Seaweed aquaculture governance in Australia

A review of state and Northern Territory seaweed aquaculture policy

by Jo Kelly and Professor Catriona Macleod
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AgriFutures® Emerging Industries

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Foreword

Australia has the potential to create a $1.5 billion seaweed industry over coming decades. Seaweed farming could contribute significantly to Australia's sustainable development agenda, but this can only be realised with appropriate regulation and management. The *Australian Seaweed Industry Blueprint* shows that as the seaweed industry develops, policy will need to evolve to ensure the regulatory framework enables the anticipated growth.

This project was initiated to gain a comprehensive understanding of the various governance and policy structures for marine seaweed aquaculture around Australia, and to provide a resource for industry to navigate aquaculture legislation and approval processes in each state and the Northern Territory.

The report provides commentary from an industry perspective on the strengths and gaps in seaweed aquaculture governance nationally, and details recommendations on development needs. Recommendations include the development of national policy on seaweed aquaculture in marine water, and support for wild and aquaculture seedstock supply via a national seaweed hatchery network. The report also highlights the importance of a science-based, adaptive policy approach.

This project was completed as part of the AgriFutures Australia Emerging Industries Program, which focuses on new industries with high growth potential. Emerging animal, plant and aquatic industries play an important role in the Australian primary industries landscape. They contribute to the national economy and are key to meeting changing global agricultural product demands. Most of AgriFutures Australia's publications are available for free download or purchase online at www.agrifutures.com.au

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In addition, we acknowledge the input of many others in various government agencies across the country who helped direct us to appropriate legislation and policy structures in each state, and provided comments on early drafts.

Abbreviations

AFMF	Australian Fisheries Management Forum
DITT	Department of Industry, Tourism and Trade (Northern Territory)
DPIRD	Department of Primary Industries and Regional Development (Western Australia)
NRE	Department of Natural Resources and Environment (Tasmania)
PIRSA	Department of Primary Industries and Regions South Australia
QDAF	Queensland Department of Agriculture and Fisheries
SDG	Sustainable Development Goal
SWG	Seaweed Working Group
UN	United Nations
UTAS	University of Tasmania
VFA	Victorian Fisheries Authority

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Purpose of the report

This project was initiated to address a key recommendation from the *Australian Seaweed Industry Blueprint* (Kelly, 2020) to provide a comprehensive understanding of the various governance and policy structures for marine seaweed aquaculture around Australia.

The report documents the state of seaweed aquaculture governance in Australia as at November 2022 and provides a resource for industry to navigate aquaculture legislation and approval processes in each state. As seaweed aquaculture is an emerging industry, so too are the governance arrangements. Thus, industry participants are advised to check agency websites and directly contact relevant state/territory government departments for the most up-to-date information. Specifically, a review of management arrangements for seaweed aquaculture and harvest was underway in Victoria at the time of writing and Western Australia was anticipating proclamation of a new *Aquatic Resources Management Act 2016*.

Based on the outcomes of a national review, the report provides commentary from an industry perspective on issues and gaps in seaweed aquaculture governance nationally, and details recommendations on development needs.

Introduction

This report outlines how seaweed aquaculture is currently managed in Tasmania, South Australia (SA), Victoria, New South Wales (NSW), Queensland, Western Australia (WA) and the Northern Territory, with a view to identifying both common governance approaches for seaweed marine aquaculture and potential opportunities for improvement.

The report provides clear information on how seaweed aquaculture is managed in each Australian state and the Norther Territory (see Appendices) in terms of the strategic policy context and specific legislation, particularly what the leasing and licensing process is and what institutional arrangements exist. This information was used to identify optimal practices in Australia and to suggest where governance could evolve to better support industry development.

It should be noted that governance approaches are evolving in some jurisdictions to support the emerging seaweed industry; for example, Victoria was undertaking a review at the time of writing.

Background: Marine seaweed aquaculture

Seaweed is considered 'extensive aquaculture', meaning that nothing is added to the crop in the marine environment and there is no high-nutrient waste produced. Seaweed is typically grown on longlines or submerged lines or frames. It is similar to oyster and mussel aquaculture, and differs from 'intensive aquaculture', which requires feed and produces significant amounts of high-nutrient waste. Seaweed is commonly recognised in research as providing significant nutrient mitigation and other ecosystem services, and can increase the resilience of marine ecosystems (Barrett *et al*., 2021; Chopin, 2014; Clements and Chopin, 2017; Park *et al*., 2021; Troell *et al*., 2022). It is widely accepted that extensive aquaculture of native species has substantially lower ecological risks and potential impacts compared with intensive aquaculture (Barrett *et al*., 2021; Clark *et al*., 2021; Great Barrier Reef Marine Park Authority, 2004a).

Further, the Australia Government's *Powering Australia* plan, commitment to the *Global Methane Pledge* and presence on the *High Level Panel for a Sustainable Ocean Economy* highlight the opportunity for seaweed aquaculture to support more sustainable food production, reduce livestock emissions and positively impact the ocean.

A recent review of expert perceptions of seaweed aquaculture in Australia demonstrated how important the industry could be in helping address several global United Nations Sustainable Development Goals (SDGs) (Spillias *et al*., 2022). The study found seaweed farming could help address SDGs 2 (Zero Hunger), 8 (Decent Work and Economic Growth), 9 (Industry, Innovation, and Infrastructure), 12 (Sustainable Production and Consumption) and 15 (Life on Land), and could play a significant role in addressing SDG 14 (Life Below Water) if clear management and governance leadership could be established. Spillias *et al.* (2022) noted the potential for seaweed farming to contribute significantly to Australia's sustainable development agenda exists, but can only be realised with consistent and appropriate regulation and management that support industry development and prevent negative outcomes.

Research methodology

This was a qualitative desktop review, supported by in-person discussions with relevant policy officers, of the various governance aspects (permitting, regulation and policy) relating to seaweed aquaculture in seven Australian jurisdictions. The *Australian Seaweed Industry Blueprint* (Kelly, 2020) framed the key gaps and barriers to industry growth, and this was used as the context to assess governance frameworks in each jurisdiction. Similarly, the *National Aquaculture Strategy* provides an understanding on gaps in governance from a broader aquaculture perspective, and this was also used to assess governance frameworks.

Documented management frameworks were defined as including legislation, policy statements, planning documents and any other policy or management-related documents identified by the jurisdiction as relevant to the management of seaweed aquaculture.

Materials for analysis were identified by an online internet search starting in each case with the relevant government websites and searching in three steps:

1. Reviewing summary government webpages for aquaculture and compiling policy and legislation mentioned.

2. Searching government webpages and compiling documents or information referencing marine seaweed aquaculture.

3. Compiling application, licensing and permitting materials, and listing agencies, policies, codes, or legislation mentioned as relevant for seaweed aquaculture.

This provided the basis to describe and map the management framework in each jurisdiction, and these were then validated with aquaculture regulatory agencies to ensure the most up-to-date materials had been gathered, all aspects of management were captured, and the resultant framework description was accurate.

The report also summarises what the seaweed industry believes are regulatory barriers to growth and provides recommendations from an industry perspective on how to develop a more nationally consistent governance framework. The result is a set of recommendations for how policy might be framed to be more nationally consistent and better support industry growth.

Seaweed industry development context

The Australian Government's *National Aquaculture Strategy* (NAS), published in 2017, identified the development potential of aquaculture for Australia. The strategy stated an aspiration at that time, to double the then-current value of Australia's aquaculture industry to $2 billion by 2027 (Department of Agriculture and Water Resources, 2017). The number one priority identified was the need to reduce regulatory burden by developing "an efficient, effective and supportive regulatory environment that reflects best practice" (Department of Agriculture and Water Resources, 2017).

There were eight priority focus areas identified in the NAS:

1. **Regulatory framework** – streamlining for efficiency
2. **Research, development and extension** – maximising benefits
3. **Market access** – supporting market development
4. **Biosecurity** – ensuring risks understood and appropriately managed
5. **Public perception** – improving understanding of aquaculture as a safe industry
6. **Environmental performance** – identifying opportunities to improve performance
7. **Investment** – encouraging responsible investment
8. **Training and education** – supporting workforce development at all levels.

All priority areas remain relevant and would be beneficial to the emerging seaweed aquaculture sector, which highlights the need to update the NAS and explicitly recognise the potential and needs of seaweed aquaculture.

With regards to priority 1, the development of an efficient regulatory framework, which is the focus of this study, the strategy proposed that various state and territory jurisdictions work together (through the Aquaculture Committee of the Australian Fisheries Management Forum) to discuss aquaculture regulation, with the aim of promoting best regulation and planning practice nationally. The NAS noted that designated aquaculture zones and regulatory consistency could achieve a more efficient and transparent regulatory framework for the aquaculture industry as a whole.

While seaweed aquaculture was identified within the strategy as a key area of potential growth, in 2017 the opportunity for seaweed was primarily associated with nutrient mitigation and integrated multi-trophic aquaculture; the full potential of seaweed had not yet been recognised. The more recent *National Fisheries Plan*, released in early 2022, strongly supports the priorities identified in the NAS, but also makes no specific mention of seaweed aquaculture or the potential of this sector (Department of Agriculture, Fisheries and Forestry, 2022a)

The *Australian Seaweed Industry Blueprint* (Kelly, 2020) provided much more detailed information about the opportunity associated with seaweed aquaculture. The Blueprint captured feedback from industry stakeholders and highlighted the key knowledge gaps and barriers to industry development; efficient, effective and supportive regulation remained a key development issue (Table 1).

Table 1. Knowledge gaps and barriers to growth of the seaweed industry (adapted from Kelly, 2020).

Barrier or gap	Implication	Proposed action
Seaweed is not embraced as a serious aquaculture industry in Australia	No representation in aquaculture, fisheries or seafood industry strategies at the federal level. Only South Australia has a specific seaweed in aquaculture strategy and policies.	Seaweed to be included in relevant federal and state government agriculture, aquaculture, biotechnology and advanced manufacturing development strategies. Seaweed sector to be recognised as a major contributor to the *National Aquaculture Strategy*. *While reference to seaweed in the NAS was limited, many of the principles proposed for aquaculture more broadly apply to the industry, and as such it is recommended that funding for these areas be extended to include seaweed.*
Difficult to obtain large-scale ocean lease areas in most state and Commonwealth waters	This is the major barrier to industry progression. Without space in which to cultivate seaweeds in the ocean, Australian production will never achieve the scale necessary to compete in foreign markets or meet growing domestic demand. Partnerships or integrated multi-trophic aquaculture (IMTA) projects with existing aquaculture leaseholders seems to be the optimal model to enter the market at this early stage of industry development.	Focus initial industry development in a few key states where ocean leases are already available, e.g. South Australia, Western Australia and Tasmania. Engage locally and regionally with existing aquaculture leaseholders, Indigenous groups and other industry groups, e.g. oyster industry. Work with other states and the Commonwealth on areas where seaweed ocean leases could be made available. *As noted above, cross-jurisdictional and broader engagement was a focus of the NAS, and as such it is recommended that funding for this area be extended to include seaweed.*
Regulation and licensing of seaweed aquaculture is complex, onerous and different in each state	Some states may have ocean leases available. However, because there are no commercial-scale operations as a precedent, or published standards for seaweed aquaculture operations in Australia, navigating the processes can be prohibitive for new entrants.	This will take time to resolve. Focus initial industry development on a few key states where demonstration farms can go ahead and where cultivation manuals can be developed for target species. Work with regulators in those jurisdictions to evolve policy and regulation, then expand to other states. *This was a key recommendation in the NAS and as such should be extended to include seaweed.*

The above factors are not dissimilar from those reported in other jurisdictions and relevant insights can be drawn from international examples of seaweed industry governance, particularly in emerging seaweed markets such as Europe, the USA, Canada and New Zealand, where there is recognition of the environmental, social and economic benefits of a seaweed industry. While it is not in the scope of this report to conduct an international policy review, key insights that are relevant to Australia are outlined below to provide important context for the findings and recommendations in this report.

A policy brief on the needs of the expanding global sustainable seaweed industry (Cottier-Cook *et al*., 2021) identified that clear seaweed-related policies and regulations to manage biosecurity issues and genetic diversity of wild populations are needed. Australia's focus on native species for cultivation is an important aspect here, however there are gaps in understanding of native species genetics, pests and diseases that urgently need addressing. The policy brief also highlights the need to develop disease-free seedbanks and nurseries to manage biosecurity from cultivated seaweeds.

A public consultation report on the European Union's *Blue Bioeconomy Roadmap* (Directorate-General for Maritime Affairs and Fisheries (EU), 2021) concluded a top priority to unlock industry development is improved regulatory and governance frameworks. Further, the consultation document highlighted the need for legal and policy frameworks at a national/regional levels that guide

sustainable production and harvesting at large scales. The expected outcome from a harmonisation and simplification of governance is less administrative burden.

The *Aotearoa New Zealand's Seaweed Sector Framework* (Sustainable Seas National Science Challenge, 2022) highlights there is an urgent need to enable marine-based seaweed aquaculture, particularly to open a pathway for commercially focused research/trials. An earlier report on the current regulatory framework (Bradly *et al*., 2021) found regulatory barriers to industry development exist and that a framework was needed that could accept some level of uncertainty of effects and adaptively manage as experience and knowledge develops.

Summary of seaweed aquaculture regulation and policy in Australia

Marine water aquaculture is regulated by state governments and the Northern Territory government within three nautical miles of the coastline. This management arrangement is defined by the *Offshore Constitutional Settlement* (OCS) and related legislation *Coastal Water (State Powers) Act 1980*, *Coastal Waters (State Title) Act 1980*, *Coastal Waters (Northern Territory Powers) Act 1980* and the *Coastal Waters (Northern Territory Title) Act 1980*) (Geoscience Australia, n.d.). The exception to this is in Tasmania, where the Australian and Tasmanian governments signed an agreement under Section 72 of the *Fisheries Management Act 1991* that provides the legal framework for offshore aquaculture research to be undertaken in the Commonwealth waters in Bass Strait (Department of Agriculture, Fisheries and Forestry, 2022b). Beyond this, the Australian Government has responsibility for Commonwealth waters. In the case of the Great Barrier Reef Marine Park, the Great Barrier Reef Marine Park Authority is the regulatory authority.

The Department of Climate Change, Energy, the Environment and Water also has a regulatory role under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBCA) if the aquaculture project is likely to significantly affect a matter of national environmental significance (Department of Agriculture and Water Resources, 2017). The EPBCA Policy Statement: Offshore Aquaculture provides guidance for self-assessment of the likelihood and significance of impacts, and specifically refers to line aquaculture of seaweeds. Matters of national environmental significance protected under the EPBCA are:

- World Heritage properties
- National Heritage places
- Ramsar wetlands of international importance
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- The Commonwealth marine environment
- Nuclear actions.

The full review of the current legislation and policy framework for seaweed aquaculture in each of the seven jurisdictions is contained in the Appendices. Table 2 contains a summary of the key governance elements for comparison across jurisdictions and is current as at November 2022.

Table 2. State-based comparison of governance for seaweed aquaculture development in Australia.

	Queensland	New South Wales	Victoria	Tasmania	South Australia	Western Australia	Northern Territory
Specific seaweed sector strategy/policy?	No	No[1]	No	No	Yes	Yes	No
Provision for seaweed aquaculture in existing legislation?	Yes	Yes	No[2]	Yes	Yes	Yes	Yes
One-stop shop for all aquaculture approvals?	No	No	Yes	Yes[3]	Yes[3]	Yes[3] – proclamation of the ARMA[4] will fully embed this	No
Designated zones for seaweed aquaculture in formal marine spatial planning?	Some – Great Sandy Regional Marine Aquaculture Plan	No	No	Yes	Yes	No	No
Commercial seaweed aquaculture approved/ allocated?	No	Yes	No	Yes	Yes	Yes	No
Provision for pilot/trial/ research licence?	Yes – development application still required	No – full state significant development process applies	Yes	Yes	Yes	Yes	Yes
Research/trials conducted or in progress	Yes – two small-scale pilots underway in different regions	No – application(s) are under consideration	Yes – some small-scale pilots on sites within aquaculture reserves	Yes	Yes	Yes	Yes

[1] Aquaculture strategy mentions seaweed.
[2] Review of seaweed aquaculture governance arrangements in progress at time of publishing.
[3] Application and assessment process managed by a single agency. Separate permit from Fisheries for collection of broodstock/seedstock.
[4] *Aquatic Resources Management Act 2016*.

Key findings

The analysis of state governance structures was compared to governance and policy practices identified in the 'Seaweed industry development context' section of this report. This information was also used to reflect upon how the management framework for seaweed cultivation in Australia might be improved to better support industry development. The findings suggest that:

- All states have fisheries or aquaculture legislation and related policies, and there is provision for seaweed either specifically or as a general inclusion in all states except Victoria, where there is provision to issue permits to trial native seaweed culture. However, arrangements in Victoria are currently under review.
- South Australia and Western Australia are the only states with specific seaweed aquaculture strategies and policies.
- All jurisdictions, except the Northern Territory, have some seaweed aquaculture approved, although in most cases this is still at a research/pilot stage.
- In many cases, seaweed species have been added to existing aquaculture leases for existing aquaculture operators, as this has been the most expeditious route to enabling industry development (e.g. New South Wales, Queensland, Western Australia, Tasmania).
- Where culture of seaweeds is permitted, it is restricted to native species, however policies for sourcing wild seedstock vary between jurisdictions.
- All states noted the need to provide support for aquaculture site selection and spatial planning at some level.
- All states acknowledged a lack of spatial and environmental information in proposed aquaculture development areas was an impediment to industry investment and development.
- The availability of seaweed aquaculture development areas/zones with provision for seaweed aquaculture is limited in most jurisdictions.
- In all states except New South Wales there is some provision for a pilot or research licence to enable proponents to trial sites without having to incur the costs or expectations of going through the full commercial approval process.
- All states seem to be progressing towards a 'one-stop shop' approval process.
- Victoria and Western Australia are currently reviewing their management frameworks in recognition of the increasing interest in seaweed aquaculture.
- Ecological sustainable development (ESD) principles are in place as the legislative base for the management of the aquatic environment, aquaculture and fisheries in all jurisdictions.
- Some jurisdictions recognise the low risk and even beneficial nature of non-intensive marine seaweed aquaculture of native species; however this does not necessarily translate into a differentiated development approval process.
- There are knowledge gaps relating to native seaweed species phenology, genetics, pests and diseases that need to be addressed to inform policy development.
- As large-scale commercial seaweed aquaculture operations are yet to fully develop anywhere in Australia, there is a need for flexible and adaptive governance frameworks and government incentives to support development of a sustainable seaweed industry.

Recommendations

The *Australian Seaweed Industry Blueprint* (Kelly, 2020) highlights the opportunity for Australia to create a $1.5 billion seaweed industry over coming decades, and as the seaweed industry develops, it will be important to evolve policy to ensure the regulatory framework enables this growth. The *National Aquaculture Strategy* (Department of Agriculture and Water Resources, 2017) also highlights the importance of a transparent and consistent management framework that provides industry with confidence and certainty to attract investment and innovation to this emerging sector.

Australia's emissions reduction targets and commitment to the *Global Methane Pledge*, *UN Decade of Ocean Science for Sustainable Development*, *High Level Panel for a Sustainable Ocean Economy* and *SDG 14 – Life Below Water* highlight the opportunity for regenerative seaweed aquaculture to support more sustainable food production, reduce livestock emissions and positively impact the ocean. On this basis, there should be no impediment for state/territory governments to support seaweed aquaculture development.

The following recommendations would assist with evolving policy frameworks to better enable a marine seaweed aquaculture industry to develop in Australia:

1. **Develop a nationally consistent strategy and policy framework for seaweed aquaculture in marine waters** underpinned by a clearly defined risk assessment and risk-appropriate management standards that reflect the low-risk nature and potential environmental benefits of sustainable marine aquaculture of native seaweeds.

2. **Identify marine seaweed aquaculture development areas where there is industry demand.** Although there is a general commitment to a formal marine spatial planning process in all states, more resources are required to undertake this at the standard and pace required. Marine spatial planning is important for industry participants, who otherwise must fund the high cost of data collection, marine surveys, risk assessment and public consultation in areas where there is no guarantee of approval.

3. **Create a fast-track approval pathway for research/trial projects.** This would de-risk projects and investments, and enable companies to 'get in the water' and prove the marine area is suitable and commercially viable before investing in a commercial approvals process.

4. **Support wild seedstock and aquaculture seedstock supply via a national seaweed hatchery network.** A hatchery network would undertake the science necessary to support regional seedstock collection and hatchery development techniques, subsequently reducing reliance on wild stock collection in the future and addressing biosecurity concerns.

5. **Government and industry to collaborate on the above recommendations.** The Australian Fisheries Management Forum Seaweed Working Group (AFMF SWG) and the peak seaweed industry group, Australian Sustainable Seaweed Alliance (ASSA), need to work together to advance policy that would better enable marine seaweed aquaculture development in Australia.

6. **Embrace a science-based, adaptive policy approach.** As the seaweed industry develops and research, technology and operational processes evolve, it is important to resource the required science to address key environmental and biosecurity risks, and proactively build social licence. Additionally, an independent expert science panel could assist industry development by providing independent technical advice to industry, AFMF SWG and ASSA on key issues.

These recommendations should be taken forward through a Seaweed Policy Reform Working Group to be established under the Department of Agriculture Fisheries and Forestry (DAFF) investment program to accelerate the seaweed industry.

Appendix A – Seaweed aquaculture management in New South Wales

Overview

There is no dedicated state government policy or strategy for seaweed aquaculture in NSW. However, the *State Environmental Planning Policy (Primary Production) 2021* (SEPP) gives an overarching planning structure for all marine, oyster and land-based aquaculture industries. The SEPP provides the legislative hierarchy under which Aquaculture Industry Development Plans (s143 *Fisheries Management Act 1994*) take effect. Aquaculture Industry Development Plans have been developed for the land-based, oyster industry and marine waters sectors, and have been developed as a whole-of-government initiative, providing a framework for expansion of the NSW aquaculture industry using industry best practice for site selection, design and operation with a streamlined approvals pathway. Further, the NSW *Marine Waters Sustainable Aquaculture Strategy* specifically mentions algae (NSW Department of Primary Industries, 2018).

Aquaculture development in NSW is regulated by the Fisheries Department within the Department of Primary Industries (DPI). Marine waters aquaculture operations require a development approval, an aquaculture lease and an aquaculture permit. All marine waters aquaculture projects are considered State Significant Development and require environmental impact statements.

The *NSW Oyster Industry Sustainable Aquaculture Strategy 2021* (OISAS) is an example of a strategic approach that could be adopted for the seaweed industry. The OISAS recognises the importance of oyster aquaculture to healthy estuaries and identifies more than 3,600 hectares of Priority Oyster Aquaculture Areas (POAAs) and the required best practice management standards. POAAs were pre-assessed by DPI and built into planning legislation. Development consent is not required in a POAA, which significantly streamlines the approvals process to support industry growth (NSW Department of Primary Industries, 2021).

Current state – seaweed aquaculture

There are approximately 50 hectares leased for existing mussel aquaculture in Twofold Bay in Eden where the operators have had seaweed species added to their leases. There are several land-based algae operations in NSW and some wild-collection licences (beach wrack).

Several leases for algae aquaculture have been applied for and are undergoing landowner consent and development approval under the State Significant Development Application process. Several more leases are being applied for under the NSW DPI lease tender process. An aquaculture lease will not be granted without a development approval. While currently relatively small, there is growing interest in marine seaweed aquaculture in NSW.

Seaweed aquaculture management framework

Policy and legislation

Seaweed aquaculture is included in the legislative basis for aquaculture in NSW in the *Fisheries Management Act 1994*. The *NSW Marine Waters Sustainable Aquaculture Strategy* (MWSAS) is legally an Aquaculture Industry Development Plan under the *Fisheries Management Act 1994* and gives an overarching planning structure for the aquaculture industry. There is also the *NSW Land Based Sustainable Aquaculture Strategy 2021* and the *Oyster Industry Sustainable Aquaculture Strategy 2021*.

The *Fisheries Management (Aquaculture) Regulation 2017* under the *Fisheries Management Act 1994* provides information on the different classes of aquaculture licences (including the various fee requirements) and makes a distinction between intensive fish or marine vegetation cultivation and non-intensive aquaculture. The definitions specifically include marine vegetation (Class 3: Conduct intensive fish or marine vegetation cultivation).

The *Environmental Planning and Assessment Act 1979* is the major framework for environmental planning, including marine aquaculture. The *State Environmental Planning Policy (Primary Production) 2021* provides the key regulatory framework for aquaculture. This SEPP identifies where marine waters aquaculture is not permitted, based on the constraint criteria set out in Table 1 of the MWSAS. Where marine waters aquaculture is permitted, a development consent is required.

Schedule 1, clause 2 of the *State Environmental Planning Policy (State and Regional Development) 2011* defines State Significant Development as "development for the purpose of aquaculture located in an environmentally sensitive area of state significance". As all NSW coastal waters are categorised as environmentally sensitive areas of state significance, all marine aquaculture requires a State Significant Development Application (SSDA). The SSDA must be accompanied by an Environmental Impact Statement (EIS) that complies with the Planning Secretary's Environmental Assessment Requirements (SEARs), which must be first requested from NSW Department of Planning and Environment (DPE). Before lodging an SSDA, landowner consent must be obtained.

Approvals and permits

Marine aquaculture in NSW requires both a lease and an aquaculture permit. New aquaculture leases are issued by DPI after development approval. The *Aquaculture Lease Allocation Policy* details the competitive process to obtain the right to apply for a marine waters lease (NSW Department of Primary Industries, 2022).

To start a marine seaweed aquaculture project in NSW you will need:

- Approval to apply for an Aquaculture Lease following a competitive process
- Preliminary approval for an Aquaculture Permit or an existing Aquaculture Permit
- Landowner consent
- Development consent – obtained via a State Significant Development Application
- An Aquaculture Lease

Section 37 permits may also be required for seedstock collection or research. Marine Park permits may also be required if the location is in a marine park or aquatic reserve.

As part of the Aquaculture Permit application process, the applicant must prepare a Commercial Farm Development Plan, Biosecurity Management Plan and Lease Development and Maintenance Plan. Aquaculture leases in NSW are let for a maximum term of 15 years and the lessee is entitled to a first renewal and then subsequent renewals, subject to conditions.

There is no differentiated pathway in NSW legislation for an aquaculture pilot or research licence, which means that a full State Significant Development Application is always needed regardless of the purpose, size or duration of the marine aquaculture project.

Institutional arrangements

Table A1 shows how the various legislation/policy instruments relate to key management areas of aquaculture production, and the managing authorities responsible in NSW.

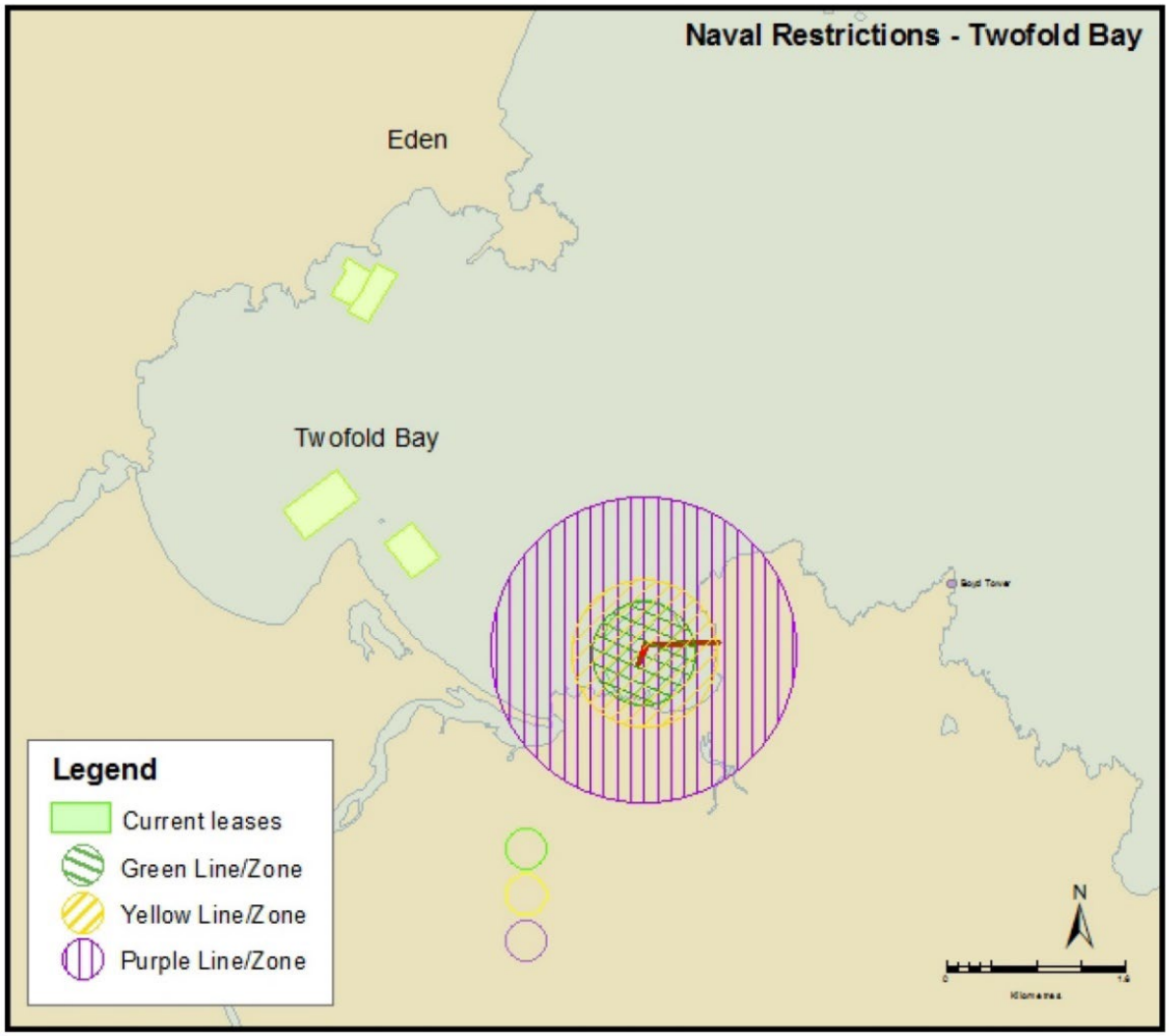
Table A1. Key management instruments and responsibilities for seaweed aquaculture in NSW.

Management element	Management authority	Legislation/policy instrument(s)
Aquaculture legislation	DPI	*Fisheries Management Act 1994*
Aquaculture strategy	All NSW Government	*NSW Marine Waters Sustainable Aquaculture Strategy 2018*
Aquaculture approvals	DPI DPE DPI	*Fisheries Management Act 1994* – aquaculture permit issued under Section 144(1) *Environmental Planning and Assessment Act 1979 – Development Consent – SSDA* *Fisheries Management Act 1994* – Section 37 permit for research or collecting marine vegetation for commercial purposes
Access to water	DPI DPE	*Fisheries Management Act 1994* – aquaculture lease under Section 163 *Crown Land Management Act 2016* – landowner consent (Crown land)
Environmental effects	DCCEEW DPE DPE DPE DPI DPE	*Environmental Protection and Biodiversity Conservation Act 1999* – matters of national environmental significance *NSW Biodiversity Conservation Act 2016* *Coastal Management Act 2016* *Heritage Act 1977* – environmental heritage *Marine Estate Management Act 2014* – marine or aquatic reserve permit *National Parks and Wildlife Act 1974*
Biosecurity (general)	DPI	*Biosecurity Act 2015* DPI biosecurity policies: Aquatic biosecurity pests and diseases; Surveillance for diseases of animals and aquatic pests
Marine safety and navigation	Transport for NSW	*Marine Safety Act 1998* and *Marine Safety Regulation 2016*
Food safety (post harvest)	DPI – NSW Food Authority	*NSW Food Authority Food Regulation 2015*

DPI = Department of Primary Industries; DPE = Department of Planning and the Environment; DCCEEW = Department of Climate Change, Energy, the Environment and Water (Commonwealth).

Seaweed aquaculture mapping

Marine aquaculture leases are shown for Twofold Bay, where seaweed aquaculture is permitted.



Appendix B – Seaweed aquaculture management in Queensland

Overview

There is no specific state government policy or strategy for seaweed aquaculture in Queensland. However, the Queensland Government's *Aquaculture Policy Statement* supports the future development and growth of an ecologically sustainable, diverse and innovative aquaculture industry, both on land and at sea (Queensland Department of Agriculture and Fisheries, 2016).

Current state – seaweed aquaculture

There is currently no ocean-based seaweed mariculture conducted commercially in Queensland. There are currently two companies in northern Australia culturing seaweed in land-based facilities for bioremediation of prawn wastewater. One existing oyster aquaculture area in Moreton Bay is conducting seaweed trials.

Queensland has two marine aquaculture plans, the *Oyster Industry Plan for Moreton Bay Marine Park* (Queensland Department of Agriculture and Fisheries, 2015) and the *Great Sandy Regional Marine Aquaculture Plan* (GSRMAP) (Queensland Department of Agriculture and Fisheries, 2010b). The GSRMAP establishes guidelines and identifies suitable sites for sustainable, non-intensive marine aquaculture development and mentions seaweed as one species that may be permitted within some zones. The area of existing and new aquaculture sites identified in the GSRMAP is 15,800 hectares.

The Great Barrier Reef Marine Park (GBRMP) covers 344,400 km^2 and extends from the tip of Queensland to just north of Bundaberg, and includes the largest coral reef ecosystem in the world. There has been recent expansion of prawn and barramundi production on land, however marine aquaculture has remained at a relatively low level (Great Barrier Reef Marine Park Authority, 2004a). The potential to use cultured seaweed to manage nutrient inputs into coastal environments around the Great Barrier Reef is the subject of a significant research project supported by the Reef Trust program, a partnership between the Great Barrier Reef Foundation and the Australian Government.

Seaweed aquaculture management framework

Policy and legislation

The *Planning Act 2016* and the *Fisheries Act 1994* are the major pieces of legislation that regulate seaweed aquaculture in Queensland. Seaweeds are considered marine plants, which are defined in Section 8 of the *Fisheries Act 1994*.

The *Aquaculture Policy Statement* recognises that marine non-intensive aquaculture has low environmental impact and may be compatible with general use, habitat protection and conservation park zones (Queensland Department of Agriculture and Fisheries, 2016). Depending on the location of the project, the *Marine Parks Act 2004* or the *Great Barrier Reef Marine Park Act 1975* may also apply.

There are three marine park areas in Queensland where the *Marine Parks Act 2004* will apply – Moreton Bay Marine Park, Great Sandy Marine Park and Great Barrier Reef Coast Marine Park (for the inshore area not covered by the *Great Barrier Reef Marine Parks Act 1975*).

The Great Barrier Reef Marine Park is administrated under the *Great Barrier Reef Marine Park Act 1975* (Commonwealth legislation) and was listed as a World Heritage Area in 1981. The Great Barrier

Reef Management Park Authority (GBRMPA) is the lead management agency for the reef – it administers the *Great Barrier Reef Marine Park Act 1975* and is a statuary body under the Australian Government. The *Great Barrier Reef Marine Park Zoning Plan 2003* is the primary planning instrument for the conservation and management of the marine park. The GBRMP Zoning Plan does allow for the possibility of no-feed seaweed aquaculture to be conducted in certain zones, subject to permissions (Great Barrier Reef Marine Park Authority, 2004a).

The *Guidelines for Aquaculture within the Great Barrier Reef Marine Park* describe "extensive aquaculture" that does not include the addition of feed as presenting substantially lower ecological risks and potential impacts than "intensive aquaculture" aquaculture (e.g. finfish) (Great Barrier Reef Marine Park Authority, 2004b).

Approvals and permits

All commercial seaweed aquaculture projects in the marine environment in Queensland require a Resource Allocation Authority (RAA) (refer to the *Policy for the allocation of marine aquaculture authorities* (Queensland Department of Agriculture and Fisheries, 2010a)), landowner consent and a Development Approval (DA). RAAs, however, do not provide tenure or exclusive use over an area.

If the project will be located within a marine park, other permits will be required from the Department of Environment and Science (DES) and/or the Great Barrier Reef Marine Park Authority (GBRMPA). For collection of broodstock for commercial purposes, a development approval is required. An RAA is not required for research projects, but a Development Approval is required.

The State Assessment and Referral Agency (SARA) has been established to provide a coordinated, whole-of-government approach to the state's assessment of development applications. A useful way to navigate Queensland legislative and policy requirements is to request pre-lodgement advice on the seaweed aquaculture project from SARA and specific advice will be provided to the proponent on all permit and approval requirements.

Depending on the location, the assessment process and requirements may vary as follows:

- For Great Sandy Marine Park – refer to the *Great Sandy Regional Marine Aquaculture Plan* (Queensland Department of Agriculture and Fisheries, 2010b). The plan streamlines and standardises the assessment process for future aquaculture applications within the Great Sandy Marine Park. The plan identifies the most appropriate sites for rack, line and ranching aquaculture, and includes infrastructure design specifications, environmental bond requirements, environmental monitoring programs and general biosecurity measures. Applications that comply with the GSRMAP do not require a separate approval under the *Environment Protection and Biodiversity Conservation Act 1999* or a separate marine parks permit (Queensland Department of Agriculture and Fisheries, 2010b).

- Moreton Bay Marine Park – refer to the *Oyster Industry Plan for Moreton Bay Marine Park* (Queensland Department of Agriculture and Fisheries, 2015). The plan details how the oyster industry is managed within the marine park and includes provisions relating to oyster furniture, equipment storage, structures and moorings. This plan is not specific to seaweed but provides guidance on planning, design and operational considerations in this location.

- Great Barrier Reef Marine Park – refer to the *Great Barrier Reef Marine Park Zoning Plan* (Great Barrier Reef Marine Park Authority, 2004a), the *Aquaculture Guidelines* (Great Barrier Reef Marine Park Authority, 2004b) and permissions information on GBRMPA's website.

Terrestrial aquaculture development areas (ADAs) exist in a number of locations in Queensland and the *Aquaculture Policy Statement* indicates additional ADAs for marine non-intensive aquaculture will be planned (Queensland Department of Agriculture and Fisheries, 2016).

Institutional arrangements

Table B1 shows how the various legislation/policy instruments relate to key management areas of aquaculture production, and the managing authorities responsible in Queensland.

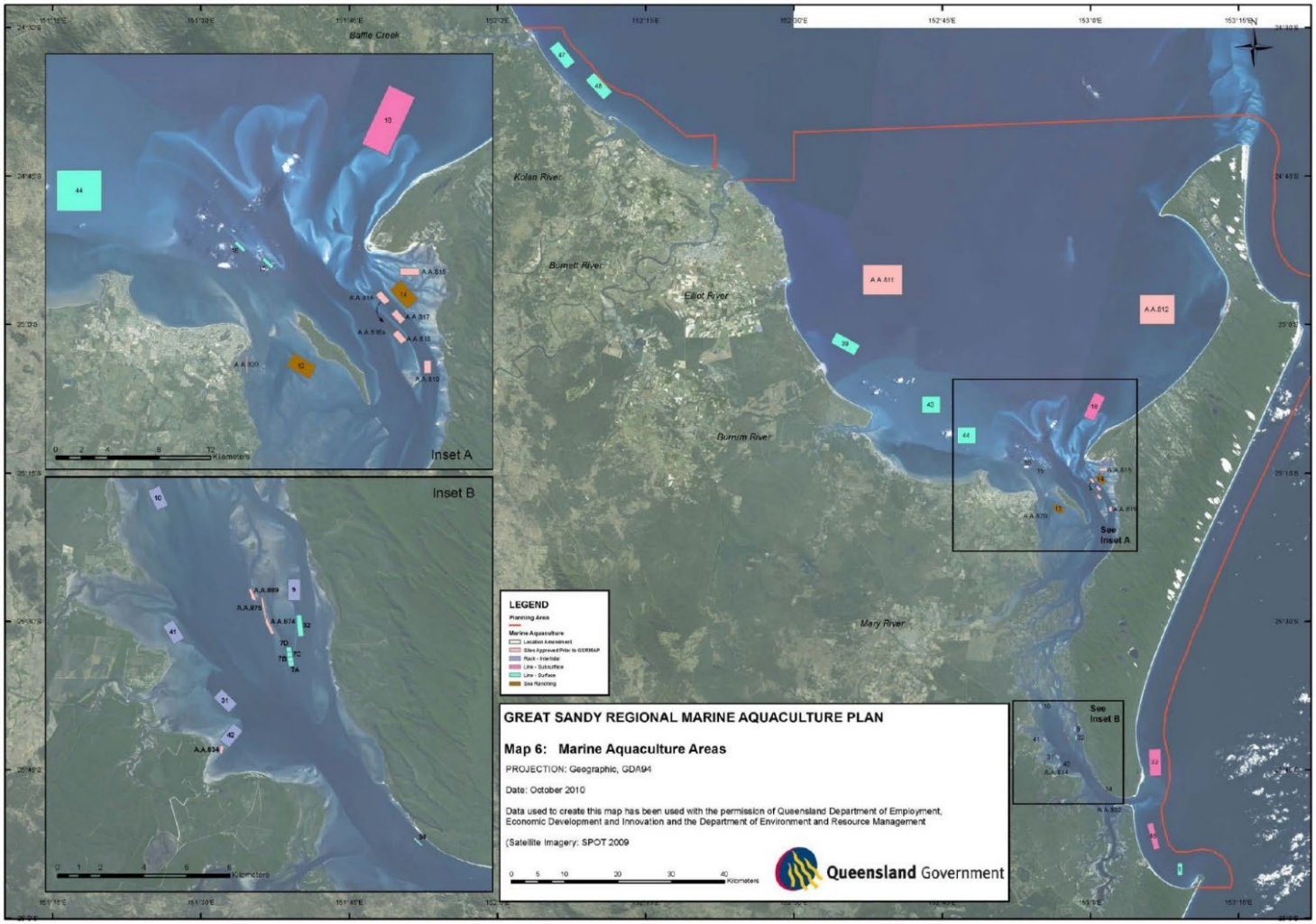
Table B1. Key management instruments and responsibilities for seaweed aquaculture in Queensland.

Management element	Management authority	Legislation/policy instrument(s)
Aquaculture legislation	DAF	*Fisheries Act 1994*
Aquaculture strategy	DAF	*Aquaculture Policy Statement*, *Great Sandy Regional Marine Aquaculture Plan* and *Oyster Industry Plan for Moreton Bay Marine Park*
Development approval	DSDILGP SARA coordinates this across the Queensland Government. SARA is typically the assessment manager in tidal waters except in some areas, e.g. port locations and the GBRMP	*Planning Act 2016*
Broodstock collection	DSDILGP	*Planning Act 2016* (Development Approval)
Access/use of tidal lands	DR DAF DES GBRMPA	*Land Act 1994* (landowner consent) *Fisheries Act 1994* and the *Policy for the allocation of marine aquaculture authorities* (Resource Allocation Authority) Declared Fish Habitat Areas (Resource Allocation Authority) *Marine Parks Act 2004* and zoning plans (Marine Park Permit); *Great Barrier Reef Marine Park Act 1975* and zoning plans (Marine Park Permit)
Environmental effects	DCCEEW DES GBRMPA	*Environmental Protection and Biodiversity Conservation Act 1999* – matters of national environmental significance *Marine Parks Act 2004* and zoning plans (Marine Park Permit) *Great Barrier Reef Marine Park Act 1975*
Biosecurity (general)	DAF – Biosecurity Queensland GBRMPA	*Biosecurity Act 2014* *Fisheries Act 1994* – translocation policy only covers aquatic animals not seaweed. GBRMPA translocation policy does cover seaweed
Marine safety and navigation	DTMR – Marine Safety Queensland	*Transport Infrastructure Act 1994* and *Maritime Safety Queensland Act 2002*
Food safety (post harvest)	Safe Food Queensland Queensland Health	*Food Act 2006* *Food Production (Safety) Act 2000*

DAF = Department of Agriculture and Fisheries; DSDILGP = Department of State Development, Infrastructure, Local Government and Planning; SARA = State Assessment and Referral Agency; DR = Department of Resources; DES = Department of Environment and Science; GBRMPA = Great Barrier Reef Marine Park Authority; DCCEEW = Department of Climate Change, Energy, the Environment and Water (Commonwealth); DTMR = Department of Transport and Main Roads.

Seaweed aquaculture mapping

This map from the *Great Sandy Regional Marine Aquaculture Plan* details areas set aside for line aquaculture (surface and subsurface); seaweed aquaculture may be possible in these areas.



Appendix C – Seaweed aquaculture management in Victoria

Overview

The current *Victorian Aquaculture Strategy 2017-2022* sets out a vision and blueprint – across Victorian aquaculture – for a productive, growing and sustainable aquaculture industry valued by the community. It does not specifically refer to seaweed aquaculture, having been developed prior to the now rapidly developing interest in seaweed aquaculture in Victoria. However, it provides commitments across Victoria's aquaculture industry to pursuit of productive aquaculture farms using sustainable practices; high-quality seafood for Victorians and export; aquaculture that is supported and valued by the community; and an efficient regulatory environment that supports business. The industry-led *Victorian Aquaculture Strategy 2022-2027* was expected to be released in late 2022 and will be accessible via the Victorian Fisheries Authority (VFA; www.vfa.vic.gov.au) and Seafood Industry Victoria (SIV; www.siv.com.au) websites.

In September 2022, the VFA published a statement on, and a sustainable pathway forward for, seaweed aquaculture in Victoria. The statement notes that seaweed aquaculture is new to Victoria and enabling seaweed aquaculture licences will require updates to regulations. The VFA has committed to carefully working through this, informed by the best available information and views of key interested stakeholders. The statement notifies industry and other interested stakeholders that management arrangements for seaweed harvesting and aquaculture are under review. The review includes an inter-agency working group and is exploring options ahead of a consultation forum with representatives of key relevant agencies and stakeholder groups, planned for early 2023. Interest in native seaweed cultivation in Victorian waters is rapidly growing (Victorian Fisheries Authority, 2022).

Current state – seaweed aquaculture

Marine aquaculture is currently undertaken in Port Phillip Bay and Western Port, and is one of the largest mussel production areas in Australia (Victorian Fisheries Authority, n.d). Individual farming sites (Crown leases) are located within a number of Aquaculture Fisheries Reserves (AFRs), which were established during a consultative marine planning process and have been reserved for the purpose of aquaculture under the *Fisheries Act 1995*.

A small number of permits have been issued to trial native seaweed culture on Crown lease areas within these aquaculture reserves. These are short-term permits, with initial permits issued on the basis that a maximum of two tonnes of seaweed broodstock may be harvested from the wild. The VFA does not intend to issue a large number of these permits or increase the maximum broodstock limit above two tonnes – it is anticipated that less broodstock will be required in the future as knowledge and best practice in this emerging industry continue to rapidly develop – but is continuing to assess applications while also conducting a review of management arrangements for seaweed aquaculture and harvesting (Victorian Fisheries Authority, 2022).

Undaria pinnatifida (wakame) is listed as a noxious aquatic species under Section 75 of the *Fisheries Act 1995* and permits are issued by VFA for its removal from areas where it is established. These permits provide for commercial sale of *Undaria* harvested under strict biosecurity conditions to prevent its spread to new areas.

Seaweed aquaculture management framework

Policy and legislation

Aquaculture in Victoria is managed under the *Fisheries Act 1995* and *Fisheries Regulations 2019*. Seaweed, algae and marine plants are not included in the definition of 'fish' in Section 5 of the Act, and this limits the extent to which seaweed aquaculture is able to be authorised or regulated under the Act. Updated regulatory arrangements are required to encourage industry development in Victoria.

For each of the AFRs, a management plan is required under the Act and these set out the policies and strategies for managing activity within each AFR.

Approvals and permits

There are nine Aquaculture Fisheries Reserves (AFRs) in which marine aquaculture is currently undertaken in Victoria. A number of aquaculture sites have been set out in each of the reserves. The following approvals are needed to conduct aquaculture in one of these sites within an AFR (Buck, 2022):

- A Crown lease for the individual site within the reserve – this provides for exclusive use of the designated site, i.e. it is not accessible to the general public. These are issued for a 21-year period with a renewal option.

- An aquaculture licence – operators need an aquaculture licence under Section 49 of the *Fisheries Act 1995*. There are several classes of onshore and offshore aquaculture licences, covering a variety of species established under the Act, but none provide for seaweed aquaculture. The VFA's review of management arrangements for seaweed aquaculture is considering the most appropriate tools to provide a pathway for seaweed aquaculture under Victorian legislation, in consultation with key relevant agencies and stakeholders.

- Consent under the *Marine and Coastal Act 2018* for use and development of coastal Crown land. This consent is already in place for all AFRs (and therefore the aquaculture sites within them).

Permits may be issued by the VFA under Section 49 of the *Fisheries Act 1995* to carry out research, exploitation, work or operation for the purpose of developing any fishery or aquaculture.

Institutional arrangements

Table C1 shows how the various legislation/policy instruments relate to key management areas of aquaculture production, and the managing authorities responsible in Victoria.

Table C1: Key management instruments and responsibilities for seaweed aquaculture in Victoria.

Management element	Management authority	Legislation/policy instrument(s)
Aquaculture legislation	VFA	*Fisheries Act 1995* and *Fisheries Regulations 2019*
Aquaculture strategy	VFA	*Victorian Aquaculture Strategy 2017-2022* and *Victorian Aquaculture Strategy 2022-2027*
Aquaculture activity (licensing)	VFA	*Fisheries Act 1995* (aquaculture license – not currently enabled for seaweed)
Crown lease	DELWP	*Land Act 1958* (Crown lease) and *Marine and Coastal Act 2018* (coastal consent)
Environmental effects	DCCEEW DELWP EPA	*Environmental Protection and Biodiversity Conservation Act 1999* – matters of national environmental significance *Flora and Fauna Guarantee Act 1988* (potential interactions with listed species, if any) and the *Wildlife Act 1975* (potential interactions with protected wildlife, if any) *Environment Protection Act 2017* (includes discharge licence for certain land-based aquaculture operations depending on nature and volume of discharge)
Biosecurity (general)	DJPR VFA (translocation only)	*Quarantine Act 1908* and *Export Control Act 1982* *VFA Translocation Guidelines* to inform fish stocking decisions under the *Fisheries Act 1995*
Marine safety and navigation	Transport Safety Victoria Maritime Safety Victoria	*Marine Safety Act 2010*
Food safety (post harvest)	PrimeSafe DJPR	*Seafood Safety Act 2003* *Food Act 1984*

VFA = Victorian Fisheries Authority; DELWP = Department of Environment, Land, Water and Planning; DCCEEW = Department of Climate Change, Energy, the Environment and Water; EPA = Environmental Protection Authority; DJPR = Department of Jobs, Precincts and Regions.

Seaweed aquaculture mapping

There are currently no seaweed aquaculture areas designated in Victoria. The map below shows the current Aquaculture Fisheries Reserves (AFRs) in Victoria.


Melbourne
Beaumaris
Beaumaris Aquaculture Fisheries Reserve
Kirk Point - Werribee Aquaculture Fisheries Reserve
Port Phillip Bay
Bates Point Aquaculture Fisheries Reserve
Grassy Point Aquaculture Fisheries Reserve
Clifton Springs Aquaculture Fisheries Reserve
Geelong
Pinnace Channel Aquaculture Fisheries Reserve
Mornington
Mount Martha Aquaculture Fisheries Reserve
Mud Island
Dromana
Dromana Aquaculture Fisheries Reserve
Flinders Aquaculture Fisheries Reserve
Flinders
Bass Strait
Western Port

Appendix D – Seaweed aquaculture management in Tasmania

Overview

Marine-based seaweed aquaculture can be authorised within the existing statutory instruments and leasing and licensing provisions in Tasmania. The permitting process under the *Living Marine Resources Management Act 1995* (LMRMA) provides for the development of seaweed aquaculture operations, with options for short-term research and pilot development permits, which can be increased in scale up to the levels provided for in a full marine farming licence.

Marine Farming Development Plans (MFDPs) drafted pursuant to the *Marine Farming Planning Act 1995* (MFPA) provide zones that may be categorised for seaweed aquaculture. However, not all zones within MFDPs provide for seaweed aquaculture, and should a licence be sought in a zoned area that has not been categorised for seaweeds, a statutory amendment to the MFDP would be required to allow for this activity. Permits may be granted to allow the trialling of seaweed aquaculture within any MFDP, and in some cases may provide the opportunity for bridging activities while a statutory amendment process is underway.

The key management principles underpinning the statutory instruments and strategic policy for aquaculture management in Tasmania are integrated, ecosystem-based and adaptive management, with a strong emphasis on ensuring environmental sustainability. Ecosystem-based management is embedded within the planning approach, and the precautionary principle is inherent within the permitting processes that precede the licensing or large-scale cultivation of both novel and known seaweed species. These planning principles and the existing ecosystem-based modelling, and broadscale monitoring associated with aquaculture management in general, provide a sound basis for the introduction of marine spatial planning and further development of fully integrated management.

Current state – seaweed aquaculture

Seaweed aquaculture is a relatively new activity in Tasmania and is just becoming established commercially, with only one main commercial operator. A small number of research permits and licences have been approved for culture of seaweeds, with some relating to the co-culture of finfish and other species alongside seaweeds.

Seaweed aquaculture management framework

Policy and legislation

The *State Coastal Policy 1996* supports sustainable development of Tasmanian marine and coastal resources while at the same time having a clear focus on the conservation of natural and physical resources for future generations; safeguarding the life-supporting capacity of air, water, soil and ecosystems; and avoiding, remedying or mitigating any adverse effects on the environment. The policy encourages integrated management and works alongside the LMRMA (Section 7.1) to underpin ecosystem-based resource management.

In Tasmania, seaweed aquaculture is primarily managed by the Department of Natural Resources and Environment (NRE Tasmania), effectively providing a ‘one-stop shop’ administration model. The LMRMA and MFPA are the key legislative instruments governing the management framework for seaweed aquaculture in Tasmania and are administered by NRE Tasmania. The *Biosecurity Act 2019* and the *Environment Management and Pollution Control Act 1994* (EMPCA) also apply to some

aspects of seaweed aquaculture. In addition, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) may apply when a proposed aquaculture activity is deemed to have the potential to significantly impact on matters of national environmental significance, and in such cases a Commonwealth assessment would also be required.

The definition of "fish" in the LMRMA includes seaweed and formally recognises opportunities for seaweed aquaculture in Tasmania. The LMRMA provides the broad framework and guidance for permitting and licensing marine farming, while the MFPA provides specific guidance and rules for leasing state waters and provisions for drafting MFDPs that then contain the management controls for marine farming operations. Together, the LMRMA and the MFPA provide the licensing and management planning framework that identifies the bodies of water (zones) where seaweed farming can be undertaken and determines the specific leases and farm management conditions that apply within those zones. The EMPCA also applies to aquaculture and sits under the purview of the Tasmanian Environmental Protection Authority (EPA), however its key relevance to seaweed aquaculture relates to the regulation of wastewater from land-based farms. The LMRMA is currently under review, and there is a commitment to review the MFPA in the near future.

Biosecurity risks are managed under the *Biosecurity Act 2019*. This Act was introduced to provide a simple and effective legal structure for the management of pests, diseases and invasive species, and provides a framework to regulate the importation of plants, animals and other material into Tasmania from interstate, and to support the management of these materials once in Tasmania. As such, seaweed movements would be controlled in part under this legislation.

Approvals and permits

The LMRMA requires a lease to be granted before a marine farming licence application can be assessed. The MFPA provides the process for the application and granting of marine farming leases in state waters. For a seaweed aquaculture application to be approved, seaweeds need to be an authorised category for the particular zone in which the application is being made. Once licenced, seaweed aquaculture can be undertaken on any lease where seaweed is an authorised category for that zone. Operations will then be managed under the marine farming licence conditions and management controls defined in the respective MFDP.

It is possible under current regulatory arrangements for multiple species to be listed on a marine farming licence, and an application to vary a licence can be submitted at any time to NRE Tasmania. The licence will list all seaweed species that can be farmed and any species-specific requirements. Obtaining a licence to farm novel species (i.e. native species that have to date not been cultured in Tasmania) involves a number of permitting steps:

1. A permit to take seedstock from the wild if the seedstock cannot be grown in an approved hatchery

2. A permit for hatchery operations where the seedstock is to be cultured or further developed by the proponent

3. A permit to install infrastructure for the purposes of an experimental grow-out operation

4. Baseline surveys and monitoring surveys may be required alongside grow-out permits to understand the environmental effects of the operation. Environmental management requirements can be applied to licences through both the planning and permitting processes.

Where a seaweed species has been added to a licence, or where an amendment process has resulted in seaweeds being added to a zone, a baseline environmental survey and/or ongoing environmental monitoring surveys may be required. A permit may be required to undertake these surveys.

It is important to acknowledge that applicants should not assume permits will be granted, or that there will be guaranteed progression from research/pilot licensing to commercial scale-production licensing.

Seedstock source is a critical consideration in developing seaweed aquaculture. The seaweed aquaculture industry is just becoming established, and as such it is still often necessary to collect seedstock from the wild. Permits to access and collect seedstock in this way are provided on a case-by-case basis, and are subject to the provisions of the *Marine Plant Policy 2017*. This policy deals only with licensing collection of 'cast' seaweed, and as such sourcing seedstock from wild stocks of native species is viewed as only an interim solution – long-term and continued use of wild stocks in this way would not be considered an appropriate basis for culture operations and would not be permissible under the existing policy.

Institutional arrangements

As noted earlier, the agency designated to implement the LMRMA and the MFPA is NRE Tasmania. Decision-making for marine farming of shellfish and marine plants generally resides with the Minister for Primary Industries and Water, or any delegation of those powers allowed for under those Acts. The Marine Farming Planning Review Panel reviews and provides recommendations to the Minister on planning proposals.

Table D1 shows how the various legislation/policy instruments relate to key management areas of aquaculture production, and the managing authorities responsible in Tasmania.

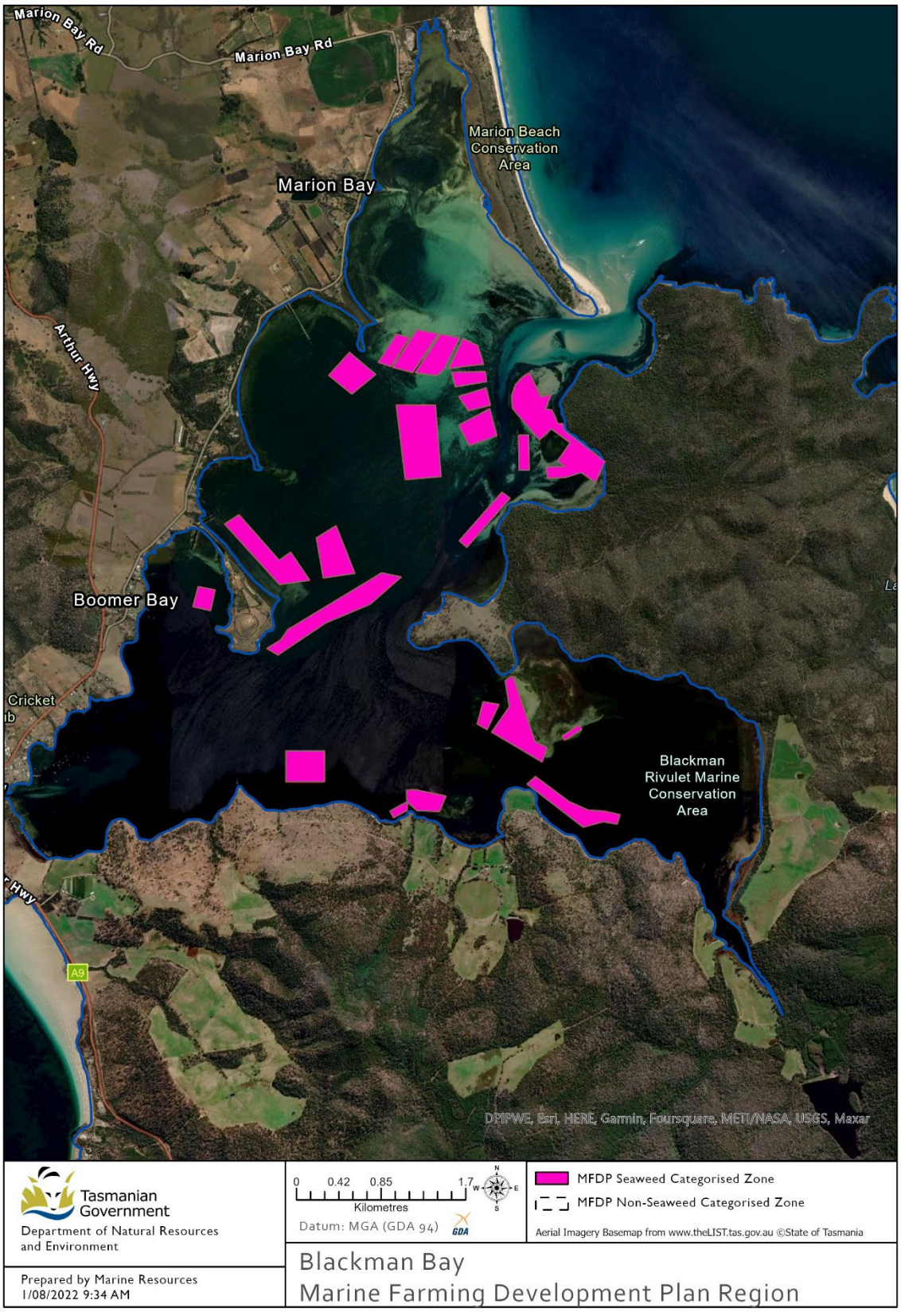
Table D1: Key management instruments and responsibilities for seaweed aquaculture in Tasmania

Management element	Management authority	Legislation/policy instrument(s)
Aquaculture legislation and environmental management	NRE EPA	*Living Marine Resources Management Act 1995*, *Marine Farming Planning Act 1995*, *State Coastal Policy (1996)* *Environmental Management and Pollution Control Act 1994*
Aquaculture strategy: Access to water (leasing)	NRE	*Marine Farming Planning Act (MFPA) 1995* and *Marine Farming Development Plans*
Aquaculture strategy: Operations (licensing)	NRE	*Marine Farming Planning Act (MFPA) 1995*
Aquaculture strategy: Biosecurity	NRE	*Living Marine Resources Management Act (LMRMA) 1995* and *Biosecurity Act 2019*
Marine safety and navigation	MAST	*Marine and Safety Authority Act 1997*
Food safety (post harvest)	FSANZ DH NRE	*Primary Produce Safety Act 2011*

NRE = Department of Natural Resources and Environment; EPA = Environment Protection Authority; MAST = Marine and Safety Tasmania; FSANZ = Food Standards Australia New Zealand; DH = Department of Health.

Seaweed aquaculture mapping

The following 13 maps show categorised seaweed farming locations identified in the MFDPs.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Marion Bay Rd
Marion Beach Conservation Area
Marion Bay
Arthur Hwy
Boomer Bay
Cricket
Blackman Rivulet Marine Conservation Area
A9
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Tasmanian Government
Department of Natural Resources and Environment
Prepared by Marine Resources
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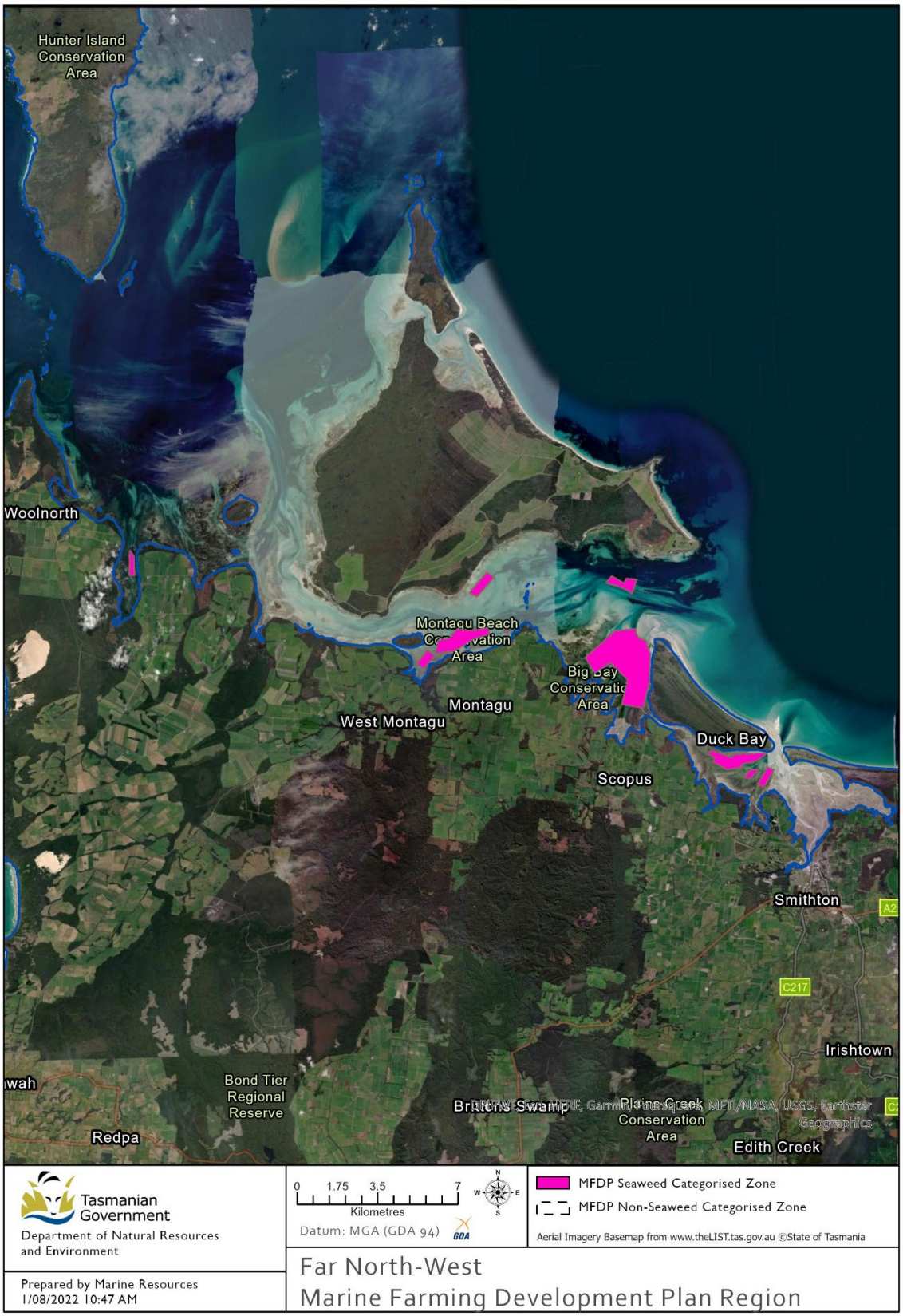
GDA
MFDP Seaweed Categorised Zone
MFDP Non-Seaweed Categorised Zone
Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
Blackman Bay
Marine Farming Development Plan Region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Woolnorth
Montagu Beach Conservation Area
Big Bay Conservation Area
Montagu
West Montagu
Duck Bay
Scopus
Smithton
A2
C217
Irishtown
Bond Tier Regional Reserve
Britons Swamp
Plains Creek Conservation Area
Edith Creek
Redpa
Tasmanian Government
Department of Natural Resources and Environment
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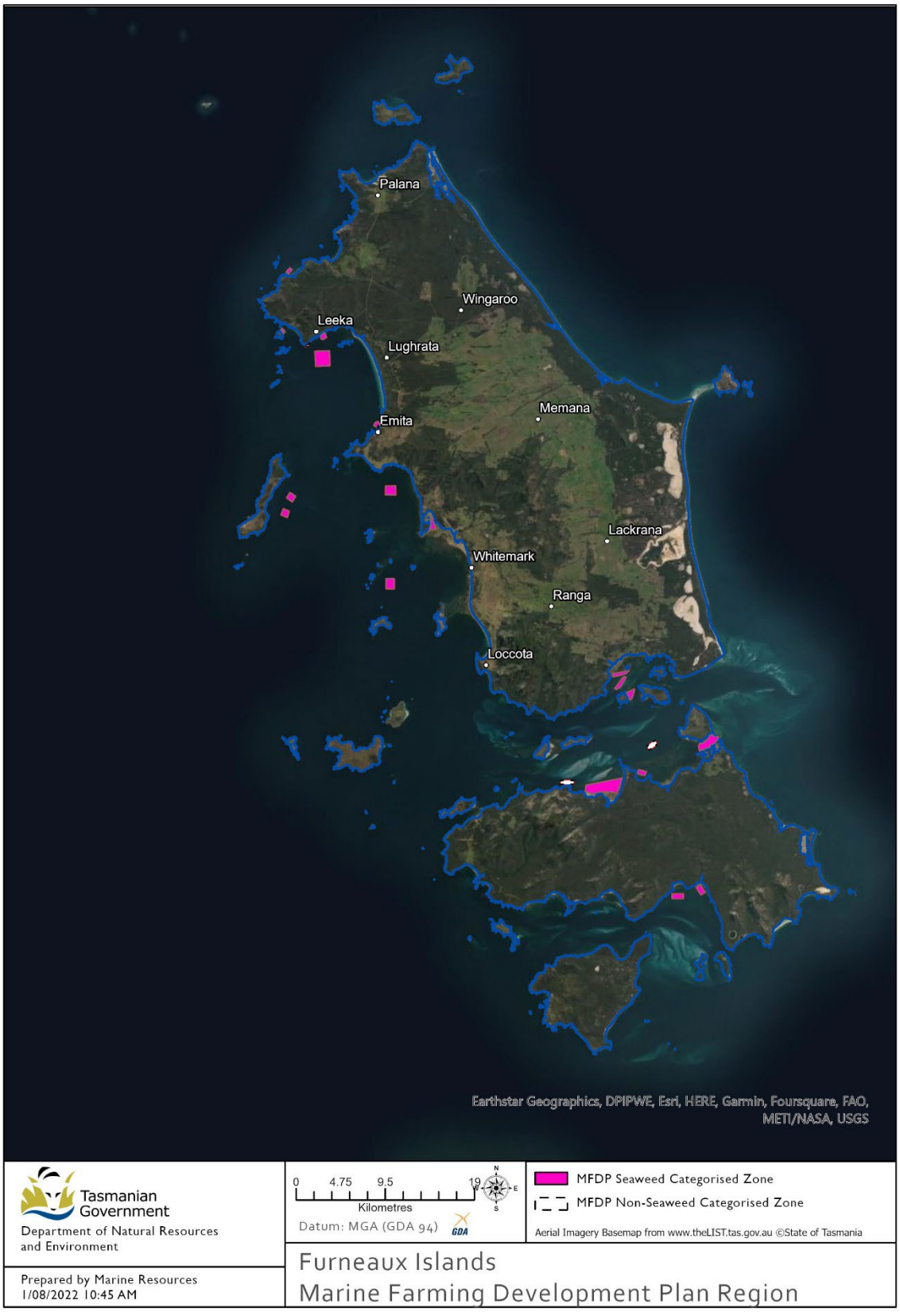
Datum: MGA (GDA 94)
MFDP Seaweed Categorised Zone
MFDP Non-Seaweed Categorised Zone
Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
Far North-West
Marine Farming Development Plan Region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Emita
Lackrana
Whitemark
Ranga
Loccota
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Department of Natural Resources and Environment
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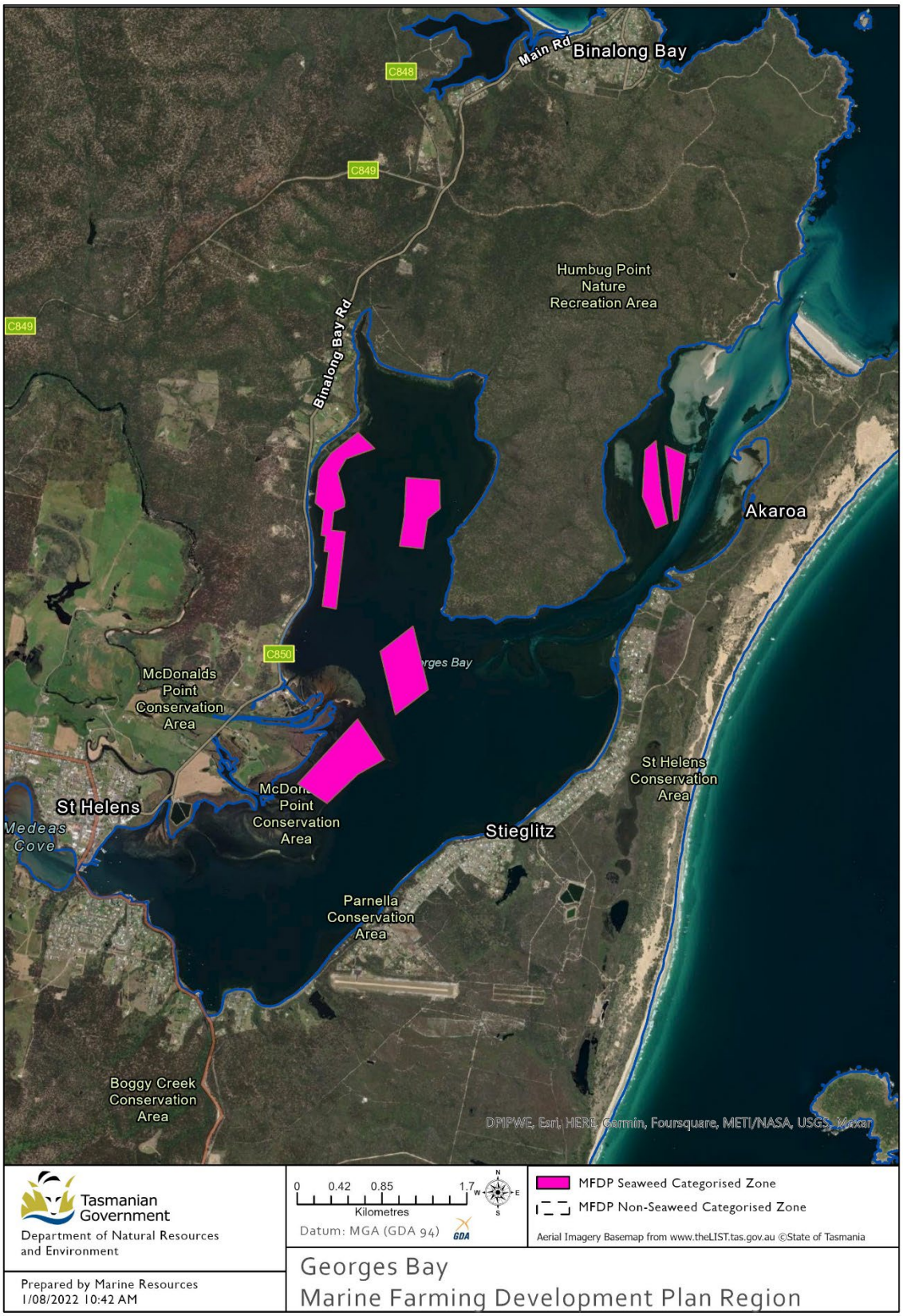
MFDP Seaweed Categorised Zone
MFDP Non-Seaweed Categorised Zone
Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
Furneaux Islands
Marine Farming Development Plan Region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C849
Humbug Point
Nature
Recreation Area
C849
Binalong Bay Rd
Akaroa
C850
McDonalds
Point
Conservation
Area
St Helens
Conservation
Area
St Helens
Medeas
Cove
Point
Conservation
Area
Stieglitz
Parnella
Conservation
Area
Boggy Creek
Conservation
Area
DPIPWE, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Maxar
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Government
Department of Natural Resources
and Environment
Prepared by Marine Resources
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MFDP Seaweed Categorised Zone
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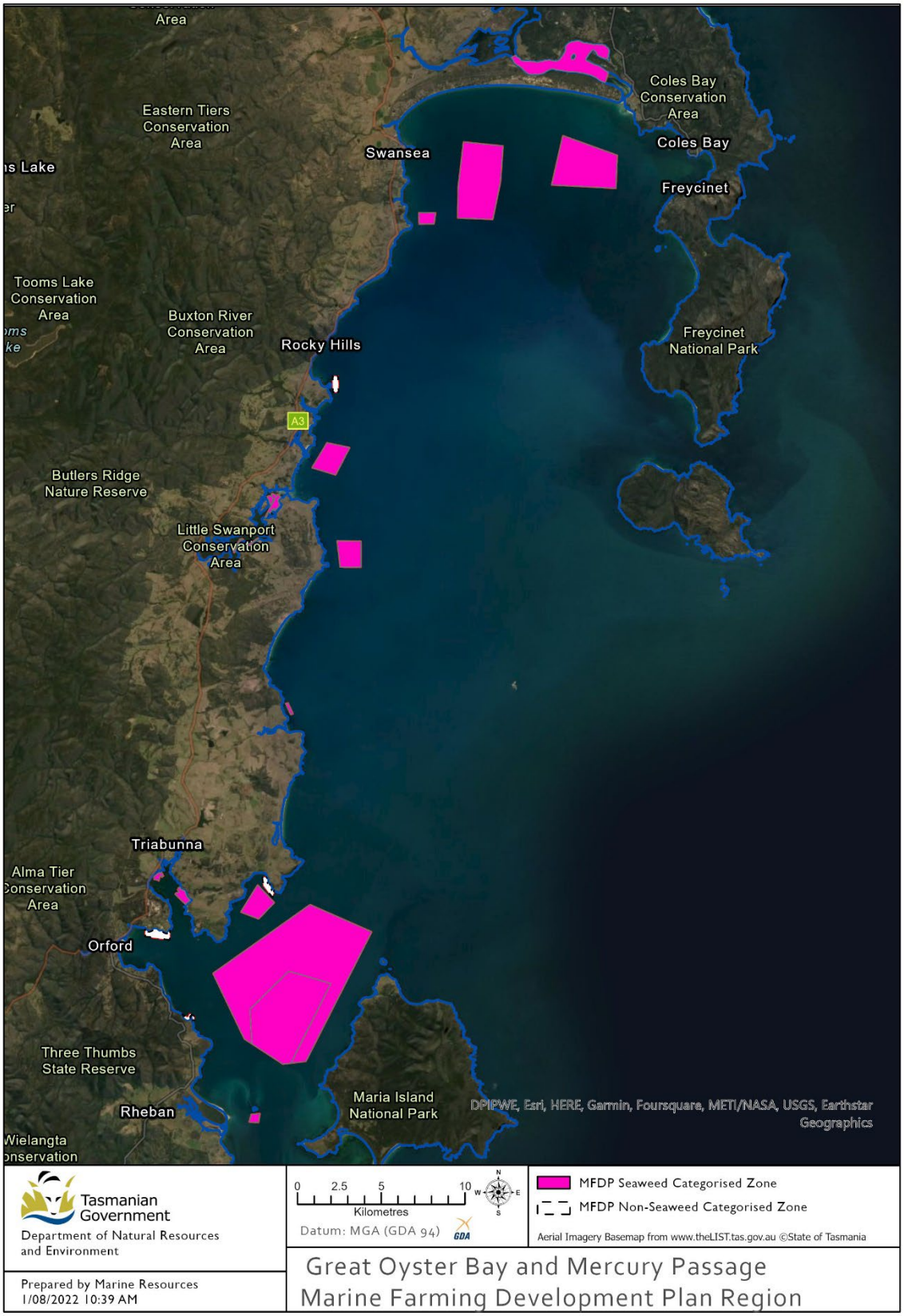
Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
Georges Bay
Marine Farming Development Plan Region


Area
Eastern Tiers Conservation Area
Coles Bay Conservation Area
Coles Bay
Swansea
Freycinet
Tooms Lake Conservation Area
Buxton River Conservation Area
Rocky Hills
Freycinet National Park
A3
Butlers Ridge Nature Reserve
Little Swanport Conservation Area
Triabunna
Alma Tier Conservation Area
Orford
Three Thumbs State Reserve
Maria Island National Park
Rheban
DPIPWE, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Earthstar Geographics
Tasmanian Government
Department of Natural Resources and Environment
Prepared by Marine Resources
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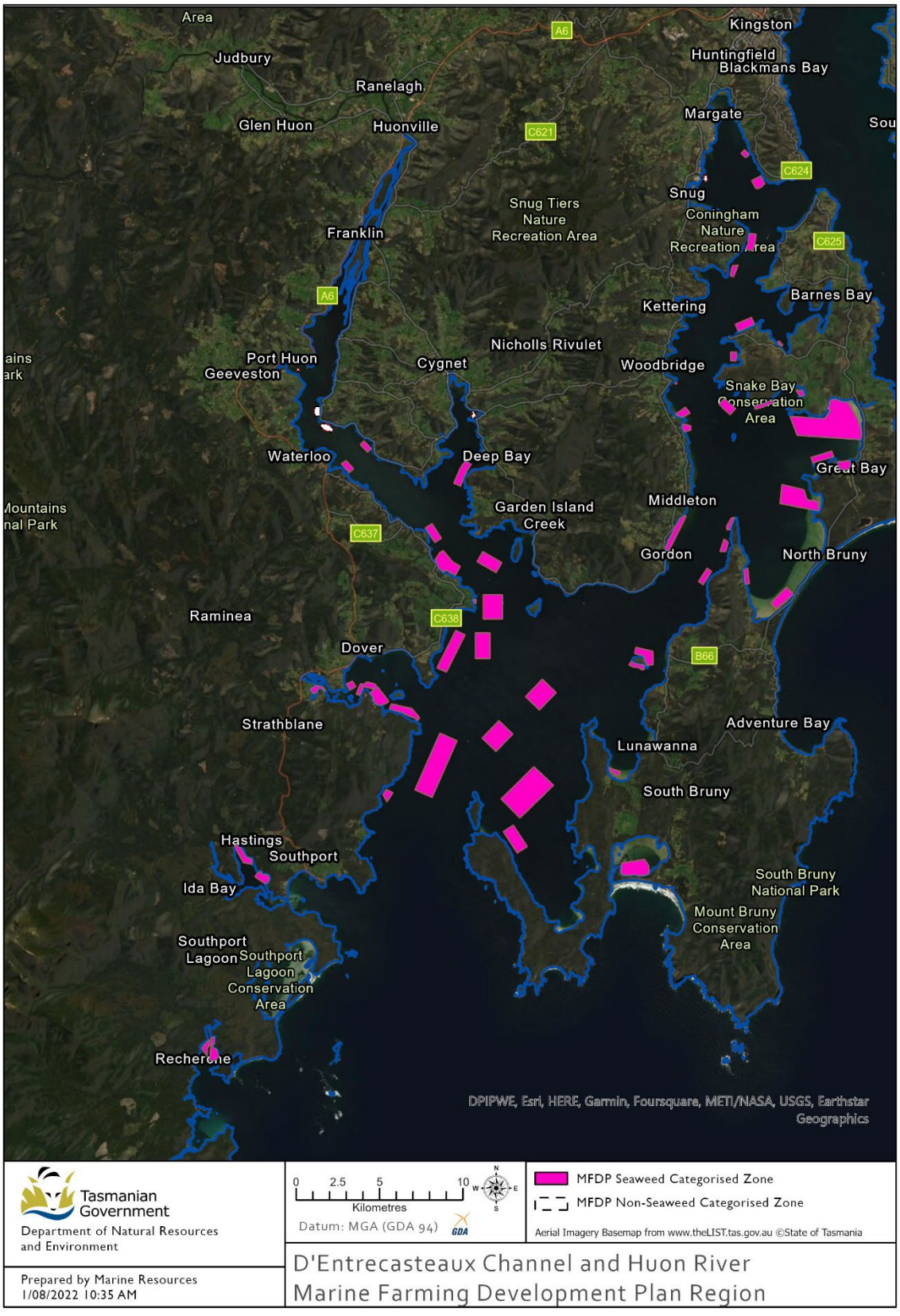
MFDP Seaweed Categorised Zone
MFDP Non-Seaweed Categorised Zone
Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
Great Oyster Bay and Mercury Passage
Marine Farming Development Plan Region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Ranelagh
Glen Huon
Huonville
A6
C621
Kingston
Huntingfield
Blackmans Bay
Margate
Sou
C624
Snug
Snug Tiers
Nature
Recreation Area
Coningham
Nature
Recreation Area
C625
Franklin
A6
Kettering
Barnes Bay
Nicholls Rivulet
Port Huon
Geeveston
Cygnet
Woodbridge
Snake Bay
Conservation
Area
Waterloo
Deep Bay
Great Bay
Garden Island
Creek
Middleton
C637
Gordon
North Bruny
Raminea
C638
Dover
B66
Strathblane
Adventure Bay
Lunawanna
South Bruny
Hastings
Southport
Ida Bay
South Bruny
National Park
Mount Bruny
Conservation
Area
Southport
Lagoon
Southport
Lagoon
Conservation
Area
Recherche
DPIPWE, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Earthstar Geographics
Tasmanian Government
Department of Natural Resources and Environment
Prepared by Marine Resources
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Kilometres
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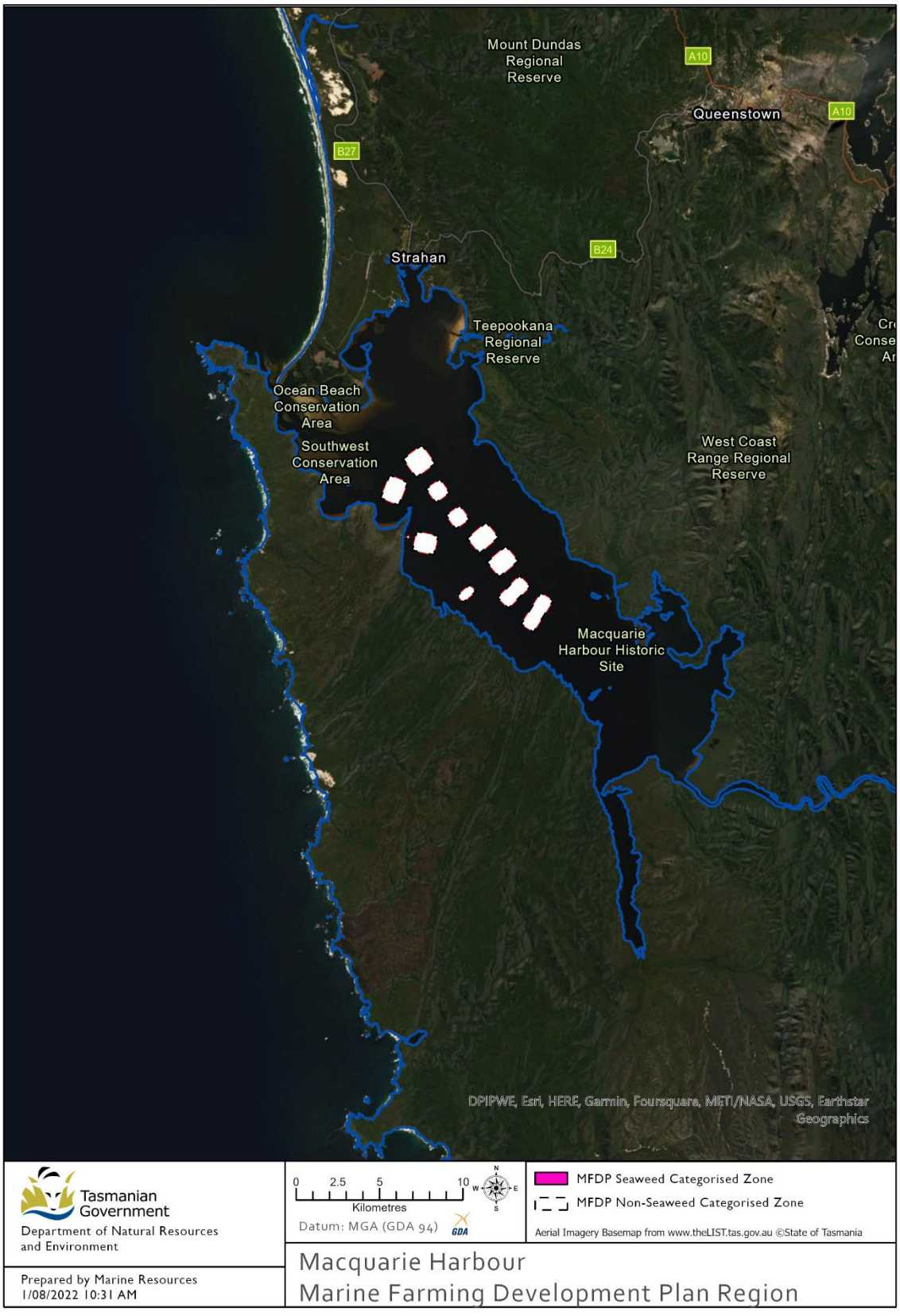
GDA
MFDP Seaweed Categorised Zone
MFDP Non-Seaweed Categorised Zone
Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
D'Entrecasteaux Channel and Huon River
Marine Farming Development Plan Region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Regional
Reserve
A10
Queenstown
A10
B27
B24
Strahan
Teepookana
Regional
Reserve
Ocean Beach
Conservation
Area
Southwest
Conservation
Area
West Coast
Range Regional
Reserve
Macquarie
Harbour Historic
Site
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Government
Department of Natural Resources
and Environment
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MFDP Non-Seaweed Categorised Zone
Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
Macquarie Harbour
Marine Farming Development Plan Region


B33
Forest Hill Rd
Sandford
Calverts Hill
Nature Reserve
School Rd
Cremorne Ave
South Arm Rd
Cremorne
Delphis Dr
Clifton Beach Rd
Bicheno St
Cape Deslacs
Nature Reserve
Clifton Beach
Clifton Beach
Conservation
Area
South Arm Rd
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Tasmanian Government
Department of Natural Resources and Environment
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GDA
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MFDP Non-Seaweed Categorised Zone
Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
Pipe Clay Lagoon
Marine Farming Development Plan Region


C351
Orielton
A3
C351
Pitt Water
Nature Reserve
Sorell
Midway Point
B31
Tasman Hwy
Hobart
International
Airport
C330
Seven Mile
Beach
C330
Acton Park
Roches Beach
DPIPWE, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Earthstar Geographics
Tasmanian Government
Department of Natural Resources and Environment
Prepared by Marine Resources
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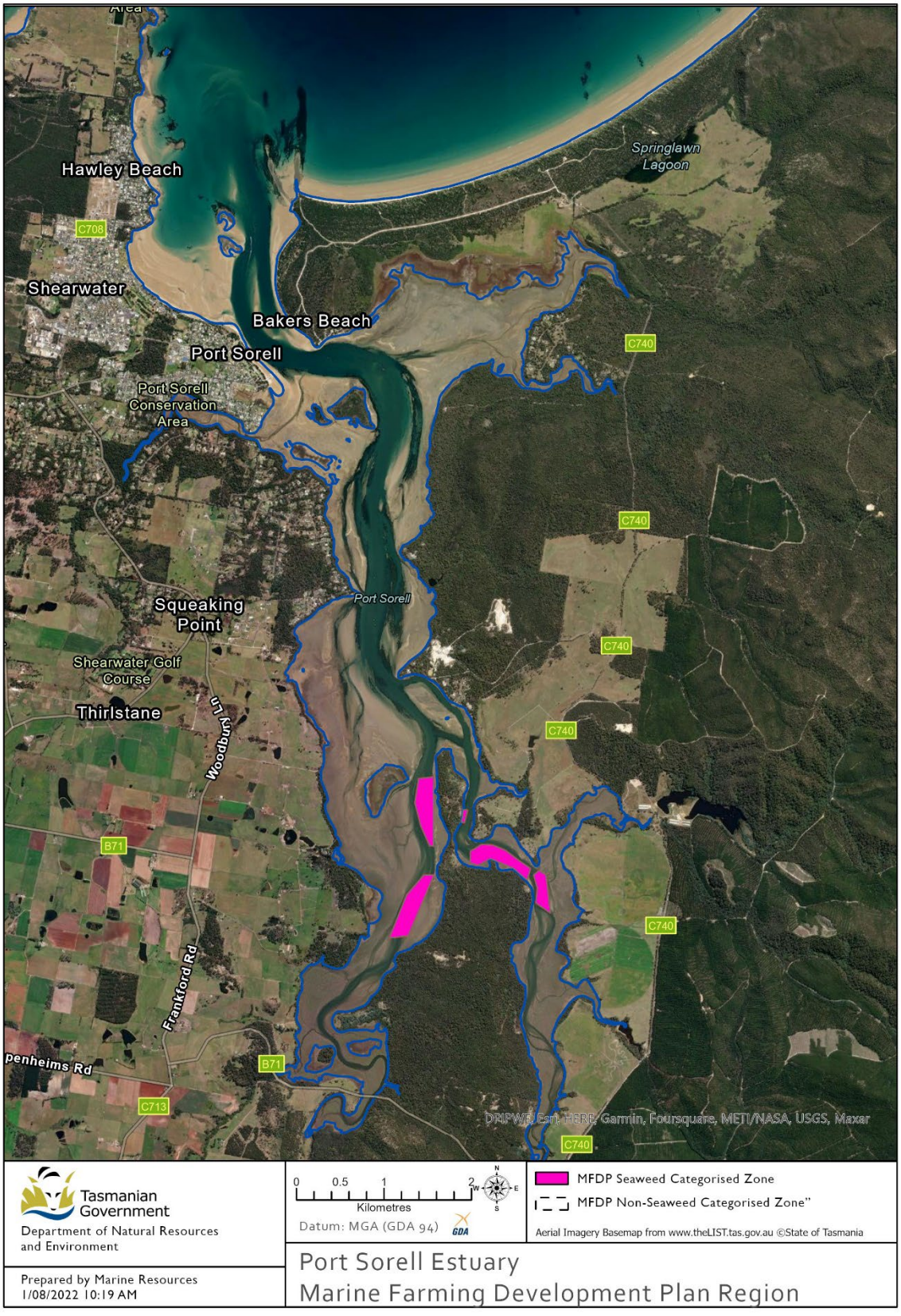
Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
Pitt Water
Marine Farming Development Plan Regions


Hawley Beach
Springlawn Lagoon
C708
Shearwater
Bakers Beach
Port Sorell
C740
Port Sorell Conservation Area
Squeaking Point
Port Sorell
Shearwater Golf Course
Thirlstane
Woodbury Ln
B71
Frankford Rd
penheims Rd
C713
DNRWET, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Maxar
Tasmanian Government
Department of Natural Resources and Environment
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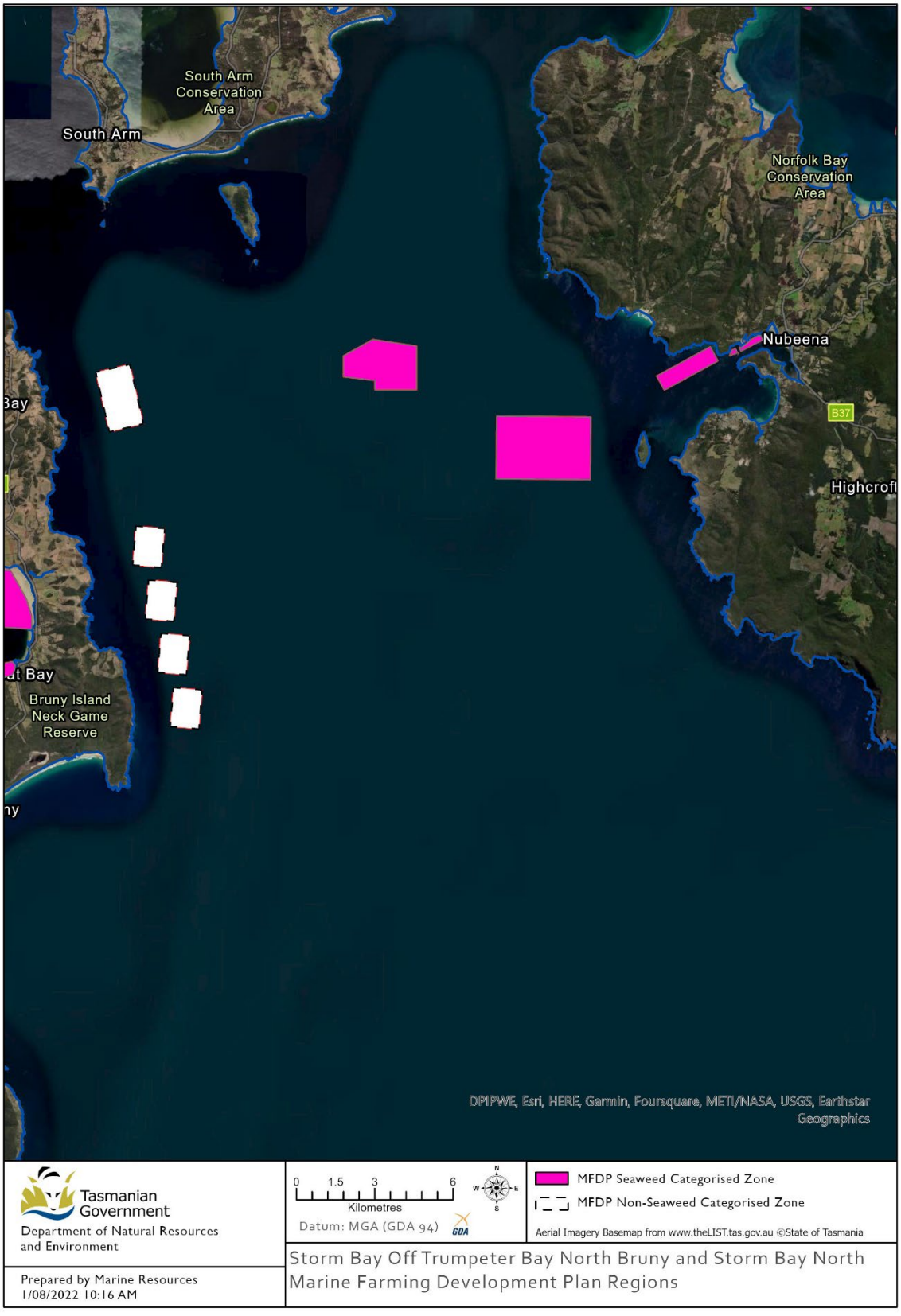
Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
Port Sorell Estuary
Marine Farming Development Plan Region


South Arm Conservation Area
South Arm
Norfolk Bay Conservation Area
Nubeena
B37
Bruny Island Neck Game Reserve
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Tasmanian Government
Department of Natural Resources and Environment
Prepared by Marine Resources
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GDA
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MFDP Non-Seaweed Categorised Zone
Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
Storm Bay Off Trumpeter Bay North Bruny and Storm Bay North Marine Farming Development Plan Regions


Beechford
Stony Head
Low Head
Greens Beach
Conservation Area
Greens Beach
A8
Lefroy
George Town
Kelso
B82
B82
Clarence Point
Tippogoree Hills Conservation Area
West Arm Conservation Area
C809
York Town
Beauty Point
A7
Long Reach
Rowella
Andersons Creek Regional Reserve
C720
Middle Arm Conservation Area
Beaconsfield
C809
Dans Hill Conservation Area
C715
Sidmouth
East Tamar Hwy
Deviot
Tamar Conservation Area
Hillwood
A7
Flowery Gully
Holwell Gorge State Reserve
C717
Loira
Swan Point
Robigana
Holwell
DPIPWE, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Maxar
Tasmanian Government
Department of Natural Resources and Environment
Prepared by Marine Resources
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Kilometres
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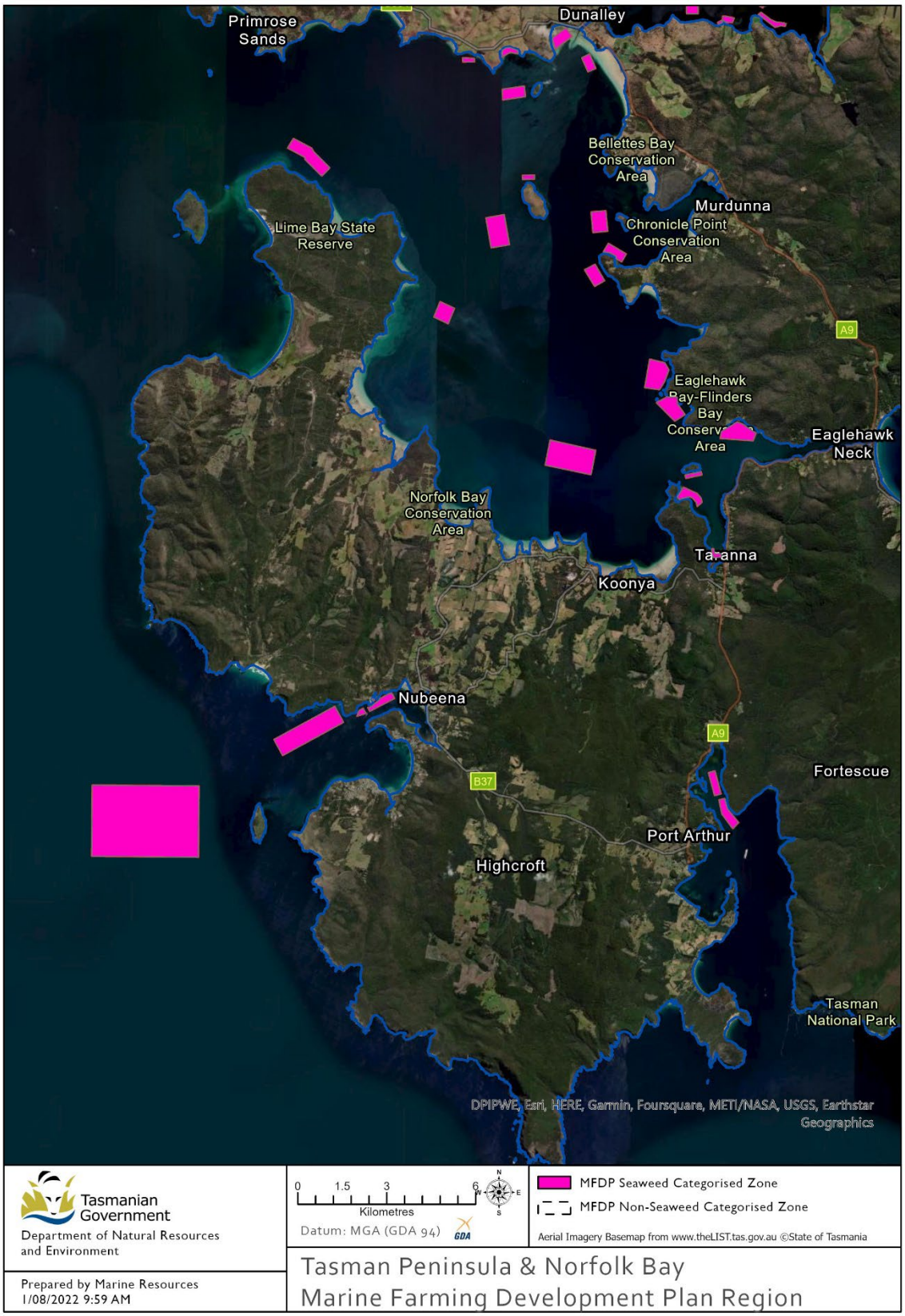
GDA
MFDP Seaweed Categorised Zone
MFDP Non-Seaweed Categorised Zone
Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
Tamar Estuary
Marine Farming Development Plan Region


Primrose Sands
Dunalley
Bellettes Bay Conservation Area
Murdunna
Chronicle Point Conservation Area
Lime Bay State Reserve
A9
Eaglehawk Bay-Flinders Bay Conservation Area
Eaglehawk Neck
Norfolk Bay Conservation Area
Taranna
Koonya
Nubeena
A9
B37
Fortescue
Port Arthur
Highcroft
Tasman National Park
DPIPWE, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Earthstar Geographics
Tasmanian Government
Department of Natural Resources and Environment
Prepared by Marine Resources
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GDA
MFDP Seaweed Categorised Zone
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Aerial Imagery Basemap from www.theLIST.tas.gov.au ©State of Tasmania
Tasman Peninsula & Norfolk Bay
Marine Farming Development Plan Region

Appendix E – Seaweed aquaculture management in South Australia

Overview

The regulatory framework for aquaculture development in South Australia is under the *Aquaculture Act 2001*. The 'one-stop shop' approach adopted by the Department of Primary Industries and Regions South Australia (PIRSA) facilitates aquaculture application processes, prevents duplication and provides transparency to applicants and resource users. Authorisation of seaweed aquaculture operations is possible within the existing statutory instruments and leasing and licensing provisions for aquaculture. The South Australian aquaculture management arrangements are based on three key management principles: integrated management, ecosystem-based management and the precautionary principle where information may be lacking or limited. These principles are evident in both the legislation and policy frameworks.

Current state – seaweed aquaculture

South Australia has a large emerging aquaculture industry with a global seaweed hub committed to commercial seaweed aquaculture development. Indigenous aquaculture development is expressly supported in South Australia, with the Narungga Nations Aboriginal Corporation (NNAC) being the first entity to obtain aquaculture leases and licences to farm algae in South Australian marine waters (Point Pearce on Yorke Peninsula).

Although significant lease areas have been approved and are now available for aquaculture, seaweed production is still at an early stage, with significant work to be completed to develop commercial culture techniques. Production of *Asparagopsis* spp., a species that has created considerable interest as a result of its potential to reduce methane production in ruminants, is a key focus in South Australia. Aquaculture development for this species is well-advanced and commercial-scale production is anticipated in the near future.

Seaweed aquaculture management framework

Policy and legislation

Aquaculture in South Australia is governed by the *Aquaculture Act 2001*. It provides the broad regulatory and operational framework for aquaculture and allows for the culture of a range of "aquatic organisms", including seaweed. The Act sets the parameters within which aquaculture can occur and outlines requirements relating to regulation and provision of leases and licences. The Act also defines statutory policies, including aquaculture zoning policies for spatial planning. Part 2.8 of the Act provides for ecologically sustainable development by providing the terms for efficient and effective regulation of the aquaculture industry and maximisation of community benefits. The *Aquaculture (Standard Lease and Licence Conditions) Policy 2022* standardises the conditions for aquaculture leases and licences, while the *Aquaculture Regulations 2016* provides the policy framework for regulation of aquaculture operations in South Australia (reporting, strategy development, environmental monitoring requirements).

While the *Aquaculture Act 2001* is the main legislative instrument for aquaculture management, other pieces of legislation can apply to seaweed aquaculture. The *Fisheries Management Act 2007* also informs the conservation and management of aquatic resources (management and regulation of fishing, and processing of aquatic resources), and in conjunction with the *Fisheries Management (Miscellaneous Broodstock and Seedstock Fishery) Regulations 2013* regulate the capture/collection

of wild stock for the purposes of aquaculture. A permit is needed to collect seaweed seedstock from the wild, and this must be authorised under the *Fisheries Management Act 2007*. Currently, applicants must provide supporting information on the risk to wild stocks associated with these collections, however the South Australian Research and Development Institute (SARDI) has been providing independent scientific support for industry development, including developing an understanding of the risk associated with wild seaweed collection.

The *Environmental Protection Act 1993* seeks to ensure ecologically sustainable development. To obtain an aquaculture licence, an environmental assessment needs to be carried out by PIRSA, with referral to the Environment Protection Authority (EPA) for additional approval to ensure that the proposal meets the objectives of the *Environment Protection Act 1993* and related environment protection policies. The *Environmental Protection Act 1993* also specifies the requirements for waste disposal and storage of chemicals, feed materials and general farm waste (Schedule 1 Part A).

A 2022 report outlining aquaculture zoning in South Australian provides a comprehensive summary of aquaculture production and management. The report broadly outlines regulation and management, biosecurity and environmental monitoring requirements, and recent trends, challenges and research developments in the industry (SA Department of Primary Industries and Regions, 2022a). The report has a section specifically on marine algae, in which it clearly identifies the potential for both economic and environmental benefits from seaweed aquaculture. The potential for seaweed to enhance ecosystem services through nutrient offsets and integrated multi-trophic aquaculture is specifically noted in this report, as is the high species diversity in South Australia and the potentially substantial economic and climate change benefits associated with *Asparagopsis* aquaculture.

However, a policy decision in 2022 resulted in the introduction of additional conservation management provisions and defined macroalgae management areas, with the aim of protecting against any potential risks associated with translocation (i.e., genetic and disease risks) (SA Department of Primary Industries and Regions, 2022b). This resulted in 20 zones being defined and limitations imposed on seedstock collection and stock movement between zones until further research is available. The South Australian Government, through SARDI, is supportive of research to better understand these risks and projects are either underway or in development.

Approvals and permits

Marine aquaculture is permitted in all state waters except areas prescribed as aquaculture exclusion zones or designated as exclusion areas under other legislation (for example, sanctuary zones within marine parks and areas near shipping and boating channels). Marine-based aquaculture activities require a lease granted by the Minister, which provides exclusive access to the seabed/water area, and a corresponding licence to undertake the specified aquaculture activity. Licence and lease applications are assessed in accordance with the *Aquaculture Act 2001* and PIRSA internal procedures. PIRSA coordinates the assessment and approval processes with other agencies, and also leads any community consultation and connection with relevant stakeholders.

Aquaculture zone policies are developed with input from relevant industry participants, government stakeholders and community members through a mandated consultation process (*Aquaculture Act 2001* Section 12 and *Aquaculture Regulations 2016* Section 5). Amendments can be made in response to submissions where appropriate; the Minister has final approval. Once approved, the policy is referred to the Environment, Resources and Development Committee of the Parliament. If there are no objections or amendments, it will be enacted by public notice in the *Gazette*.

Zone policies specify the species that may be farmed, the aquaculture system allowed and limitations on biomass in each defined zone. The approval process includes assessment of the environmental, conservation, heritage, industrial, social and economic conditions of the area based on available data. Technical information can be obtained from independent scientific technical investigations focused on the environmental conditions and sustainable carrying capacity of the potential zone.

A **lease** provides the user access to a specific area(s) of state waters for a specific period of time. Aquaculture leases are divided into four classes (*Aquaculture Act 2001* Part 6):

- **Pilot leases (maximum of 12 months):** Granted in an area outside an aquaculture zone to trial aquaculture development in new areas. A pilot lease can be renewed for successive terms, but for no more than five years. If the leaseholder can demonstrate the productive use of the lease area, they may apply to convert the pilot lease into a production lease.

- **Production leases (long-term operation):** Granted in an area within an aquaculture zone. If the area is designated as a public call area, the application can only be made following a public call. Production leases are required for all established operations, are long term in nature (maximum 30 years) and can only be transferred with the consent of the Minister.

- **Research leases:** May be granted in areas within or outside an existing aquaculture zone. These are used by operators or research organisations to increase, enhance or diversify aquaculture production. These are not transferable and the term is determined by the specific expectations of the researchers, with a maximum of five years.

- **Emergency leases:** May be granted in areas within or outside an existing aquaculture zone and are temporary. These leases are granted for a maximum term of six months and are intended as a response to matters related to the protection of the environment or the preservation of endangered aquaculture stock.

A **licence** authorises the nature of the activity, the species to be farmed and the amount of stock permitted. Licence applications must undergo an Ecologically Sustainable Development risk assessment based on a nationally accredited framework to assess the sustainability of the activity in relation to its potential environmental impact. The EPA approves aquaculture licences and amendments to aquaculture licence conditions based on their environmental risk management. In addition, the Aquaculture Tenure Allocation Board (ATAB) assesses all applications for production leases. Stakeholders, including the public, relevant fishing industry bodies and nearby aquaculture licence holders, are notified of the application and invited to identify potential conflicts or concerns (*Aquaculture Act 2001* Division 4). Licence proponents must provide individual aquaculture strategies specifying measures to mitigate any adverse environmental impacts associated with their operations, and these must be approved by the Minister. However, there is potential to obtain sector-based approval for generic activities related to aquaculture (*Aquaculture Regulations 2016* Subdivision 2).

Permits to collect wild broodstock and seedstock can be obtained from the PIRSA Fisheries and Aquaculture Division. Applications require specific details of the activities to be undertaken, including intended amount collected and locations. It is possible to collect species for broodstock from licenced commercial fishers (where these exist), and in that case documents provided by the commercial processor will be required for compliance purposes.

The *Aquaculture Regulations 2016* require an Environmental Monitoring Program (EMP) for all aquaculture licences. These are sector-specific, and sometimes species/operations-specific, and generally contain information on site development and productivity, feed and chemical inputs, interactions with other marine species, debris and disease incidents, and waste and refuse disposals.

There is currently little information on the biosecurity risks associated with seaweed aquaculture, however all seaweed aquaculture licences will have conditions related to managing biosecurity/ translocation risks. In addition, PIRSA has developed specified macroalgae management areas across the state to minimise movement of seaweed between regions, until further information on the risks is available. Seaweed/seedstock collection permits are also restricted to ensure seaweed stock is only collected from the same macroalgae management/licence area.

Institutional arrangements

The Minister responsible for administering the Act has the powers to make/amend aquaculture policies and grant aquaculture licences and leases. The Minister is supported by the Aquaculture Tenure Allocation Board (ATAB), a statutory body that advises the Minister on matters relating to the fair and transparent allocation of aquaculture lease tenure applications within aquaculture zones (*Aquaculture Act 2001* Part 6 Division 4). ATAB consists of six members appointed by the Governor based on their expertise and knowledge.

The Fisheries and Aquaculture Division within PIRSA is responsible for seaweed legislation and regulation, and for assessment and ongoing management of leases and licences to farm and sell seaweed species through the Aquaculture Unit. The Fisheries Unit of the Fisheries and Aquaculture Division regulates and manages the harvesting of wild seedstock and broodstock to be used in aquaculture.

SARDI provides scientific and technical advice across government, industry and the community on issues associated with the sustainable development of aquaculture activities. SARDI has developed a number of research subprograms that seek to support aquaculture development in general and seaweed aquaculture development specifically.

The 'one-stop shop' approach adopted by PIRSA provides a straightforward access point for anyone interested in seaweed aquaculture development, legislation and policy; the application processes; or monitoring and assessment requirements. Table E1 shows how the various legislation/policy instruments relate to key management areas of aquaculture production, and the managing authorities responsible in South Australia.

Table E1: Key management instruments and responsibilities for seaweed aquaculture in South Australia.

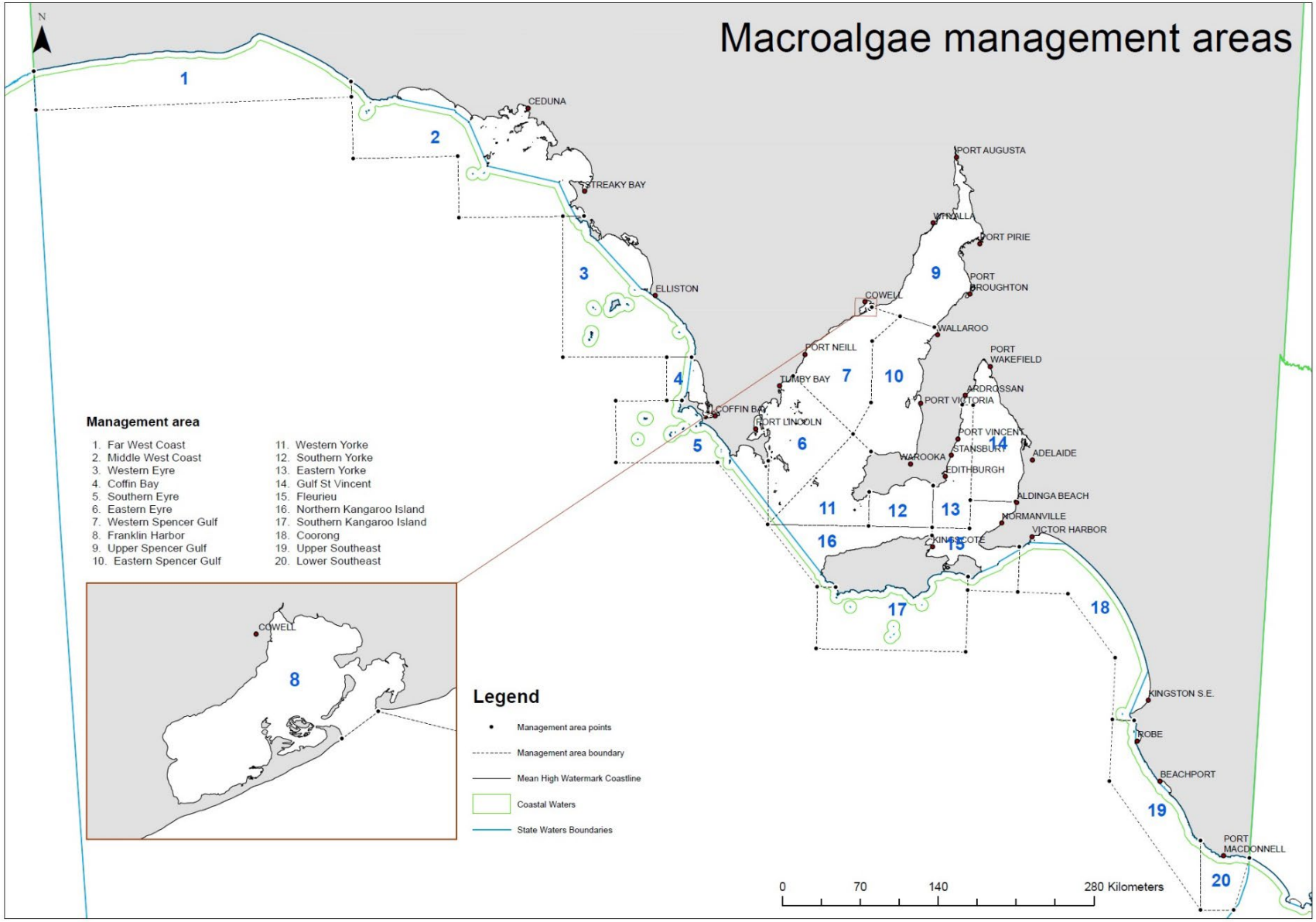
Management element	Management authority	Legislation/policy instrument(s)
Aquaculture legislation	PIRSA Fisheries and Aquaculture Division EPA DEW	*Aquaculture Act 2001*
Aquaculture operations (licensing)	PIRSA Fisheries and Aquaculture Division	*Aquaculture Act 2001* *Aquaculture Regulations 2016* *Fisheries Management Act 2007* *Fisheries Management Regulations 2013*
Access to water (leasing)	PIRSA Fisheries and Aquaculture Division DIT (if outside an aquaculture zone)	*Aquaculture Act 2001* and *Aquaculture Regulations 2016* *Harbors and Navigation Act 1993*
Environmental effects	PIRSA Fisheries and Aquaculture Division EPA	*Aquaculture Act 2001* *Environment Protection Act 1993*
Biosecurity and aquatic animal health	PIRSA Fisheries and Aquaculture Division PIRSA Biosecurity Division	*2020-2023 Biosecurity Policy* *Aquaculture Regulations 2016* *Livestock Act 1997* *Fisheries Management Act 2007*
Marine safety and navigation	Marine Safety SA	
Food safety (post harvest)	PIRSA Seafood Safety Division	*Food Act 2001* *Primary Produce (Food Safety Schemes) (Seafood) Regulations 2017* *Food Standards Code*

PIRSA = Department of Primary Industries and Regions; EPA = Environmental Protection Authority; DEW = Department for Environment and Water; DIT = Department for Infrastructure and Transport.

Seaweed aquaculture mapping

The first map on the next page shows the macroalgae management areas. Maps are also included from each of the aquaculture zone policies that include algae on the species list. These are:

- Cape D'Estrees (Source: *Aquaculture Policy 2006*)
- Anxious Bay (Source: *Aquaculture Policy 2007*)
- Coffin Bay (Source: *Aquaculture Policy 2008*)
- Lower Eyre Peninsula (Source: *Aquaculture Policy 2013*)
- Tumby Bay (Source: *Aquaculture Policy 2015*)
- Port Neill (Source: *Aquaculture Policy 2008*)
- Fitzgerald Bay (Source: *Aquaculture Policy 2008*)
- Eastern Spencer Gulf (Source: *Aquaculture Amendment Policy 2021*)


Macroalgae management areas
N
Management area
1. Far West Coast
2. Middle West Coast
3. Western Eyre
4. Coffin Bay
5. Southern Eyre
6. Eastern Eyre
7. Western Spencer Gulf
8. Franklin Harbor
9. Upper Spencer Gulf
10. Eastern Spencer Gulf
11. Western Yorke
12. Southern Yorke
13. Eastern Yorke
14. Gulf St Vincent
15. Fleurieu
16. Northern Kangaroo Island
17. Southern Kangaroo Island
18. Coorong
19. Upper Southeast
20. Lower Southeast
Legend
Management area points
Management area boundary
Mean High Watermark Coastline
Coastal Waters
State Waters Boundaries
0
70
140
280 Kilometers
CEDUNA
STREAKY BAY
ELLISTON
PORT AUGUSTA
WHYALLA
PORT PIRIE
PORT BROUGHTON
COWELL
WALLAROO
PORT NEILL
PORT WAKEFIELD
TUMBY BAY
ARDROSSAN
PORT VICTORIA
COFFIN BAY
PORT LINCOLN
PORT VINCENT
STANSBURY
ADELAIDE
WAROOKA
EDITHBURGH
ALDINGA BEACH
NORMANVILLE
VICTOR HARBOR
KINGSCOTE
KINGSTON S.E.
ROBE
BEACHPORT
PORT MACDONNELL
1
2
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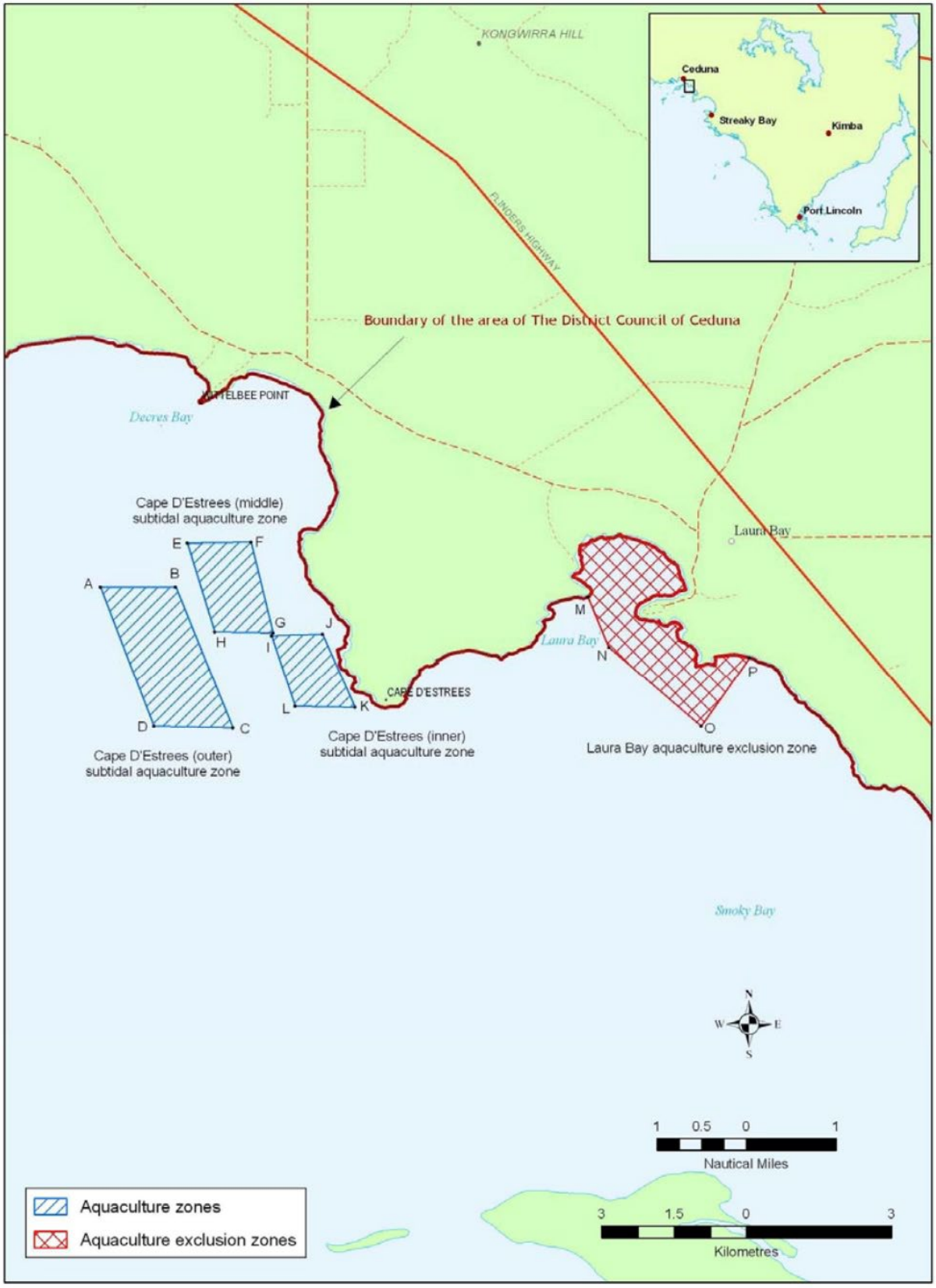
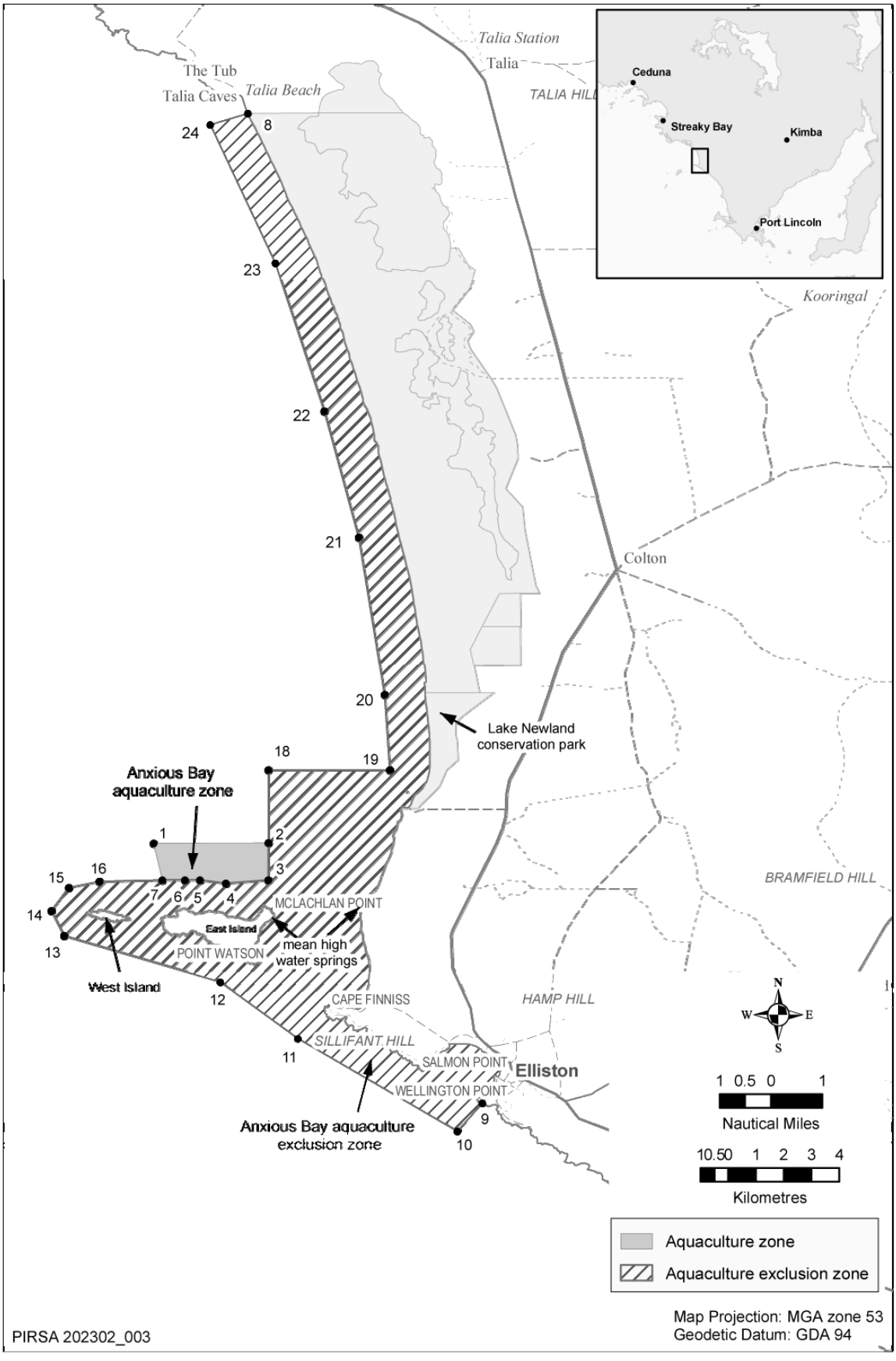
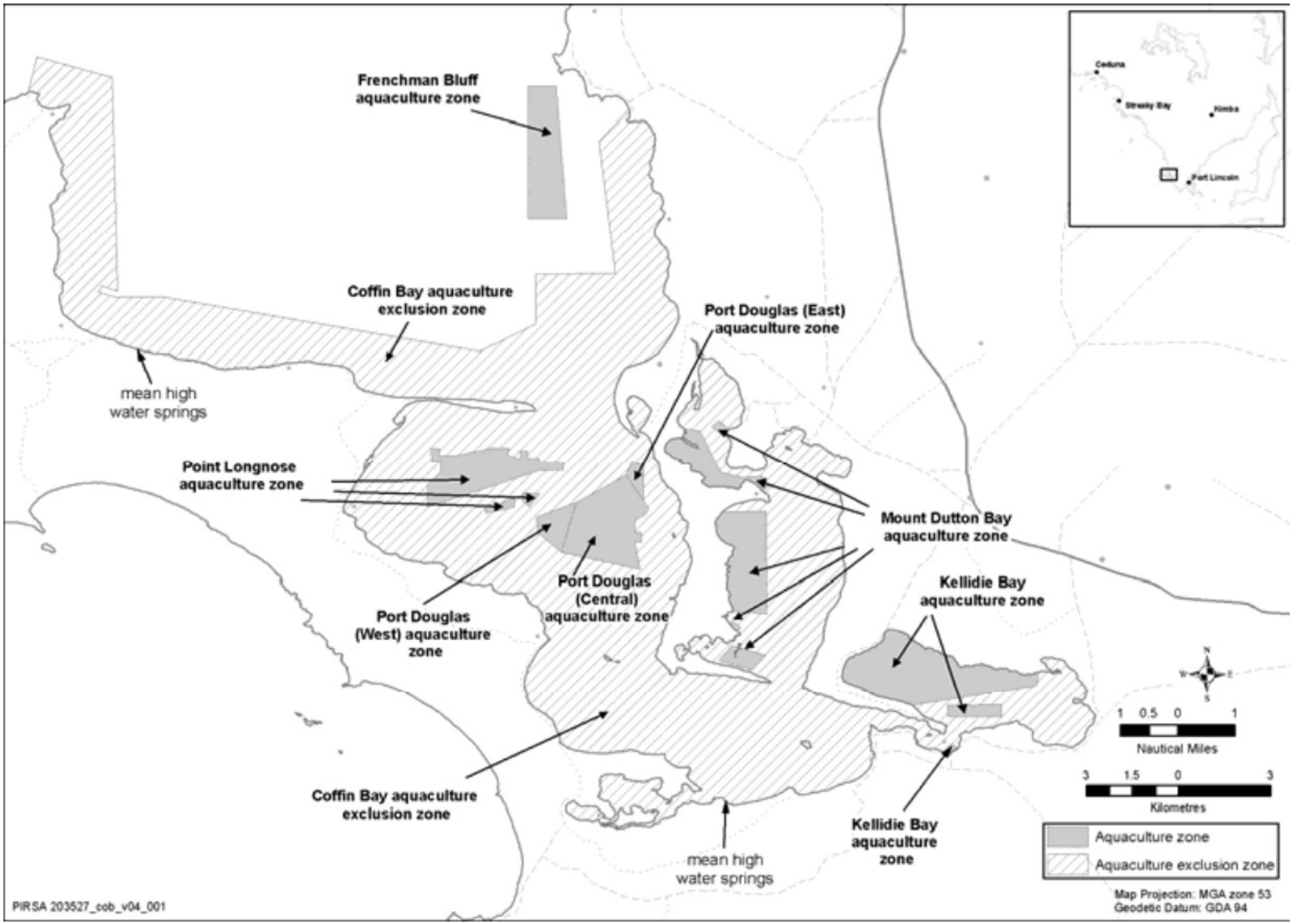
Cape D’Estrees aquaculture and exclusion zones



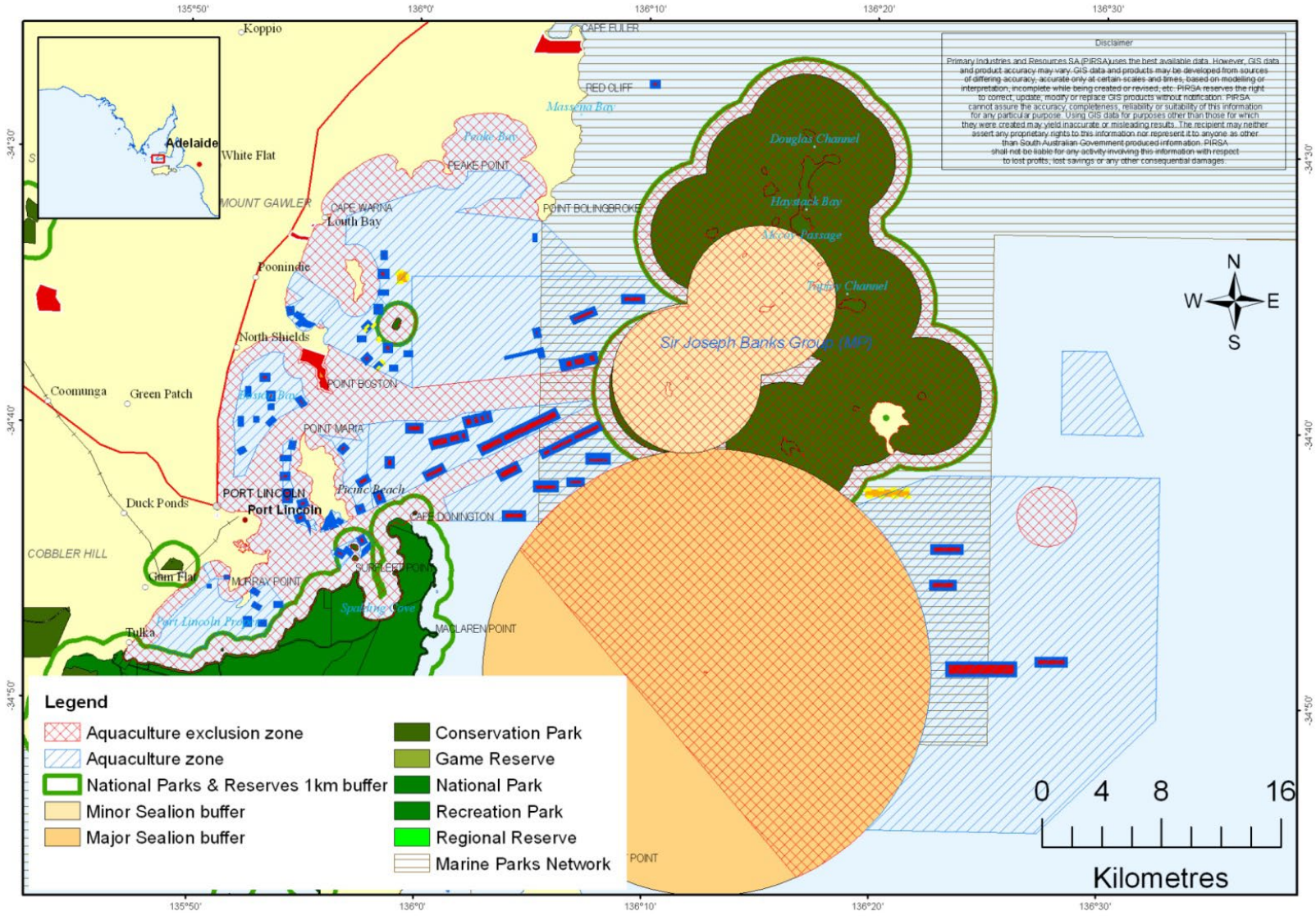
Anxious Bay aquaculture and exclusion zones



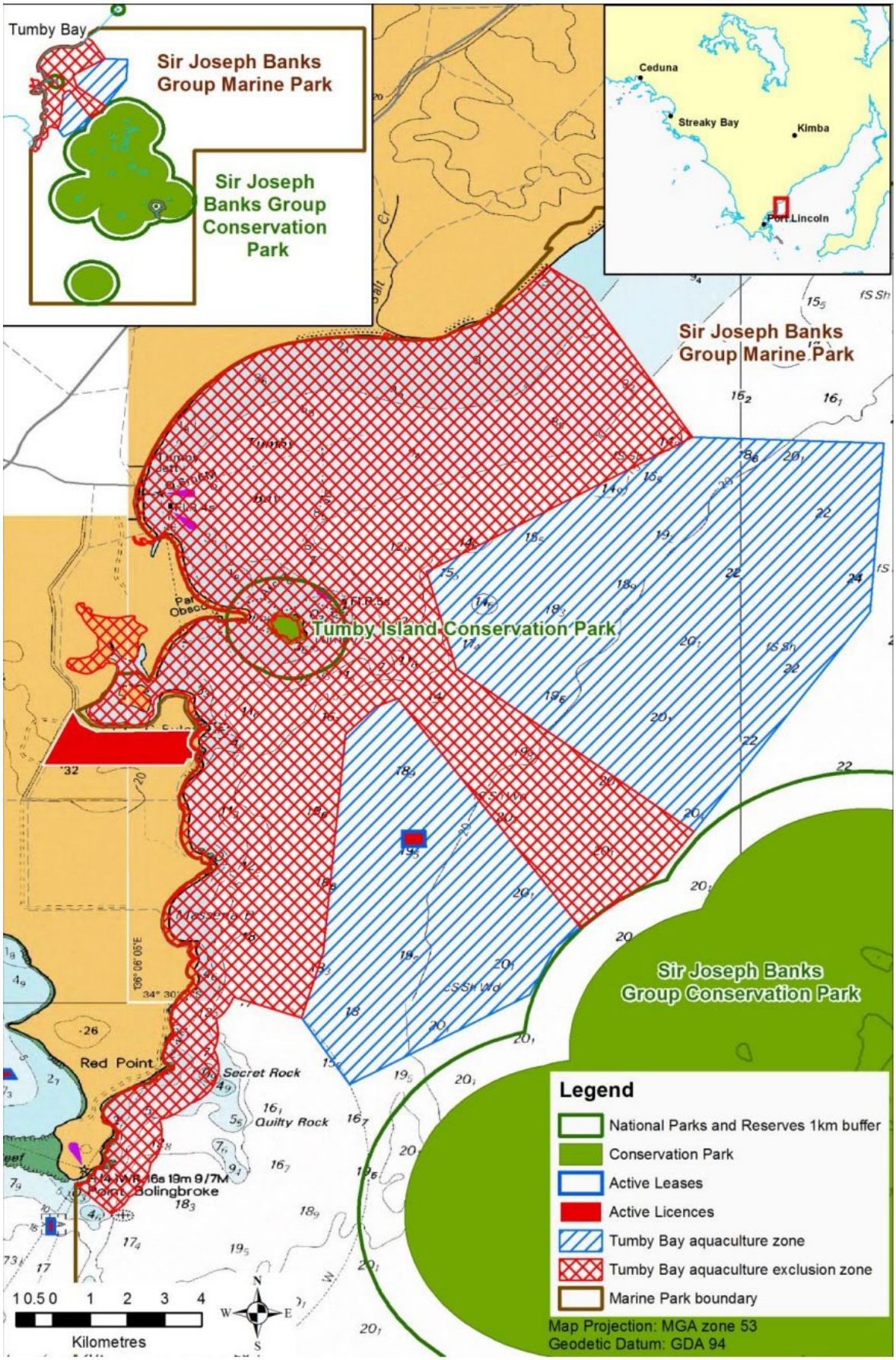
Coffin Bay aquaculture and exclusion zones



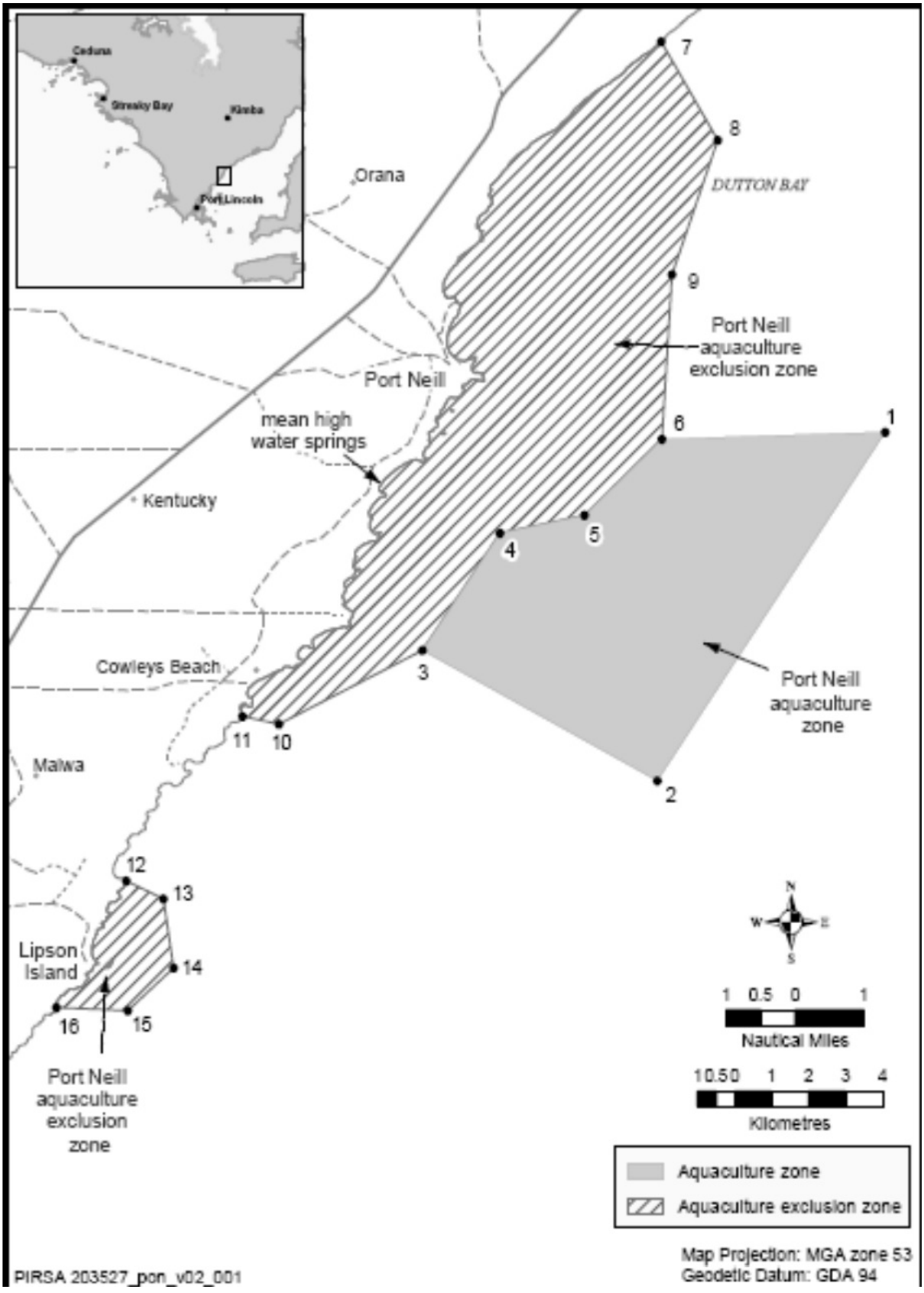
Lower Eyre Peninsula aquaculture and exclusion zones



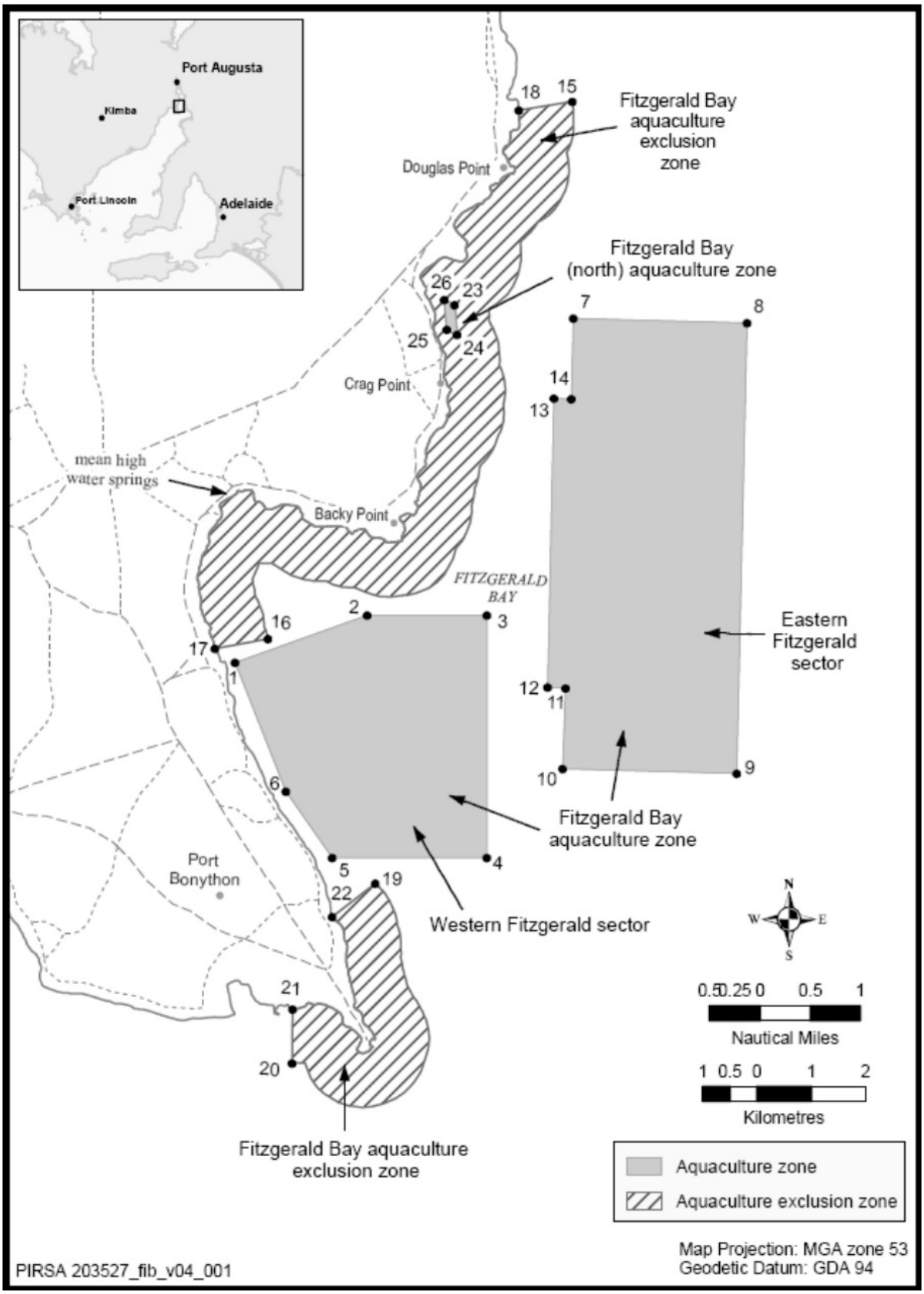
Tumby Bay aquaculture and exclusion zones



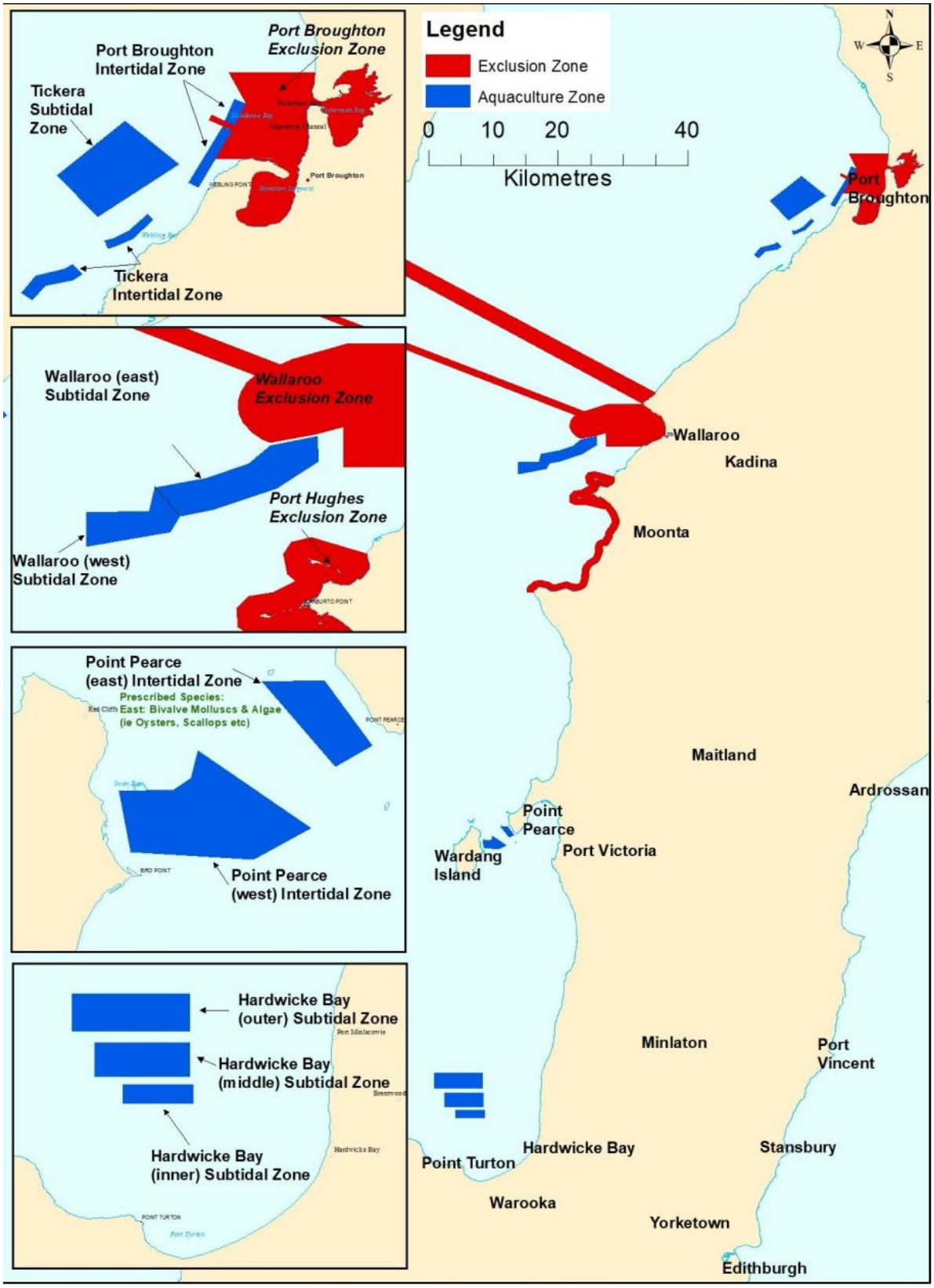
Port Neill aquaculture and exclusion zones



Fitzgerald Bay aquaculture and exclusion zones



Eastern Spencer Gulf aquaculture and exclusion zones



Appendix F – Seaweed aquaculture management in Western Australia

Overview

There is strong state government support for aquaculture in Western Australia, with multiple development initiatives recently established or underway. The government is reforming the regulation and approvals processes with a view to reducing both 'red tape' and costs by streamlining regulatory processes and management functions, aiming for a 'one-stop shop' administration model.

Endorsed by the government, the *Aquaculture Development Plan 2020* (WA Department of Primary Industries and Regional Development, 2020) outlines a clear strategy to support the sector going forward, with seaweed aquaculture explicitly noted. The industry is undergoing a legislative transition, with the primary aquaculture management legislation, the *Fish Resources Management Act 1994* (FRMA), about to be replaced by the *Aquatic Resources Management Act 2016* (ARMA) as soon as the new Act is proclaimed. That said, the Government does provide targeted support for aquaculture site selection and spatial planning. Three aquaculture development zones have been established, and the review of governance and management strategies as part of the new legislative processes has the specific intent of supporting aquaculture within an integrated, adaptive and ecosystem-based management framework.

Seaweed aquaculture is included in the legislation and its own policy, *Fisheries Occasional Publication No. 143: Aquaculture of Seaweed in Western Australia* (WA Department of Primary Industries and Regional Development, 2022), under a very broad definition of "fish". While application and approval processes for seaweed aquaculture are not as well-developed as for marine finfish and shellfish, the regulatory framework is rapidly developing. However, seaweed aquaculture in Western Australia faces some quite specific challenges due to the remote location of aquaculture zones, the dynamic and high-energy nature of the coast, and resultant limitations relating to site selection, infrastructure viability and access to skilled personnel.

Current state – seaweed aquaculture

In 2020, Western Australia only had 14 hectares of aquaculture lease areas approved for seaweed culture (Kelly, 2020), but this has increased markedly since then, with more than 650 ha approved. The aquaculture potential of the red seaweed *Asparagopsis* is being explored by a number of companies in the state and the University of Western Australia. This species is considered to have significant commercial potential as a feed additive to reduce methane production in ruminants, particularly cattle.

The *Aquaculture Development Plan 2020* identifies economic growth, economic feasibility, resilience through diversification, and job security and quality as explicit goals. As a result, the Government of Western Australia has invested in several projects focused on aquaculture development, including investment in hatchery and production facilities and support for research collaborations. New development sites for aquaculture have been identified on the northwest, west and south coasts, and a GIS tool to assist with identifying areas suitable for aquaculture, including seaweeds, is being developed. The government has also committed to supporting the industry through market analysis and product development, and has indicated it may support industry certification schemes, such as Aquaculture Stewardship Council and Marine Stewardship Council, to help ensure quality and sustainability (WA Department of Primary Industries and Regional Development, 2020).

Seaweed aquaculture management framework

Policy and legislation

The *Fish Resources Management Act* 1994 (FRMA), the primary legislation under which aquaculture is managed, is about to be replaced by the *Aquatic Resources Management Act 2016* (ARMA), when the ARMA has been proclaimed. Seaweed aquaculture is included as part of the definition of aquaculture in both pieces of legislation. The ARMA has been specifically framed to support commercial fishing, recreational fishing and aquaculture, and has a major focus on aquatic resource sustainability. It provides a more progressive management approach based on three key management principles: integrated management, ecosystem-based management and the precautionary principle. The ARMA has been framed to ensure economic, social, and other benefits from aquatic resources are managed effectively, and that those benefits and the ecosystems that sustain them are maintained for future generations. The ARMA provides a clear aquaculture leasing and licensing process, and outlines requirements for lease management and environmental monitoring and performance criteria. There are also processes for approval of pilot or research and development trials (approval can be obtained through a Ministerial exemption). Such trials allow proponents to test the viability of their business proposition before committing to an aquaculture licence and lease.

FOP 143 was released in September 2022 and outlines policy principles and guidelines relating to the assessment of licences and exemptions for seaweed aquaculture in Western Australia (WA Department of Primary Industries and Regional Development, 2022). It also sets out management guidelines for species selection, farming infrastructure, environmental monitoring and biosecurity protocols, and notes these will evolve as knowledge and experience develop in the state and nationally.

The Department of Primary Industries and Regional Development (DPIRD) is the agency responsible for approving aquaculture activities and supporting aquaculture development in the state. DPIRD is managing the legislative transition and the *Aquaculture Development Plan 2020* is the policy framework supporting the transition. Although the *Aquaculture Development Plan 2020* strongly focuses on shellfish and finfish, it does provide for seaweed aquaculture. The plan also recognises opportunities for Indigenous economic improvement and participation. DPIRD's Aboriginal Economic Development (AED) unit is engaging with communities that have expressed interest in being involved in aquaculture, including seaweed aquaculture.

Other broader pieces of legislation have application to seaweed aquaculture. The *WA Coastal Zone Strategy 2017* focuses on the conservation of the coast and seeks to identify and address threats to coastal sustainability. In addition, aquaculture development needs to comply with federal requirements under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA), and any conditions or requirements associated with the federal bioregional marine plans for the northwest and southwest regions in WA. These bioregional marine plans were established to underpin an ecosystem-based approach for development and management of large areas of the marine environment in Western Australia, which all coastal development activities need to consider.

Approvals and permits

All aquaculture activities require a licence to implement aquaculture projects, and an aquaculture lease to gain tenure of Western Australian coastal waters. An aquaculture lease provides a non-exclusive right to occupy or use the site (land or water) for aquaculture activities. An aquaculture licence authorises the specific aquaculture activity at that defined site. Both the lease and licence are site-specific. An aquaculture lease does not authorise the use of the leased area without an aquaculture licence. Applications for an aquaculture licence in coastal waters, or areas vested in the Minister for Fisheries, are required to be accompanied by an application for an aquaculture lease.

An aquaculture lease is granted under Section 97 of the FRMA for up to 21 years and, as noted above, needs to be held in conjunction with an aquaculture licence (granted under Section 92 of the FRMA), which is normally issued for a period of 12 months. Aquaculture licences can be renewed annually, subject to compliance with the conditions of authorisation. Leases and licences may be granted in "General Use" zones of marine parks but will not be granted for other designated areas within marine parks, marine nature reserves or other conservation areas specified under the *Conservation and Land Management Act 1984*. However, the Minister can issue leases with specific conditions or expectations, for example the provision of aquaculture parks (e.g. the Broome Tropical Aquaculture Park).

Aquaculture licences require a Management and Environmental Monitoring Plan (MEMP) to address any risks associated with the activities authorised under the licence, including key areas of environmental impact and biosecurity. Licence holders are required to operate in a manner that protects environmental values and reflects contemporary views on the importance and place of the aquatic environment within society. The MEMP must provide sufficient detail to satisfy the DPIRD Chief Executive Officer that any risks to the environment and public safety will be managed (*Fish Resources Management Act 1994* Section 92A(1)). The MEMP should provide detailed information on the background and purpose of the aquaculture activity, including its objectives, the species of fish to be farmed, the location of the site, the farming method, environmental monitoring and management, and biosecurity risks and provisions. Projects deemed to have significant environmental impacts may be referred to the Environmental Protection Authority (EPA) for further assessment, in accordance with the *Environmental Protection Act 1986*. Similarly, large-scale projects may also be subject to additional specific requirements or conditions, and operators may need to provide additional baseline data.

Institutional arrangements

In September 2022, DPIRD finalised a policy that includes guiding principles (a) for proponents applying to undertake seaweed aquaculture and (b) for regulators assessing seaweed aquaculture applications. However, Table F1 shows how the various legislation/policy instruments relate to key management areas of aquaculture production, and the managing authorities responsible in Western Australia.

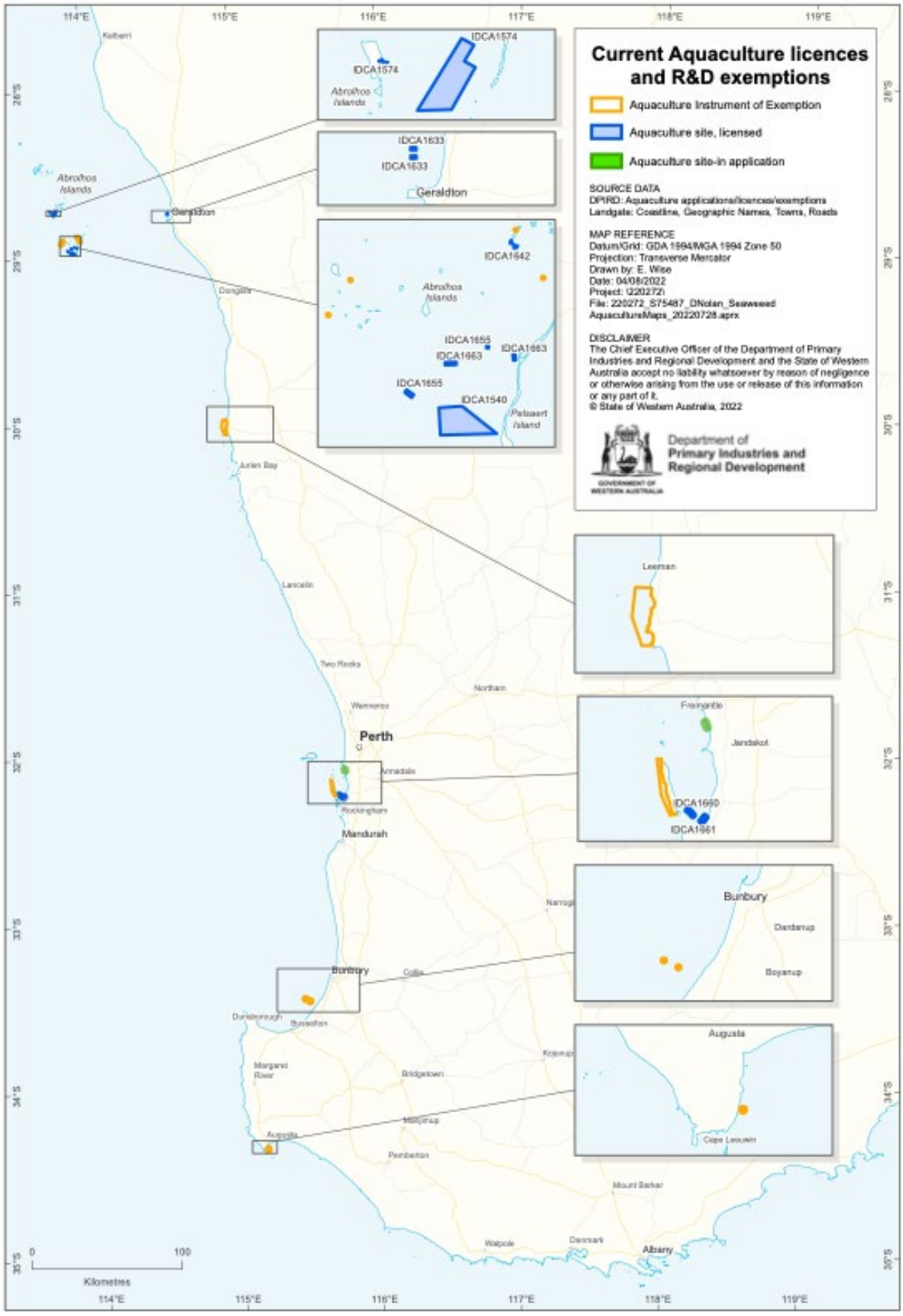
Table F1: Key management instruments and responsibilities for seaweed aquaculture in Western Australia.

Management element	Management authority	Legislation/policy instrument(s)
Aquaculture legislation	DPIRD	*Fish Resources Management Act 1994* *Fish Resources Management Regulations 1995* *Aquatic Resources Management Act 2016* *Aquaculture Development Plan 2020*
Aquaculture strategy	DPIRD	*Aquaculture Development Plan 2020* *WA Coastal Zone Strategy 2017*
Aquaculture operations (licensing)	DPIRD	*Fish Resources Management Act 1994* *Aquatic Resources Management Act 2016* *Fisheries Occasional Publication No. 143*
Access to water (leasing)	DPIRD	*Fish Resources Management Act 1994* *Aquatic Resources Management Act 2016* *Fisheries Occasional Publication No. 143*
Environmental effects	DPIRD EPA	*Fish Resources Management Act 1994* *Aquatic Resources Management Act 2016* *Fisheries Occasional Publication No. 143*
Biosecurity (general)	DPIRD	*Aquatic Biosecurity Policy 2017* *Aquatic Resources Management Act 2016* *Fisheries Occasional Publication No. 143*
Marine safety and navigation	DT	
Food safety (post harvest)	DH	*Safe Seafood Australia* (produced by Food Standards Australia New Zealand

DPIRD = Department of Primary Industries and Regions; EPA = Environmental Protection Authority; DT = Department of Transport; DH = Department of Health.

Seaweed aquaculture mapping

The below map shows the seaweed aquaculture areas and exemptions in Western Australia.



Appendix G – Seaweed aquaculture management in the Northern Territory

Overview

About 82% of the Northern Territory (NT) coastline is owned by Aboriginal people and the Northern Territory Government is committed to working with Aboriginal communities to help them actively participate in the seafood industry (NT Department of Industry, Tourism and Trade, 2019). Therefore, there is a significant opportunity for Traditional Owners to lead marine aquaculture projects. There is no specific government policy or strategy for seaweed aquaculture.

Current state – seaweed aquaculture

There have been no ocean-based seaweed aquaculture projects in the Northern Territory to date.

Seaweed aquaculture management framework

Policy and legislation

The *Northern Territory Fisheries Act 1988* is the key piece of legislation for aquaculture development in the Northern Territory. The Act defines aquaculture as "the farming or culturing of fish or aquatic life", and defines aquatic life as "any species of plant or animal in the marine environment".

The *Fisheries Division Strategic Plan 2019-2022*, produced by the Department of Industry, Tourism and Trade, outlines plans for a sustainable and competitive seafood industry, among other goals (NT Government Department of Industry, Tourism and Trade, 2019).

Approvals and permits

To apply for an aquaculture licence, the proponent will need to:

- Identify the site and right to use
- Prepare a Notice of Intent (NOI)
- Obtain other approvals
- Complete and submit a licence application.

As part of the approval process, the Fisheries Division of the Department of Industry, Tourism and Trade will send the application to the Northern Territory Environment Protection Authority (NT EPA) for an environmental assessment. Large-scale aquaculture developments will likely require an Environmental Impact Statement. A permit for a research or trial project may be obtained under Section 17 of the *Fisheries Act 1988*.

For commercial fisheries and aquaculture, a Section 19 Land Use Agreement is required to conduct business on Aboriginal land; this includes waters overlying Aboriginal land, e.g. between the high tide and low tide mark, regardless of whether the operator holds a fishing licence issued by the Northern Territory Government.

Institutional arrangements

Table G1 shows how the various legislation/policy instruments relate to key management areas of aquaculture production, and the managing authorities responsible in the Northern Territory.

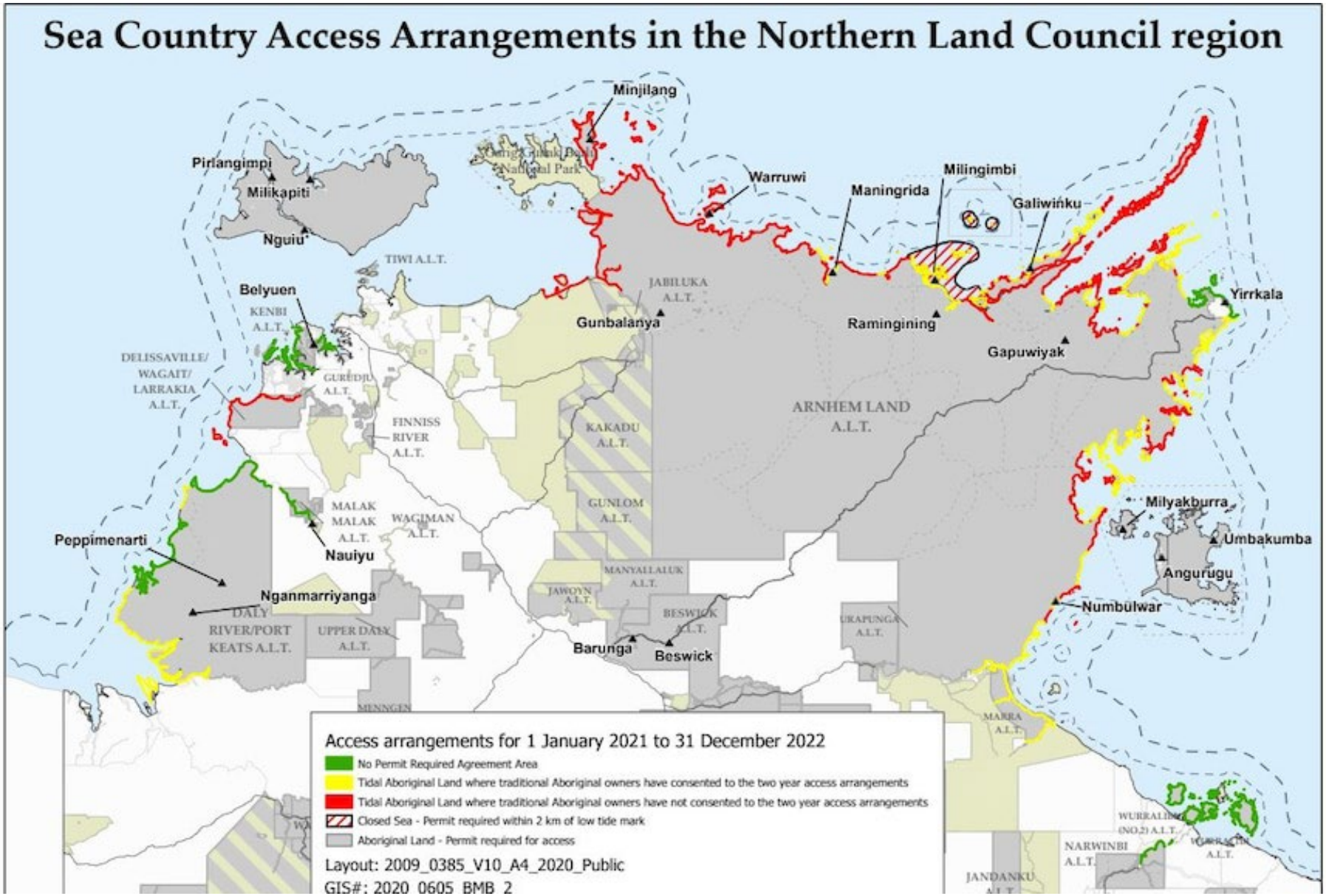
Table G1: Key management instruments and responsibilities for seaweed aquaculture in the NT.

Management element	Management authority	Legislation/policy instrument(s)
Aquaculture legislation	DITT	*Northern Territory Fisheries Act 1988*
Aquaculture strategy	DITT	*Fisheries Division Strategic Plan 2019-2022*
Aquaculture operations (licensing)	DITT	*Northern Territory Fisheries Act of 1988*
Access to water (leasing)	Northern Land Council DIPL	*Aboriginal Land Rights (Northern Territory) Act 1976* – Section 19 Land Use Agreement *Crown Lands Act 1992* – lease
Environmental effects	DCCEEW EPA	*Environmental Protection and Biodiversity Conservation Act 1999* – matters of national environmental significance *Environmental Protection Act 2019*
Biosecurity (general)	DITT Aquatic Biosecurity Unit	*Biological Control Act 1986*
Marine safety and navigation	DIPL	*Marine Safety (Domestic Commercial Vessel) (National Uniform Legislation) Act 2013*
Food safety (post harvest)	DH	*Food Act 2004*

DITT = Department of Industry, Tourism and Trade; DIPL = Department of Infrastructure, Planning and Logistics; DCCEEW = Department of Climate Change, Energy, the Environment and Water (Commonwealth); EPA = Environmental Protection Agency; DH = Department of Health

Seaweed aquaculture mapping

The Northern Territory does not have allocated seaweed aquaculture. The map below (Garrick, 2020; supplied by the Northern Land Council) shows the Sea Country access arrangements relevant for proposed future seaweed aquaculture.


Sea Country Access Arrangements in the Northern Land Council region
Minjilang
Pirlangimpi
Milikapiti
Nguiu
Warruwi
Maningrida
Milingimbi
Galiwinku
Yirrkala
Belyuen
Gunbalanya
Ramingining
Gapuwiyak
Peppimenarti
Nauiyu
Nganmarriyanga
Barunga
Beswick
Milyakburra
Umbakumba
Angurugu
Numbulwar
TIWI A.L.T.
KENBI A.L.T.
JABILUKA A.L.T.
DELISSAVILLE/ WAGAIT/ LARRAKIA A.L.T.
GUREDJU A.L.T.
FINNISS RIVER A.L.T.
KAKADU A.L.T.
ARNHEM LAND A.L.T.
MALAK MALAK A.L.T.
WAGIMAN A.L.T.
GUNLOM A.L.T.
MANYALLALUK A.L.T.
JAWOYN A.L.T.
BESWICK A.L.T.
URAPUNGA A.L.T.
DALY RIVER/PORT KEATS A.L.T.
UPPER DALY A.L.T.
MENNGEN
MARRA A.L.T.
NARWINBI A.L.T.
JANDANKU
Access arrangements for 1 January 2021 to 31 December 2022
No Permit Required Agreement Area
Tidal Aboriginal Land where traditional Aboriginal owners have consented to the two year access arrangements
Tidal Aboriginal Land where traditional Aboriginal owners have not consented to the two year access arrangements
Closed Sea - Permit required within 2 km of low tide mark
Aboriginal Land - Permit required for access
Layout: 2009_0385_V10_A4_2020_Public
GIS#: 2020_0605_BMB_2

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