



DISCUSSION PAPER

HAWKESBURY SHELF **MARINE BIOREGION** ASSESSMENT

Suggested management initiatives



Marine Estate
Management Authority





What is the purpose of this discussion paper?

The NSW Government is inviting your comments on suggested initiatives to enhance and conserve marine biodiversity in the Hawkesbury Shelf marine bioregion (the bioregion) while continuing to enjoy the benefits the community derives from the bioregion.

The Hawkesbury Shelf bioregion extends from Stockton (Newcastle) in the north to Shellharbour (near Wollongong) in the south. It includes the coastline, estuaries, coastal lakes and lagoons, beaches, and ocean waters out to the continental shelf. The area in NSW state waters—which extends to three nautical miles from the coastline—is the focus. Two-thirds of the State’s population of 7.5 million people live on the coast along the bioregion.

What is the Hawkesbury Shelf marine bioregion assessment?

The Assessment aims to **enhance marine biodiversity in the Hawkesbury Shelf marine bioregion while achieving balanced community outcomes, including opportunities for a wide range of recreational and commercial uses.**

The NSW Government asked the **Marine Estate Management Authority** (Authority) to undertake the Assessment and to develop and assess options to improve management. More information about the process followed, along with supporting information, is available at the NSW Marine Estate website www.marine.nsw.gov.au.



What are the suggested management initiatives?

The community has identified a range of benefits associated with the bioregion and its uses. This paper presents eight suggested management initiatives which are being considered to address priority threats to those benefits - the environmental assets and social and economic values and uses of the bioregion. You are invited to consider and comment on these suggested initiatives. You can also provide new evidence about threats to the bioregion, such as threats that affect your use and enjoyment of the bioregion.

The suggested initiatives aim to help reduce or mitigate priority threats to:

- the environmental assets of the bioregion—the natural attributes, components and living resources. This includes the living and non-living parts of the marine environment such as estuaries and marine waters, marine animals and plants and their habitats
- the social and economic values and uses that the NSW community derive from the bioregion—for example going to the beach, boating, diving, fishing and shipping—these are referred to as ‘community benefits’.

The suggested management initiatives focus on managing priority threats more effectively and efficiently through government intervention.

EIGHT SUGGESTED MANAGEMENT INITIATIVES:

- 1. Improving water quality and reducing marine litter**
- 2. On-ground works for healthy coastal habitats and wildlife**
- 3. Marine research to address shipping and fishing knowledge gaps**
- 4. Spatial management for biodiversity conservation and use sharing**
- 5. Improving boating infrastructure**
- 6. Reducing user conflicts in Pittwater**
- 7. Improving accessibility**
- 8. Land use planning for coasts and waterways.**

These suggested initiatives are further described in this paper. Some of the initiatives aim to enhance marine biodiversity conservation while others are intended to improve social or economic benefits.

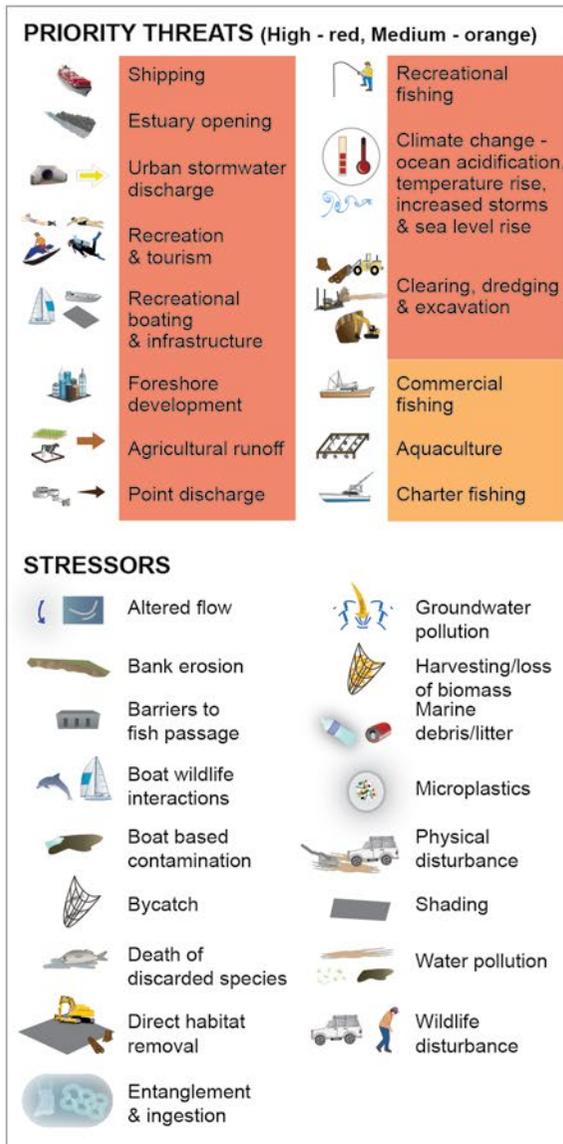
The priority threats, and the stressors that drive each priority threat, are also described in this discussion paper and further detailed in the supporting background reports on the NSW marine estate website www.marine.nsw.gov.au.

Figure 1 shows the priority threats, associated stressors and the environmental assets of the bioregion. Figure 2 shows the priority threats and stressors to social and economic benefits derived from the bioregion.

What are the supporting background reports?

There are **seven background reports** that were developed as part of this Assessment. You can download them from the NSW marine estate website www.marine.nsw.gov.au:

- Summary of Hawkesbury Shelf community and stakeholder engagement (MEMA, 2015a)
- Hawkesbury Shelf environmental background report (MEMA, 2015b)
- Review of 15 pre-identified sites (MEMA, 2015c)
- Hawkesbury Shelf marine bioregion threat and risk assessment (TARA) report (BMT WBM, 2015)
- Social and economic background information report on the NSW marine estate (Vanderkooi Consulting, 2015)
- Sea countries of New South Wales: a benefits and threats analysis of Aboriginal people's connections with the marine estate (Feary, 2015)
- Peer review of ‘Sea countries of New South Wales: a benefits and threats analysis of Aboriginal people's connections with the marine estate’ (Schnierer, 2015).



Some symbols courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science (ian.umces.edu/symbols/)

Figure 1. The environmental assets of the Hawkesbury Shelf marine bioregion and the priority threats and associated stressors to these assets.





Figure 2. The social and economic activities and uses (benefits) of the Hawkesbury shelf marine bioregion and the priority threats to those benefits.

Some symbols courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science (ian.umces.edu/symbols/)

How do I provide my feedback?

Below are some questions that you can consider when providing your feedback. Please clearly state in your response which initiative or initiatives you are commenting on.

HAVE YOUR SAY

QUESTION 1

What do you see as the strengths of the suggested initiative/s to maximise the benefits you receive from the marine estate?

QUESTION 2

What do you see as the weaknesses of the suggested initiative/s to maximise the benefits you receive from the marine estate?

QUESTION 3

What changes would make the suggested initiative/s more effective at addressing the priority threats (and why)?

QUESTION 4

Are there any other initiatives that you would like to see address priority threats?

QUESTION 5

Do you have any new evidence about threats and risks that may change the associated risk ratings? Please provide report references, data or web-links to information.

QUESTION 6

Are there any comments you would like to make on the Assessment process?

You are invited to provide feedback through an [online submission form](#).

Alternatively, you can post your submission to:

Submission – Hawkesbury Shelf marine bioregion initiatives
NSW Department of Primary Industries
Locked Bag 1
Nelson Bay NSW 2315

If you want more information on the Assessment to inform your submission, refer to the NSW marine estate website www.marine.nsw.gov.au.

If you have any queries you can email contact.us@marine.nsw.gov.au.

The Authority may publish your submission unless you advise otherwise. Publication of submissions will usually include your name and the name of your organisation, if relevant. The Authority will remove contact details such as your email address, postal address and telephone number. At the Authority's discretion, certain submissions (or part of submissions) may not be published due to their length, content, appropriateness or confidentiality. All submissions received could be disclosed, if requested, in accordance with the *Government Information (Public Access) Act 2009*.

Submissions close Sunday, 24 April 2016.



What's next?

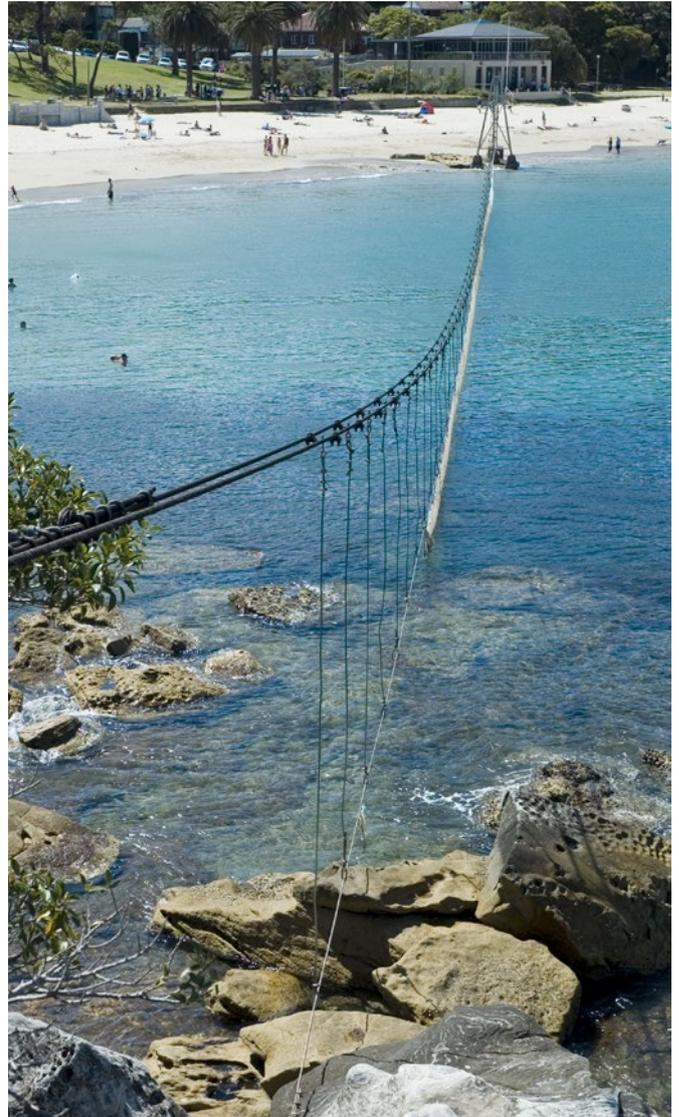
Your input will inform the final management initiatives to be considered by the NSW Government later in 2016. Until then, existing management rules will remain in place: none of the suggested initiatives will be implemented until the Assessment is complete and the NSW Government announces the outcome.

Several of the final initiatives are likely to involve further community and stakeholder engagement prior to, or during their implementation.

A 5-step process to marine estate management

The Assessment has piloted the Authority's new 5-step decision-making process for marine estate management outlined in the 2013 [Principles Paper](#) and the [Marine Estate Management Act 2014](#). The diagram in Figure 3 shows the steps. The suggested initiatives in this paper have been developed by following the first four steps.

This process was developed in response to the recommendations from the [Independent Scientific Audit of Marine Parks](#) with guidance from independent social, economic and environmental experts on the [Marine Estate Expert Knowledge Panel](#).



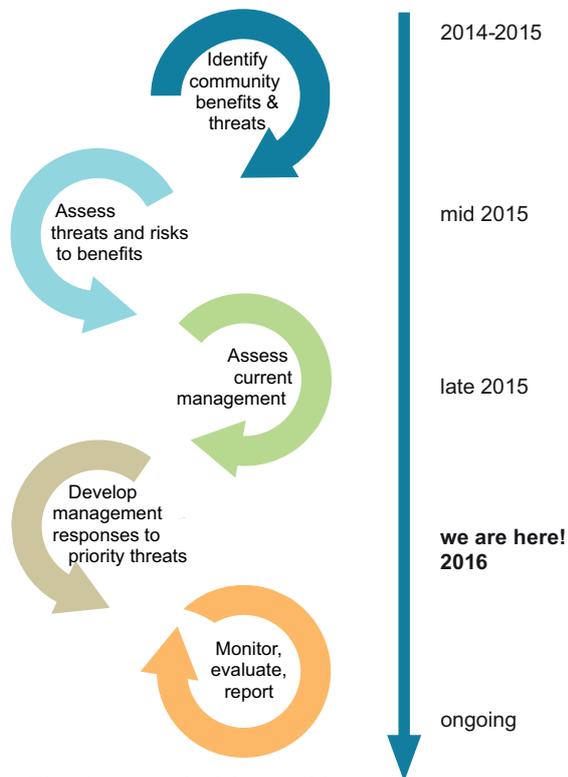


Figure 3. The five step decision-making process for marine estate management in NSW.

STEP 1

IDENTIFY COMMUNITY BENEFITS AND THREATS

During 2014 and 2015 **we asked you what benefits**—the uses and values—you enjoy from the marine estate of NSW and the bioregion (MEMA, 2015a). Benefits can be environmental, social or economic. We also asked you about the threats to these benefits and opportunities to reduce these threats.

We invited you to tell us how you use and value 15 sites that were identified by the NSW Government as possibly needing additional protection (MEMA, 2015c). We also asked you to identify extra sites; resulting in 44 more sites that are now being assessed.

You responded through the statewide 2014 **Marine Estate Community Survey**, web portal, submissions, workshops and meetings in 2015. In undertaking this assessment, we have drawn on **your feedback** (MEMA, 2015a), other **background reports** and a range of scientific and other credible information sources.

STEP 2

ASSESS THREATS AND RISKS TO BENEFITS

Independent and agency experts used your feedback and the background reports to develop a risk rating—minimal/low/moderate/high—for each threat. Using the Authority's **Threat and Risk Assessment Framework**, the risk ratings were determined in workshops by assessing the consequence and likelihood of each threat.

The trend of each threat was assessed on the basis of how it varies over time (in 5, 10, or 20 years, and up to 50 years for climate change) and space (local, regional or statewide). Cumulative impacts were considered. Also noted was the quality of the evidence used—was it adequate, limited or inferred?

Priority threats are the high and moderate threats that were identified. A total of 15 priority environmental threats and 5 priority social and economic threats were identified in the **threat and risk assessment (TARA) report** (BMT WBM, 2015) and are summarised in this discussion paper.





STEP 3

ASSESS CURRENT MANAGEMENT

There are current NSW Government programs that help mitigate priority threats. The NSW Government has also announced reforms that will help in the near future (Table 3).

We are undertaking further evaluation of current management and the eight suggested initiatives and will use your feedback to inform our final advice to the NSW Government.

We have also considered the role of government in this Assessment and the **opportunities you proposed to reduce threats** in Step 1 (MEMA, 2015a).



STEP 4

DEVELOP MANAGEMENT RESPONSES TO PRIORITY THREATS

We drafted a suite of eight suggested management initiatives to help address the priority threats.

The suggested initiatives were designed to improve current management, and there are alternative initiatives to address management gaps.

Your feedback on this discussion paper will help us evaluate these suggested initiatives: are they likely to be effective and efficient; can they be improved and if so, how? Your feedback will also help us balance different uses across the bioregion.

The initiatives will then be revised to develop a final set of management initiatives that will be presented to the NSW Government.

Once the Assessment is complete, the NSW Government will determine the final management initiatives to be implemented by agencies.

STEP 5

MONITOR, EVALUATE, REPORT

NSW Government agencies will monitor and evaluate the effectiveness of the final management initiatives over time. Public reporting by NSW Government agencies will be an important step in evaluating and reporting on the implementation of the final initiatives.

Over time, NSW Government agencies will need to adapt management arrangements to ensure they continue to mitigate the priority threats.



STEP 1

What you told us about the bioregion

The outcomes of community engagement for the bioregion from Step 1 are outlined in the Authority's **Summary of Hawkesbury Community and Stakeholder Engagement Report** (MEMA, 2015a). The views of the community and stakeholders on benefits, threats and opportunities were identified through:

- the 2014 **Marine Estate Community Survey** of more than 1,700 residents and visitors
- targeted engagement for the Assessment in 2015 (MEMA, 2015a):
 - peak stakeholder workshops (4)
 - Aboriginal engagement workshops (3)
 - a web portal with an interactive map (more than 1,500 entries)
 - meetings with local councils (8)
 - written submissions (more than 2,300 received)
- literature reviews of social and economic information, including Aboriginal cultural heritage (Vanderkooi Consulting, 2015; Feary, 2015).

A brief summary of the findings is provided here.

PRIORITY ENVIRONMENTAL BENEFITS

You told us the priority environmental benefits of the bioregion are:

- clean waters that support a variety of habitats and marine life
- abundance of marine life
- uniqueness of marine life
- a way to observe and interact with a variety of marine life.

PRIORITY THREATS TO ENVIRONMENTAL BENEFITS

You told us the greatest threats to these environmental benefits are:

- littering/dumping of rubbish/marine debris
- oil and chemical spills
- water pollution from sediment or runoff
- loss of coastal habitats
- loss of biodiversity/ecosystem services
- overfishing/overharvesting
- shark nets
- lack of resources for management
- foreshore/coastal and catchment development.

PRIORITY ECONOMIC BENEFITS

You told us the priority economic benefits derived from the bioregion are:

- a source of income
- a key source of seafood, particularly for Aboriginal people
- home to iconic images of Australia, which promote tourism
- a trade route for goods around Australia and the world.

PRIORITY THREATS TO ECONOMIC BENEFITS

You told us the greatest threats to the economic benefits derived from the bioregion are:

- water pollution affecting the viability of tourism
- loss of natural areas that support tourism
- increasing costs to access and use the NSW marine estate, which may discourage tourism
- poor access to use and enjoy the marine estate
- habitat loss/modification
- depletion of fish stocks and unsustainable practices.

PRIORITY SOCIAL BENEFITS

You told us the priority social benefits derived from the bioregion are:

- its intrinsic value for the NSW community as a central part of Australia's heritage and culture
- its natural beauty, even if people cannot visit it regularly
- uniqueness and value that can be passed onto future generations (bequest value)
- a safe space to spend quality time and socialise with friends and family
- the opportunity to live a healthy and active lifestyle.

You told us that these social benefits are amplified in Aboriginal communities with many of the core traditions that underpin Aboriginal culture being fundamentally linked to the marine estate.

PRIORITY THREATS TO SOCIAL BENEFITS

You told us the greatest threats to these social benefits derived from the bioregion are:

- loss of Aboriginal culture/knowledge
- anti-social behaviour affecting personal safety and enjoyment
- loss of appeal due to water pollution/littering
- overcrowding
- danger to swimmers from other recreational activities such as boating and jet skiers
- lack of public access to the marine estate
- lack of education on major threats
- lack of funding and resourcing for education and research
- habitat loss
- overfishing/overharvesting
- ecosystem failure affecting community health and wellbeing.

SUGGESTED MANAGEMENT RESPONSES TO ADDRESS THESE THREATS

Your suggested management responses to address these threats include:

- water quality and litter management (i.e. water sensitive urban design, stormwater controls, runoff and sewage management)
- improved compliance, uniformity of regulation
- education, public engagement, research and monitoring
- improved land use and catchment planning
- better management of invasive species
- long-term, holistic and consistent government policies and management plans
- habitat enhancement and rehabilitation
- spatial management of habitat (e.g. marine protected areas)
- improved fisheries management in terms of areas and catch quota
- action on climate change (reducing emissions, land use planning, research)
- funding and incentive schemes
- developing partnerships
- improved public awareness and education on Aboriginal community connection to sea country and involvement in traditional sea management
- promotion of nature-based tourism
- improved boating management and infrastructure for boating access
- management of emerging industries e.g. mining
- alternative solutions to shark nets and their removal adjacent to protected areas
- promotion of sustainable local commercial fisheries.



STEP 2

Threat and risk assessment

Community and stakeholder engagement has been critical to identify the benefits that the bioregion supports, the threats the community believes affect these benefits, and potential opportunities to reduce these threats.

What is threat and risk assessment?

A threat is an activity, event or process that poses a potential level of risk to a community benefit. 'Community benefits' are defined as environmental, social and economic uses and values that contribute to the wellbeing of a community—in this case, the people who live near to, and visit the Hawkesbury Shelf marine bioregion. Benefits are based on what people think is important (what they value).

Threats may be made up of various stressors, for example the threat generated by urban stormwater may result in stressors such as litter, marine debris, micro-plastics and water pollution. A risk is the chance of something happening from these threats that will have an unacceptable impact on achieving management objectives for community benefits.

Controversially, many of the uses and values of the marine estate in the bioregion can also be seen as threats to other uses and values. For example, 'recreational boating' provides many social benefits, but can also be seen as a threat to other uses and values such as swimming, diving, conserving environmental assets and heritage etc.

The Authority has prepared a **Threat and Risk Assessment Framework** for the NSW marine estate to guide the process of threat and risk assessment (TARA) by agencies and the general public. This framework was used in the Assessment.

All threats that generated high or moderate risks to economic, social or environmental benefits in the Assessment were deemed to be 'priority threats'.

KEY POINTS ABOUT THREATS IN THE BIOREGION:

Many threats are happening across the bioregion rather than just at specific sites. Many threats can be found across NSW.

Many threats are expected to increase over the next 20 years in the absence of additional management.

The risk of environmental threats is greater in the estuaries of the bioregion than on the coastline and in marine waters.

The process and results of the TARA can be found in the **Hawkesbury Shelf Marine Bioregion Threat and Risk Assessment Report** (BMT WBM, 2015) and are summarised here.

Priority threats to environmental assets

Environmental threats that were assessed are activities (like shipping or urban development) or issues (like urban stormwater discharge) which may affect the environmental assets of the bioregion. Each threat includes a number of stressors that affect the overall level of risk. For example, the activity 'recreational boating and boating infrastructure' generates environmental stressors such as physical disturbance to habitat from anchors, propellers, moorings, boat wake, water pollution from oil, sewerage or antifoulants, or wildlife disturbance from noise or physical interaction.

Table 1 summarises the priority threats to the environmental assets of the bioregion. The priority threats have been listed according to both the risk level (high, moderate) and scale at which they are operating (local, regional or statewide).

Table 1. Priority threats to the ENVIRONMENTAL assets of the Hawkesbury Shelf marine bioregion, from HIGH (H) in red to MODERATE (M) in orange, and the scale and trend of the threats.

THREAT/ACTIVITY	SCALE	ENVIRONMENTAL ASSET			OVERALL	
		Clean waters	Marine habitat & assemblages	Threatened & protected species	RISK	TREND
Shipping	Localised	M	H	H	H	↑ Increasing
Estuary opening/ modified freshwater flows	Regional/ localised	M	H	H	H	● Static
Urban stormwater discharge	Regional	H	H	H	H	↑ Coastal & marine waters Increasing ● Estuary Static
Recreation & tourism (swimming, shark meshing program, four wheel driving etc.)	Regional		H	H	H	↑ Increasing ● Shark meshing Static
Recreational boating & boating infrastructure	Regional	M	H	H	H	● Regional Static ↑ Estuary Increasing
Foreshore development	Regional		H	H	H	↑ Increasing
Agriculture diffuse source runoff	Regional	H	M	M	H	↑ Coastal & marine waters Increasing ● Estuary Static
Point source discharges (e.g. industrial thermal, sewage effluent & septic runoff)	Regional	H	M	M	H	● Industrial discharges Static ↑ Sewage and septic discharges Increasing
Recreational fishing	Regional		M	H	H	↓ Decreasing
Climate change	State-wide	H	H	H	H	↑ Increasing
Clearing, dredging & excavation activities	State-wide	H	H	H	H	● Statewide Static ↑ Regional clearing Increasing
Commercial fishing	Regional for coastal and marine waters Localised in estuaries (Tuggerah & Hawkesbury)		M	M	M	↓ Decreasing
Aquaculture	Localised		M	M	M	↓ Oyster growing areas in estuaries Decreasing
Charter fishing	Regional for marine waters Localised in estuaries			M	M	↑ Regional marine waters Increasing Localised estuaries Increasing
Other charter activities	Localised			M	M	↑ Marine waters Increasing

Priority threats to social and economic benefits

The threats to social and economic benefits that were assessed include lack of access, the effect of poor regulation or over regulation, resource-use conflicts, and impacts on cultural heritage and use. Each threat generates stressors that affect the overall risk rating. For example, the threat resource-use conflict can arise from several stressors such as: equity in sharing access to areas or resources within the marine estate; anti-social behaviour or over-crowding affecting people's participation and enjoyment; and theft (illegal fishing).

Table 2 summarises the priority threats to the social and economic benefits of the bioregion. Further information on these threats and benefits can be found in the Social and Economic Background Information Report on the NSW marine estate website (Vanderkooi Consulting, 2015).

The priority threats have been listed according to both the risk level (high, moderate) and scale at which they are operating (local, regional, statewide). Threats to the environmental assets that also impact social and economic benefits are shown in Table 1.

Table 2. Priority threats to the SOCIAL AND ECONOMIC BENEFITS of the Hawkesbury Shelf marine bioregion, from HIGH (H) in red to MODERATE (M) in orange, and the scale and trend of the threats.

THREAT	SCALE	SOCIAL BENEFIT			ECONOMIC BENEFIT			RISK	OVERALL	
		Participation	Enjoyment	Cultural heritage & use	Intrinsic & bequest values	Viability of businesses	Direct economic values		TREND	
Lack of access availability	Regional	H	H	H	M	M	H	H	▲	Increasing
Effect of regulation	Regional	H	H	H	H	H	M	H	▲	Increasing
Resource use conflict	Regional	H	H	H	H		M	H	▲	Increasing
Lack of funding and support for research	Regional	H				H		H	▲	Increasing
Impacts on cultural heritage and use	Regional			H				H	▲	Increasing

Which threats are not addressed?

Not all priority threats and stressors are addressed by the suggested management initiatives in this paper. Management is proposed where it can effectively and efficiently minimise or mitigate the threats and meet the aims of the Assessment. Additionally, many threats operate at a statewide scale: they will be considered as we complete the statewide TARA and develop the 10-year Marine Estate Management Strategy for the whole NSW marine estate.



STEP 3

How are current programs and reforms addressing the priority threats?

The eight suggested initiatives outlined in this paper take into account existing management. Table 3 lists the current programs and policies, as well as reforms that will be implemented in the near future, that already contribute to mitigating priority threats.

Table 3. Current NSW Government management programs and reforms addressing priority threats.

REFORMS	DETAILS
Coastal reforms	The NSW coastal reforms include a draft Coastal Management Bill, a new coastal management manual, and an Explanation of Intended Effects for a new Coastal Management State Environmental Planning Policy (SEPP). The coastal reform package will help address several priority threats. In particular, it will support managing risks associated with climate change (e.g. sea level rise), coastal protection works and foreshore development, physical disturbance near sensitive coastal locations such as coastal wetlands, lakes and littoral rainforests, catchment runoff and impacts on estuary health, and constraints to public access to beaches and headlands.
Greater Sydney Commission	The Greater Sydney Commission was established in 2015. Members include Social, Environment and Economic Commissioners. District plans will need to have regard to relevant government policies and plans in force at the time a draft district plan is prepared. District plans also consider other matters that the relevant strategic planning authority considers relevant. District plans will help address the threats of foreshore development, lack of access availability and effect of regulation.
Container deposit scheme	The NSW Government has committed to implementation of a container deposit scheme for the recycling of drink containers by 1 July 2017. This scheme will contribute to the Premier's priority of reducing the volume of litter in NSW by 40 per cent by 2020. It will help address the threats of litter and debris in the marine bioregion.
Hey Tosser! Program	'Hey Tosser!—It's a dirty look' is the NSW Government's litter education campaign that began in 2014. It is a statewide, mass media campaign based on social research and incorporating compliance mechanisms. The campaign is planned to run until 2017. The message of the campaign is to "put it in the bin" or "take your rubbish with you" and that "fines apply". This campaign aims to reduce land and water-based littering and responds to the threats of litter and marine debris.
Biodiversity reforms	The NSW Government is already taking action to address the threat of riparian clearing and drainage through the biodiversity reforms. These reforms will support more sustainable development while facilitating the conservation of important riparian areas. This will help address the threats of foreshore development and clearing, dredging and excavation activities.
NSW climate change programs and responses	<p>The NSW Government provides information that helps government, business and local communities to plan and prepare for climate change in NSW. This includes high-resolution climate projection data and impact information, regional vulnerability assessments, and supporting adaptive responses. For example the NSW & ACT Regional Climate Modelling project provides future projections for more than 100 climate variables. There is a \$3 million NSW Adaptation Research Hub. A comprehensive study of east coast lows and their impacts, past and future changes, is part of the Eastern Seaboard Climate Change Initiative.</p> <p>The draft Coastal Management Bill also aims to mitigate current and future risks from coastal hazards, taking into account the effects of climate change. The Bill is intended to encourage the improvement of resilience of coastal assets to the impacts of an uncertain climate future, including the impacts of extreme storm events.</p>

REFORMS	DETAILS
Lower Hawkesbury Nutrient Management Strategy	<p>This strategy has been in place since 2010. It will continue to reduce the threat of point and diffuse source water pollution through a framework for current and future initiatives, increased awareness of existing initiatives and opportunities for collaboration, strategic guidance for stakeholders, and consideration of nutrient management objectives in strategic planning and investment decision. It also provides support and guidance to decision-makers and grant applicants.</p>
Moorings review	<p>Transport for NSW and the Department of Primary Industries are investigating transitional arrangements for mandating the use of Environmentally Friendly Moorings in environmentally sensitive areas in the next 3–5 years. There are more than 26,600 mooring sites managed by Roads and Maritime in NSW. Most of these are block and chain moorings, which can damage sensitive seagrass beds. This will address the threat of boating and boating infrastructure on seagrasses.</p>
NSW Boating Now	<p>NSW Boating Now is a five-year boating infrastructure program (2015–2020) developed to support the delivery of new and improved boating facilities through partnerships with local councils and other organisations. Specific projects funded through this program could address environmental threats where boating activities may contribute to riverbank erosion caused by boating activities, water pollution through sewage effluent and pump-out facilities as well as social threats such as increased demand for boat storage.</p>
Sydney Harbour Maritime Environmental Services	<p>The Maritime Environmental Services, part of Transport for NSW, clean Sydney Harbour and the navigable waters of the Parramatta and Lane Cove Rivers, public beaches and foreshores. They also monitor and maintain Sydney Harbour’s vessel sewage disposal points. On average more than 3,500 cubic metres of rubbish is collected each year, ranging from large objects such as trees and tyres, to debris washed into the harbour from adjoining suburbs, to small items left behind on beaches and foreshores by the public. This service helps address the threat of litter and debris in the bioregion.</p>
Parramatta River ferry services	<p>In March 2015, the NSW Government announced a \$100 million plan to boost Parramatta River ferry services. It includes four new vessels that are designed specifically for the river with the minimisation of vessel wash to be a key design consideration (which may contribute to bank erosion).</p>
Commercial Fisheries Business Adjustment Program	<p>Under current fisheries management arrangements, in most cases the value of fishing rights (shares) is not proportional to catch or effort. By linking shares with catch or fishing effort, this program (which includes \$16 million in adjustment funding) seeks to create greater certainty for fishers, greater viability for the industry, and a stronger base for sustainable fisheries in the long term. The reforms will remove or reduce existing overcapacity and deliver further improved control over commercial catches, thereby addressing several risks identified through the TARA associated with commercial fishing activities in the bioregion.</p>
Aboriginal Cultural Fishing Regulation	<p>The Aboriginal Cultural Fishing Regulation forms part of the framework for managing fisheries resources in NSW. On the proposed commencement of Section 21AA of the <i>Fisheries Management Act 1994</i>, the take and possession limit provisions of the Act will cease to apply in respect of cultural fishing. Regulated catch arrangements across all stakeholder groups provide mechanisms to manage pressures on fisheries resources for the future of stocks and ongoing sharing of the resources. Establishing formal cultural take and possession arrangements will maintain consistency in management approach, promote and protect cultural fishing and assist in addressing some of the threats to social benefits identified in the TARA for Aboriginal people.</p>

STEP 4

The eight suggested management initiatives

Table 4 summarises the suggested management initiatives. The table outlines the actions within each initiative, the priority threats or activities being addressed, the stressors creating the high

and moderate risk level and whether the initiatives require additional funding. It also shows how each of the suggested initiatives is contributing towards the aim of the Assessment.

Table 4. Summary of suggested management initiatives for the Hawkesbury Shelf marine bioregion.

Suggested management initiative, objective & funding source	Summary of actions	Priority threat or activity being addressed H – High risk M – Moderate risk	Stressors creating the high or moderate risk	Meets aim of the Assessment	
				Enhances marine biodiversity	Maximises social and/or economic benefits
Initiatives aimed at addressing environmental threats					
1. Improving water quality and reducing marine litter <i>Reduce water pollution from catchments and litter entering the bioregion</i> <i>New government funding required</i>	<ul style="list-style-type: none"> • Develop outcome based bioregion management assessment and targets for water quality. • Prioritising and implementing works and extension programs to address catchment runoff • Expand the recreational fishing and boating environmental education strategy. • Expand the 'Hey Tossler!' program, including targeted grants for the installation of trash racks on stormwater infrastructure, and establishing a Tangler bin program. • Implement mechanisms to reduce sources of water pollution • Explore ways to remove micro-plastics and reduce their impacts. 	<ul style="list-style-type: none"> • Urban stormwater discharge (H) • Agricultural diffuse source runoff (H) • Point source discharges (H) • Recreation and tourism (H) • Recreational fishing (H) • Impacts on cultural heritage and use (H) • Charter fishing (M) 	<ul style="list-style-type: none"> • Contaminated runoff • Water pollution • Marine debris/litter • Microplastics • Groundwater pollution • Environmental degradation of cultural heritage sites/uses • Boat-based contamination 	✓	✓

Suggested management initiative, objective & funding source	Summary of actions	Priority threat or activity being addressed H – High risk M – Moderate risk	Stressors creating the high or moderate risk	Meets aim of the Assessment	
				Enhances marine biodiversity	Maximises social and/or economic benefits
Initiatives aimed at addressing environmental threats					
<p>2. On-ground works for healthy coastal habitats and wildlife</p> <p>.....</p> <p><i>Improve the health of coastal habitats and marine wildlife safety</i></p> <p>.....</p> <p><i>New government funding required</i></p>	<ul style="list-style-type: none"> Identify priorities and provide grants for coastal habitat rehabilitation, fish passage restoration and environmentally friendly infrastructure/ coastal development projects. Develop an urban mangrove management policy to conserve mangroves while balancing environmental, social and economic outcomes. Implement marine wildlife incident planning and guidelines. 	<ul style="list-style-type: none"> Clearing, dredging and excavation activities (H) Recreation and tourism (H) Foreshore development (H) Estuary opening/ modified freshwater flows (H) Impacts on cultural heritage and use (H) 	<ul style="list-style-type: none"> Changes in flow patterns Barriers to fish passage Physical disturbance Sediment re-suspension / disturbance Harvesting/ loss biomass Boat wildlife interactions Entanglements and ingestion 	✓	✓
<p>3. Marine research to address shipping and fishing knowledge gaps</p> <p>.....</p> <p><i>Address key knowledge gaps identified from the TARA that result in moderate and high risks in the bioregion</i></p> <p>.....</p> <p><i>New government funding required</i></p>	<ul style="list-style-type: none"> Examine ship anchoring activities and potential for physical disturbance to key habitats Investigate sediment re-suspension and associated impacts on environmental assets. Research wildlife disturbance and effectiveness of ways to reduce by-catch or non-target mortality in marine wildlife from both commercial and non-commercial fisheries. 	<ul style="list-style-type: none"> Urban stormwater discharge (H) Clearing, dredging and excavation activities (H) Shipping (H) Foreshore development (H) Climate change (H) Lack of funding and support (H) 	<ul style="list-style-type: none"> Marine debris/ litter Foreshore development Wildlife disturbance Physical disturbance Government funding 	✓	✓
<p>4. Spatial management for biodiversity conservation and use sharing</p> <p>.....</p> <p><i>Enhance the conservation of biodiversity and use sharing through spatial management measures</i></p> <p>.....</p> <p><i>New government funding required</i></p>	<ul style="list-style-type: none"> Design a system of targeted marine protected areas/ spatial closures based on detailed analysis and community engagement. 	<ul style="list-style-type: none"> Climate change (H) Recreation and tourism (H) Recreational boating and boating infrastructure (H) Estuary opening/ modified freshwater flows (H) Recreational fishing (H) Aquaculture (M) Charter activities (M) Resource-use conflict (H) Impacts on cultural heritage and use (H) 	<ul style="list-style-type: none"> Physical disturbance Wildlife disturbance Climate change stressors Reduction in abundance of harvested species/loss biomass Anti-social behaviour Overcrowding 	✓	✓

Suggested management initiative, objective & funding source	Summary of actions	Priority threat or activity being addressed H – High risk M – Moderate risk	Stressors creating the high or moderate risk	Meets aim of the Assessment	
				Enhances marine biodiversity	Maximises social and/or economic benefits
Initiatives aimed at addressing threats to social and economic benefits					
<p>5. Improving boating infrastructure</p> <p>.....</p> <p><i>Improve boating infrastructure for better access and to improve environmental outcomes</i></p> <p>.....</p> <p><i>Funded via the NSW Boating Now program</i></p>	<ul style="list-style-type: none"> • Develop boat storage strategies for the bioregion. • Streamline the assessment and approval of new boating and water-based development. 	<ul style="list-style-type: none"> • Effect of regulation (H) • Access availability (H) • Recreational boating and boating infrastructure (H) 	<ul style="list-style-type: none"> • Physical disturbance • Boat-based contamination • Limited access infrastructure • Over-regulation 	✓	✓
<p>6. Reducing user conflicts in Pittwater</p> <p>.....</p> <p><i>Reduce resource-use conflict between commercial fishers and other user groups in Pittwater</i></p> <p>.....</p> <p><i>Estimated cost to be determined in consultation with the Pittwater community</i></p>	<ul style="list-style-type: none"> • Implement market based mechanisms to resolve resource-use conflict in Pittwater. 	<ul style="list-style-type: none"> • Resource-use conflict (H) 	<ul style="list-style-type: none"> • Equitable resource sharing issues • Overcrowding/ congestion 		✓
<p>7. Improving accessibility</p> <p>.....</p> <p><i>Identify and address opportunities to improve access availability in the bioregion.</i></p> <p>.....</p> <p><i>Estimated cost to be determined during consultation with key stakeholders</i></p>	<ul style="list-style-type: none"> • Provide wheelchair access at key locations in the bioregion. Identify key locations through stakeholder engagement. • Further engagement with Aboriginal communities to address access issues to the marine estate for cultural purposes. 	<ul style="list-style-type: none"> • Access availability (H) 	<ul style="list-style-type: none"> • Limited access infrastructure • Over-regulation 		✓

Suggested management initiative, objective & funding source	Summary of actions	Priority threat or activity being addressed H – High risk M – Moderate risk	Stressors creating the high or moderate risk	Meets aim of the Assessment	
				Enhances marine biodiversity	Maximises social and/or economic benefits
Initiatives aimed at addressing threats to environmental assets and social and economic benefits					
<p>8. Land use planning for coasts and waterways</p> <p>.....</p> <p><i>Review foreshore land use planning to deliver a range of benefits, cut red tape and improve environmental outcomes</i></p> <p>.....</p> <p><i>Within existing funding</i></p>	<ul style="list-style-type: none"> Review Sydney Harbour Regional Environmental Plan (REP) and State Environmental Planning Policies (SEPPs). 	<ul style="list-style-type: none"> Effect of regulation (H) Impacts on cultural heritage and use (H) Foreshore/urban development (H) 	<ul style="list-style-type: none"> Over-regulation Physical disturbance 	✓	✓



INITIATIVE 1

Improving water quality and reducing marine litter



What are the community benefits associated with clean water?

Clean marine and estuarine waters support a variety of unique and abundant marine life. Clean waters are also essential to almost all of the uses and activities that generate social and economic benefits from the marine estate.

Uses and activities that are highly dependent on clean water include:

- recreational, commercial and cultural fishing
- aquaculture
- recreational activities, e.g. swimming and surfing
- conservation of environment and heritage.

Other uses and activities that are somewhat dependent on clean water include:

- research and education
- recreational boating
- cruise shipping
- commercial boating and charters
- tourism and accommodation
- coastal urban settlement
- water transport services.

The dependency of these uses and activities on clean water were identified through the [Marine Estate Community Survey](#), Hawkesbury Shelf community engagement and the TARA.

What are the priority threats and stressors?

THREATS/ACTIVITIES	STRESSORS
<ul style="list-style-type: none">• Urban stormwater discharge• Agricultural diffuse source runoff• Point source discharges• Recreation and tourism• Recreational fishing• Impacts on cultural heritage and use• Charter fishing.	<ul style="list-style-type: none">• Contaminated runoff• Water pollution• Marine debris/litter• Micro-plastics• Groundwater pollution• Environmental degradation of cultural heritage sites/uses• Boat-based contamination.

There are two parts to this initiative:

- Reducing litter and marine debris
- Reducing water pollution from catchment runoff.

1.1. REDUCING LITTER AND MARINE DEBRIS

How could this initiative help?

The objective of this initiative is to reduce litter and marine debris in the bioregion. The initiative supports the Premier's commitment to reduce the volume of litter in NSW by 40 per cent by 2020. The initiative proposes an extension to the successful 'Hey Tossler!', 'Tangler Bin', recreational fishing and boating environmental education programs and NSW Environment Protection Authority's Litter Prevention Strategy to focus on marine litter and debris. The initiative includes:

- collecting data to understand the sources of marine debris and litter and their impacts
- targeted grant funding to install trash catching racks on stormwater infrastructure

INITIATIVE 1 Improving water quality and reducing marine litter

- integration of water sensitive urban design into coastal developments
- encouraging awareness and behavioural change through education campaigns focusing on reducing litter and sources of plastic marine debris
- encouraging and supporting community initiatives such as litter collection and citizen science programs
- exploring opportunities:
 - to support research into the feasibility of removing micro-plastics from the bioregion
 - for a behaviour change campaign to prevent the impacts of micro-plastics on marine biodiversity in the bioregion
 - to work with industry and other agencies to further research impacts of micro-plastics on wildlife
- expanding the 'Tangler Bin' program to reduce fishing debris at popular coastal fishing spots in the bioregion
- educating recreational fishers and boaters on the importance of disposing bait bags, fishing tackle and waste appropriately—by expanding the existing coastal Local Land Services recreational fishing and boating environmental education program.
- developing guidance on suitable management targets that are based on the likelihood and magnitude of ecological effects; the Illawarra Regional Growth Strategy is a good example that can be used as a starting point
- ensuring water quality is addressed in State, Regional and Local Plans under the new Strategic Planning Framework
- updating the NSW Government's *Best-Practice Management of Water Supply and Sewerage Framework* (published in 2007) to include water sensitive urban design requirements
- developing an urban stormwater management framework to help managers assess the likelihood of poor environmental outcomes and where the greatest benefit would arise from stormwater treatment
- reviewing pollution sources (including land management practices) that lead to diffuse water pollution, then assessing and implementing management works that will be of greatest benefit, for least cost
- researching ways to more efficiently identify the risks posed by pollutants as they are transported downstream to estuaries and then coastal waters
- supporting extension and delivery of best-practice farm management to reduce nutrient and chemical runoff and acid and deoxygenated water discharges
- researching the value of and options for capturing and reusing stormwater from catchment runoff
- engaging with local councils on best practice urban stormwater measures
- finalising the review and implementation of the recommendations of:
 - the NSW Diffuse Source Water Pollution Strategy
 - the Lower Hawkesbury Nutrient Management Strategy.

1.2. REDUCING WATER POLLUTION FROM CATCHMENT RUNOFF

How could this initiative help?

The objective of this initiative is to reduce land-based water pollution from catchment runoff in the bioregion. Relevant environmental stressors include impacts from nutrient enrichment, agricultural chemicals, land management, salts, groundwater pollution, micro-plastics, and boat-based contamination.

The initiative proposes a set of actions to improve water quality, including:

- raising awareness through community feedback mechanisms (e.g. report cards) for all estuaries and coastal marine bioregions

INITIATIVE 2

On-ground works for healthy coastal habitats and wildlife



What are the community benefits associated with healthy coastal habitats and wildlife?

Healthy coastal habitats and wildlife assemblages are valued for their biodiversity values and because they underpin the many uses and activities that generate social and economic benefits from the marine estate.

Uses and activities that are highly dependent on healthy coastal habitats and wildlife include:

- recreational, commercial and cultural fishing
- aquaculture
- research and education
- commercial boating and charters
- conservation of environment and heritage.

Other uses and activities that are somewhat dependent or enhanced by healthy coastal habitats and wildlife include:

- recreational activities, e.g. scuba diving, snorkelling
- recreational boating
- tourism and accommodation.

These benefits were identified through community engagement and the TARA.

What are the priority threats and stressors?

THREATS/ACTIVITIES	STRESSORS
<ul style="list-style-type: none">• Clearing, dredging and excavation activities• Recreation and tourism• Foreshore development• Estuary opening/modified freshwater flows• Impacts on cultural heritage and use.	<ul style="list-style-type: none">• Changes in flow patterns• Barriers to fish passage• Physical disturbance• Sediment re-suspension /disturbance• Harvesting/loss biomass• Boat wildlife interactions• Entanglements and ingestion.

There are three parts to this initiative:

- rehabilitation works
- urban mangrove management policy
- marine wildlife incident planning and guideline implementation.

2.1 REHABILITATION WORKS

How could this initiative help?

The objective of this initiative is to deal with 'legacy' impacts on coastal habitats, including wetlands, by repairing or rehabilitating affected environmental assets. Habitat rehabilitation provides an opportunity for government, community and developers to recover lost or degraded habitats, increase productivity and improve water quality in the bioregion, and it is an opportunity the NSW community identified as being important in the **Marine Estate Community Survey**. Restoring stream connectivity, improving water quality and rehabilitating aquatic habitats can enhance aquatic biodiversity as well as improve social and economic benefits in the bioregion.

INITIATIVE 2 On-ground works for healthy coastal habitats and wildlife

The initiative includes:

- rehabilitating tidal coastal wetlands by opening floodgates in non-flood periods to allow tidal inundation and fish passage and other rehabilitation and protection activities
- identifying development offset sites for the rehabilitation of coastal wetlands in the bioregion using methodology being developed as part of the NSW Government biodiversity reforms
- providing grants to improve aquatic biodiversity and stimulate community involvement in marine estate habitat rehabilitation projects such as:
 - modifying high priority instream barriers to provide fish passage (e.g. floodgates, road crossings and weirs)
 - restoring oyster reef habitat to improve aquatic biodiversity and environmental services such as water filtering
 - improving management and condition of eroding river banks and riparian vegetation through stock management, revegetation and weed control
 - re-establishing crayweed (*Phyllospora comosa*) at whole-of-reef scales at several localities in the vicinity of Sydney after the loss of this species in the 1970s and 1980s
- undertaking 'green engineering' projects to ensure coastal development such as seawalls, jetties, marinas and other infrastructure is environmentally friendly.

2.2 URBAN MANGROVE MANAGEMENT POLICY

How could this initiative help?

The objective of this initiative is to develop a policy that provides a balance between maintaining public safety, amenity and waterway views and the environmental benefits provided by mangrove habitats.

Mangroves provide important habitat for fish, crabs, birds and other animals. Mangrove trees provide large amounts of organic matter, which is eaten by many small aquatic animals. In turn, these animals provide food for larger fish and other animals. Mangroves also help maintain water quality by filtering silt from runoff and recycling nutrients, and they play a vital role in protecting foreshores from storm surges and wind and wave conditions.

In some areas, there has been a historical decline of mangroves due to clearing or reclamation and changes in water flow from waterfront developments. Mangroves are sometimes illegally removed to maintain or improve water views or private access to waterways.

In other areas, mangrove communities are expanding due to the build-up of sediments from catchment clearing, development and stormwater runoff. The expansion of mangroves can affect other environmental assets, such as endangered saltmarsh communities, and create maintenance problems for essential public infrastructure such as stormwater systems and boating facilities.

Mangroves are protected under the *Fisheries Management Act 1994*. Their protected status can sometimes create a regulatory burden for land managers and increases red tape for the public authorities that are responsible for maintaining essential public infrastructure.

INITIATIVE 2 On-ground works for healthy coastal habitats and wildlife

The urban mangrove management policy aims to address issues relating to the clearing and trimming of mangroves for foreshore and urban development and maintenance of public infrastructure.

The policy aims to allow foreshore property owners and managers to:

- selectively trim or remove fringing mangrove trees, where there is a public benefit, under a maintenance permit or code of practice; the aim is to protect and retain valuable mangrove habitats while reducing red tape
- ensure their management of mangroves is in compliance with NSW State laws
- lawfully trim mangroves in urban areas to retain or regain access to, and views of, waterways.

2.3 MARINE WILDLIFE INCIDENT PLANNING AND GUIDELINE IMPLEMENTATION

How could this initiative help?

The objective of this initiative is to reduce unacceptable marine wildlife disturbance in the bioregion. Marine wildlife incident planning and the implementation of planning guidelines, such as those adopted by the International Maritime Organisation, provides the strategic framework to evaluate wildlife populations along the NSW coast. It aims to identify and map important sites for marine fauna and identify those species that are sensitive to disturbance. Clearly identifying these species and sites will significantly reduce the possibility of disturbance from maritime operations and marine pollution responses, providing alternative operational and response options.

There is an increasing likelihood of collisions, near-misses, alarm caused by noise and activity and damage due to wash resulting from interactions between boats (large and small) or vehicles with wildlife.

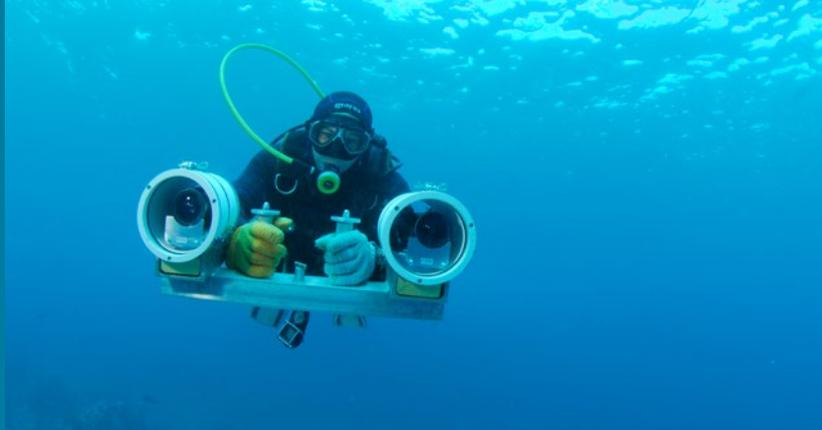
Concern arises when these interactions occur with iconic protected or endangered species like whales, seals, penguins, seabirds, shorebirds and turtles.

Aspects of the initiative include:

- improving voluntary reporting of interactions with marine animals by large and small commercial vessel operators and zoos, aquariums and wildlife rescue organisations. This will improve our understanding of the frequency, circumstances and locations of interactions to inform the ongoing management of the impact of interactions
- establishing a program to monitor whale sightings by mariners
- expanding access to the NSW Office of Environment and Heritage's 'Elements' database so that members of the community, industry and other agencies can anonymously enter information on vessel strikes on wildlife
- educating recreational fishers and boaters on ways to improve habitat protection to minimise the spread of marine pests and promote reporting of wildlife interactions.
- developing incident action plans for unacceptable wildlife interactions with cetaceans (whales and dolphins) in key areas of the bioregion
- improving awareness of existing vessel and aircraft approach distance guidelines with respect to marine mammals.

INITIATIVE 3

Marine research to address shipping and fishing knowledge gaps



What are the community benefits associated with shipping and fishing?

Ports and shipping deliver major economic benefits to the NSW community. Port Jackson, Port Botany, Port Kembla and the Port of Newcastle are located in the bioregion and account for over 170 million tonnes total annual throughput, increasing on average by approximately 9 per cent each year (Vanderkooi Consulting, 2015). The value of goods imported and exported through NSW ports was \$54.1 billion and \$32 billion respectively in the 2012–13 fiscal year. Ports in the bioregion contribute almost all of the \$6.5 billion ports' contribution to the NSW economy; this is 1.3 per cent of NSW gross domestic product (Vanderkooi Consulting, 2015).

Recreational and commercial fisheries bring a range of social and economic benefits to the community. For recreational fishing, these benefits include enjoyment, wellbeing, relaxation, socialising, and consumption of catch; in NSW, over 800,000 recreational fishers enjoy these benefits each year. Recreational fishing accounts for approximately \$1.5 billion in direct expenditure and \$3.5 billion of economic output to the NSW economy annually, and much of this is derived from within the Hawkesbury Shelf bioregion (Vanderkooi Consulting, 2015).

Commercial fisheries provide many of the same benefits as recreational fisheries, but commercial fishers also derive direct economic benefits associated with business viability, employment and value of production that contribute to regional and NSW economies. The value of the NSW wild fisheries catch is approximately \$80 million annually, but only some of this comes from the bioregion (Vanderkooi Consulting, 2015).

What are the priority threats and stressors?

THREATS/ACTIVITIES	STRESSORS
<ul style="list-style-type: none">• Urban stormwater discharge• Clearing, dredging and excavation activities• Shipping• Foreshore development• Climate change• Lack of funding and support.	<ul style="list-style-type: none">• Marine debris/litter• Foreshore development• Wildlife disturbance• Physical disturbance• Government funding.

Shipping and commercial vessels generate a high risk to parts of the sea bed, due to anchor and chain damage, and to marine wildlife due to noise and disturbance near major anchorages. Most ships anchor outside State waters—more than three nautical miles from the coastline—but anchor chains can drag inside State waters and damage deep reefs and soft sediments. Commercial fishers in the bioregion have raised concerns about the impacts of the anchorages off Newcastle and Port Kembla on marine habitats, the degradation of fishing grounds from physical disturbance, litter and debris, and restrictions on access to trawl and trap and line fishing grounds in State and Commonwealth waters. There is generally a lack of evidence about the impacts of shipping and no information on sediment re-suspension from vessels moving into and out of major ports within the bioregion.

Fishing presents risks to threatened and protected marine mammals, reptiles and birds in both estuarine and marine waters: the TARA indicated that the risk to wildlife was moderate for commercial fishing and

INITIATIVE 3 Marine research to address shipping and fishing knowledge gaps

high for recreational fishing. The source of these risks can include activities such as incidental or accidental bycatch of threatened and protected species and marine reptiles drowning in crab traps. The risks associated with these activities were assessed as decreasing over time, but the extent of interactions is not fully understood, and the level of confidence in the evidence base for recreational fishing was low, relying on inference. This indicates a knowledge gap.

How could this initiative help?

The objective of this initiative is to better understand aspects of shipping, and commercial and recreational fisheries that generate moderate and high risks.

Components of the initiative include research:

- into the impact of anchoring activities on deep water habitats and wildlife disturbance from noise in the two main offshore anchorages
- into sediment re-suspension and associated impacts on environmental assets in the lower Hunter in the south arm swing basin where vessels turn
- to quantify interactions between recreational and commercial fishing activities and threatened and protected marine mammals, reptiles and birds in both estuarine and marine waters
- into the effectiveness of novel mitigation measures and technologies aimed at reducing by-catch or non-target mortality in marine wildlife from both commercial and recreational fisheries.

This initiative aims to improve our knowledge of how specific stressors from these activities affect marine species, and which species are most affected. This would allow a more informed determination of the risks to threatened and protected marine species, and allow measures to be developed to reduce impacts.



INITIATIVE 4

Spatial management for biodiversity conservation and use sharing



What are the community benefits associated with biodiversity?

The NSW community values protection of the marine estate, with 82 per cent of respondents to the **Marine Estate Community Survey** indicating the importance of maintaining the abundance and diversity of marine life in the marine estate.

Thriving habitats and the diverse and unique ecology of the marine estate are seen as key drivers of economic outcomes in NSW; particularly for tourism. Commercial and recreational fishers recognise the need to conserve marine life so that future generations are able to appreciate the marine estate as they have. People also want to know that the marine estate is there to enjoy both now and in the future, even if they do not visit it regularly. In this way, the marine estate provides intrinsic, bequest and existence values to the NSW community.

The Survey also found that the natural beauty of the marine estate is a major reason for people wanting to live on or near the coast of NSW.

Other social benefits of coastal and marine conservation identified via the Survey are:

- protection of the coastal and marine environment
- protection of marine biodiversity
- passive recreational activities, such as swimming, snorkelling, diving, kayaking and nature appreciation away from other incompatible activities, such as power boating, fishing, foreshore development.

Conserving the environment and biodiversity assists in maximising community benefits associated with recreation, recreational fishing, recreational boating, cruise shipping, commercial and charter boating, coastal urban settlement, tourism and accommodation and retail and trade.

What are the priority threats and stressors?

THREATS/ACTIVITIES	STRESSORS
<ul style="list-style-type: none">• Climate change• Recreation and tourism• Recreational boating and boating infrastructure• Estuary opening/ modified freshwater flows• Recreational fishing• Aquaculture• Charter activities• Resource-use conflict• Impacts on cultural heritage and use.	<ul style="list-style-type: none">• Climate change stressors• Physical disturbance• Wildlife disturbance• Reduction in abundance of harvested species/ loss biomass• Anti-social behaviour• Overcrowding.

How could this initiative help?

The objective of this initiative is to enhance the conservation of marine biodiversity through the use of spatial management to address key stressors identified through the TARA.

This initiative would involve one, or a combination, of the following options:

1. a network of targeted marine protected areas comprising sanctuary zones in existing aquatic reserves or additions and extensions to the existing system of aquatic reserves
2. a large-scale multi-use marine park similar to those that exist in other bioregions
3. spatial closures to address stressors from particular activities, such as closures to boating to provide refuge areas for marine mammals and reduce risks associated with vessel strike, or closures to certain fishing gear to reduce impacts on threatened and protected species.

INITIATIVE 4 Spatial management for biodiversity conservation and use sharing

Key stressors that may be effectively and efficiently mitigated through spatial management include reductions in abundance of harvested species, particularly reef and rocky shore invertebrates and sedentary fin-fish, other wildlife and physical disturbance. Spatial management may also improve resilience of habitats and species to the impacts of climate change such as sea level rise, acidification, temperature increase and other stressors.

Spatial management, such as separating activities, can help enhance biodiversity outcomes and resolve resource-use conflict, anti-social behaviour and overcrowding issues.

The ecological and other characteristics of the bioregion and the environmental, social and economic threats suggest that the use of spatial management mechanisms could best be achieved through a network of targeted marine protected areas. This preliminary view is based on the characteristics of the marine bioregion and the priority threats that have been identified through the TARA.

Pre-identified sites

The NSW Government requested the Authority investigate 15 sites in the bioregion where the community had requested increased protection. These sites are listed in Table 5 and mapped in Figure 4.



INITIATIVE 4 Spatial management for biodiversity conservation and use sharing

Table 5. The 15 pre-identified sites considered as part of the Assessment (Source: MEMA, 2015c).

Pre-identified site	Local Government Area	Current management	Size (ha)	Year marine protected area was declared
1. Bouddi National Park Marine Extension	Gosford City	Commercial & recreational fishing closure (no-take)	287	1971
2. Barrenjoey Head Aquatic Reserve	Pittwater	Aquatic reserve (partial-take)	25	2002
3. Narrabeen Head Aquatic Reserve	Pittwater	Aquatic reserve (partial-take)	7	2002
4. Long Reef Aquatic Reserve	Warringah	Aquatic reserve (partial-take)	72	1980
5. Cabbage Tree Bay Aquatic Reserve	Manly	Aquatic reserve (no-take)	17	2002
6. North Harbour Aquatic Reserve	Manly, Mosman Municipal	Aquatic reserve (partial-take), intertidal protected area	261	1982
7. Bronte-Coogee Aquatic Reserve	Randwick City, Waverley	Aquatic reserve (partial-take), fishing closure for Blue Groper	42	2002
8. Cape Banks Aquatic Reserve	Randwick City	Aquatic reserve (partial-take)	23	2002
9. Towra Point Aquatic Reserve	Sutherland Shire	Aquatic reserve (partial-take & no-take zones)	1444	1987
10. Boat Harbour Aquatic Reserve	Sutherland Shire	Aquatic reserve (partial-take)	66	2002
11. Shiprock Aquatic Reserve	Sutherland Shire	Aquatic reserve (no-take)	2	1982
12. Wybung Head	Wyong Shire	No protection		
13. North Harbour Aquatic Extension (Manly Wharf and Cove)	Manly	Intertidal protected area, commercial fishing closure, critical habitat – little penguins		
14. Chowder Bay	Mosman Municipal	Intertidal protected area, commercial fishing closure, spearfishing closure		
15. Magic Point, Malabar	Randwick	Critical habitat – Grey Nurse Shark		

INITIATIVE 4 Spatial management for biodiversity conservation and use sharing

Ten pre-identified sites are aquatic reserves protected under the *Marine Estate Management Act 2014* whilst one is a marine extension under the *National Parks and Wildlife Act 1974*. Four of these contain 'no-take' zones where collecting, destroying or interfering with all forms of marine life is prohibited. The remainder of the sites have either no protection for biodiversity (i.e. Wybung Head) or partial protection with a focus on marine invertebrate conservation and few restrictions on fin-fish harvesting (MEMA, 2015c).

What you have told us about the pre-identified sites so far

During 2015 the Authority developed a web-portal to seek feedback from the community on the values and benefits they derive from Hawkesbury Shelf marine bioregion, the perceived threats and opportunities to reduce threats and enhance biodiversity. You provided a [range of feedback on the pre-identified sites](#) from the community which highlighted that the majority of these sites are highly valued (MEMA, 2015a; MEMA, 2015c).

You told us:

- the sites provide opportunities for a range of social and economic benefits associated with conserving environment and heritage including participation, enjoyment, cultural heritage and use, and a range of direct and indirect economic values including ecotourism.
- some of the aquatic reserves are highly accessible and are relatively safe for water activities. For example, Cabbage Tree Bay and Bronte-Coogee aquatic reserves provide readily accessible high quality diving and snorkelling locations relative to pre-identified sites in remote areas (e.g. Boat Harbour and Barrenjoey Head) and have high nature tourism values.
- Magic Point is heavily used by dive operators due to the presence of Grey Nurse Sharks, and

Shiprock Aquatic Reserve is also an important site for dive operators due to its biodiversity values.

- Long Reef, Narrabeen and Cabbage Tree Bay aquatic reserves and Manly Cove intertidal protected area are focal sites for school and community education programs run by council environment centres and private companies. Several conservation-focused community groups (e.g. Friends of Cabbage Tree Bay, Reefcare Long Reef and Manly Penguin Wardens) foster stewardship of these sites.

These sites have been the focus of internationally recognised scientific research (e.g. Cape Banks Aquatic Reserve and Magic Point). Aquatic reserves and Bouddi National Park marine extension have been used as scientific reference sites to provide insight into the impact of harvesting on abundance, size and diversity of marine organisms, by way of comparisons with unprotected areas. These research and education opportunities are not available in the absence of marine protected areas, and are a key social and economic benefit of marine protected areas.

The key threats to the environmental benefits of these 15 sites include:

- illegal fishing and hand gathering—including use of illegal gear, harvesting of under-sized and protected species and exceeding bag limits, lack of compliance resources, ineffective communication of rules and lack of understanding/inconsistent application of the rules at different sites
- legal fishing and hand gathering—which contributes marine debris that can impact on biodiversity and aesthetic values and affects other recreational values such as snorkelling and scuba diving
- recreation and boating, education activities and tourism—resulting in wildlife and physical disturbance and litter/marine debris where activities are intense (e.g. Cabbage Tree Bay, Long Reef) and reduction in the natural beauty of the marine estate

INITIATIVE 4 Spatial management for biodiversity conservation and use sharing

- land-based impacts (coastal development, stormwater runoff, reclamation, lack of compliance)—can contribute to water pollution, marine debris/litter, micro-plastics and altered habitats
- shark meshing—as a potential threat to marine biodiversity from the capture of non-target marine species.
- is not **adequate**, due to the small size of reserves (individually and in total area), the small number of no-take reserves, the boundaries of the reserves, which often cut across continuous habitat features, the compliance challenges caused by complex rules and resourcing, and potential impacts of external threats.
- is not **representative**, as it does not include examples of coastal lakes, deep rocky reefs, deep sandy seabed, and it includes only small areas of habitats such as shallow rocky reefs, rocky shores, estuarine reefs and some seagrass species.

Another 44 sites were also identified through the web-portal. These sites are being further evaluated as part of the spatial management initiative for potential addition to a network of targeted marine protected areas (Figure 4).

How adequate is their level of protection?

The Assessment reviewed the current system of aquatic reserves and the marine components of national parks in the Hawkesbury Shelf marine bioregion against internationally recognised conservation planning principles of **comprehensiveness, adequacy and representativeness** (CAR principles). It found that the current system:

- is not **comprehensive**, with only one per cent of the bioregion represented in 10 aquatic reserves and the Bouddi National Park marine extension

CAR principles will help inform government decision making about spatial management initiatives. They provide context about the effectiveness of the existing marine protected area network. Where social, economic or environmental risks are considered best managed by spatial management initiatives, the CAR principles will be considered in designing these initiatives. If the threat is most effectively dealt with by another management approach, additional spatial management will not necessarily be recommended simply to meet CAR principles. Further community consultation and engagement will be required before any proposals for marine protected areas or other types of spatial closures are adopted.





Figure 4. Hawkesbury Shelf marine bioregion, highlighting the 15 pre-identified sites and additional 44 sites nominated through the 2015 community and stakeholder engagement.

INITIATIVE 5

Improving boating infrastructure



What are the community benefits associated with recreational boating?

Recreational boating brings significant economic and social benefits to the NSW community. An estimated 1.8 million people go boating in the NSW marine estate each year (Vanderkooi Consulting, 2015). The social benefits of boating include health benefits of physical activity, enjoyment of being on the water, socialising with family and friends, excitement of activities such as boat and yacht racing and the opportunity to enjoy the beauty of the NSW marine estate. The economic benefits are also significant: approximately 13,000 people are employed in the boating industry in NSW and up to \$2 billion of direct revenue is generated and a further \$1.38 billion in indirect spending has been estimated for recreational boating activities, a large proportion of which is generated from this bioregion.

The benefits from recreational boating are reliant on adequate infrastructure such as boat launching ramps, navigation aids, access points, storage facilities, moorings, and marinas.

Marinas play an important role—many provide services to the general public (such as fuel, pump-out facilities, chandlery and boat repair), and they provide social benefits by offering community events, such as ‘try sailing’ days, as well as economic benefits. They contribute to the economy through purchasing products and services, employing staff, renting spaces to business tenants, engaging contractors, and paying lease payments and taxes. NSW marina operators invest in capital expenditure aimed at enhancing the quality and diversity of their facilities and services, to provide revenue-producing facilities or services, and additional boat storage capacity (e.g. berths/pens, moorings, dry stack or hard stand).

What are the priority threats and stressors?

THREATS/ACTIVITIES	STRESSORS
<ul style="list-style-type: none">• Effect of regulation• Access availability• Recreational boating and boating infrastructure.	<ul style="list-style-type: none">• Physical disturbance• Boat-based contamination• Limited access infrastructure• Over-regulation.

This suggested initiative aims to address the stressors of limited access infrastructure and over-regulation. The stressors of physical disturbance and boat-based contamination arising from recreational boating and boating infrastructure are currently being addressed by the response to the Moorings Review and NSW Boating Now programs (Table 3) and via the activities proposed in Initiatives 1 and 2.

There are two parts to this suggested initiative:

- boat storage strategies
- reducing red tape for low-risk boating infrastructure.

5.1. BOAT STORAGE STRATEGIES

How could this initiative help?

The objective of this initiative is to look at opportunities and constraints to meet increasing demand for boat storage in the bioregion.

Boat storage facilities are required for commercial and recreational boating activities in the bioregion, including public and private moorings and marinas.

The lack of availability of boat storage facilities can reduce the incentive for recreational boating, lessen the enjoyment of recreational boating and raise the cost of boat ownership. As found in the

INITIATIVE 5 Improving boating infrastructure

Sydney metropolitan area, the lack of boat storage facilities has resulted in an increase of boats stored on trailers in city streets and driveways, increasing congestion in some residential areas. Boat storage facilities allow recreational boating activities and the social benefits described above to be realised.

The need to take a more strategic approach to boat storage was identified as a key issue in several NSW waterway regions during a comprehensive stakeholder engagement program in 2014 to improve the NSW boating experience (Transport for NSW working with Roads and Maritime Services and DPI Crown Lands).

Councils in many of these regions, including Pittwater and Lake Macquarie, have indicated their willingness to work with Transport for NSW to develop boat storage strategies for their waterways, and to help plan for the best mix of boat storage options needed to cope with the forecast increase in the number of boats. In developing boat storage strategies, consideration will be given to piloting innovative approaches to on-water boat storage, including multiple-mooring systems and public marinas.

This work would build on the Sydney Harbour Boat Storage Strategy released by Transport for NSW in 2014, which seeks to identify the optimal mix of boat storage facilities required to meet the forecast demand in boat ownership in and around Sydney Harbour over the next decade.

LAKE MACQUARIE BOAT STORAGE STRATEGY

Transport for NSW has started the Lake Macquarie Boat Storage Strategy in consultation with Roads and Maritime Service, Lake Macquarie City Council and Wyong Shire Council. The Strategy will estimate the shortfall in boat storage over the next 5, 10 and 25 years for each category of boat storage, taking into account:

- environmental impacts of boat storage, including environmentally friendly moorings to minimise physical damage to seagrass
- the need to maximise open water recreational space
- possible efficiency improvements to existing storage
- opportunities to trial alternate mooring systems
- current restrictions on boat storage
- improved management of dinghy storage.

PITTWATER BOAT STORAGE STRATEGY

Transport for NSW and Roads and Maritime Services will be involved as key stakeholders in Pittwater Council's Pittwater Waterway Review – Our Waterway's Future. The purpose of the review is to identify the major issues, challenges and opportunities that affect Pittwater waterway, including planning for the best way to respond to growing demand for boat storage.

BOTANY BAY BOAT STORAGE STRATEGY

Transport for NSW and Roads and Maritime Services is also intending to develop a Boat Storage Strategy for the Botany Bay, Georges River and Port Hacking region. As for the boat storage strategies in Lake Macquarie and Pittwater, the boat storage strategy examines options to enhance boat storage to meet future demand while minimising the environmental impact of boat storage infrastructure.

INITIATIVE 5 Improving boating infrastructure

5.2. REDUCING RED TAPE FOR LOW-RISK BOATING INFRASTRUCTURE

How could this initiative help?

The objective of this initiative is to reduce red tape for boating infrastructure in the marine estate. The stressors it aims to address include limited access to land-water interface infrastructure and inefficient or over regulation.

The initiative proposes to use Transport for NSW's current Joint Expert Maritime Working Group—which has representatives from the boating and maritime industries and relevant NSW Government agencies—to identify, prioritise and implement

streamlining initiatives for the assessment and approval of new boating and water-based development. There are opportunities for exempt and complying development provisions to be made for low-risk water-based development and activities, as well as opportunities to streamline assessment and approval pathways for boating infrastructure generally.

The NSW Department of Planning and Environment is also engaging with the Joint Expert Maritime Working Group about the review of the *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005* which can assist with streamlining low-risk boating infrastructure approval processes.



INITIATIVE 6

Reducing user conflicts in Pittwater



What are the community benefits associated with Pittwater?

As for many other areas in the marine estate, Pittwater estuary at the mouth of the Hawkesbury River provides a variety of community benefits. The waters of Pittwater support marine biodiversity, and the natural beauty of the waterway provides enjoyment for residents and visitors alike. The natural beauty and views of Pittwater provide great scenic amenity and add value to residential properties. Recreational fishing, leisure boating, charter boats, kayaking, sailing and swimming are all popular activities in Pittwater. The estuary provides a place for people and communities to socialise and lead an active, healthy lifestyle.

Economic benefits include providing income for locals through industries such as tourism and support services associated with boating and recreational fishing. Pittwater is a focal point for boating and recreational fishing and currently supports commercial fishing activities as part of the Estuary General fishery.

What are the priority threats and stressors?

THREATS/ACTIVITIES	STRESSORS
<ul style="list-style-type: none">Resource-use conflict.	<ul style="list-style-type: none">Equitable resource sharing issuesOvercrowding/congestion.

There is evidence of social conflict between commercial fishing and other groups in Pittwater, such as a community petition to have commercial fishing banned in Pittwater and ongoing opposition to commercial fishing in the Pittwater estuary from a range of recreational fishing groups. Resource-use conflict presents a high risk to the social benefits associated with participation, enjoyment, and cultural heritage and use, and a high risk to the economic benefits associated with intrinsic and bequest values. Resource-use conflict also presents a moderate risk to direct economic values.

How could this initiative help?

The objective of this initiative is to reduce resource-use conflict between commercial fishing and other user groups in Pittwater.

Commercial fishing contributes to local seafood supply, and commercial fishers have existing use rights to operate in NSW waters including Pittwater. Management controls such as closures to netting on weekends at popular recreational areas such as Coasters Retreat and The Basin have been implemented to reduce resource-use conflict, but there are still community concerns about the continuation of commercial fishing in Pittwater.

Under this initiative options and sources of local funding or market-based mechanisms will be explored to buy-out or compensate commercial fishers for any negotiated loss of access rights. Market mechanisms could include, for example, one-off payments or annual stewardship payments to avoid fishing in certain areas at certain times of the year amongst other options.

INITIATIVE 7

Improving accessibility



What are the community benefits associated with access?

Improving access infrastructure, including for people with disabilities, was identified through the **Marine Estate Community Survey** and Hawkesbury Shelf community and stakeholder engagement as an important social opportunity. Without easy and unhindered access to the marine estate, many people in NSW feel that their deeper connection to the marine estate is under threat. This not only underpins the need for up-to-date and reliable infrastructure access, but also the need to provide safe marine areas.

Access is also of paramount importance to the Aboriginal community, given their spiritual and cultural link to the marine estate, as well as it being a source of food (Feary, 2015).

What are the priority threats and stressors?

THREATS/ACTIVITIES	STRESSORS
<ul style="list-style-type: none">Access availability.	<ul style="list-style-type: none">Limited access infrastructureOver-regulation.

Many access issues such as boating infrastructure, coastal land use planning and spatial management that provide for use sharing and access to the marine estate are dealt with in other suggested initiatives in this discussion paper. The TARA identified that disabled access to several islands in the bioregion and Sydney Harbour was limited as a result of insufficient infrastructure, and this is a primary focus of this initiative.

The TARA also identified that land ownership and restrictions on access to camping and collecting

places where social events occur can impact contemporary Aboriginal culture. Some of these issues may be addressed through the statewide Marine Estate Management Strategy (currently under development) and other processes such as the Crown Lands Review and Aboriginal Cultural Fishing Regulation but the opportunity to further address access issues for Aboriginal cultural purposes also exists through this Assessment.

How could this initiative help?

The objective of this initiative is to identify and address opportunities to improve access availability in the bioregion. The stressors it aims to address are limited access infrastructure and over-regulation.

There are two parts to this initiative:

- assessment of existing public disabled access
- further engaging with Aboriginal communities on access for cultural purposes.

7.1 ASSESSMENT OF EXISTING PUBLIC DISABLED ACCESS

How could this initiative help?

The initiative would involve an assessment of existing public disabled access to islands in the bioregion. Discussions with councils and relevant stakeholder groups would aim to identify opportunities to improve access and prioritise locations for consideration via existing funding programs (e.g. Boating Now, Recreational Fishing Trust and via Family and Community Services). This includes an assessment of land-side infrastructure that connects to wharves (e.g. footpaths, steps, ablation blocks etc.) that also need to be accessible.

INITIATIVE 7 Improving accessibility

7.2 FURTHER ENGAGING WITH ABORIGINAL COMMUNITIES ON ACCESS FOR CULTURAL PURPOSES

How could this initiative help?

The suggested initiative would involve further engagement with Aboriginal communities to identify issues and options to address access issues to the marine estate for cultural purposes. This includes engagement to maximise opportunities for Aboriginal

communities' access to the marine estate, and to ensure that the implementation of other initiatives outlined in the discussion paper will not detrimentally impact access for Aboriginal cultural purposes.



INITIATIVE 8

Land use planning for coasts and waterways



What are the community benefits associated with our coasts and waterways?

The **Marine Estate Community Survey** and Hawkesbury Shelf engagement identified that the most important benefits provided by the marine estate to the NSW community are:

- clean waters supporting a unique and abundant marine life
- natural beauty and a safe place for people and communities to socialise and lead an active healthy lifestyle
- the income provided for locals through various industries, particularly tourism and seafood related industries.

The amenity, leisure and lifestyle options offered by coastal living make it an attractive place to live. Almost two thirds of the NSW population (7.5 million people) live in coastal local government areas along the edge of the bioregion.

What are the priority threats and stressors?

THREATS/ACTIVITIES	STRESSORS
<ul style="list-style-type: none">• Effect of regulation• Impacts on cultural heritage and use• Foreshore/urban development.	<ul style="list-style-type: none">• Over-regulation• Physical disturbance.

Many of these threats are addressed by other initiatives in this discussion paper or by existing legal frameworks, but effective land use planning is essential to guide future development so that community benefits are maximised over time. In addition to the current Coastal Reforms (Table 3), the three 'catchment based' State Environmental Planning Policies (SEPPs) relevant to the bioregion would be reviewed.

REVIEW OF STATE ENVIRONMENTAL PLANNING POLICIES

How could this initiative help?

The objective of this initiative is to update, streamline and enhance the SEPPs in NSW.

A number of SEPPs relate directly to the Hawkesbury Shelf marine bioregion, in particular:

- Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005
- Greater Metropolitan Regional Environmental Plan No 2—Georges River Catchment
- Sydney Regional Environmental Plan No 20—Hawkesbury-Nepean River.

These SEPPs set out planning principles which apply to the relevant catchments for Sydney Harbour, Georges River and the Hawkesbury–Nepean River.

The proposed review of the SEPPs would provide an opportunity to consider some of the threats to environmental assets and social and economic benefits identified in the TARA that are specific to those catchments within the bioregion. The NSW Department of Planning and Environment proposes to look for opportunities to reduce red tape as part of this review.

How are these initiatives addressing the priority environmental threats?

Table 4 outlines the suggested initiatives that aim to directly address the threats and the underlying stressors. Table 6 shows how all of the stressors generated by the priority threats may also benefit directly and indirectly from the initiatives.

Table 6. The stressors contributing to each ENVIRONMENTAL threat and how they may be addressed by the suggested management initiatives.

Stressor creating high or moderate risk	PRIORITY THREAT														SUGGESTED MANAGEMENT INITIATIVE									
	Shipping	Estuary opening/ modified freshwater flows	Urban stormwater discharge	Recreation & tourism	Recreational boating & boating infrastructure	Foreshore development	Agriculture diffuse source runoff	Point discharges	Recreational fishing	Climate change	Clearing, dredging & excavation activities	Commercial fishing	Aquaculture	Charter fishing	Other charter activities	Improving water quality & reducing litter	On-ground works for habitats & wildlife	Spatial management	Marine research	Improving boating infrastructure	Reducing user conflicts in Pittwater	Improving accessibility	Land use planning for coasts & waterways	
Altered flow patterns		●				●											★							
Bank erosion	●				●	●				●							★							
Barriers to fish passage		●															★							
Climate change stressors									●									★						
Groundwater pollution							●	●								★	★							
Harvesting/ loss of biomass										●							★	★						
Marine debris/ litter			●	●						●					●	★	★	★						
Micro-plastics			●					●								★								
Physical disturbance	●	●		●	●	●		●	●	●	●	●	●	●	●		★	★	★	★			★	
By-catch				●						●				●										
Sediment resuspension / disturbance											●						★							
Shading e.g. marine vegetation					●								●				★		★					
Water pollution	●		●		●		●	●		●	●					★	★		★					
Wildlife disturbance	●			●	●	●			●	●		●		●			★	★	★					

How are these initiatives addressing the priority threats to social and economic benefits?

Table 7 shows the stressors associated with the priority threats to social and economic benefits and how they could be addressed by the eight suggested management initiatives.

Table 7. The stressors contributing to each SOCIAL AND ECONOMIC threat and how they can be addressed by the suggested management initiatives.

Stressor creating high or moderate risk	PRIORITY THREAT/ACTIVITY				SUGGESTED MANAGEMENT INITIATIVE								
	Lack of access availability	Effect of regulation	Resource use conflict	Lack of funding & support for research	Impacts on cultural heritage & use	Improving water quality & reducing litter	On-ground works for habitats & wildlife	Spatial management	Marine research	Improving boating infrastructure	Reducing user conflicts in Pittwater	Improving accessibility	Land use planning for coasts & waterways
Anti-social behaviour, overcrowding			●					★		★	★		
Change in government funding priorities for research				●				★					
Equity issues			●					★			★	★	★
General lack of infrastructure	●									★		★	
Inefficient regulation		●				★	★	★					★
Limited access infrastructure	●									★		★	★
Marine protected areas & closures	●							★			★	★	
Over regulation		●								★		★	★
Physical disturbance					●	★	★	★	★	★			★
Resource use conflict					●			★			★	★	
Theft			●					★					
Under regulation (inadequate)		●				★	★	★		★			★





Discussion paper: Hawkesbury Shelf marine bioregion assessment

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The NSW Marine Estate Management Authority is advised by the Marine Estate Expert Knowledge Panel. The Authority was established by the NSW Government in 2013 to advise on policies, priorities and directions for the NSW marine estate.

The NSW marine estate includes marine waters, estuaries and the coast from the Queensland border in the north to the Victorian border in the south. It extends seaward out to three nautical miles. The full definition and map can be found at www.marine.nsw.gov.au.

This discussion paper, background reports and a glossary of key terms are also available at www.marine.nsw.gov.au.

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