

MACLEAY RIVER OYSTER FARMERS ENVIRONMENTAL MANAGEMENT SYSTEM

A VOLUNTARY, INDUSTRY-DRIVEN ENVIRONMENTAL INITIATIVE



VERSION 1 (May 2014)



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CONTACT & FEEDBACK:

This EMS is an ongoing process of environmental improvement, and the Macleay River Oyster Farmers welcome any comments or suggestions that you might have. To encourage feedback, a blank form has been included at the back of this document on which you can make comments. Please forward correspondence to:

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1. HOW TO USE THIS EMS

How to use the EMS to ...

Explain oyster farming practices

An introduction to the oyster industry is provided from page 9. This discusses farming methods used in the Macleay River, species grown, and brief explanation of the comprehensive water quality monitoring program that oyster farmers undertake to ensure a safe and premium quality product.

How to use the EMS to:

Highlight the high risk activities to the local oyster industry
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High risk activities to oyster farming in the Macleay River have been identified through a risk analysis. This allows potential risks to be identified and ranked as low, moderate, significant or high depending on the likelihood of a risk occurring and the severity of the consequence. A summary of these risks are provided on page 23.

Risks have been split into two groups:

- External risks: May arise from other people's activities, or from natural events such as extreme weather conditions
- Internal risks: May arise as a result of oyster farming operations

How to use the EMS to:

Improve environmental performance of the industry & environmental conditions in the Macleay River
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An Environmental Improvement Plan (page 25) provides background information on how the risks may impact on the oyster industry. This plan also outlines how oyster growers and other stakeholders can work to protect the estuary and the future of this important local industry.

How to use the EMS to:

Demonstrate that oysters farmers are continually improving their environmental performance

Every year (or biennially) it is encouraged that oyster farmers, or a nominated organisation such as OceanWatch Australia, review the environmental performance of the industry against the Improvement Plan. A Review Form has been including in this document on page 41.

Undertaking this review allows farmers to see how successfully they are working towards the Improvement Plan. A summary of the years achievements should be added to the back of this document, and can be used as the basis of a media release promoting the actions of the local industry.

2. INTRODUCTION

An Environmental Management System (EMS) is a step-by-step process to identify and manage environmental impacts, risks and opportunities. The model is based on a philosophy of **continual improvement** – that is, recognising current performance against certain requirements, and then working towards realistic and achievable improvements in the future.

The benefit for oyster farmers to develop an estuary-wide EMS is that it:

- **Provides an organised, documented and coordinated approach to both improving and demonstrating environmental sustainability**

Other benefits that can be gained from having an EMS include:

- Avenue to engage with stakeholders and to improve catchment conditions;
- Ability to portray a positive public image of the industry;
- Reduced operating costs;
- Higher product prices from having a clean, green image;
- Improve compliance levels across operators.

An EMS helps ensure the long term sustainability of oyster farming by reducing or preventing identified negative impacts on the environment.

The Macleay River Oyster Farmers recognise that they have a responsibility to cultivate oysters on behalf of the community as sustainably as current technology and techniques allow, and to improve as new methods develop.

The Macleay River Oyster Farmers have a vested interest in maintaining and improving the local environment, with their livelihoods dependant on the health and productivity of the estuary. The oyster growers are demonstrating their commitment by voluntarily participating in this industry-driven EMS.

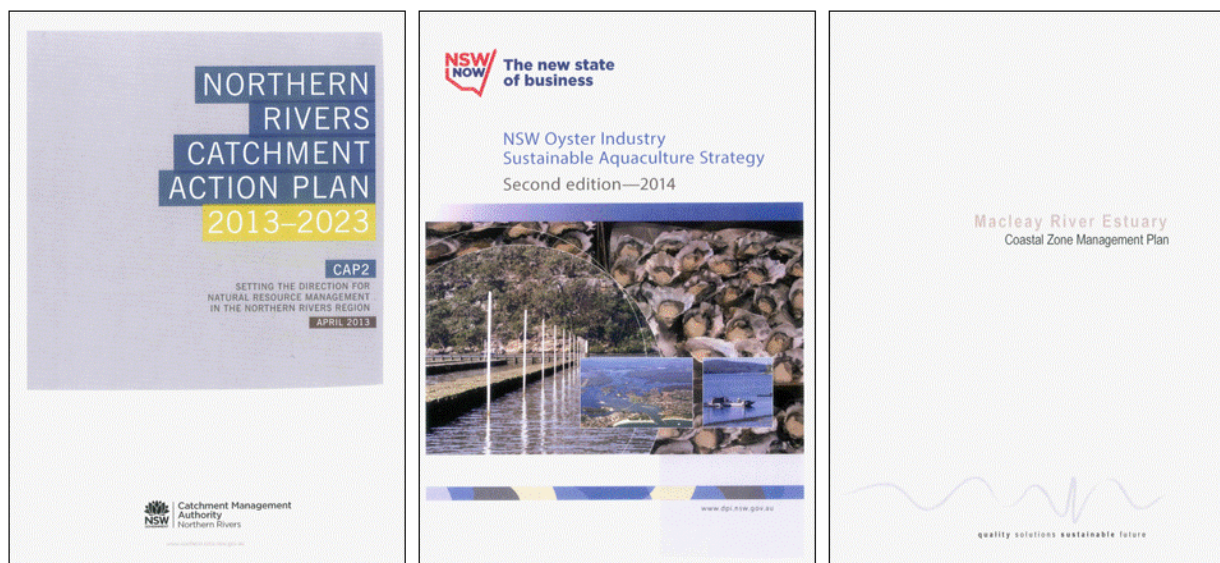


2.1. RELATIONSHIP TO OTHER PLANS & REGULATIONS

An EMS is designed to complement existing laws, guidelines and strategies that control and guide environmental management and best-practice marine resource use. These include:

Fisheries Management Act	1994
NSW Threatened Species Conservation Act	1995
Environmental Protection & Biodiversity Conservation Act	1999
Environmental Protection & Biodiversity Conservation Regulations	2000
Fisheries Management (General) Regulation	2002
NSW Shellfish Industry Manual	2011
State Environmental Planning Policy (SEPP) 62 – Sustainable Aquaculture	2011
Macleay River Estuary Coastal Zone Management Plan (& Study)	2012
Northern Rivers Catchment Action Plan 2013 – 2023 (CAP2)	2013
New South Wales Oyster industry – Sustainable Aquaculture Strategy	2014

Macleay River Oyster Farmers are committed to implement the voluntary best practice standards provided in the NSW Oyster Industry Sustainable Aquaculture Strategy.



2.2. SCOPE

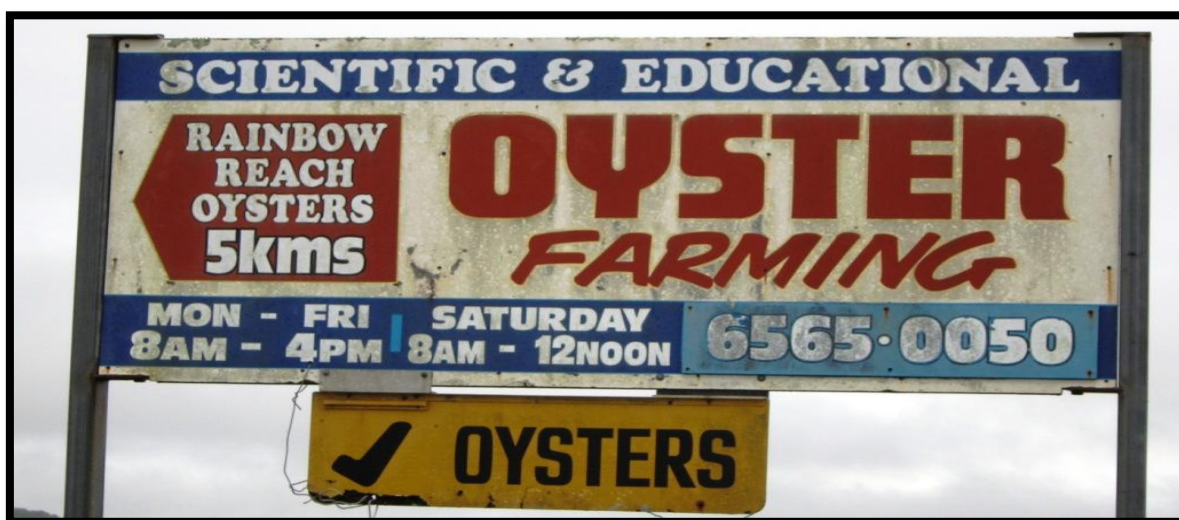
The scope of this EMS is limited to:

- The environmental aspects of aquaculture operations undertaken by Macleay River Oyster Farmers
- The most significant environmental aspects of activities and processes within the lower catchment that may impact upon oyster farming in the Macleay River

2.3. DEVELOPMENT

As an industry driven initiative, this EMS was developed by oyster farmers on the Macleay River through a series of workshops, with a facilitator, Andy Myers from OceanWatch Australia. This project is supported by OceanWatch Australia, through funding from North Coast Local Land Services, Catchment Action NSW and the Australian Government's Caring for our Country.

Whilst this EMS was compiled with regards to International Standard, ISO 14001:2004 (Environmental Management Systems), it is not fully compliant with the standard in its current form. The ISO standard describes the general requirements for documenting and implementing environmental management.



2.4. EMERGENCY RESPONSE

The Macleay River Oyster Farmers will respond to emergency situations and accidents, and work with the appropriate authorities to prevent or mitigate any associated negative impacts.

Growers are encouraged to work with the appropriate Authorities to develop 'Emergency Response Plans'. These plans will enable suitable preparation and planning, and a quick reaction in the event of an emergency. These actions will help to mitigate the negative impacts on the environment and the industry, increasing resilience.

Emergency response plans may include: oyster mortality & disease, fuel & oil spills, release of hazardous chemicals, natural disasters, effluent spill / release, fires, explosions.

2.5. REVIEW AND COMMUNICATION

An EMS is based on the philosophy of **continual improvement**. In accordance with this concept, the Macleay River Oyster Farmers will endeavour to undertake a periodic review to measure their performance against the Environmental Improvement Plan (see '*Review Form*' page 41).

This annual review will also provide the opportunity for growers to discuss incidents where the provisions of this EMS were not met. Failures may be:

- Intentional or unintentional
- An indication of inappropriate policy or actions
- Due to highly unusual circumstances
- Some combination of the above

Possible responses may include:

- No action
- A review of the EMS
- Training

In addition to the review, the Macleay River Oyster Farmers will periodically reassess the environmental risks to oyster farming, and update the Environmental Improvement Plan to reflect the changing condition of the estuary and the catchment.

The Macleay River Oyster Farmers will provide the local community and other stakeholders with regular progress reports as they work towards implementing their Environmental Improvement Plan.



3. INDUSTRY DESCRIPTION

3.1. SYDNEY ROCK OYSTERS (*Saccostrea glomerata*)

The Sydney rock oyster is endemic to Australia and is found in bays, inlets and sheltered estuaries between Hervey Bay (QLD) and Wingan Inlet (VIC). It is capable of tolerating a wide range of salinities and occupies the intertidal zone to 3 metres below low water. Within this range they are common on hard rocky substrates.

Sydney rock oysters generally spawn in the Macleay River between February and June, typically coinciding with a full moon. Oysters are 'broadcast spawners', meaning that both male and female gametes are released into open water for fertilisation. Within hours of fertilisation the eggs develop into free-swimming planktonic larvae that remain in estuarine and coastal waters for up to 3 weeks. During this time the larvae develop clear shells and a retractable foot, before settling on a suitable substrate, using the foot to find an appropriate site. The foot is resorbed once larvae are attached, the shell darkens and the small animal takes on the appearance of an adult oyster. Settled, footless oyster larvae are known as 'spat'. They remain settled in that location for the rest of their life.

Growth rates vary with local conditions, but generally wild Sydney rock oysters reach 40–60 grams in 3-4 years. They are capable of spawning after 1 year, and have the peculiar trait of changing sex from males to females as they grow older. A later sex reversal is possible, but around 75% of prime eating oysters are female.

All oysters are filter feeders, straining organic material (mainly plankton) from the surrounding water. Mortality is highest in the free swimming & early settlement phases, and at this stage oysters are subject to prey from a variety of fish species. Once the shell has hardened they are less vulnerable to fish predation, but stingrays, mud crabs, whelks and starfish all feed on adult oysters.

To assist the industry, commercial hatcheries now selectively breed select oysters with a fast growth rate so that quick-growing spat can be derived. These hatchery-reared oysters can grow to market size in half the time of wild-caught spat (i.e. 2 years instead of 4). See box on page 14 for more details.



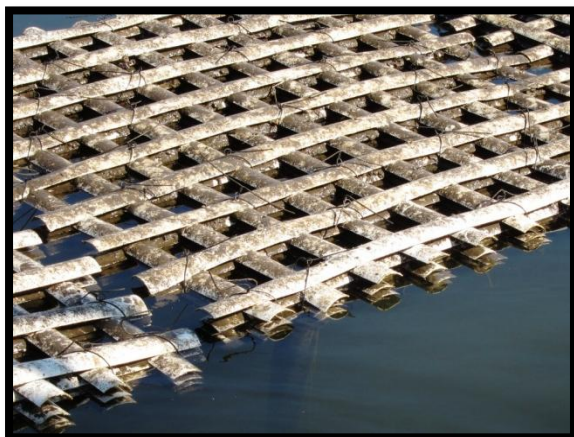
3.2. FARMING METHODS

Macleay River oyster farmers utilise a variety of techniques to commercially cultivate oysters. Each method has pros and cons, and the choice of a particular method depends on personal preference as well as the location and features of the lease.

Spat for cultivation of Sydney rock oysters can either be:

1. self-sourced by harvesting naturally occurring spat;
2. brought from oyster farms in other estuaries where the settlement of spat is consistently high (e.g. Hastings River);
3. purchased from commercial hatcheries. These spat are often bred from family lines that grow quickly and have natural resistance to disease. These spat are available through the work of NSW DPI (Fisheries) in Port Stephens.

Self collection of spat in the Macleay River is undertaken through the use of plastic slats. Thin strips of arced PVC are layered horizontally across a frame, creating a stacked lattice effect. This maximises the surface area available for spat settlement, whilst the small distance between layers protects juvenile oysters from predators such as fish. The catching slats are secured to horizontal racking that is supported by intermittent upright posts.



In the Macleay River, spat collectors are deployed early in the year, coinciding with high natural spatfall between the months of February and June. By June, sufficient numbers of spat have settled and these juvenile oysters are of a large enough size to be grown using other techniques. Spat are easily removed from the catching slats by bending and twisting the plastic.



Spat that are collected using the slat method, or that are purchased from other farms or hatcheries, are required to be dealt with individually (termed '**single seed**'). Spat that is purchased can be bought at varying stages of development; the smaller the spat the cheaper they are, however mortality rates and handling requirements are increased.

Spat can be on-grown using a number of different methods, however many farmers in the Macleay River use hard-wearing plastic cylinders for early growth. These cylinders are either attached to a long-line system, or strung between parallel rails of a rack & rail system.



The long-line system involves establishing a series of hanging lines, onto which cylinders, containing oysters are attached. The line is supported intermittently with vertical uprights. Cylinders are often attached to the long-lines with shark-clips, allowing them to rotate with the wind and tide.

The rack and rail system is traditionally used to support trays, but can also be used to tether cylinders. Historically, oyster farmers used tar or treated timber in rack construction to combat wood boring marine organisms; however this is being phased out in many estuaries. Common replacement products include composite posts (wood / recycled plastic amalgam) and untreated wood sheathed in plastic.

A PVC pipe, or other buoyancy aid, may be added to cylinders to provide floatation and to agitate the oysters. This movement reduces the tendency for oyster to cluster together, and promotes even oyster growth throughout the stock. Oysters are produced with a marketable cupped shape, and are graded and dried at frequent intervals. As they grow, oysters are moved to cylinders with larger mesh sizes and are progressively thinned to provide more growing room. This promotes water flow through the cylinder, giving oysters increased access to food.

Another method becoming increasingly popular is the use of floating pillows on long-lines. Oysters are placed in reusable plastic mesh bags, which are then attached with shark clips to long-lines. By floating the bags this ensures that oysters remain in the nutrient rich upper waters. Pillows are normally arranged on opposite sides of a length of polyurethane rope. To dry the oysters, the pillows on one side can be flipped over and rested on top of the neighbouring pillow with the height of the combined floatation enabling the top pillow to rest clear of the water.



Intertidal baskets are also commonplace in the Macleay River. These utilise the rack and rail structures to support baskets of oysters. The height of the rack is calculated so that oysters are intertidal; remaining underwater for the majority of the tidal cycle, but then fully exposed at low water. Exposing / drying oysters is a technique to manage biofouling, and is also used to toughen the oyster, strengthening the abductor muscle to prolong shelf life post-harvest.



Many oyster farmers use trays at some point during the cultivation process. Plastic trays require very little maintenance and are gradually being introduced to replace treated timber and wire trays. Tray divisions prevent oysters from clustering from wind or wave action, which would otherwise result in uneven growth. Snap on lids provide added protection from the elements and predation. Once again, trays are typically supported by rail and rail systems that are designed to expose oysters for part of the tidal cycle.



One final method that is used to grow oysters is rafts. There are a few different types of rafts, but all serve to suspend stacks of trays below the surface of the water. As trays are constantly submerged, these oysters are particularly susceptible to over-catch from settling oysters and other fouling organisms. Furthermore, because sub-tidal oysters are close to the muddy riverbed, there is increased risk of mudworm infestation. To manage these issues, oysters are frequently pulled up and dried, killing fouling organisms and parasites.



Breeding oysters for disease resistance and fast growth:

In 1990, NSW DPI established a generational breeding program, through which select individuals with fast growth rate formed a parent stock from which fast-growing spat could be derived. After 4 years trialling these oysters on the Georges River, QX disease hit the estuary and decimated local oyster populations. Whilst this was a set-back, it was discovered that some of the trial oysters survived the outbreak and subsequently these oysters formed the brood stock from which a fast growing, more disease resistant oyster could be bred.

The generational breeding program is now in its 14th year. Whilst the intellectual property of the program belongs to NSW DPI and FRDC, production of spat is managed by the Select Oyster Company (SOCo). SOCo is a non-profit company that's been set up to commercialise the Sydney rock oyster breeding program, and to help NSW oyster farmers improve productivity and viability.

At present, 4 commercial hatcheries are producing SOCo lines of stock, with varying degrees of success. Demand for SOCo stock currently exceeds supply, and getting hold of spat remains a major issue for oyster farmers throughout the state. From the hatchery, freshly metamorphosed spat are distributed to a small group of oyster farmers in various NSW estuaries, who act as nursery operators to grow the oysters to a more distributable size.

3.3. LAND BASED ACTIVITIES

The nature of commercial oyster cultivation not only requires significant water based infrastructure but also necessitates a functional land base from which operations can be conducted. Whilst some oyster farmers in the Macleay River work from freehold property, others operate on Crown Land, for which they require a lease arrangement with the Department of Lands.

These sheds serve multiple functions. They are used to store surplus cultivation equipment (including trays, cylinders, bags, rafts), to clean, grade and depurate oysters, and to maintain equipment (including outboard engines, tractors, and hydraulic cranes).



The condition and amenities available at these shed sites vary considerably. In the Macleay River few of the land-based depots are serviced by the reticulated town sewerage system, and therefore farmers must maintain on-site sewerage management systems, or make arrangements to use facilities off site.

Provision of utilities is also patchy. Not all sheds have electricity, and whilst town water is available, a few farmers have made arrangements to harvest rainwater off shed roofs.

Oyster farmers do not storage large volumes of fuel or oil in their sheds, and hence bunding is rarely used to protect against spills. Only small quantities of fuel and oil are held in sheds for everyday use, and these are stored in appropriate canisters.

For many years, tarred & treated timber was the mainstay of the industry, used to increase the durability of cultivation infrastructure in the harsh estuarine environment, protecting it from wood boring marine organisms. Oyster farmers throughout NSW are now phasing out the use of tarred & treated timber by converting to plastic trays, plastic sleeved timber posts, or adopting alternative farming methods based on low-impact long-lines systems. Converting to these eco-friendly products reduce ongoing maintenance requirements and associated costs, and also eliminates potential contaminants entering the estuary. Whilst there are a few tar pits remaining in the area, local oyster growers are committed to their eventual removal.

3.4. WATER QUALITY MONITORING

Due to a wide variety of activities and processes that can impact estuary health, oyster farmers on the Macleay River maintain a 'Quality Assurance Program'. Through this program, water and meat quality is assessed every two weeks, with additional biotoxin assessments conducted once a month. This rigorous sampling regime ensures that immediate action can be taken should pollution levels threaten the health of the river and the viability of oyster stocks.

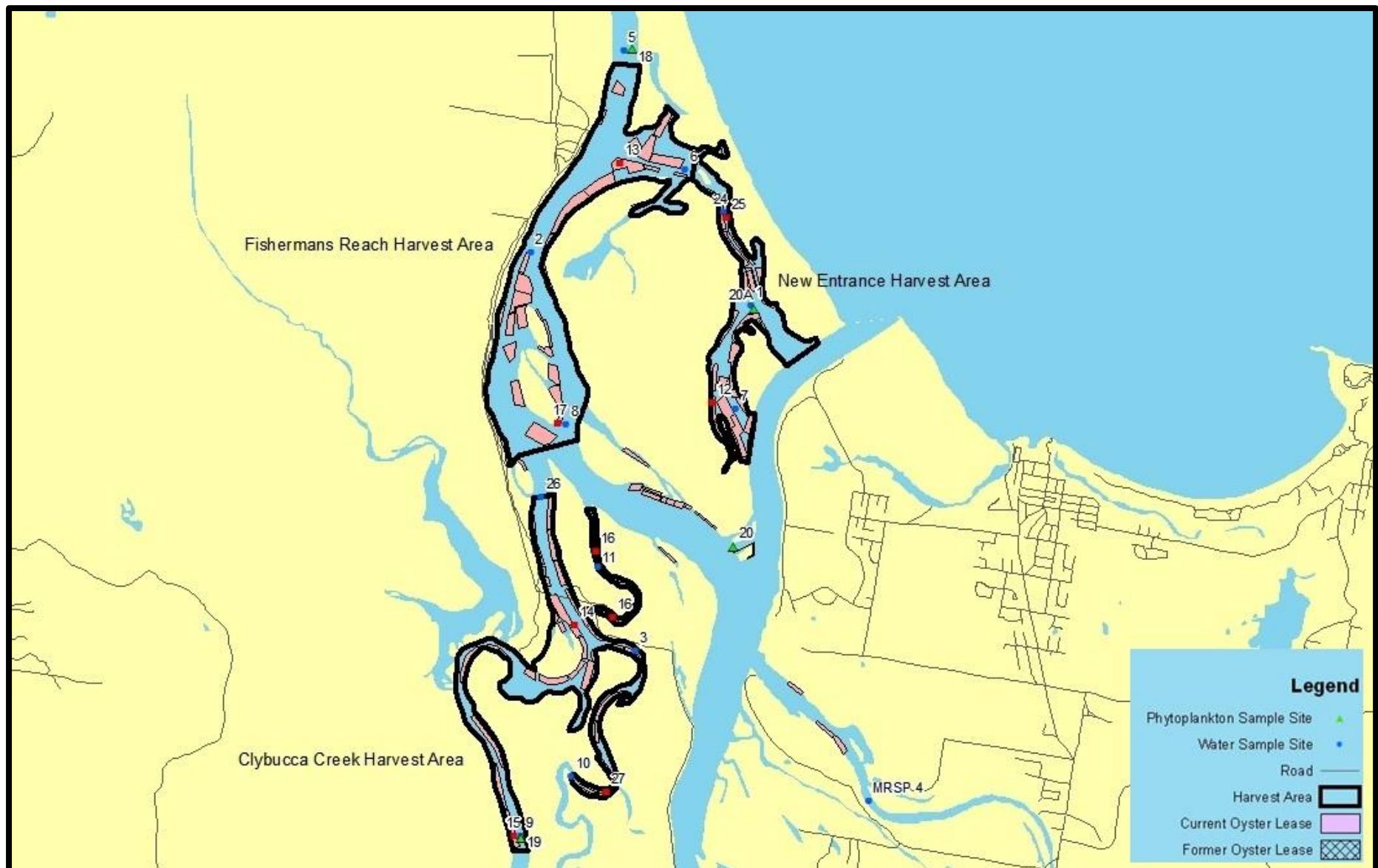
The water and meat quality samples validate each farmers licence issued by the NSW Food Authority and all growers are required to pay a substantial levy to fund this local Quality Assurance Program (QAP). The program greatly benefits the wider community by providing an indication of catchment health. The long-term, standardised dataset also provides an invaluable record of changing environmental conditions. In this way, the oyster farmers of the Macleay River contribute significantly to the scientific understanding of the waterway and its management.

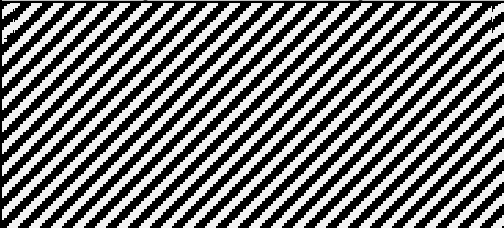
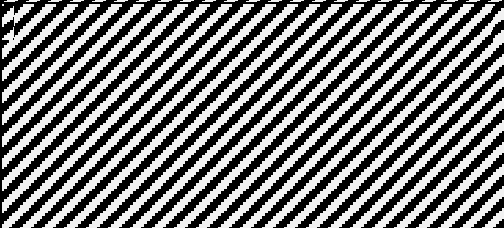
There are 3 areas in the estuary that are classified by the NSW Food Authority for the harvesting of oysters (see map on next page). These areas are classified in accordance with the 'Australian Shellfish Quality Assurance Program'. Two of these areas (Clybucca Creek & Fishermans Reach) are classified as **conditionally restricted**, whilst the third area, New Entrance, is **conditionally approved**.

The **conditionally restricted** status recognises that there may be some local issues with water quality, but at levels low enough to be removed from shellfish via depuration. Depuration is a statutory process that requires oysters to be placed in a sterilised recirculation tank for 36 hours. During this process the oysters self cleanse in recirculated water, which is sterilised using ultraviolet light.

The **conditionally approved** status allows oyster growers to directly harvest from their lease areas (i.e. no depuration required) when water quality monitoring results fall within strict parameters. If these water quality parameters are not met then the area reverts to a conditionally restricted status, however if environmental conditions continue to deteriorate then the harvest area will close.

As described above, **all harvest areas must met strict water quality criteria**. If these criteria are not met, then the area closes and oyster farmers are unable to depurate or sell oysters until there is an improvement in environmental conditions.



Harvest Area	Conditionally approved (direct harvest)	Conditionally restricted (depuration required)	Closed
Clybucca Creek		Rainfall < 50mm in 48hrs AND Rainfall < 80mm in 7 days AND Salinity > 18ppt	Rainfall > 50mm in 48hrs OR Rainfall > 80mm in 7 days OR Salinity < 18ppt
Fishermens Reach		Rainfall < 50mm in 48hrs AND Rainfall < 80mm in 7 days AND Salinity > 18ppt	Rainfall > 50mm in 48hrs OR Rainfall > 80mm in 7 days OR Salinity < 18ppt
New Entrance	Rainfall < 45mm in 48 hrs AND Salinity > 26 ppt at site 6	45 mm < Rainfall in 48hrs < 50 mm AND 18 ppt > Salinity	Rainfall > 50mm in 48 hrs OR Rainfall > 80mm in 7 days OR Salinity < 18ppt at site 6

4. ENVIRONMENTAL REVIEW

4.1. MACLEAY RIVER

The Macleay River estuary is located on the mid-north coast of NSW, 450 km NE of Sydney. The estuary drains a catchment of 11,450km², extending from the tablelands of Armidale in the upper catchment, down to wide floodplains to the east of Kempsey.

60% of the floodplain is covered by highly productive wetlands, or back-swamps, that are important to the health of the estuary and provide habitat for aquatic birds and fish. Around 15% of the coastal floodplain wetlands of NSW are located within the Macleay River catchment. The estuary is important for commercial and recreational fishing activities, oyster farming, as well as recreational boating opportunities in the lower reaches.

Floodplains are conducive to the formation of acid sulphate soils (ASS), and it is estimated that some 31,000 ha of the floodplain below Kempsey is underlain by high-risk ASS. The coastal floodplain is also very fertile and over time has been progressively cleared and drained for agricultural use, human settlement and recreation. Extensive modifications to the floodplain have enabled this development, with the installation of 382 floodgates, 34.4 km of constructed levees and 138 km of constructed drains (Macleay River Floodplain Project, 2000).

In the lower catchment, water supply & sewerage services are provided by Kempsey Shire Council. Seven sewerage treatment plants operate within the LGA, at West Kempsey, South Kempsey, Gladstone, South West Rocks, Crescent Head, Hat Head and Frederickton. Whilst 1% of the treated effluent is reused, 99% is discharged into the environment.

According to Kempsey Shire Councils State of the Environment Reporting (2012), there are 4,675 registered on-site sewerage management systems (OSMS), of which 24% failed that years test. Concentrations of septic systems are found at Stewart's Point, Fishermen's Reach and Grassy Head.

The upper catchment of the Macleay River has historically been subject to antimony and gold mining, and there is a legacy of arsenic and antimony contamination extending 300km down the river. In more recent times, further waterway contamination has resulted from mine dam overflows. These events have been implicated in downstream fish kills.



4.2. RISK ASSESSMENT PROCESS

Risk is the chance of something happening that will have an impact on the environment and / or the industry

An EMS is based on a risk analysis approach. Potential risks are identified and ranked as low, moderate, significant or high depending on the **likelihood** of a risk happening and the **consequence** if the risk does occur. Each specific risk is ranked, based upon the tables below:

LIKELIHOOD OF A RISK HAPPENING

1. Rare	May occur in exceptional circumstances (e.g. once in 10 years)
2. Unlikely	Uncommon, but has been known to occur
3. Possible	Some evidence to suggest this may possibly occur
4. Likely	May occur
5. Almost certain	Expected to occur in most circumstances (e.g. 2-3 times a year)

CONSEQUENCE IF THE RISK DOES OCCUR

1. Negligible	Minimal impact. Unlikely to be measureable from natural variability
2. Minor	Possible detectable but minimal impact on structure / function
3. Moderate	Maximum acceptable level of impact on the environment. Time frame for recovery more months than years
4. Major	Will result in wider and long term impacts
5. Severe	Very serious impacts with relatively long time frame for recovery to an acceptable level. Includes irreversible damage

RISK MATRIX

		Consequence				
		Negligible	Minor	Moderate	Major	Severe
Likelihood	Rare	Low	Low	Moderate	Significant	Significant
	Unlikely	Low	Low	Moderate	Significant	High
	Possible	Low	Moderate	Significant	High	High
	Likely	Moderate	Significant	Significant	High	High
	Almost certain	Significant	Significant	High	High	High

RISK CATEGORY & MANAGEMENT RESPONSE

Low	No further procedures or action required to address issue
Moderate	Appropriate action required to address issue May include continuation of current arrangements
Significant	Management attention required Action to address issue needs to be taken
High	Strong and immediate action required New or further risk control measures needed

Potential risks that are considered may be split into:

- 1) External risks: Risks that arise from other people's activities, or from natural events such as extreme weather conditions
- 2) Internal risks: Risks that arise as a direct result of oyster farming operations



4.3. SUMMARY OF ENVIRONMENTAL RISKS

External Risks		Risks that arise from other people's activities, or from natural events such as extreme weather conditions				
		Consequence				
		Negligible	Minor	Moderate	Major	Severe
Likelihood	Rare		T		H	
	Unlikely		S	R		
	Possible			L, M, N O, P, Q	E, F, G	
	Likely			J, K	D	
	Almost certain			I	B, C	A

- A. Acidic water released through disturbance or drainage of acid sulphate soil
- B. Failing septic tanks close to estuary (Stewarts Pt, Fishermens Reach, Grassy Hd)
- C. Cattle effluent entering waterway due to unrestricted access to waterway
- D. Lack of communication between authorities and the local oyster industry
- E. Contaminated run-off from Frederickton Sewerage Treatment Plant and Abattoir
- F. Formation of black water (low dissolved oxygen)
- G. Release of toxic heavy metals, arsenic and antimony from mining sites (historic and proposed) in the upper catchment.
- H. Oil, fuel and chemical spills
- I. Public accessing lease areas, resulting in oyster theft and infrastructure damage
- J. River-bank erosion through stock trampling & boating activity
- K. Siltation of leases & channels through floodgate mismanagement & bank erosion
- L. Failing reed bed wastewater systems close to the estuary
- M. Water-users discharging effluent (esp. house boats)
- N. Contaminated run-off from industrial area flowing into Spencers Creek
- O. Leacheates from waste management facility seeping into Spencers Creek
- P. Wind blown chemicals & run-off from agricultural land behind Fishermens Reach
- Q. Unknown chemical use and questionable toilet facilities at Clybucca tomato farm
- R. Dry weather discharges from sewerage treatment plants into the Macleay River
- S. Pump-station overflows during wet weather events
- T. Pacific Highway upgrade

Note:

Oyster farmers are unsure as to the likelihood and/or consequences of risks L-Q. Rather than omitting these risks, local growers have taken a precautionary approach and will take action to mitigate their exposure to these potential threats.

Internal Risks

Risks that arise as a result of oyster farming practices, as well as issues of disease

		Consequence				
		Negligible	Minor	Moderate	Major	Severe
Likelihood	Rare	L, M	K	G		
	Unlikely		I, J	E, F		
	Possible					A
	Likely		H	C, D	B	
	Almost certain					

- A. Loss of stock through disease outbreaks & poor oyster resilience
- B. Oyster stocks infected with mudworm
- C. Contaminants from tarred & treated timber infrastructure leaching into the estuary
- D. Tar leaching from pit & application area into the surrounding environment
- E. Shed site erosion due to farm machinery operation & washing of oysters & gear
- F. Waterway contamination from faulty toilets not connected to reticulated system
- G. Fuel or oil spills from oyster punts or shed depot sites
- H. Visual pollution of leases that have not been maintained (incl. derelict leases)
- I. Potable water used to clean equipment & oysters
- J. Resource use & carbon emissions associated with use of mains electricity
- K. Chemicals that leak through poor storage or an adverse event
- L. Wash from oyster punts travelling to and from leases
- M. Noise from oyster farming activities

5. ENVIRONMENTAL IMPROVEMENT PLAN

Addressing External Risks:

Low pH / Acid Sulphate Soils:

Background:

It is estimated that 31,000 ha of the Macleay floodplain below Kempsey is underlain by high-risk acid sulphate soils (ASS). These are naturally occurring sediments that contain iron sulphides. Under most conditions, where the soil remains waterlogged, ASS are harmless. When iron sulphides are exposed to air, by drainage, drought, excavation of the soil, or a lowering of the watertable, they react with oxygen in the air, and can produce large quantities of sulphuric acid. This acid is stored in the soil, and is usually released after rain, or after flood waters have receded.

Acidification of waterways severely degrades estuarine ecosystems, often resulting in fish kills and disease. Oysters can survive in low pH waters for a time, with reduced feeding activity, reduced growth and damage to soft tissue, but eventually the shell dissolves and the oyster dies. Indeed, following release of acidic water from the floodplain, oyster stocks in the Macleay River have suffered significant thinning of shells, and subsequent mortalities. Composed of calcium carbonate, shells are bleached white as acid eats into the structure.

Recognising the risk posed by acid sulphate soils, local authorities (e.g. Kempsey Shire Council, Northern Rivers Catchment Management Authority), in partnership with cooperative landowners, have developed numerous projects to address this issue. Some of the actions already taken have included:

- Improved floodgate management protocols
- Increased number of floodgates under active management
- Redesign of drain profiles (move to shallow v-shape)
- Revegetation of acid scald areas
- Encouraged uptake of wet pasture management
- Installation of floodgate lifting devices
- Raised water levels in drains

Floodgates play an important role in the oxidation of acid sulphate soils and mobilisation of acidic waters, and a cooperative approach is often needed for effective management. Many authorities have programs in place to manage floodgates and drainage systems to reduce the risk of acid sulphate soil formation, and the export of acidic water.

Whilst there is little direct action that oyster farmers can take to address the risk posed by acid sulphate soils, farmers will continue to engage with stakeholders and support projects that improve catchment management.

Risks to be reduced by the actions below:

Initial Risk:

- Acidic water released through disturbance or drainage of acid sulphate soils

High

Actions (see 'Review Form' on page 41 for how performance can be monitored)

1. Engage with, and support Kempsey Shire Council, North Coast Local Land Services and other organisations to improve catchment management
2. Report all earthworks of concern to Kempsey Shire Council

Effluent:

Background:

Effluent contamination of waterways is a big concern to the oyster industry. Pollution of this nature contaminates shellfish & closes harvest areas as a means to protect food safety. This can lead to loss of income for farmers, and there are cases where ongoing issues of contamination have effectively driven oyster farmers from the river (e.g. Bellinger / Kalang in northern NSW). Not only does effluent impact on the oyster industry, but it can have impacts on estuarine ecosystems and severe implications on public health.

The performance of on-site sewerage management (OSMS) infrastructure is an ongoing concern. Kempsey Shire Council currently maintains a register of 4,675 systems within the LGA. In 2012, council inspected 897 systems of which 219 (24%) failed, and a further 500 were identified as being unregistered or unapproved. With the reticulated sewerage network not extending to Fishermen's Reach, Stewart's Point or Grassy Head, these areas are of particular concern given their close proximity to the Fishermen's Reach Oyster Harvest Area (see page 17).

Reed bed wastewater systems close to the estuary have also been flagged as a potential source of effluent contamination. There are concerns that compared to traditional on-site sewerage management systems, reed beds treatment trains are incredibly difficult to service and remediate following installation.

Specific amenities of concern to the oyster industry include those on house boats and those provided at the Clybucca tomato farm. Whilst the capacity and performance of facilities at these locations are unknown, any inadequacies or failures could have severe downstream implications. House-boats are obviously located on the waterway, and effluent mis-management would result in direct estuary contamination. It is essential that these vessels use pump-outs, and do not discharge effluent directly into the Macleay River. The tomato farm at Clybucca has expanded its onsite workforce enormously in recent years. Oyster farmers are concerned that the current amenities available on site do not have the capacity to handle the expanding workforce.

Sewerage Treatment Plants (STP's) and associated pump-stations pose a variable risk. Sewage overflows and by-passes typically occur during wet weather events, at which point the estuary is closed to oyster harvesting in any case. Of much greater concern is the unexpected release of effluent during dry periods. Whilst oyster farmers recognise that these releases are unintentional, usually as a result of infrastructure failure or tree roots in the system, they can have a significant impact on the oyster industry through closure of harvest areas.

In its lower reaches, the Macleay River winds through an expansive, fertile coastal floodplain. Over time, this has been progressively cleared and drained for agriculture, including pasture for grazing and crop production. Where river-banks are unfenced, stock access to creeks can result in faecal contamination of the waterway. It is worth noting that while exclusion of stock from waterways is not legislated, the Fisheries Management Act 1994 and 2010 Regulations now prohibit the movement and grazing of cattle on marine vegetation (including mangroves).

The health of oysters is largely influenced by water quality, with their capacity to tolerate disturbances and disease linked to the health of the estuary. Oysters growing in a healthy ecosystem are more resilient to disturbance than those growing in an unhealthy system. To improve the health of oysters during stressful periods, farmers will endeavour to engage with catchment improvement projects beforehand, with the aim of improving the overall health of the estuary.

Effluent (continued):

Risks to be reduced by the actions below:

• Failing septic tanks (especially Stewarts Pt, Fishermens Reach, Grassy Head)	High
• Cattle effluent entering waterway due to unrestricted access to waterway	High
• Failing reed bed wastewater systems	Significant
• Water-users discharging effluent (especially concerned about house-boats)	Significant
• Unknown chemical use & questionable toilet facilities at Clybucca tomato farm	Significant
• Dry weather discharges from sewerage treatment plants into the Macleay River	Moderate
• Pump station overflows during wet weather events	Low

Actions (see 'Review Form' on page 41 for how performance can be monitored)

3.	Communicate with council about the importance of oyster harvest areas and the value of the on-site sewerage management system inspection program
4.	Request clarification from council about protocol if a system fails an inspection
5.	Support applications for riverbank fencing and riparian revegetation
6.	Engage with landholders and authorities, and where possible, facilitate on-ground works
7.	Raise concerns about reed bed wastewater systems with council and the NSW EPA.
8.	Contact NSW Maritime regarding effluent management and pump-out usage by house-boats on the Macleay River
9.	Contact council regarding toilet facilities at Clybucca tomato farm, and if appropriate, request an inspection
10.	Encourage council to increase capacity of pump-station holding tanks
11.	Work with council to develop a clear line of communication, for immediate notification following events which may impact on water quality

Low Dissolved Oxygen / Formation of Blackwater:

Background:

Blackwater is a term used to describe water with little or no oxygen in it. It is formed when the oxygen present in water is used in the decomposition of vegetation. Although this is a natural process, changes to the floodplain have enhanced the development of Blackwater.

Blackwater usually has short-term harmful impacts on the environment. Low levels of dissolved oxygen, combined with the toxic components of some organic matter, can lead to the death of aquatic organisms, and may be evidenced by fish kills. Although fish are particularly vulnerable to oxygen deprivation, they are sometimes able to escape by swimming to unaffected areas.

In the Macleay River system, local oyster farmers have observed large quantities of Smartweed. As this weed decays, oxygen is stripped from the waterbody, with the potential to create Blackwater events independent of flooding.

Risks to be reduced by the actions below:

• Formation of black water (low DO)	High
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Actions (see 'Review Form' on page 41 for how performance can be monitored)

12.	Engage with, and support Kempsey Shire Council, North Coast Local Land Services and other organisations to improve catchment management
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Urban Run-Off & Development:

Background:

Run-off from urban areas is often associated as a diffuse source of pollution, however in this context, localised run-off events are examined. The first of which involves Frederickton Sewage Treatment Plant and a nearby abattoir.

There have been unsubstantiated reports that the combined run-off from these sites has had severe impacts on primary producers lower in the catchment. This has potentially resulted in the death of cattle, and given rise to human health issues. Whilst the composition and true impact of the run-off is unclear, such reports are understandably of concern to the oyster industry and require further investigation.

Compared to residential zones, the run-off from industrial areas and leachates from waste management facilities have a greater potential for environmental impact. Within the 11,450km² of the Macleay River catchment there are obviously numerous industrial areas, however many of these are located considerably further up in the catchment and are set-back from waterways. At South West Rocks, the industrial area and landfill are both situated relatively close to the Spencers Creek tributary, which is home to a number of oyster lease areas.

It is noted that Kempsey Shire Council does undertake weekly water quality sampling at a number of locations within the Macleay estuary and some of its tributaries. With a key interest and vast experience with water quality data, the oyster farmers have suggestions as to how the sampling program may be improved, and the data reported. Such improvements include sampling at the same stage in the tidal cycle, and events based testing (after rain) at the high risk sites mentioned above.

The upgrade to the Pacific Highway, and the potential impact this could have on environmental flows and water quality in the Macleay River and associated creeks is of some concern to oyster farmers. As this upgrade is already underway, oyster farmers have little option to influence the process, other than to remain vigilant to any developments and changes in the estuary.

Oyster leases in the Macleay River are classified as Priority Oyster Aquaculture Areas. It is legislated that these areas must be shown on Local Environmental Plans and council must have regard for these areas in preparing new LEP's. The Director-General of NSW DPI may object to the terms of the draft LEP on the grounds of deleterious effects on an oyster aquaculture area. Furthermore, in determining applications for development approval the consent authority must consider the potential impacts of the activity on oyster aquaculture areas.

Risks to be reduced by the actions below:

	Initial Risk:
• Contaminated run-off from Frederickton Sewerage Treatment Plant & abattoir	High
• Contaminated run-off from industrial area flowing into Spencers Creek	Significant
• Leachates from waste management facility seeping into Spencers Creek	Significant
• Pacific Highway upgrade	Low

Actions (see 'Review Form' on page 41 for how performance can be monitored)

13.	Contact council and NSW EPA to clarify the STP / abattoir event
14.	Request council to adapt water quality monitoring program to include events based testing at high-risk sites and sampling at same stage of the tide
15.	Work with council to develop a clear line of communication, for immediate notification following events which may impact on water quality
16.	Maintain vigilance about developments and changes in the estuary as Pacific Highway upgrade progresses

Mining Activities:

Background:

The upper catchment of the Macleay River has historically been subject to antimony and gold mining, with historic practices resulting in significant arsenic and antimony contamination of soil and in-stream sediments. This contamination extends 300kms downstream into the Macleay River estuary and floodplain. With large stores of arsenic and antimony bound in upstream sediments, the estuary will remain contaminated long into the future.

In more recent times, there have been well-documented cases of further waterway contamination. Overflows from contaminated dams on site sites appear to be the mechanism of recurrent pollution. The pollutants involved (arsenic, antimony and other heavy metals) are extremely toxic to aquatic life, cause infertility in oysters and have been implicated in downstream fish kills.

Despite this legacy of soil and in-stream sediment contamination, there is currently a proposal to reinstate processing at the Hillgrove facility in the upper catchment (Bakers Creek tributary). Oyster farmers will maintain vigilance with respect to this proposal, and make submissions that represent the interests of the industry. Key oyster industry organisations (e.g. NSW DPI, NSW Food Authority, NSW Farmers Association) will be kept informed in this matter, so that support may be provided by these authorities / organisations if required.

It is noted that the Nambucca River oyster farmers also face an antimony / gold mining proposal in the upper catchment, and there may be value in discussing joint approaches and successful strategies.

Risks to be reduced by the actions below:

- Release of toxic heavy metals, arsenic and antimony from mining sites (historic and proposed) in the upper catchment

Initial Risk:

High

Actions (see 'Review Form' on page 41 for how performance can be monitored)

17. Engage in the consultation process and make submissions on behalf of the industry
18. Seek support from oyster industry representatives: NSW DPI, NSW Food Authority and NSW Farmers Association
19. Engage with oyster farmers in the Nambucca River to discuss joint approaches and successful strategies

Public Access to Lease:

Background:

The market demand and limited supply of oysters has led to an increase in the occurrence of theft in recent years. The unregulated sale of oysters can pose serious health threats to consumers as the product may have been stolen during times when water quality was poor.

By 2007, the scale of the problem prompted key Government agencies (NSW DPI, NSW Food Authority & NSW Police Force) to join forces and launch 'Operation Trident', to tackle oyster thefts and address the growing black market trade. Fines up to \$275,000 and/or imprisonment apply. To combat theft, local farmers will report all incidences to Operation Trident on 1800 333 000.

To compound stock losses, cultivation infrastructure is often destroyed / stolen. Damage to growing infrastructure may also occur as a result of navigational error, or inadequate signage of lease areas.

Risks to be reduced by the actions below:

Initial Risk:

- Public accessing lease areas, resulting in oyster theft & infrastructure damage

High

Actions (see 'Review Form' on page 41 for how performance can be monitored)

- | | |
|-----|---|
| 20. | Report all incidences of oyster theft to Operation Trident (T: 1800333000) |
| 21. | Seek amendment to the NSW Recreational Boating Manual to educate waterway users about the needs of industry & Operation Trident |
| 22. | Improve signage around lease areas |

Communication:

Background:

To ensure the long-term sustainability of oyster farming on the Macleay River, the EMS specifies actions that will reduce negative impacts on the environment. Whilst some improvements can be made by industry alone, others require cooperation with authorities. This is based on the principle that oysters rely on good water quality, and this is primarily determined by catchment practices.

In the past, oyster farmers on the Macleay River have worked alongside various authorities and organisations to drive improvements in the catchment. Currently, the oyster industry is not represented on the Macleay River Estuary Management Committee, however through the creation of this EMS, key stakeholders will be provided with a copy of local industry priorities.

An effective and timely line of communication with authorities is critically important. As upstream events and pollution can impact on downstream industries, notification is essential to give industry the opportunity to take action. Depending on the timeframe and nature of the pollution, industry may be able to mitigate any potential impact.

Risks to be reduced by the actions below:

Initial Risk:

- Lack of communication between authorities and the local oyster industry

High

Actions (see 'Review Form' on page 41 for how performance can be monitored)

- | | |
|-----|---|
| 23. | Launch and distribute EMS to educate community & inform local authorities of industry priorities |
| 24. | Work with council to develop a clear line of communication, for immediate notification following events which may impact on water quality |

Erosion & Sedimentation:

Background:

Erosion and downstream sedimentation is a natural process in many areas, however erosion of riverbanks may be exacerbated through riparian vegetation removal, stock access to creeks and excessive boat wash.

Suspended sediments affect water clarity & light penetration through the water column, which is an essential requirement for phytoplankton & seagrass growth. Significant erosion not only impacts on estuary health, but can also affect the feeding apparatus of oysters and lead to mudworm infestations. This can severely impact the oyster health and can result in mortalities.

Alterations to the floodplain can serve to both speed-up and slow-down the export of sediments from the catchment. By creating drainage channels there is the potential to expedite the loss of sediment, however floodgates that are closed during rain events physically prevent soil loss. It should be noted that drain sediments can become very acidic and when disturbed can lead to a reduction in oxygen concentrations to lethal levels (see section on low dissolved oxygen / formation of Blackwater on page 27).

Oyster farmers have a unique knowledge of the estuary, they are in a prime position to advise and work with authorities and other organisations to identify erosion hot-spots and sources of sediment. Appropriate catchment management practices such as erosion control structures, planting programs and fencing / stock exclusions are all measures that could be used in bank stabilisation projects.

Risks to be reduced by the actions below:

- River bank erosion through stock trampling and boating activity
- Siltation of leases & channels through floodgate mismanagement & bank erosion

Initial Risk:

Significant

Significant

Actions (see 'Review Form' on page 41 for how performance can be monitored)

- | | |
|-----|---|
| 25. | Engage with landholders, authorities and other organisations to facilitate on-ground improvements |
| 26. | Engage with, and support Kempsey Shire Council, North Coast Local Land Services and other organisations to improve catchment management |
| 27. | Report all earthworks of concern to council |

Chemicals, Fuel & Oil:

Background:

The Macleay River oyster farmers maintain a regular water & meat quality monitoring regime to ensure that prompt action can be taken should pollution levels threaten the health of the river and oyster stocks. Anecdotal evidence suggests that the oyster industry is often the first to detect local pollution events such as toxic algae, sewage, chemicals & fuel spills. Such events not only threaten the oyster industry, but have severe implications on public & ecological health.

Growers are encouraged to work with appropriate authorities to develop 'Emergency Response Plans'. Such plans will enable suitable preparation and planning, and a quick reaction in the event of an emergency. These actions will help to mitigate the negative impacts on the environment and the industry. Emergency response plans may include: fires; explosions; fuel & oil spills; release of hazardous chemicals; natural disasters; oyster disease & mortality; effluent spill / release.

Areas of Fishermen's Reach and Clybucca are both subject to extensive crop production. Avocados, tomatoes and a variety of other produce are under cultivation. At Fishermen's Reach, oyster farmers are concerned about the current application of pesticides. Whilst the run-off of these toxic chemicals is an obvious risk, farmers have also noticed wind-borne chemicals as a result of spraying in windy conditions. Given the proximity to the Fishermen's Reach Oyster Harvest Area, this is a significant risk that can easily be addressed by changing application protocols.

Chemical use at the Clybucca tomato farm is more of an unknown, however oyster farmers are interested to learn what chemicals are in use, and the potential they have to impact on downstream oyster production.

Risks to be reduced by the actions below:

	Initial Risk:
• Oil, fuel and chemical spills	Significant
• Wind-blown chemicals & run-off from agricultural land behind Fishermens Reach	Significant
• Unknown chemical use & questionable toilet facilities at Clybucca tomato farm	Significant

Actions (see 'Review Form' on page 41 for how performance can be monitored)

28.	Develop emergency response plans to manage emergency situations
29.	Alert / work with authorities to aid containment after a spill
30.	Bring issues of wind-borne chemicals to the attention of the NSW EPA
31.	Make enquiries as to chemical usage at the Clybucca tomato farm and the risk these pose to the oyster industry downstream

Addressing Internal Risks

Diseases & Parasites:

Background:

Disease outbreaks are largely influenced by environmental factors, which impact both on the ability of the pathogen to infect the oyster, and on the oysters' ability to defend itself. Oysters growing in a healthy ecosystem are more resilient to disturbance than those growing in an unhealthy system.

Oyster disease: Sydney rock oysters in the Macleay River are thought to be susceptible to two seasonal diseases:

- *Qx disease* - caused by the parasite *Marteilia sydneyi*, impacts on stocks over summer, and
- *Winter mortality* - caused by the parasite *Bonamia roughleyi*, which is most prevalent over the winter and spring months.

Whilst the Qx parasite was identified in the estuary in 2006 by NSW DPI (Fisheries), local farmers are sceptical as to the ongoing prevalence of the parasite. Whilst other estuaries in the region (e.g. Clarence & Kalang Rivers) have suffered notable outbreaks, the Macleay has not experienced significant mortalities in many years.

Prior to 2006, the Macleay River was home to 22 oyster farming businesses, many of whom specialised in catching spat, and then selling this on to farmers in other estuaries. Following the discovery of Qx, local growers were prohibited from selling spat to other estuaries, to protect against disease translocation. As a result of this restriction, many farmers left the local industry, and currently only 10 oyster farming businesses remain. In order to lift this restriction, farmers would need to pay for, and deliver 6 years of test results clear from Qx.

Winter mortality may occur over the winter months in small amounts, although most oysters infected with this parasite don't actually die until spring. Farmers may be able to reduce the impact of this disease by moving oysters to areas of lower salinity, and by increasing their growing height.

Mudworm: Where high levels of silt persist in the water column this can affect the sensitive feeding apparatus of oysters. This can lead to infestations of mudworm, a parasite that can severely impact the health of oysters, and in many cases result in mortality.

Risks to be reduced by the actions below:

- Loss of stock through disease outbreaks & poor oyster resilience
- Oyster stocks infected with mudworm

Initial Risk:

High

High

Actions (see 'Review Form' on page 41 for how performance can be monitored)

32. Report mortalities above 5% to NSW DPI
33. Read industry newsletters & engage with researchers working on oyster disease & mudworm
34. Continue working to improve estuary & catchment health to increase oyster resilience

Tar & Treated Timber Infrastructure:

Background:

For many years, tarred & treated timber has been used to increase the durability of cultivation infrastructure, protecting it from marine borers. There is no evidence indicating that this contaminates the oysters or neighbouring species (White, 2001), however over time the potential exists for chemicals in these wood preservatives to leach into the surrounding waters.

Oyster farmers throughout NSW are now phasing out the use of tarred & treated timber by converting to polyurethane trays, plastic sleeved timber posts, or adopting alternative farming methods using plastic cylinders and floating pillows (see section 3.2. *Farming Methods* for more details). Converting to these new products will reduce ongoing maintenance requirements and associated costs, and also eliminate potential contaminants entering the estuary. There are a few tar pits remaining in the area, however the local oyster farmers are committed to their eventual removal.

Many farmers are working towards the exclusive use of re-useable plastic products, but this is a costly, time consuming and labour intensive task. While conversion to non-degradable products will ultimately save the farmers time and money, the sheer logistics of such an operation means the change will not occur overnight.

In some circumstances, the wood removed from a lease might still be structural sound. Rather than the costly and wasteful act of disposing of this material at landfill, farmers may choose to sheath the wood in plastic to prevent any further leaching of contaminants, and then re-use on a lease.

Risks to be reduced by the actions below:

- Contaminants from treated & tarred timber infrastructure leaching into the estuary
- Tar leaching from pit / application area into the surrounding environment

Initial Risk:

Significant

Significant

Actions (see 'Review Form' on page 41 for how performance can be monitored)

- | | |
|-----|--|
| 35. | Continue phase out of treated and tarred timber infrastructure |
| 36. | Where no environmental harm may result, adopt principles of reuse and recycle |
| 37. | Other material to be tipped at licenced EPA approved waste management facilities |
| 38. | Decommission and remove tar pits |

Noise & Visual Pollution:

Background:

In 2014 the NSW Department of Primary Industries (Fisheries) released the 2nd version of the NSW Oyster Industry Sustainable Aquaculture Strategy (OISAS). This strategy includes criteria for acceptable lease materials and maintenance, as well as their visual amenity. This document is complemented by best practice guidelines that have been developed for a number of cultivation methods:

- Best Practice Guidelines for Oyster Raft Construction:
www.dpi.nsw.gov.au/_data/assets/pdf_file/0003/421275/INT11-83575-Best-Practice-Guidelines-Oyster-Raft-Construction.pdf
- Best Practice Guidelines for Floating Basket Long-Line Oyster Cultivation:
www.dpi.nsw.gov.au/_data/assets/pdf_file/0009/509634/Floating-Basket-Long-Line-Oyster-Cultivation-Guidelines.pdf

The aesthetics of lease areas is one of the main community concerns about oyster farming throughout coastal NSW. Oyster farmers in the Macleay River take pride in the appearance of their leases, however, it is recognised that there are some areas in need of improvement. Where the aesthetics of oyster leases are questioned, these concerns are usually directed towards abandoned leases. Without ongoing maintenance these areas have deteriorated over time. Local farmers have been working with NSW DPI to identify derelict leases, and are working towards remediation of these areas.

Community concerns about the aesthetics of oyster lease areas also stems from a lack of understanding about the industry and cultivation requirements. Communication is a key component of this EMS, and farmers will work to engage with the local community to demystify the industry. The first step is the distribution of this EMS.

Noise issues are particularly relevant to shed sites which use a variety of equipment & practices that emit noise. Farmers take common sense steps towards minimising noise and leases are only normally worked between 7am – 6pm, depending on tides and weather conditions.

Risks to be reduced by the actions below:

• Visual pollution of leases that have not been maintained (incl. derelict leases)	Initial Risk: Significant
• Noise from oyster farming activities	Low

Actions (see 'Review Form' on page 41 for how performance can be monitored)

39.	Maintain leases for visual amenity as outlined in the Oyster Industry Sustainable Aquaculture Strategy (OISAS)
40.	Launch and distribute EMS to educate community, waterway users and local authorities
41.	Utilise opportunities to engage and educate community about farming practices
42.	Continue to work with NSW DPI to identify and rehabilitate derelict leases
43.	Follow NSW DPI best practice guidelines for noise as outlined in the NSW Oyster Industry Sustainable Aquaculture Strategy (OISAS)

Erosion & Sedimentation:

Background:

Due to the nature of oyster farming, growers require a land based depot than can be easily accessed from the water. For this reason, many oyster sheds are located directly adjacent to the waterway. Considering their location, any sediment displacement that occurs at oyster sheds typically flows straight into the receiving waters. Any erosion control measures considered therefore need to manage sediment on site, before mobilised soil enters the waterway.

Erosion not only impacts on estuary health through smothering seagrass & inhibiting light penetration, but can also affect the feeding apparatus of oysters and lead to infestations of mudworm. This can impact on the health of oysters, and can result in mortalities. Sediment instability at shed sites can also have severe consequences on business productivity, creating OHS issues and hinder machinery operation. To mitigate these issues, some farmers in the Macleay River have already constructed sumps to capture sediment that is mobilised when washing oysters, equipment and other machinery.

Oyster farmers spend a considerable amount of time on the Macleay River as they travel to and from lease areas. Knot limits and no wash zones are not only designed to protect river banks from erosion, but to safeguard other waterway users and vessels in the area.

Risks to be reduced by the actions below:

- Shed site erosion due to farm machinery operation & washing of oysters & gear
- Wash from oyster punts travelling to and from leases

Initial Risk:

Moderate

Low

Actions (see 'Review Form' on page 41 for how performance can be monitored)

- | | |
|-----|--|
| 44. | Develop means to capture sediment mobilised in washing down activities |
| 45. | Comply with knot limits when operating oyster punts in the estuary |

Effluent:

Background:

As well as spending considerable amount of time on the water tending their leases, the nature of commercial oyster cultivation also requires farmers to spend extended periods at their land based facilities, whether it be culling over-catch and fouling organisms, grading or maintaining equipment.

Few of these sheds are serviced by the reticulated town sewerage system, and therefore farmers must maintain on-site sewerage management systems, or make arrangements to use facilities off site. Despite being well-maintained by the farmers and subject to regular council inspections, these present a potential pollution risk through infrastructure failure.

Expansion of the reticulated sewerage network is beyond the reach of oyster farmers. Until connection is possible, farmers will continue to inspect and maintain these amenities.

Risks to be reduced by the actions below:

- Waterway contamination from faulty toilets not connected to reticulated system

Initial Risk:

Moderate

Actions (see 'Review Form' on page 41 for how performance can be monitored)

- | | |
|-----|---|
| 46. | Continue maintenance and inspection schedule of toilet facilities |
| 47. | Take opportunities to connect to the reticulated system and decommission septic tanks |

Chemicals, Fuel and Oil:

Background:

The main environmental concern in the use of chemicals, fuel and oil is the potential for stormwater and land contamination from spills. There is no bulk storage on site, and hence no bunding is currently employed to protect against spills. Only small quantities are held in sheds for everyday use, and these fluids are stored in appropriate canisters. Secondary containment is recommended to act as a back-up to contain spills in the unlikely event that the first container fails.

As oyster farming involves the use of a variety of machinery, including outboard engines, grading machines, tractors, fork-lifts, it is important for farmers to maintain this equipment in good condition to protect against leaks. Such maintenance is built into everyday farming activities, and is fundamental to maintain productivity.

Very few chemicals are used in oyster farming, with the most common probably being chlorine. Chlorine is used to disinfect depuration tanks, and should be stored as directed on the associated 'Safety Data Sheet'. Chlorine is corrosive & potentially hazardous to health, and all oyster farmers & employees should have access to the 'Safety Data Sheet' which should be stored with the chemical at all times.

Growers are encouraged to work with appropriate authorities to develop 'Emergency Response Plans'. Such plans will enable suitable preparation and planning, and a quick reaction in the event of an emergency. These actions will help to mitigate the negative impacts on the environment and the industry. Emergency response plans may include: fires; explosions; fuel & oil spills; release of hazardous chemicals; natural disasters; oyster disease & mortality; effluent spill / release.

Risks to be reduced by the actions below:

- Fuel or oil spills from oyster punts or shed depot sites
- Chemicals that leak through poor storage or an adverse event

Initial Risk:

Moderate

Low

Actions (see 'Review Form' on page 41 for how performance can be monitored)

- | | |
|-----|---|
| 48. | Develop an Emergency Response Plan to effectively manage emergency situations |
| 49. | Alert and work with authorities to aid containment after a spill |
| 50. | Only small volumes of fuel and oil stored on site if no secondary containment |
| 51. | Consider secondary containment of oils and fuels (e.g. bunding) |
| 52. | Ensure chlorine and other chemicals are stored with the appropriate safety data sheet |

Resource Use:

Background:

Recognising that potable water is a valuable resource, farmers are committed to minimising water consumption & wastage. A few farmers already utilise rainwater tanks, whilst others are looking at funding opportunities to offset the cost of tank installation. This will enable farmers to harvest run-off from shed roofs, and use this rainwater to clean equipment and machinery.

Oyster farmers are conscious of the rising costs of electricity and carbon emissions associated with conventional, coal powered energy production. Renewable sources of electricity, such as solar and wind energy, would provide farmers with an alternative means to power tools and machinery at shed sites. Some sheds are currently without power, which is an obvious limitation on industry productivity. Renewable energy may provide a cost effective, environmental responsible option for these sites.

Risks to be reduced by the actions below:

	Initial Risk:
• Potable water used to clean equipment & oysters	Low
• Resource use & carbon emissions associated with use of mains electricity	Low

Actions (see 'Review Form' on page 41 for how performance can be monitored)

53.	Install rainwater tanks to minimise use of potable water
54.	Investigate viability of renewable energy to supplement shed site energy needs

ENVIRONMENTAL POLICY MACLEAY RIVER OYSTER FARMERS

Environmental Policy:

It is the policy of the Macleay River Oyster Farmers to conduct all aquaculture activities in an environmentally responsible manner, appropriate to the nature and scale of operations.

The aim is to ensure that aquaculture activities do not cause environmental pollution, and that oyster growers operate under the principles of ecologically sustainable development.

To achieve this Macleay River Oyster Farmers should:

- Comply with relevant laws and regulations and implement industry best practice (OISAS)
- Plan for environmental hazards and work towards mitigating their potential impacts
- Recognise and protect the cultural and aesthetic values of the Macleay River and its catchment
- Cultivate oysters in a manner that minimises: resource consumption; waste production; pollution
- Communicate openly with relevant stakeholders on environmental matters
- Contribute to scientific research and innovation relevant to oyster cultivation and estuarine environments
- Strive for continual improvement



7. ANNUAL REVIEW FORM

Reviewed by:

Date of review:

Review period:

Actions:		Measured Improvement:	Measure:
1.	Engage with, and support Kempsey Shire Council, North Coast LLS and other organisations to improve catchment management	No. of engagements with council, LLS and other organisations about improved catchment management	.....
		Letters of support supplied	.....
2.	Report all earthworks of concern to Kempsey Shire Council	No. times earthworks of concern have been identified	.....
		No. times concerns brought to attention of council	.....
3.	Communicate with council about the importance of oyster harvest areas and the value of the on-site sewerage management system inspection program	Information communicated to council	Yes / No
4.	Request clarification from council about protocol if a system fails an inspection	Request made	Yes / No
		Reply received from council	Yes / No
5.	Support applications for riverbank fencing and riparian revegetation	Letters of support supplied	.....
6.	Engage with landholders and authorities, and where possible, facilitate on-ground works	No. of engagements about bank stabilisation projects (revegetation, stock exclusion etc)	.....
7.	Raise concerns about reed bed wastewater systems with council and the NSW EPA.	Concerns raised with council and NSW EPA	Yes / No
		Reply received	Yes / No

Actions:		Measured Improvement:	Measure:
8.	Contact NSW Maritime regarding effluent management and pump-out usage by house-boats on the Macleay River	Concerns raised with NSW EPA about house-boats and pump-out usage	Yes / No
		Reply received	Yes / No
9.	Contact council regarding toilet facilities at Clybucca tomato farm, and if appropriate, request an inspection	Concerns raised with council	Yes / No
		Reply received from council	Yes / No
10.	Encourage council to increase capacity of pump-station holding tanks	No. of engagements with council about holding tanks and maintenance of pumping stations	.....
		Were these engagements successful	Yes / No
11.	Work with council to develop a clear line of communication, for immediate notification following events which may impact on water quality	Clear communication protocol developed with council	Yes / No
		No. of times the protocol was used	.....
		No. of times the protocol should have been used	.....
12.	See Action 1 (but addresses a different risk)		
13.	Contact council and NSW EPA to clarify the STP / abattoir event	Contact made with council and the NSW EPA	Yes / No
		Reply received	Yes / No
14.	Request council to adapt water quality monitoring program to include events based testing at high-risk sites and sampling at same stage of the tide	Request made	Yes / No
		Sampling program amended	Yes / No
15.	See Action 11 (but addresses a different risk)		
16.	Maintain vigilance about developments and changes in the estuary as Pacific Highway upgrade progresses	Any changes noticed	Yes / No
		Any action taken as a result of these changes	.....

Actions:		Measured Improvement:	Measure:
17.	Engage in the consultation process and make submissions on behalf of industry	No. of engagements through consultation process	.....
		Formal submission made on behalf of oyster industry	Yes / No
18.	Seek support from oyster industry representatives: NSW DPI, NSW Food Authority and NSW Farmers Association	Support requested from these organisations	Yes / No
		Feedback / support provided	Yes / No
19.	Engage with oyster farmers in the Nambucca River to discuss joint approaches and successful strategies	Contact made with Nambucca River oyster farmers	Yes / No
20.	Report all incidences of oyster theft to Operation Trident (T: 1800333000)	No. of times oysters have been stolen	.....
		No. of times thefts reported to Operation Trident	.....
21.	Seek amendment to the NSW Recreational Boating Manual to educate waterway users about the needs of industry & Operation Trident	Contact made with NSW Maritime	Yes / No
		Amendment implemented	Yes / No
22.	Improve signage around lease areas	No. of improvements made to signage around lease areas (marker posts and educational signs)	.....
23.	Launch and distribute EMS to educate community & inform local authorities of industry priorities	EMS launched	Yes / No
		EMS distributed to key stakeholders and authorities	Yes / No
24.	See Action 11 (but addresses a different risk)		
25.	See Action 6 (but addresses a different risk)		
26.	See Action 1 (but addresses a different risk)		
27.	See Action 2 (but addresses a different risk)		
28.	Develop emergency response plans to manage emergency situations	Emergency response plans developed	Yes / No

Actions:		Measured Improvement:	Measure:
29.	Alert / work with authorities to aid containment after a spill	No. of times RMS alerted to spills	.....
		Details of any assistance provided	.....
30.	Bring issues of wind-borne chemicals to the attention of the NSW EPA	Concerns raised with NSW EPA	Yes / No
		Reply received	Yes / No
31.	Make enquiries as to chemical usage at the Clybucca tomato farm and the risk these pose to the oyster industry downstream	Enquiry lodged with NSW EPA	Yes / No
		Reply received	Yes / No
		Details of any further action taken	.....
32.	Report mortalities above 5% to NSW DPI	No. of reports made to NSW DPI	.....
33.	Read industry newsletters & engage with researchers working on oyster disease & mudworm	Receives and reads 'Aquaculture' publication from NSW DPI and other newsletters relevant to industry	Yes / No
		No. of engagements made with researchers working on mudworm and oyster related diseases	.....
34.	Continue working to improve estuary & catchment health to increase oyster resilience	No. of catchment projects oyster farmers have engaged in to improve estuary health	.....
35.	Continue phase out of treated and tarred timber infrastructure	Amount of tarred and treated timber infrastructure removed from the estuary	..... kg
36.	Where no environmental harm may result, adopt principles of reuse and recycle	% estimate of oyster infrastructure removed from the estuary that has been reused / recycled %
37.	Other material to be tipped at licenced EPA approved waste management facilities	Amount of oyster infrastructure that has been disposed at licensed waste management facilities	..... kg
38.	Decommission and remove tar pits	No. of tar pits remaining in the estuary	.....

Actions:		Measured Improvement:	Measure:
39.	Maintain leases for visual amenity as outlined in the Oyster Industry Sustainable Aquaculture Strategy (OISAS)	No. of compliance notices received from NSW DPI with regards to visual amenity	.....
		No. of reasonable complaints received from the community	.....
40.	See Action 23 (but addresses a different risk)		
41.	Utilise opportunities to engage and educate community about farming practices	No. of publicity / promotional opportunities used to discuss oyster farming practices	.....
42.	Continue to work with NSW DPI to identify and rehabilitate derelict leases	Derelict leases identified and NSW DPI informed	Yes / No
		No. of derelict leases in the Macleay River estuary	.....
43.	Follow NSW DPI best practice guidelines for noise as outlined in NSW Oyster Industry Sustainable Aquaculture Strategy (OISAS)	No. of noise complaints received	.....
44.	Develop means to capture sediment mobilised in washing down activities	No. of collection sumps / sediment collection mechanisms in place	.....
45.	Comply with knot limits when operating oyster punts in the estuary	No. of fines received for exceeding knot limits	.....
46.	Continue maintenance and inspection schedule of toilet facilities	No. of times toilet facilities have malfunctioned	.....
47.	Take opportunities to connect to the reticulated system and decommission septic tanks	No. of sheds not connected to the reticulated sewerage network	.....
48.	See Action 28 (but addresses a different risk)		
49.	Alert and work with authorities to aid containment after a spill	No. of times RMS alerted to spills from oyster industry	.....
		Details of any assistance provided	.....
50.	Only small volumes of fuel and oil stored on site if no secondary containment	No. of fuel / oil containers larger than 20l stored at shed sites without secondary containment	.....
51.	Consider secondary containment of oils and fuels (e.g. bunding)	No. of secondary containment measures put in place	.....

Actions:		Measured Improvement:	Measure:
52.	Ensure chlorine and other chemicals are stored with the appropriate safety data sheet	No. of chemical containers stored inappropriately or without the correct safety data sheet	.....
53.	Install rainwater tanks to minimise use of potable water	No. of rainwater tanks in operation at shed sites	.....
54.	Investigate viability of renewable energy to supplement shed site energy needs	Viability of renewable sources of energy investigated	Yes / No
		No. of farmers utilising renewable energy at shed sites	.....

8. SUPPORT FOR OYSTER FARMERS

8.1. RURAL SUPPORT PROGRAM



Department of
Primary Industries



The Rural Support Program works with rural communities to improve their attributes of resilience through greater knowledge, skills and practices and the development of plans to face future adverse climatic events. Rural communities and individuals are also assisted during dry periods and to recover following other emergencies, such as Natural Disasters.

The program interfaces with existing programs within NSW DPI, such as climate adaptation and emergency management and networks with other agencies to develop human skills that contribute to the attributes of resilience. Existing programs are strengthened by integrating initiatives focused on climate variability and natural disasters, within NSW Primary Industries and the other providers of support to rural communities.

The primary audience is individuals, farm businesses and the rural communities in which they reside. Particular attention is given to disaster risk identification and reduction through planning and management at the prevention, preparation and recovery phases of natural disaster management

Contact your local Rural Support Worker for a specific projects and activities:

Location	Rural Support Worker	Office number	Mobile	Email
ORANGE	Cheryl Pope (Team Leader)	6391 3948	0428 435 593	cheryl.pope@dpi.nsw.gov.au
GRAFTON	Jan Bruce	6640 1600	0427 257 191	jan.bruce@pi.nsw.gov.au
GUNNEDAH	Jenny Croft	6741 8336	0429 446 417	jenny.croft@dpi.nsw.gov.au
DUBBO	Pip Brown	6881 1266	0429 396 697	pip.brown@dpi.nsw.gov.au
SCONE	Caroline Long	6544 4900	0428 296 332	caroline.long@dpi.nsw.gov.au
GOULBURN	Dick Kearins	4828 6600	0427 781 514	dick.kearins@dpi.nsw.gov.au
HAY	Danny Byrnes	6993 1608	0428 973 141	danny.byrnes@dpi.nsw.gov.au
ALBURY	Di Pritchard	6051 7703	0417 231 852	di.pritchard@dpi.nsw.gov.au

8.2. USEFUL CONTACTS

NSW Department of Primary Industries (NSW DPI)

The key regulatory agency for the NSW Oyster Industry. The department administers leases and permits, collates production data, develops policy and also has an industry development role. The department is also a key NSW aquatic habitat protection and compliance agency and develops policies and guidelines for the industry that are consistent with habitat protection objectives

(02) 4982 1232	Port Stephens Fisheries Centre
(02) 5524 0600	Local Fisheries Office (Port Macquarie)
(02) 6652 3977	Local Fisheries Office (Coffs Harbour)
1300 550 474	Reporting illegal fishing activity
1800 043 536	Reporting illegal fishing activity (Fishermen's Watch – 24hr service)

Kempsey Shire Council

Local government has a diverse role covering town planning, building approvals, local roads, parking, public libraries, public toilets, water and sewerage, approval and inspection of septic systems, waste removal domestic animals and community facilities. Of particular importance to the NSW oyster industry is council's part in managing estuarine water quality and resolving land and water use conflicts through estuary management planning, land use planning and development control. Council may also provide waste management services to the industry. Council's also assist the oyster industry with water quality monitoring and have a role in investigating water pollution incidents.

(02) 6566 3200	Main number
1300 663 211	Sewer service difficulties and faults
1300 663 211	Local roads and bridges
1300 663 211	Water service difficulties and faults
132 500	SES (State Emergency Service)

NSW Maritime

State government's maritime regulator responsible for providing safe and sustainable ports and waterways. The authority helps to establish aquaculture lease marking requirements and helps to determine if a lease area will adversely affect navigation. NSW Maritime also has responsibilities for pollution from vessels.

13 12 56	General info line & environmental emergencies (oil spills)
13 12 36	Phone payments
(02) 9563 8511	Head office (Rozelle)
1800 658 784	Water Police (24hr line to report marine crime)

NSW Food Authority

The NSW Food Authority provides regulatory framework for safe and correctly labelled food to be produced in NSW. Of particular importance to the oyster industry, the NSW Food Authority has responsibility for implementing the NSW Shellfish Program that classifies and establishes management plans for oyster harvest areas. The NSW Food Authority also licences oyster depuration, processing and handling facilities.

1300 552 406	Main line
(02) 6552 3000	Licensing enquiries and invoicing

North Coast Local Land Services (LLS)

Local Land Services (LLS) coordinate natural resource management at the catchment scale. The LLS is responsible for involving regional communities in catchment planning and identification of natural resource management priorities for their region, and are the primary means for the delivery of funding from the NSW and Commonwealth Governments to help land managers improve and restore the natural resources of the state. Key roles include preparing Catchment Action Plans, and managing investment programs to implement the plans, and promoting community participation in regional natural resource management action and decision making. Implementation of the Catchment Action Plans in the coastal LLS regions will lead to favourable outcomes for the oyster industry.

1300 795 299	Main number
(02) 6562 7822	Local office (Kempsey)

NSW Office of Environment and Heritage (OEH)

OEH has responsibility for protected and threatened wildlife throughout NSW. Of particular relevance to oyster aquaculture leases is the OEH's role in the protection of marine mammals and reptiles, such as dolphins and sea turtles which may swim into shallow water, and shorebirds or waders which often forage in the intertidal zone and roost nearby.

OEH leads the implementation of the Diffuse Water Pollution Management Strategy which provides a framework for natural resource and environment agencies, including local government and LLS to better manage pollution from non-licensed activities.

OEH works with local councils and communities to maintain or improve the health of our estuaries. OEH supports local government through the Coastal Zone Management Program which provides guidance and support for both coastal and estuary management planning and actions. OEH works with the oyster industry to provide estuary process information when available to help resolve issues such as dredging.

131 555	Environment emergency line (Environmental Protection Authority)
1300 361 967	National Parks
(02) 6566 6621	Local OEH Office (Macleay)

Marine Estate Management Authority

Marine Estate Management Authority manages the NSW Marine Parks estate. These parks are large marine and estuarine protected areas that are designed to conserve all forms of marine plant and animal species (biodiversity). The Marine Estate Management Authority is responsible for the declaration, management, selection and zoning of marine parks and the regulation of ecologically sustainable use of these areas.

1300 550 474	General enquiries
(02) 6691 0600	Local office - Solitary Islands Marine Park (southern boundary at Coffs)

Crown Lands – Trade and Investment

The Crown Lands Division is the primary administrator for Crown land tenures and unallocated Crown land across NSW. The division leases land to the oyster industry for land-based activities and also gives owners consent to lodgement of development applications for new aquaculture lease areas where development consent is required.

Future management of land based sites located on Crown Land will be driven by the need for both the grower and the Crown Lands Division to maintain an environmentally sensitive and professional well managed land base. This will be achieved through the process of a long term lease agreement and an associated work plan that is developed in partnership with the grower to achieve sound environmental and social outcomes.

1300 052 637	Main line
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NSW Department of Planning and Infrastructure

The Department of Planning and Infrastructure's key role for the oyster industry is in ensuring that the OISAS is integrated into the state land use planning and development control framework. The department ensures that strategies such as OISAS integrate the government's social, economic and environmental agendas to promote sustainability.

(02) 9228 6111	Head office
(02) 9228 6333	Information centre

Environmental Protection Authority

The EPA is tasked with making those subject to environmental regulation aware of Government and community expectations about the protection of our environment and the health of local communities, by raising general awareness of regulatory requirements and delivering strong compliance and enforcement programs.

The EPA shares responsibility for regulating pollution of waters in NSW with local government and the Roads and Maritime Services. The EPA is responsible for regulating state and local government agencies and those premises holding an environmental protection license. Roads and Maritime regulate water pollution from vessels and local government regulates most other sources.

131 555	Main number and to report pollution
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9. EMS COMMENTS & SUGGESTIONS

Please use this space to record any comments and suggestions that you have.

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