessel traffic in the Great Barrier Reef</p>

Annex 6: Attributes of Outstanding Universal Value

Examples of the key attributes that contribute to the Outstanding Universal Value of the Great Barrier Reef World Heritage Area are identified in the Statement of Outstanding Universal Value and are outlined below. It should be noted that attributes may not be expressed equally over the whole Great Barrier Reef World Heritage Area. It is also important to note that attributes representing Outstanding Universal Value can change over time as new information comes to light.

DSEWPAC Property ID 154 STATEMENT OF OUTSTANDING UNIVERSAL VALUE GREAT BARRIER REEF

Brief synthesis

As the world's most extensive coral reef ecosystem, the Great Barrier Reef is a globally outstanding and significant entity. Practically the entire ecosystem was inscribed as World Heritage in 1981, covering an area of 348,000 square kilometres and extending across a contiguous latitudinal range of 14° (10°S to 24°S). The Great Barrier Reef (hereafter referred to as GBR) includes extensive cross-shelf diversity, stretching from the low water mark along the mainland coast up to 250 kilometres offshore. This wide depth range includes vast shallow inshore areas, mid-shelf and outer reefs, and beyond the continental shelf to oceanic waters over 2,000 metres deep.

Within the GBR there are some 2,500 individual reefs of varying sizes and shapes, and over 900 islands, ranging from small sandy cays and larger vegetated cays, to large rugged continental islands rising, in one instance, over 1,100 metres above sea level. Collectively these landscapes and seascapes provide some of the most spectacular maritime scenery in the world.

The latitudinal and cross-shelf diversity, combined with diversity through the depths of the water column, encompasses a globally unique array of ecological communities, habitats and species. This diversity of species and habitats, and their interconnectivity, make the GBR one of the richest and most complex natural ecosystems on earth. There are over 1,500 species of fish, about 400 species of coral, 4,000 species of mollusk, and some 240 species of birds, plus a great diversity of sponges, anemones, marine worms, crustaceans, and other species. No other World Heritage property contains such biodiversity. This diversity, especially the endemic species, means the GBR is of enormous scientific and intrinsic importance, and it also contains a significant number of threatened species. At time of inscription, the IUCN evaluation stated "... if only one coral reef site in the world were to be chosen for the World Heritage List, the Great Barrier Reef is the site to be chosen".

Criterion (vii): The GBR is of superlative natural beauty above and below the water, and provides some of the most spectacular scenery on earth. It is one of a few living structures visible from space, appearing as a complex string of reefal structures along Australia's northeast coast.

From the air, the vast mosaic patterns of reefs, islands and coral cays produce an unparalleled aerial panorama of seascapes comprising diverse shapes and sizes. The Whitsunday Islands provide a magnificent vista of green vegetated islands and spectacular sandy beaches spread over azure waters. This contrasts with the vast mangrove forests in Hinchinbrook Channel, and the rugged vegetated mountains and lush rainforest gullies that are periodically cloud-covered on Hinchinbrook Island.

On many of the cays there are spectacular and globally important breeding colonies of seabirds and marine turtles, and Raine Island is the world's largest green turtle breeding area. On some continental islands, large aggregations of over-wintering butterflies periodically occur.

Beneath the ocean surface, there is an abundance and diversity of shapes, sizes and colours; for example, spectacular coral assemblages of hard and soft corals, and thousands of species of reef fish provide a myriad of brilliant colours, shapes and sizes. The internationally renowned Cod Hole near Lizard Island is one of many significant tourist attractions. Other superlative natural phenomena include the annual coral spawning, migrating whales, nesting turtles, and significant spawning aggregations of many fish species.

Criterion (viii): The GBR, extending 2,000 kilometres along Queensland's coast, is a globally outstanding example of an ecosystem that has evolved over millennia. The area has been exposed and flooded by at least four glacial and interglacial cycles, and over the past 15,000 years reefs have grown on the continental shelf.

During glacial periods, sea levels dropped, exposing the reefs as flat-topped hills of eroded limestone. Large rivers meandered between these hills and the coastline extended further east. During interglacial periods, rising sea levels caused the formation of continental islands, coral cays and new phases of coral growth. This environmental history can be seen in cores of old massive corals.

Today the GBR forms the world's largest coral reef ecosystem, ranging from inshore fringing reefs to mid-shelf reefs, and exposed outer reefs, including examples of all stages of reef development. The processes of geological and geomorphological evolution are well represented, linking continental islands, coral cays and reefs. The varied seascapes and landscapes that occur today have been moulded by changing climates and sea levels, and the erosive power of wind and water, over long time periods.

One-third of the GBR lies beyond the seaward edge of the shallower reefs; this area comprises continental slope and deep oceanic waters and abyssal plains.

Criterion (ix): The globally significant diversity of reef and island morphologies reflects ongoing geomorphic, oceanographic and environmental processes. The complex cross-shelf, longshore and vertical connectivity is influenced by dynamic oceanic currents and ongoing ecological processes such as upwellings, larval dispersal and migration.

Ongoing erosion and accretion of coral reefs, sand banks and coral cays combine with similar processes along the coast and around continental islands. Extensive beds of Halimeda algae represent active calcification and accretion over thousands of years.

Biologically the unique diversity of the GBR reflects the maturity of an ecosystem that has evolved over millennia; evidence exists for the evolution of hard corals and other fauna. Globally significant marine faunal groups include over 4,000 species of molluscs, over 1,500 species of fish, plus a great diversity of sponges, anemones, marine worms, crustaceans, and many others. The establishment of vegetation on the cays and continental islands exemplifies the important role of birds, such as the Pied Imperial Pigeon, in processes such as seed dispersal and plant colonisation.

Human interaction with the natural environment is illustrated by strong ongoing links between Aboriginal and Torres Strait Islanders and their sea-country, and includes numerous shell deposits (middens) and fish traps, plus the application of story places and marine totems.

Criterion (x): The enormous size and diversity of the GBR means it is one of the richest and most complex natural ecosystems on earth, and one of the most significant for biodiversity conservation. The amazing diversity supports tens of thousands of marine and terrestrial species, many of which are of global conservation significance.

As the world's most complex expanse of coral reefs, the reefs contain some 400 species of corals in 60 genera. There are also large ecologically important inter-reefal areas. The shallower marine areas support half the world's diversity of mangroves and many seagrass species. The waters also provide major feeding grounds for one of the world's largest populations of the threatened dugong. At least 30 species of whales and dolphins occur here, and it is a significant area for humpback whale calving.

Six of the world's seven species of marine turtle occur in the GBR. As well as the world's largest green turtle breeding site at Raine Island, the GBR also includes many regionally important marine turtle rookeries.

Some 242 species of birds have been recorded in the GBR. Twenty-two seabird species breed on cays and some continental islands, and some of these breeding sites are globally significant; other seabird species also utilize the area. The continental islands support thousands of plant species, while the coral cays also have their own distinct flora and fauna.

Integrity

The ecological integrity of the GBR is enhanced by the unparalleled size and current good state of conservation across the property. At the time of inscription it was felt that to include virtually the entire Great Barrier Reef within the property was the only way to ensure the integrity of the coral reef ecosystems in all their diversity.

A number of natural pressures occur, including cyclones, crown-of-thorns starfish outbreaks, and sudden large influxes of freshwater from extreme weather events. As well there is a range of human uses such as tourism, shipping and coastal developments including ports. There are also some disturbances facing the GBR that are legacies of past actions prior to the inscription of the property on the World Heritage list.

At the scale of the GBR ecosystem, most habitats or species groups have the capacity to recover from disturbance or withstand ongoing pressures. 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.

Some of the key ecological, physical and chemical processes that are essential for the long-term conservation of the marine and island ecosystems and their associated biodiversity occur outside the boundaries of the property and thus effective conservation programmes are essential across the adjoining catchments, marine and coastal zones.

Protection and management requirements

The GBR covers approximately 348,000 square kilometres. Most of the property lies within the GBR Marine Park: at 344,400 square kilometres, this Federal Marine Park comprises approximately 99 per cent of the property. The GBR Marine Park's legal jurisdiction ends at low water mark along the mainland (with the exception of port areas) and around islands (with the exception of 70 Commonwealth managed islands which are part of the Marine Park). In addition the GBR also includes over 900 islands within the jurisdiction of Queensland, about half of which are declared as 'national parks', and the internal waters of Queensland that occur within the World Heritage boundary (including a number of long-established port areas).

The World Heritage property is and has always been managed as a multiple-use area. Uses include a range of commercial and recreational activities. The management of such a large and iconic world heritage property is made more complex due to the overlapping State and Federal jurisdictions. The Great Barrier Reef Marine Park Authority, an independent Australian Government agency, is responsible for protection and management of the GBR Marine Park. *The Great Barrier Reef Marine Park Act 1975* was amended in 2007 and 2008, and now provides for "the long term protection and conservation of the Great Barrier Reef Region" with specific mention of meeting "... Australia's responsibilities under the World Heritage Convention."

Queensland is responsible for management of the Great Barrier Reef Coast Marine Park, established under the *Marine Parks Act 2004 (Qld)*. This is contiguous with the GBR Marine Park and covers the area between low and high water marks and many of the waters within the jurisdictional limits of Queensland. Queensland is also responsible for management of most of the islands.

The overlapping jurisdictional arrangements mean that the importance of complementary legislation and complementary management of islands and the surrounding waters is well recognised by both governments. Strong cooperative partnerships and formal agreements exist between the Australian Government and the Queensland Government. In addition, strong relationships have been built between governments and commercial and recreational industries, research institutions and universities. Collectively this provides a comprehensive management influence over a much wider context than just the marine areas and islands.

Development and land use activities in coastal and water catchments adjacent to the property also have a fundamental and critical influence on the values within the property. The Queensland Government is responsible for natural resource management and land use planning for the islands, coast and hinterland adjacent to the GBR. Other Queensland and Federal legislation also protects the property's Outstanding Universal Value addressing such matters as water quality, shipping management, sea dumping, fisheries management and environmental protection.

The *Federal Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides an overarching mechanism for protecting the World Heritage values from inappropriate development, including actions taken inside or outside which could impact on its heritage values. This requires any development proposals to undergo rigorous environmental impact assessment processes, often including public consultation, after which the Federal Minister may decide, to approve, reject or approve under conditions designed to mitigate any significant impacts. A recent amendment to the EPBC Act makes the GBR Marine Park an additional 'trigger' for a matter of National Environmental Significance which provides additional protection for the values within the GBR.

The GBR Marine Park and the adjoining GBR Coast Marine Park are zoned to allow for a wide range of reasonable uses while ensuring overall protection, with conservation being the primary aim. The zoning spectrum provides for increasing levels of protection for the 'core conservation areas' which comprise the 115,000 square kilometres of 'no-take' and 'no-entry' zones within the GBR.

While the Zoning Plan is the 'cornerstone' of management and provides a spatial basis for determining where many activities can occur, zoning is only one of many spatial management tools and policies applied to collectively protect the GBR. Some activities are better managed using other spatial and temporal management tools like Plans of Management, Special Management Areas, Agreements with Traditional Owners and permits (often tied to specific zones or smaller areas within zones, but providing a detailed level of management not possible by zoning alone). These statutory instruments also protect the Outstanding Universal Value of the property.

Many Aboriginal and Torres Strait Island peoples undertake traditional use of marine resource activities to provide traditional food, practice their living maritime culture, and to educate younger generations about traditional and cultural rules and protocols. In the GBR these activities are managed under both Federal and Queensland legislation and policies including Traditional Use of Marine Resource Agreements (TUMRAs) and Indigenous Land Use Agreements (ILUAs). These currently cover some 30 per cent of the GBR inshore area, and support Traditional Owners to maintain cultural connections with their sea country.

Similarly non-statutory tools like site management and Industry Codes of Practice contribute to the protection of World Heritage values. Some spatial management tools are not permanently in place nor appear as part of the zoning, yet achieve effective protection for elements of biodiversity (e.g. the temporal closures that are legislated across the GBR prohibit all reef fishing during specific moon phases when reef fish are spawning).

Other key initiatives providing increased protection for the GBR include the comprehensive Great Barrier Reef Outlook Report, (and its resulting 5-yearly reporting process); the Reef Water Quality Protection Plan; the GBR Climate Change Action Plan; and the Reef Guardians Stewardship Programmes which involve building relationships and working closely with those who use and rely on the GBR or its catchment for their recreation or their business.

The 2009 Outlook Report identified the long-term challenges facing the GBR; these are dominated by climate change over the next few decades. The extent and persistence of damage to the GBR ecosystem will depend to a large degree on the amount of change in the world's climate and on the resilience of the GBR ecosystem to such change. This report also identified continued declining water quality from land-based sources, loss of coastal habitats from coastal development, and some impacts from fishing, illegal fishing and poaching as the other priority issues requiring management attention for the long-term protection of the GBR.

Emerging issues since the 2009 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.

Further building the resilience of the GBR by improving water quality, reducing the loss of coastal habitats and increasing knowledge about fishing and its effects and encouraging modified practices, will give the GBR its best chance of adapting to and recovering from the threats ahead, including the impacts of a changing climate.



Australian Government
Australian Maritime Safety Authority

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