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## **PRELIMINARY EVALUATION REPORT – EASTERN SEA FARMS LIMITED, OFFSHORE OF OPOTIKI, BAY OF PLENTY (MFISH REF: C18-1037 & C18-1038)**

### **Summary**

#### ***Purpose***

1 This report provides you with a preliminary evaluation of the application by Eastern Sea Farms Limited for a marine farming and spat catching permit under s 67J and s 67Q of the Fisheries Act 1983. The report also provides a recommended preliminary decision (given below) for you to consider.

2 On 1 January 2005, the Aquaculture Reform (Repeals and Transitional Provisions) Act 2004 was enacted. The Act requires MFish to continue to process all marine farming and spat catching permit applications under the old legislation in the Fisheries Act 1983, where the resource consent application was notified before the start of the aquaculture moratorium in November 2001.

#### ***Reasons for the undue adverse effects test***

3 Under s 67J (8) of the Fisheries Act 1983 the chief executive may not issue a marine farming or spat catching permit unless he or she is satisfied that the activities contemplated by the application would not have an undue adverse effect on fishing or the sustainability of any fisheries resource.

4 The undue adverse effects test protects existing legitimate uses of coastal marine waters for fishing against diminution by the expansion of aquaculture. This is not an absolute protection, but a protection against “undue” adverse effects. The test does not allow a comparison of the benefits that might be gained from marine farming in an area, such as the economic benefits, with the benefits that are provided by fishing. The test also does not allow beneficial effects of one fishing sector to outweigh adverse effects on another fishing sector.

## ***Recommendation***

5 This report recommends you make a preliminary decision to approve the northern 3,800 ha, equating to 984 longlines, of marine farming permit application C18-1037 by Eastern Sea Farms Limited subject to the following condition:

- i) The permit holder must abide by the current Mussel Industry Environmental Code of Practice.

6 This report recommends you make a preliminary decision to approve the northern 3,800 ha, equating to 984 longlines, of spat catching permit application C18-1038 by Eastern Sea Farms Limited subject to the following condition:

- i) Spat catching can occur only if a Ministry of Fisheries approved Adaptive Management Plan is implemented.

7 This recommendation is made on the grounds that, given the information available at this time and with the conditions imposed in paragraphs 5 and 6, the Ministry of Fisheries (MFish) is satisfied the activities contemplated by this application would not have an undue adverse effect on fishing or the sustainability of any fisheries resource.

## **Reasons for the Recommendation**

8 Because the marine environment is a dynamic and ever changing system, we seldom can obtain precise measurements of expected impacts of shellfish farms on fisheries resources. On a small scale (e.g. a few hectares), effects of well located and managed marine farm developments are unlikely to threaten the sustainability of fisheries resources. But, with dramatic increases in size, there is a corresponding increase in uncertainty of predicting potential effects of the farm on the sustainability of fisheries resources, including flow-on effects to upper trophic levels such as finfish.

9 Due to the size of the application site, MFish considers impacts on the sustainability of fisheries resources are likely. For example, it is expected that phytoplankton depletion and benthic deposition of bio-deposits from the farm would occur. The application site could also change fishstock biomass and distribution through alterations in the natural habitat within the water column and on the seafloor. However, the overall consequences of effects from the proposed development of the application site on the sustainability of fisheries resources cannot be precisely determined at this time.

10 The applicant's resource consent allows a total of 1312 longlines over 4,750 ha when the farm is fully developed. The site is split into two distinct areas, a large northern site (3800 ha) to the north and a smaller southern site (950 ha) to the south. MFish cannot be satisfied, give the uncertainty in the available information, that the proposed 1312 longlines would not have an undue adverse effects on fishing and the sustainability of any fisheries resource. However, MFish is satisfied the development of 948 longlines over 3,800 ha of the farm would not be unduly adverse because it would localise adverse effects to fishing and fisheries resources instead of spreading adverse effects over two separate areas.

11 MFish recommends using the northern site to minimise impacts on marine mammals. DOC has recently recommended to Environment Bay of Plenty that aquaculture development does not occur within 6 km of the shore of Bay of Plenty, corresponding roughly with the 30 – 40 m depth

contour. The recommendation is made for the protection of nursing right whales, Bryde's whales, common dolphins and their nursing calves, and for foraging bottlenose dolphins. Although the application site is further than 6 km from shore, it still spans the 30 – 40 m depth contour, likely impacting on area considered important for marine mammals (including endangered species).

12 Commercial fishing would also be impacted by the development of the application site. Commercial fishing would be excluded within and near to the boundaries of the farm. Additionally, fishing effort depends on biomass and distribution of target and bycatch fishstocks; therefore impacts on the sustainability of fisheries resources would also impact on fishing. However, MFish is satisfied the development of 3,800 ha of the farm would not be unduly adverse because use of the northern site would reduce the loss of fishable area for commercial fishers by compacting the marine farm structures instead of spreading them over two separate areas.

13 MFish considers recreational fishers fish at the application site but that development of the farm would unlikely have considerable adverse effects on their current fishing activity.

14 MFish considers customary fishers fish at the application site but that development of the farm would unlikely have considerable adverse effects on their customary use and management.

15 Without further assessment of risks associated with the scale of development at the application site, MFish is unable to accurately determine the risk of adverse effects to fisheries resources in the region from spat catching activities. MFish considers the use of an approved Adaptive Management Plan would effectively mitigate adverse effects on fisheries resources from spat catching activities.

16 The information presented in this report is the best information available at this time, but there is some uncertainty in the information. Where information is uncertain, unreliable or inadequate, decision makers should be cautious as outlined in s 10 of the Fisheries Act 1996.

17 The decision has involved the interpretation, extrapolation, and weighting of information. A decision-maker with a differing view on the appropriate weight to accord various pieces of information could use logical argument and a sound analytical process to arrive at a different conclusion and, therefore, a different recommendation.

# PRELIMINARY EVALUATION REPORT – MARINE FARMING AND SPAT CATCHING PERMIT APPLICATION, EASTERN SEA FARMS LIMITED, OFFSHORE OF OPOTIKI, BAY OF PLENTY (MFISH REF: C18-1037 & C18-1038)

## Part A: The Application

### *Details*

Applicant:	Eastern Sea Farms Limited
Date received:	24 June 2002
Location of application site:	3 nautical miles (6.2 km) offshore of Opotiki, Bay of Plenty
Size of application site:	4,750 ha (in two distinct areas: a large northern site of 3,800 ha and a smaller southern site of 950 ha)
Species to be farmed:	Green-lipped mussels ( <i>Perna canaliculus</i> )
Stock source:	Locally caught, Kaitaia and hatchery.
Farm management details:	Submerged offshore longline farming – droppers suspended from a single backbone submerged below the surface. Full-scale development has 1312 backbone lines spaced 50 m apart, arranged in 16 blocks of lines separated by 500 m wide navigational channels.  Spat catching media used for mussel spat catching.
Stocking density:	Not provided.
Resource consent:	Approved 2 May 2002 for a total of 20 years commencing from the date of issue of the marine farming and spat catching permits from MFish:  <i>61233</i> to occupy 1,900 ha for 5 years to capacity of Stage 1. <i>61599</i> to occupy 4,750 ha for 15 years subsequent to Stage 1. <i>61524</i> to erect structures in 1,900 ha for 5 years to capacity of Stage 1. <i>61600</i> to erect structures in 4,750 ha for 15 years subsequent to Stage 1. <i>61234</i> to disturb and deposit material on the seabed for 20 years. <i>61235</i> discharge contaminated water to the ocean for 20 years.

### *Background*

18 The resource consent is currently under appeal in the Environment Court. Under the dual permit system, MFish is able to process the application but could not issue a marine farming permit unless the Court approves the resource consent. With this understanding, Eastern Sea Farms Limited requested MFish to process the marine farming and spat catching permit applications at this time.

## Location

19 The application site is located in Bay of Plenty on the east side of the North Island (Figure 1). The site is split into two distinct areas, a large northern site (3800 ha) and a smaller southern site (950 ha). The innermost side of the farm is located approximately 6.2 km offshore from Opotiki.

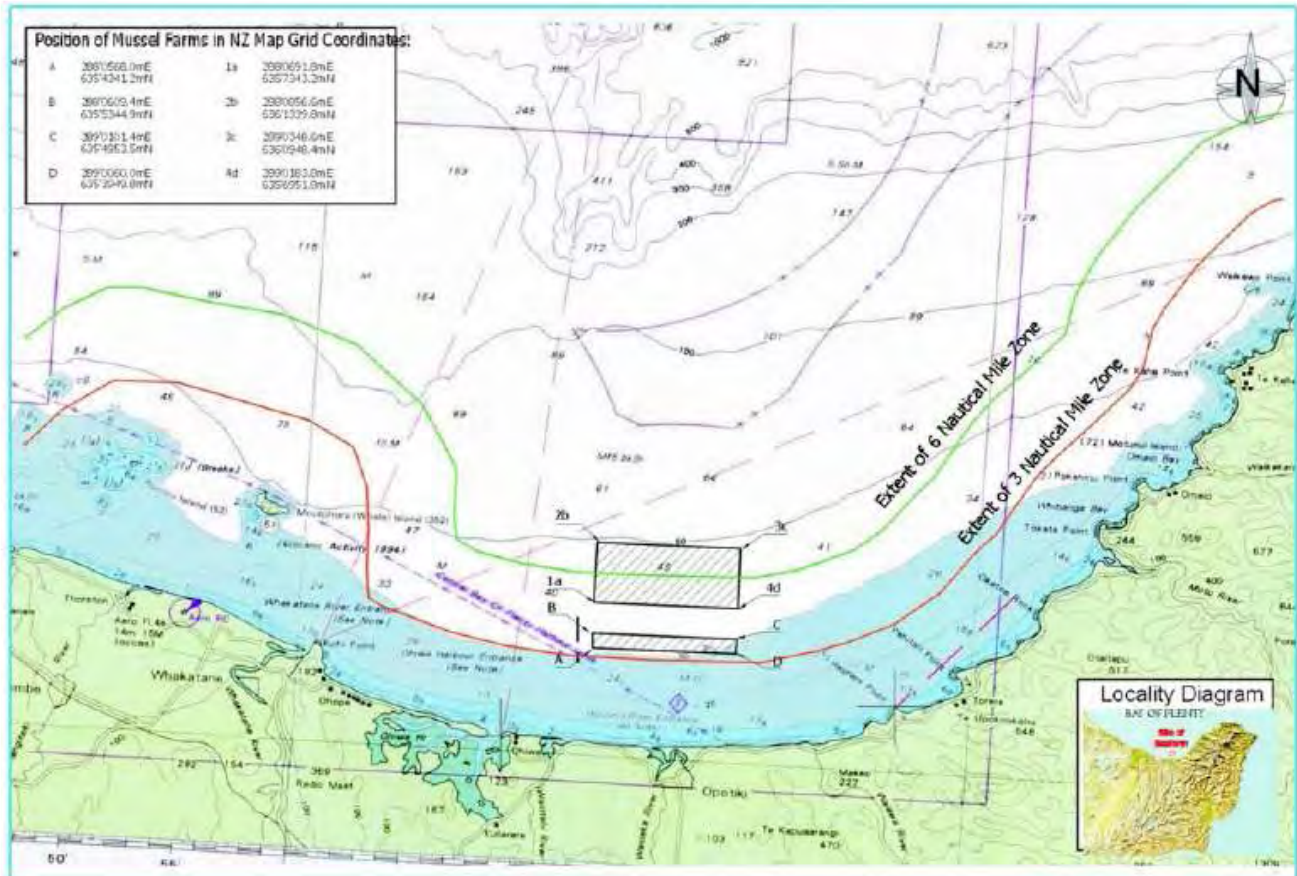


Figure 1. Location of the application site.

## Structures

20 At full development, the proposed farm would consist of 1312 longlines spaced 50 metres apart. The longlines would be arranged in 16 blocks separated by 500 m wide navigation channels (Figure 2). A total of 12 blocks with 984 longlines would be developed at the northern site and four blocks with 328 longlines at the southern site (Figure 3). All longlines would be 200 m in length. Because of the navigational channels, the total area occupied by marine farming structures would be 3200 ha.

21 The Fisheries Resource Impact Assessment (FRIA) also suggests mussel farming at the application site would be developed within a dropper line to backbone ratio of 20:1. This equates to 5,284 km of seeded dropper rope. However, the water depth could allow for a larger ratio and more backbone.

22 Conditions of the resource consent require the applicant to develop the farm in accordance with an Engineering Feasibility Study of the application site. The applicant must also submit an engineering report to Environment Bay of Plenty about the structures to be used at the site. The

proposed farming structures would most likely be submerged below the sea surface (see Appendix 1). However, official confirmation of this information has not been provided to MFish.

23 The applicant said spat catching media would be used at the site, but did not identify the specific types or quantity of the spat catching structures.

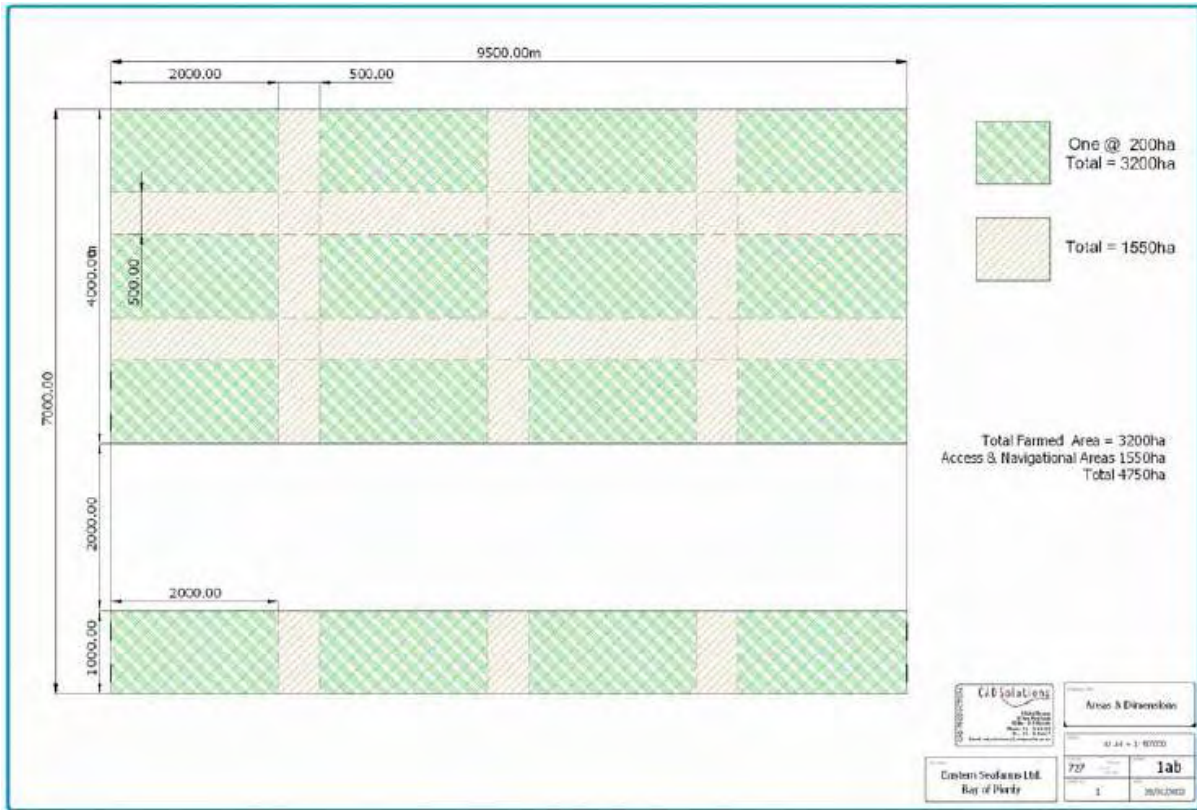
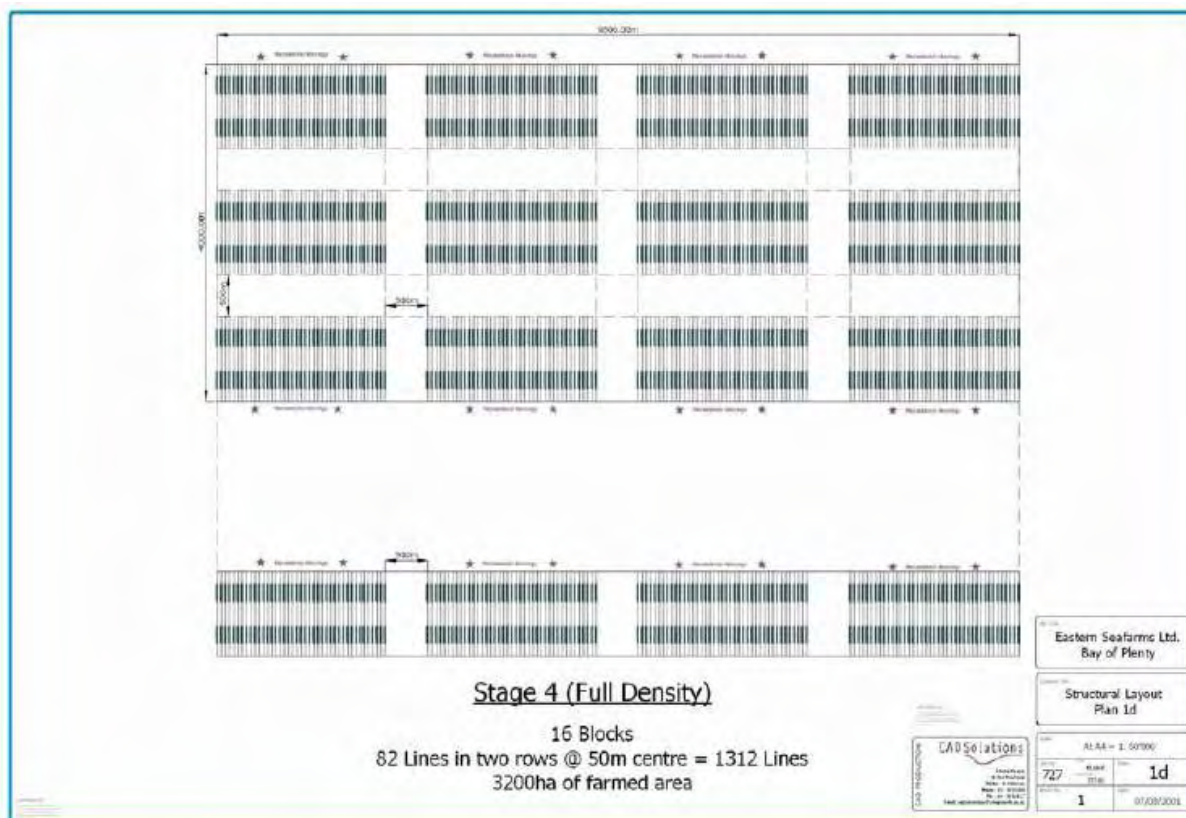


Figure 2. Structures layout of the application site.



**Figure 3.** Longline layout of the application site at full development.

### ***Development Plan***

24 The coastal permit authorises the farm to be developed in four stages. Details are outlined in Table 1.

**Table 1.** Staging of Development (See Appendix 2 for maps of each stage of development).

Stage	Number of Blocks	Maximum number of longlines	Earliest authorised date for development
1	8	256	After MFish permit issued and Environmental Monitoring Plan is approved by Environment Bay of Plenty
2	16	672	Stage 1 complete* +3 years
3	16	912	Stage 2 complete +3 years
4	16	1312	Stage 3 complete +3 years

\*Complete means at least 75% of the lines are in place.

25 Conditions of the coastal permits require the applicant to undertake an Environmental Monitoring Plan<sup>1</sup> for the duration of the consent. The Environmental Monitoring Plan must include a baseline benthic survey, ongoing water column and benthic surveys, and a written record detailing all marine mammal sightings.

26 Each stage of development can proceed only if, based on monitoring reports, Environment Bay of Plenty is satisfied the marine farm is not having a significant adverse effect on the water

<sup>1</sup> Adaptive management approaches to managing the effects of development on natural systems, in the face of incomplete scientific knowledge, are endorsed by the Department of Conservation and the Ministry for the Environment through the New Zealand Biodiversity Strategy (2000).

column characteristics, benthic environment or marine mammals in the permit area or greater Bay of Plenty region. If, following any monitoring reports, one or more of the circumstances set out by Environment Bay of Plenty have not been satisfied, the subsequent stage of activity would not proceed and monitoring would continue. The applicant would also have to take any such steps Environment Bay of Plenty require in order to remedy or mitigate any significant adverse effects identified as being caused by the activities of the marine farm.

27 However, under 67J of the Fisheries Act 1983, the Chief Executive of MFish must be satisfied the activities contemplated by the application would not have an undue adverse effect on fishing or fisheries resources at any time. MFish cannot re-evaluate the application for each stage of development. As such, MFish assesses potential impacts of the application site for full development of the farm.

## **Part B: Fisheries Resource Impact Assessment (FRIA)**

28 All marine farming permit applications must include an ecological investigation assessing the effects of the activity considered by the application on the sustainability of fisheries resources (referred to as a FRIA)<sup>2</sup>. MFish's 'Guide to Preparing A Fisheries Resource Impact Assessment' (MFish 2002a) sets out the type and quality of information MFish needs to meet its obligations under fisheries legislation.

### ***The Applicant's FRIA***

29 The application provided by Eastern Sea Farms included information on the following:

- ◆ major fisheries resources in the region of the application site
- ◆ fishing activities in the region of the application site
- ◆ predicted effects of the application site on fishing
- ◆ predicted effects of the application site on the sustainability of fisheries resources
- ◆ consultation conducted by Eastern Sea Farms
- ◆ an adaptive management plan
- ◆ legislative requirements for a fisheries permit.

30 The assessment is based on four scientific reports completed by Cawthron Institute:

- ◆ Cawthron Report No. 663 (Gibbs & Knight 2001) contains a water-column assessment consisting of surveys of the water-column and water currents at the site, a review of other data contained in literature and a sustainability modelling study.
- ◆ Cawthron Report No. 672 (Hopkins & Robertson 2001) describes the seabed at the site and assesses the potential ecological impacts of the proposed mussel farming on that seabed.
- ◆ Cawthron Report No. 810 (Gibbs & Tuckey 2003a) is an investigation of fishing activities within and around the application site based on recent catch history for the area.

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<sup>2</sup> See Appendix 3 for Glossary of Scientific Terms used in this report.

- ◆ Cawthron Report No. 823 (Gibbs & Tuckey 2003b) provides information on the likely interactions between the application site and fisheries resources.

### ***Standard of Information***

31 MFish scientists have peer reviewed the applicant's FRIA (Appendix 4). MFish believes the reports address the FRIA key elements to a high scientific standard. MFish scientists agree the statements and conclusions made by Cawthron give a fair, adequate and robust assessment of likely effects on fisheries resources. MFish scientists agree the collection, recording, reporting and analysis of data appears to be scientifically adequate and robust. The modelling scenarios used throughout the report also appear to be scientifically adequate and robust (including fisheries abundance and distribution models, plankton depletion models, and benthic deposition zone models).

32 However, in addition to the information from Cawthron, MFish scientists are aware of other research that has enhanced their understanding of the fishing and fisheries resources in this area. That additional information has been considered, where necessary, alongside Cawthron's information. As a result, in some areas, MFish scientists may not always agree with Cawthron's conclusions in their totality, despite the standard of the information.

### ***Other Sources of Information***

33 This assessment relies heavily on the four scientific reports from the Cawthron Institute. However, MFish has also used other sources of information including NIWA trawl surveys, published journal articles, MFish catch effort data, and submissions from commercial, recreational, and customary stakeholders.

34 Various elements of the FRIA report have been refuted by submitters and other scientific studies. The decision maker should therefore consider the rigour and mandate of reports and submissions when considering any disputes or differences in the interpretation of information.

35 MFish also recognises much of the information submitted from stakeholders for this assessment is anecdotal and that submitters may have a vested interest in their support or opposition to this application. The report provides a summary of relevant considerations from the submissions, but because the decision maker must take into account the individual merits of each submission, all submissions should be read in full when making a decision.

### ***Description of the Area Potentially Affected by the Application***

36 The following is a description of the area potentially affected by the application. Information is cited from the FRIA reports unless stated otherwise.

#### ***Substrata***

37 The application site is located over a flat and relatively homogenous muddy seabed. Mud content tended to decline, as sand content increased, along a gradient towards the southern portion of the site. Total mud content ranged from roughly 50% - 90%. Sediments beneath the application site had low-medium organic matter content.

38 Cawthron stated commercial trawling activities have physically disturbed a majority of the soft sediment seabed habitat in Bay of Plenty, including the seafloor under the application site.

## *Fisheries resources*

### *Benthic fauna*

39 The benthic ecology survey indicated there were two distinct animal communities; one located in the muddier northern site and the other in the less muddy southern site.

40 The northern section consisted of a relatively homogenous and very diverse population (127 taxa) of primarily invertebrate animals living both on and within the sediment surface. Deposit feeding sea cucumbers and brittle stars, and scavenging hermit crabs and whelks were the most abundant and widespread of the epifauna. Sea cucumbers, brittle stars, deposit feeding polychaete worms and small crustaceans dominated the infauna. Most of the major feeding groups were represented within the fauna including surface and burrowing deposit feeders, filter feeders, scavengers, and carnivores.

41 The less muddy southern site consisted of a slightly different biological community but still consisted of mainly deposit feeders and scavengers. The obvious difference was the low abundance of sea cucumbers, hermit crabs and encrusting bryozoans. Brittle stars and polychaetes were the most abundant fauna at the southern site.

### *Phytoplankton*

42 During a site survey in June 2001, chlorophyll *a* concentration was higher on the southern side of the site. Chl *a* concentration on the outer boundary was mostly around 0.4 µg/l, with an isolated patch of 0.75 µg/l at the western end of the boundary. The chl *a* concentration along the inner boundary was significantly greater, with a band of enhanced chl *a* (1.0 µg/l) around 8 m deep.

43 Satellite images of Bay of Plenty from June 2000 – June 2001 suggest ambient chl *a* concentrations at the application site ranged from around 0.5 to over 4 µg/l. This is a typical range of coastal chl *a* concentrations.

### *Fishstocks*

44 Cawthron did not target finfish species in any of the site surveys because of the difficulties in sampling such highly mobile and temporally variable animals. However, Cawthron stated a significant fishery likely populates the site. Finfish species almost certainly use the area as a feeding ground and possibly for reproduction and refuge. Environment Court evidence from Russell Cole also stated the application site and surrounding area may have some value as a nursery ground for snapper and trevally.

45 NIWA (Morrison et al 2001) trawl surveys show numerous fishstocks inhabit the area of the application site (for maps of trawl survey results, refer to Appendix 5). NIWA (Hurst et al 2000) also produced a report of areas of importance for spawning, pupping or egg-laying, and juveniles of New Zealand coastal fish. This report shows numerous juvenile fishstocks (0+ and 1+ year classes) were found in Bay of Plenty, including the area of the application site. In agreement with Cole's evidence, juvenile snapper and trevally were identified in the area of the application site. The report also states ripe or running ripe snapper and gurnard are commonly found in inner Bay of Plenty. Seventeen other coastal fishstocks were also identified as possibly ripe or running ripe in inner Bay of Plenty. Submitters similarly stated snapper and trevally regularly spawn between Ohiwa and Te Kaha in Eastern Bay of Plenty.

46 Catch effort information held by MFish also shows considerable commercial fishing activity occurs in the area of the application site. Catch effort depends on finfish biomass, suggesting large quantities of finfish inhabit the area of the application site at some time during the year.

47 Rock lobsters also occur throughout the inshore regions of the Bay of Plenty.

#### *Water depth*

48 Water depths at the application site range from 28.4 m to 46.4 m.

#### *Wave and current conditions*

##### *Wave conditions*

49 A study of the wave climate near Tauranga (western Bay of Plenty) revealed significant wave heights were less than 1 m for 70% of the time. The mean significant wave height was 0.8 m, with a maximum value of 4.3 m (presumably associated with storm events).

50 The applicant did not provide an assessment of wave conditions at the application site in particular. The link between wave conditions in western Bay of Plenty with eastern Bay of Plenty and the application site were not stated. However, given the openness of Bay of Plenty, MFish considers wave conditions at Tauranga could be similar to those offshore of Opotiki.

##### *Current conditions*

51 Studies showed water currents at the application site were primarily forced by tides and local wind events. The net drift deployment period was to the west, although under different wind and wave conditions this could differ.

52 Data collected over a 25-day period suggest the mean current speed at the application site was 8.2 cm/s (which is within the normal range for coastal areas along the continental shelf) and the tidal currents appeared as oscillating currents that rotate from flowing to the south-west to the south-east. The study measured strong currents (greater than 20 cm/s) flowing to the north but these were likely associated with strong southerly wind events.

53 During two 1-day surveys around the boundary of the site, the currents were generally less than 10 cm/s in magnitude and often in variable directions.

54 Integrated trajectory of the measured water currents reveals that the net transport at the site during the survey period was to the west, with some tidal reversals. The mean transport speed was 2 cm/s. The trajectory shows a passive tracer (for example phytoplankton) would move roughly 10 km shoreward, but because currents close to shore become more and more directed along the shoreline, this would not necessarily be the case.

## **Part C: Consultation with Stakeholders**

55 MFish invited representative groups of commercial, recreational and customary fishers to comment on this application. See Appendix 6 for a full list of consulted parties. Due to the large quantities of submissions, a summary of relevant considerations from the submissions is provided in the following section. However, full copies of all submissions are provided in Appendix 7 and should be read in full when making a decision.

56 Initial consultation produced a wide and varied response from fishers and the local community. A total of 152 individuals, groups or organisations submitted on the application. The majority of the submissions were on some type of submission form. The forms have been grouped together by type below.

***Submission form by individuals and groups/organisations***

<b>Type</b>	<b>Individuals</b>	<b>Groups/Organisations</b>
Customary fishers submission form (S1-S30)*	29	1
Whakatohea iwi submission form (S31-S73)	43	-
Local fishers submission forms (S74-S105)	30	2
Opotiki District Council submission form (S106-S123)	18	-
Individual submission in letter form (S124-S141)	18	-
Group/Organisation submissions in letter form (S142-S154)	-	13
Individuals submitting more than once (S99 & S140; S104 & S136)	2	-
<b>TOTAL</b>	<b>136</b>	<b>16</b>

\*S# represents the submission number for locating individual submissions in Appendix 7.

***Submissions by type of fishing***

<b>Type</b>	<b>Individuals</b>	<b>Groups/Organisations</b>
Commercial fishing (S140-S141, S148-S154)*	2	7
Recreational fishing (S74-S105, S106-S107, S120, S125-S135, S144-S147)	44	6
Customary fishing (S1-S73, S124, S142-S143)	73	3
Unknown (S108-S119, S121-S123, S136-S139)	19	-

\*S# represents the submission number for locating individual submissions in Appendix 7.

***Comments from Commercial Fishers***

57 The following is a summary of comments from commercial finfishing organisations:

- ◆ The location of the application site is within an extensively-used trawl fishing ground for snapper, trevally, gurnard, tarakihi, John Dory and various bycatch (referred to as the Eastern Bay of Plenty coastal mixed trawl fishery), particularly during the summer months.
- ◆ Purse seining and long lining also occur in the area of the application site.
- ◆ Large quantities of catch come from the area of the application site. Some submitters provided quantitative catch data from the site.
- ◆ The application site would exclude trawling within the farm boundaries and in the immediate area around the site because the trawl vessels need additional space to set and haul nets.

- ◆ There are very few (or no) alternative sites because catch rates and areas are fully utilized. Available fishing ground for the coastal trawl fishery is mainly constrained by the seabed topography and characteristics and fish distribution. Cost of relocating is also a factor for alternative fishing sites in FMA1.
- ◆ Exclusion from core fishing grounds decreases the harvest area, increasing pressure in the remaining fishing grounds. This has the potential to place increased fishing pressure on the fishstocks.
- ◆ Some commercial fishers refuted the fishing assessment provided by the applicant.
- ◆ Some commercial fishers raised concerns about the initial consultation process for the application. Northern Inshore Fisheries Company Ltd stated they did not address adverse effects on fishing because they have significant and fundamental concerns regarding the consultation process undertaken by MFish.

58 G. Strongman (S141) said he fishes in the area of the application site during the winter months for snapper (with a good bycatch of tarakihi, gurnard and flounder) using a Danish seine. The application site would prohibit using a Danish Seine and would bar him from his traditional fishing grounds. Extra time, and consequent costs, would be required to fish elsewhere.

59 B. Howe (S140) stated, based on his 27 years of commercial fishing experience, there is no way the marine farm would have a detrimental affect on commercial fishing because the fishing is exactly the same either side, inside and outside the area of the application site.

60 CRA2 Rock Lobster Company Ltd and the New Zealand Rock Lobster Industry Council (S154) raised concerns about the potential impact on local fishing grounds from the development of the application site. Large mussel farms potentially interrupt the shoreward movement of pueruli and may even attract pueruli that otherwise would settle and recruit to the wild fishery. They submitted a condition be placed on the permit that would avoid/mitigate undue adverse effects on rock lobster fishing and the sustainability of the CRA2 rock lobster fishery.

### ***Comment from Recreational Fishers***

61 The following is a summary of comments from the local fishers submission forms:

- ◆ A key theme in the submissions was the attraction/enhancement of the fishstocks the farm would create.
- ◆ Submitters said they fish at the application site (to varying degrees). Some submitters say fishing at the site is the same as other areas in Eastern Bay of Plenty; some submitters say it is better.
- ◆ Submitters said fishing methods used at the site include line, trolling and gill net. These methods could still be used at the application site if the farm were developed.
- ◆ Submitters said fishstocks targeted at the site include kahawai, kingfish, snapper, tarakihi, trevally, flatfish, moki and hāpuku.
- ◆ Most submitters said the farm would not have negative impacts on recreational fishers' ability to fish at the site. Some submitters suggest the farm would make

fishing at the site easier. Some submitters said they would be able to catch the same amount of fish but with less effort or catch more fish if the farm were developed.

- ◆ Most submitters said there are alternative sites nearby in eastern Bay of Plenty that provide the same species in similar quantities. I. Booth (S76) suggested alternative options were not available.
- ◆ T. McLellan (S74) stated he would be concerned about excess mussel shells on the beach in the future, if it were to happen.
- ◆ The following are quotes from submitters regarding impacts of the application site on fisheries resources (and the number of submitters making the comment):
  - *Provide habitat in the water column for a wide range of sea creatures (10)*
  - *Provide additional food and habitat for juvenile fish (10)*
  - *Provide additional food and habitat for juvenile and adult fish (12)*
  - *Use a small part of the plankton for mussel growth (11)*
  - *Increase the amount of shell on the seafloor (8)*
  - *Slightly change the amount of organic matter on the seafloor (11)*
  - *Provide roosts for birds (6)*
  - *Provide additional food for birds (7)*
- ◆ Some submitters said a positive benefit of the farm would be the decrease and/or prevention of commercial fishing.
- ◆ B. McPhee (S84) and D. McPhee (S85) stated there are two commercial trawlers seen in the area of the application site on a regular basis. They said Sanford do not own either of the vessels.

62 The following is a summary of comments from the Opotiki District Council submission form:

- ◆ A key theme in the submissions was the enhancement of the fishstocks (and therefore fishing opportunities) the farm would create.
- ◆ Some submitters said they recreationally fished in the area of the application site.
- ◆ In reference to commercial fishing, M. Kiri (S106) stated the application site is not a special fishing ground; the calibre of fishing is exactly the same type of fishing 10-15 km either side of Opotiki. J. Forbes (S107) said he has observed commercial fishers' use of the site significantly increased in the past few years since the marine farm became known.

63 In comparison to other submissions from recreational fishers, the submission provided by the Opotiki Aquaculture and Fishing Group was considerably larger and thoroughly outlined the fishers' concerns about the application site (S147). The following is a summary of comments from their submission:

- ◆ Recreational fishing occurs at the application site. The groups points out, though, that recreational fishing at the application site may not be easily separated from customary fishing. Quote: *A point to be made here also is that this term 'recreational' does not really fit the fact that most fishing out of Opotiki area is done solely to supplement whānau (family) diets and to our knowledge 'sport or fun' type catch and release fishing is seldom practiced from here.*
- ◆ The group generally supports the application but raised concerns about the following:
  - recreational fishers' access to the site
  - safety concerns for recreational fishers fishing at the site
  - phytoplankton depletion
  - zooplankton consumption
  - the introduction of foreign invader species or less desirable species
  - consequences of attraction/recruitment on overall fishstocks.
- ◆ Copies of most references used in the submission were also provided.

64 The following is a summary of comments from other recreational fishers' letters:

- ◆ Submitters stated recreational fishing occurs at the site to varying degrees ("limited" to "common"). Snapper, tarakihi, kahawai and gurnard are among the most commonly targeted species. Most submitters stated the application site would not adversely affect their fishing activities.
- ◆ Many fishers submitted the marine farm would enhance the fishstocks (and therefore fishing opportunities) in the area.
- ◆ B. Feinbaum (S132) said he was concerned about potential effects on fishing from the shore if fish are diverted into or around the farm.
- ◆ Some submitters raised concerns about depletion of fishstocks by commercial fishers and said a positive benefit of the farm would be the decrease and/or prevention of commercial fishing.

### ***Comments from Customary Fishers***

65 The customary fishers submission form lists questions relating to fishing at the site. The following questions are quoted from the submission form and are followed by a summary of answers (including the number of times each answer was identified in the submissions).

- ◆ *What fishing methods do you use?* rod/handline (36), longline (2), free dive (1)

- ◆ *How much fishing occurs at the site?* frequently used (12), moderately used (7), used a little (5)
- ◆ *What kind of fish do you catch?* snapper (27), kahawai (18), tarakihi (13), gurnard (7), mango (2), flounder (2), trevally (1)
- ◆ *How much do you catch?* enough (23), a few (5), 1-2 per week (1)
- ◆ *For customary fishers, are there any cultural values associated with fishing in that location?* yes (19), nil/no (8)
- ◆ *Would the farm prohibit you using your regular fishing methods?* no (29), yes (1)
- ◆ *What other fishing methods could you use?* boat (10), longline (9), net (6), setline (3), handline (2), spearing (1), offshore line fishing (1), n/a (8)
- ◆ *Are other methods as good at catching fish?* yes (14), n/a (7)
- ◆ *How would the proposed farm affect how much you can catch?* no effect (15), positive affect (14), limit how much I can catch (3), farm would be breeding ground (3)
- ◆ *Additionally, for customary fishers, how would your customary management practices be affected?* enhanced (17), n/a (9)
- ◆ *Are there other places you can fish? If not, why?* yes (24), no (1, economic reasons)
- ◆ *Can you find the same types of fish at these other sites?* yes (25)
- ◆ *How easy is it to fish these other sites?* quite easy (12), ok/fair (8), requires long travel (2)
- ◆ *Are there limitations to fishing at other sites (i.e. weather restrictions or limitations because of types of fishing gear you can use)?* no (19), yes (3, weather)
- ◆ *Will it cost you more to fish at these other sites? If so, how much more?* no (18), yes (8, petrol costs)
- ◆ *How would the farm affect the fish you target and any other fisheries resource?* nil (10), allow regeneration (10), enhance and build stock numbers (7, like a marine reserve)
- ◆ *Fisheries resources are not limited to the food we eat; it includes also the other species in the sea and the habitats that support them. What effect will this have?* the food chain will improve for all marine life (18), only possible through exclusion of commercial fishing (6), nil (3).

66 The customary fishers submission form from Taumata Kaumatua o Te Whakatohea (S1) also had the following statement (the statement was included with 4 individual submissions as well):

- ◆ *The Mussel Farm will provide for the regeneration of depleted fish stock and all species within the total food chain including fish historic and entrenched in our cultural practices. In doing so will allow for the practice and management of our cultural values that is not possible today. All of this will only be possible by the exclusion of the Commercial Fisheries.*

67 The Whakatohea iwi submission form was a letter signed by each submitter. A summary of the letter follows:

- ◆ The area of the application site is within the mana whenua, mana moana of Whakatohea and is enshrined in Whakatohea tikanga me nga kawa. The proposed farm incorporates three traditional fishing grounds; Te Hira, Whaitau and Perapera.
- ◆ The application site would not compromise the fishing rights of Whakatohea. The ability to catch fish in the area would not be restricted and fishstocks are likely to increase.
- ◆ The proposed restriction of commercial fishing in the proposed farm site is viewed as a positive factor to allow for the regeneration of fishstocks. It is evident that commercial fishers can catch their quota in adjacent areas within the Bay of Plenty.
- ◆ The submission is in support of the application because it will have somewhat similar effects as a marine reserve, which could maintain customary and recreational fishing rights.

68 Ngaiterangi Iwi (S142) stated they are too distant from Opotiki for their customary fishing activities to be affected. They are not directly involved in commercial fishing, so consider the issue is best left to the fishing companies and skippers. Ngaiterangi also stated they reserve their decision to oppose or support the marine farming permit application until the resource consent appeal is heard.

69 Opotiki District Council (S143) submitted the marine farm would enhance the fishstocks (and therefore fishing opportunities) for customary and recreational fishers.

## **Part D: Evaluation of Effects**

### ***Legislation***

70 Section 67J(1)(b) and Section 67Q(1) of the Fisheries Act 1983 provide that no person shall undertake marine farming or spat catching except under the authority of a marine farming or spat catching permit issued by the Chief Executive of the Ministry of Fisheries.<sup>3</sup> Section 67J(8) provides that the Chief Executive may not issue a marine farming permit unless satisfied the activity contemplated by the application would not have an undue adverse effect on fishing or the sustainability of any fisheries resource.

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<sup>3</sup> Before the Fisheries Act 1983, leases and licences were issued for marine farms under the Marine Farming Act 1971.

71 The Fisheries Act 1983 defines “fishing” as the catching, taking, or harvesting of fish aquatic life, or seaweed. The definition includes any other activity that may reasonably be expected to result in, or be in preparation for, the catching, taking or harvesting of fish, aquatic life, or seaweed. The Fisheries Act 1983 does not define “fisheries resource”, but instead defines “fishery resource” meaning any fishery, or any stock, species, habitat, or location of fish, aquatic life, or seaweed.

72 Section 67J(8) of the Fisheries Act 1983 does not establish specific criteria for consideration when deciding whether a proposed marine farming or spat catching permit application would have an undue adverse effect on fishing or the sustainability of any fisheries resource. While the word “undue” is not defined by statute and defies a precise measurement, it is a word of common usage that denotes in one way or another a sense of seriousness. Something affected unduly is not affected to a minimal degree but to a significant degree. It is a subjective consideration, balancing all relevant factors. Both quantitative and qualitative factors can be relevant. The assessment whether an adverse effect is “undue” is a matter of judgment for the statutory decision maker.

73 For this application, the best available information is the information from the Cawthron Institute and other research studies. Information from submissions is also relevant and should be given the weight deserved. In general, the more objective the relevant information, the more weight it will carry. MFish acknowledges there are gaps in available information and uncertainty because the marine environment is very dynamic and ever changing. Therefore, given the uncertainty in the information, some caution should be exercised in the evaluation of this application.

### ***Evaluation of the Effects of the Activity on the Sustainability of any Fisheries Resource***

74 MFish considers that there may be a number of effects on fisheries resources for each application. A generic explanation of these effects is contained in Appendix 8, while effects specific to this application are discussed in the following sections:

- ◆ discharge of wastes and contaminants
- ◆ effects of providing structures that support new communities
- ◆ uptake of plankton
- ◆ changes to nutrient cycling
- ◆ alterations to wave and current action
- ◆ changes to water clarity and light availability
- ◆ introduction of pests and diseases
- ◆ effects on the heterogeneity of local populations
- ◆ effects on associated and dependent species
- ◆ effects of spat catching.

### ***Discharge of wastes and contaminants***

75 MFish considers, due to the size of the application site, the discharge of wastes and contaminants (such as fine-grained organic particles and live mussels, shell litter and other biota) from the application site may adversely affect fisheries resources in Bay of Plenty. Although significant adverse effects to the local benthic habitat and communities are unlikely, Cawthron

stated a change in benthic community structure is likely to alter the feeding behaviour and distribution of fishstocks in the region.

76 The extent of depositional impacts of marine farming activities varies depending on mussel stocking densities, line spacing and water depth. The lower mussel stocking densities and wider spaced lines at the application site would reduce depositional effects. The application site is also in relatively deep water with moderate currents; therefore deposition would have a considerable distance to fall to the bottom and consequently greater opportunity for dispersal and dilution by currents. The spacing between farm blocks ensures large areas of seabed would not be uniformly exposed to sedimentation.

77 Cawthron estimated depositional effects would only extend to a maximum of 391 m from the application site boundaries, with an average extent of 111 m. In total, the application site and depositional footprint would cover roughly 50 square kilometres of seabed, which is less than 1% of Bay of Plenty.

78 Cawthron stated the most likely response to discharges and deposition from the application site would be a slight organic enrichment of the seabed within the depositional footprint of the site and an accompanying change in the biological community structure. The benthic community impacts within and adjacent to the farm area (within 200 m) are likely to include an increase in biodiversity<sup>4</sup> as follows:

- ◆ a relatively major, but localized, shift in benthic habitat and community structure from a diverse but one-dimensional community dominated by deposit, suspension and predatory feeders (sea cucumbers, polychaetes, molluscs, crustaceans, brittlestars, bryozoans), towards a shell-reef type community with less dominance by polychaetes, an increase in abundance and biomass of crustaceans, and an increase in the proportions of suspension feeders and large mobile carnivores
- ◆ a localised increase in deposit feeders, but not to the detriment of existing suspension feeders, resulting from moderate increase in organic enrichment
- ◆ a significant and localized build up of live and/or decaying biofouling species (especially seasquirts and associated mussels that have dislodged from the farm).

79 Some submitters stated the application site would increase the amount of shell and slightly change the amount of organic matter on the seafloor. However, the basis for these claims was not evident so they have not been included in this assessment.

80 Any changes (and in this case what Cawthron calls a relatively major shift) in the ecological structure of the sub-tidal mud communities over large areas of seabed would have the potential to result in cumulative changes to the food web that may extend beyond the farm perimeters. Cawthron stated that these changes in benthic community structure could potentially impact on the feeding behaviour of demersal fish species.

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<sup>4</sup> Although increases in biodiversity beneath farms represent a change from the pre-existing situation, they can in some cases be viewed as a positive rather than a negative effect, particularly where benthic communities have previously been impacted by other activities (e.g. dredging and trawling). The existing benthic fauna beneath the application site is likely to be already modified by such activities. If the farm is approved, these activities would cease. Some recovery and stabilisation of the benthic community is therefore likely to occur. However, this recovery would be influenced by the impacts of the farm.

81 Cawthron predicted changes in the benthic community structure could likely cause increased abundance of bottom-feeding fish (e.g. snapper, tarakihi, gurnard, and flounder) because of the increase in the abundance of food items. Demersal fishstocks tend to have relatively small home ranges – only hundreds of metres for the adults of some species. Therefore, these fishstocks are more likely to be impacted by the establishment of a large marine farm than wider ranging pelagic fishstocks (Gibbs 2004). However, the effect of large-scale marine farm development on recruitment or displacement of fishstocks in the area has not been studied in New Zealand.

82 MFish trawl surveys, catch effort information, and submissions from fishers suggest finfish populations in Bay of Plenty are not evenly distributed and the area of the application site appears to be particularly important for fishstock biomass in Bay of Plenty. As such, finfish habitat is likely to be directly affected by the application site.

83 Evidence also suggests the application site is important for recruitment of various species, particularly snapper and trevally. MFish does not know why fishstocks would prefer the area of the application for feeding or reproduction. However, Cawthron stated commercial trawling activities have occurred at the site, suggesting fish nursery or feeding habitats in this region are already impacted. MFish considers a marine farm, even of this size, could prove to be the lesser of the two impacts.

84 The discharge of wastes and contaminants from the application site would likely impact on fisheries resources in the area under the farm and extending hundreds of metres from the farm boundaries. These effects are likely to be adverse, causing changes in benthic habitat and community structure. However, consequences to the wider regional ecosystem as a result of changes to benthic communities and subsequent changes to the overall food web (including demersal fishstocks) are not known. Since the area of the application site appears to be important for fishstocks biomass and distribution, MFish considers deposition from the farm has a risk of impacting the sustainability of fisheries resources, particularly demersal fishstocks.

#### *Effects of providing structures that support and encourage new communities*

85 Due to the size of the application site, MFish considers marine farm structures could lead to a redistribution of both demersal and pelagic fishstocks in the Bay of Plenty. The structures may also impact puerulus settlement in Bay of Plenty.

#### *Demersal and pelagic fishstocks*

86 The introduction of the structures and mussel culture effectively acts to create hard substrate habitat in the water column. Other fouling organisms, such as ascidians and macro-algae, would then attach to the structures and some accumulate on the seabed below the farm<sup>5</sup>. Cawthron stated various species of fish would be attracted to the food source associated with the mussel farm structures. As such, there is likely to be some kind of impact to both demersal and pelagic fishstocks.

87 In reference to a large offshore marine farm, Cole (Eastern Seafarms Limited 2004) considers numerous species of fish may aggregate markedly around the farm structures. Anecdotal evidence from mussel farms in New Zealand suggests that various fish species increase in abundance around mussel farms. For example, snapper have been seen around mussel farms, particularly during harvesting, and are thought to prey on newly seeded mussels. Some submitters

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<sup>5</sup> Depositional effects were previously discussed under *Discharge of wastes and contaminants*.

also stated the application site would increase the food and habitat for fish. However, the basis for these claims was not evident.

88 The suspended biofouling community attached to the mussel structures could likely increase abundance of other pelagic fish species (e.g. jack mackerel, skipjack tuna and kahawai) around the farm at times. Pelagic predators, such as kingfish, are also likely to congregate around the farm structures, attracted to small fishes taking refuge within the structures. The Opotiki Aquaculture Group stated the current Cawthron mussel growth experiment at the site has attracted quite a school of kingfish already (refer Appendix 7, S147).

89 However, Cole (Eastern Seafarms Limited 2004) considered it unlikely that fisheries species likely to aggregate at the application site would associate exclusively with the farm. Since pelagic fish generally have large home ranges, they are unlikely to change their behaviour from wide-roaming species to a more sedentary lifestyle within and around farms (Gibbs 2004). They might occupy it seasonally or intermittently but would be expected to move elsewhere as well. Hence, in terms of attracting or repelling these pelagic fishes, unless farms take up a significant part of their substantial home range, then the presences of a few isolated blocks of farms in an area is unlikely to lead to any significant behavioural changes (Gibbs 2004). For this application site, Cawthron considers the potential for a large redistribution of the existing fish populations in the area is possible because the application site is relatively extensive. However, the extent and impacts of this shift in population dynamics has not been assessed in New Zealand.

90 Consequently, MFish is left to determine the potential adverse effects based on theoretical information only. Given the considerable amount of commercial fishing in the area of the application site, the area likely supports a large finfish biomass. If a large redistribution of the existing finfish populations in the area of the application site occurs, as suggested by Cawthron, large amounts of finfish may be affected. Without knowing how significantly a large marine farm would impact a shift in population dynamics, MFish considers there is a risk the farm may alter the sustainability of fisheries resources.

#### *Puerulus settlement*

91 The offshore nature of the farm, together with the size of the site, raised concerns with local commercial rock lobster fishermen about the settlement of rock lobster pueruli on the structures. Since pueruli are known to occur in Eastern Bay of Plenty, some pueruli are likely to settle on the suspended mussel culture. However, Cawthron stated uncertainty remains about how many pueruli are likely to settle on the site and whether this settlement would affect recruitment into the fishery.

92 In brief, pueruli develop in oceanic waters and then migrate towards shore at the end of their larval stage, settling on hard substrates. The application site structures would create an artificial substrate for pueruli to settle on. The lines can provide vast amounts of creviced shelter for settling lobsters and there is also abundant food present for juveniles. All submerged parts of a mussel farm are potential settlement areas – the longlines, as well as the supporting buoys and ropes. Pueruli settling on the application site may then not recruit into the fishery.

93 Cawthron stated it is unknown whether the numbers of puerulus that settle on the mussel lines adversely affect recruitment to the adult population, and therefore the fishery. For example, it is conceivable that the puerulus settling on the lines would not have found any other suitable habitat to settle on and hence would never have recruited into the fishery. Similarly, a proportion of these would still have become prey for other species. Conversely, it is also possible that the number of

pueruli that settle on the farm structures, and therefore never make it to the inshore habitat, is so high that there is an adverse impact on numbers recruited into the near-shore fishery.

94 That pueruli settle on mussel longlines is well known, but whether there is any attraction or it is simply random encounter is unknown. For instance, high settlement along the east coast of central New Zealand during 1991 and 1992 led to large numbers of pueruli and small juveniles on mussel longlines in Port Underwood (Booth 1992). An average of almost one lobster per metre of mussel longline was estimated. In contrast, NIWA research shows densities of pueruli in the water column rarely exceed one larva per 500 m<sup>3</sup>, suggesting a much lower estimate of potential settlement. Although the application site is only 9.5 km wide, it has over five million metres of longline in the water column. Therefore, MFish considers it is possible the application site would impact on recruitment of juvenile rock lobsters into the inshore regions of Bay of Plenty.

95 MFish recognises settlement at the application site may not be as high as was recorded in Port Underwood. As there is geographic variation in levels of settlement, mussel farms might be sited where settlement is low. Highest settlement in inshore areas has been observed between East Cape and Kaikoura. However, in low settlement areas, puerulus settlement in mussel farms may be even more critical to the inshore fishery (Booth 2003).

96 MFish asked Cawthron about the settlement of pueruli on the trial lines<sup>6</sup> at the application site or the existing offshore farm in Hawkes Bay. Cawthron said the information was not publicly available at this time.

97 MFish considers development of the application site would likely have an impact on puerulus settlement at the site. How this relates to recruitment, though, is largely unknown. Because of the small proportion of proposed mussel structures to total area in Bay of Plenty, MFish considers the risk of alterations to the sustainability of rock lobsters is low. However, additional impacts to the commercial rock lobster fishery are discussed under *Assessment of the Effects of the Activity on Fishing*.

98 Note: The New Zealand Rock Lobster Industry Council has requested a condition be placed on the marine farming permit that requires the application to recover and relocate juvenile rock lobster that settle on the farm. A permit condition under s 67J of the Fisheries Act 1983 cannot authorize the taking of undersize fisheries resources for sustainability or enhancement purposes.

### *Uptake of plankton*

99 MFish considers the risk plankton depletion would alter the sustainability of fisheries resources in the region is low.

### *Phytoplankton*

100 In terms of phytoplankton depletion, Cawthron suggests that the proposed activities would generally be sustainable. Using computer simulations, Cawthron predicted (at full development) around 10% of the phytoplankton passing through the farm would be removed from the water column. This would result in patches of phytoplankton-depleted water and at times, these would still exist a considerable distance away from the farm before mixing and recovery takes place within the water-column. However, there remains some uncertainty about these estimates.

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<sup>6</sup> The Cawthron Institute has permission for study of trial lines at the application site under a resource consent from Environment Bay of Plenty and a special permit from the Ministry of Fisheries.

Cawthron highlighted that the model cannot be validated until at least Stage 1 is operational. This is because the natural environment is so variable that modelling it cannot be exact. The natural spatial and temporal variation in phytoplankton concentrations can be considerable. Consequently, Cawthron had to use a set of appropriate idealised environmental conditions to give insight into how the farm may affect phytoplankton abundance and distribution.

101 On one hand, even significant depletions in phytoplankton concentrations may not have adverse effects on the sustainability of fisheries resources in the region. The area of the application site is subject to the effects of river outflow, which can enhance phytoplankton concentrations. The reason this area is so productive for fish may be because phytoplankton is not a limiting factor.

102 On the other hand, if additional phytoplankton depletion caused by the application site occurs while natural phytoplankton concentrations are low, food availability for wild organisms in the region may be reduced. Evidence suggests the area of the application site is important for fishstocks; these fishstocks may suffer if mussel culture out competes them for food sources. Fishers have raised concerns about effects of phytoplankton depletion on fishstocks. However, MFish considers the risk that both of these events occur simultaneously, and for extended periods of time without recovery, is low.

103 The main risk associated with plankton depletion over large areas is that the precise outcome of plankton depletion on ecology is not well understood. Cawthron stated there is no defensible way to address what the flow on effects of removing 10% of phytoplankton from the water column would be. Similarly, because water column characteristics vary significantly over short, medium and long term time scales, Cawthron cautioned a single point in time pre-development assessment is generally of little value as a baseline determination of farm effects.

104 At the present point in time, information suggests adverse effects from the uptake of phytoplankton are likely to occur, but consequences would be short-term and small. As such, MFish considers the risk alterations to phytoplankton concentrations would impact the sustainability of fisheries resources is low.

### *Zooplankton*

105 Works by a number of authors show mussels consume zooplankton as well. The majority of marine vertebrates and invertebrates are broadcast spawners; as a result, the eggs and larvae of these taxa form part of the zooplankton community for periods of time. Hence, the presence of the application site would undoubtedly increase the levels of zooplankton mortality over and above what would normally be occurring in the water column. However, zooplankton communities at the application site were not studied.

106 Instead, Cawthron did a computer simulation, which suggests that the increase in zooplankton mortality would be very small (typically less than 5%). This is a result of the fact that although the farm is large, the culture density per hectare is not great. But, because meso-zooplankton has relatively slow re-growth, this could result in a greater spatial extent and intensity of depletion around farms than for phytoplankton (Zeldis et al. 2004). And, as with phytoplankton, there is no defensible way to address what the flow on effects of removing 5% of zooplankton from the water column would be.

107 However, MFish considers a possible change in zooplankton community structures does pose a risk to the finfish populations in Bay of Plenty. The true vulnerability of fish eggs and larvae to predation by mussels is unknown; the zooplankton species presently at the application site

are also not known at this time. Scientists, trawl surveys and fishers suggest the area of the application site may have some value as a nursery ground for snapper and trevally. If zooplankton consumption by mussels occurs at the application site, it may then have direct consequences on the recruitment of these species.

### *Changes to nutrient cycling*

108 Because of the size of the application site, MFish considers the application site could potentially decreased nitrogen levels in the water column.

109 Nutrient flows, and the relative magnitude of nutrient pools, have the potential to be significantly altered within a mussel farm. In the context of mussel farms, nitrogen is possibly the most significant of the nutrients because of the large amount of nitrogen excreted by mussels and the overall dependence on this nutrient for phytoplankton growth.

110 Cawthron stated the application site would almost certainly increase the nitrogen content of the sediments. The response of the benthic community to such shifts in nutrient dynamics has not yet been quantified, but Cawthron stated the magnitude of the increased nitrogen content in the sediments under the application site is likely to be relatively small. However, combined with the nitrogen loss from the exported mussels, Cawthron predicted this would result in an overall nitrogen deficit in the water column. Cawthron did not provide any other information regarding consequences of a nitrogen deficit in the water column on phytoplankton production and nutrient availability for other organisms.

111 At present, MFish does not know the consequences of large-scale marine farm development on nutrient cycling in the water column. Nutrient deficit in the water column could lead to decreases in food availability for naturally occurring populations. Because this area appears to be important to fish productivity, MFish considers the application site has the potential to adversely affect the sustainability of fisheries resources.

### *Alterations to wave and current action*

112 MFish considers the risk of adverse effects caused by changes to the existing wave regime is low but there is a risk of adverse effects caused by changes to the existing current regime.

113 Understanding how waves, current, and stratification are modified is important because changes to hydrodynamics can influence circulation (the interplay between waves, tidal currents and wind driven currents), local mixing, and nutrient uptake. Alterations in water transport and nutrient availability would most directly impact fisheries resources that depend on these systems for food. However, very little is known about the precise pathways for hydrodynamic influence on local ecology.

114 Cawthron stated effects would likely be minimal because the application site has a low stocking density and a large distance between the longlines. Therefore the mussel culture would cover a much smaller proportion of the water column. Cawthron did not provide any scientific evidence to support these statements. However, a recent study of a large offshore marine farm in New Zealand shows large-scale mussel farms influence waves, currents and local water stratification to a significant degree (Plew et al 2005).

115 Since water currents at the application site are largely forced by tides and local wind events, alterations to the wind-sea waves and currents at the site could impact nutrient flows in the area.

The study found large marine farms would have a big impact on wind-sea waves but little effect on long-swell waves (Plew et al 2005). Generally the waves of interest in terms of environmental effects are these shallow water waves. Because most of the structures at the application site would be submerged below 10 m, effects on wind-sea waves would not likely be large.

116 Still, large mussel farms can present a potentially significant drag to water currents moving through the site. The orientation of the longlines to the flow would have an influence on drag, with longlines in line with the flow presenting less frontal area<sup>7</sup> (Plew et al 2005). Water currents at the application site were often measured in variable directions but net drift was to the west. Since the structures would be orientated north to south, they would have considerable frontal area and consequently cause some degree of drag.

117 The study also found stratification might restrict vertical movement or mixing of the water column (Plew et al 2005). Significant stratification was not identified during the surveys of the application site. Still, single measurements of temperature and salinity would not be expected to represent year-round stratification patterns at the application site. Restrictions to vertical mixing are possible, particularly if temperature stratification occurs during the warmer summer months.

118 The fully stocked mussel farm would unlikely change the overall hydrodynamic characteristics of Bay of Plenty. This is because the application site would cover less than 1% of Bay of Plenty. However, because of its size, the application site is likely to alter local hydrodynamics to some degree, which may impact nutrient availability in the area of the application site. The area of the application site appears to be important for fishstock biomass and recruitment, signifying numerous natural populations depend on the nutrient availability in the area. Therefore alterations in the water, and consequently nutrient, flow may have direct consequences for local fishstocks. As such, MFish considers there is a risk that alterations in currents would have adverse effects on local fisheries resources.

#### *Changes to water clarity and light availability*

119 MFish considers the risk of adverse changes to water clarity and light availability because of the application site is low because the structures are widely spaced and stocking densities are low. Surveys of the application site also did not identify any algal species. Also, the depth of the application site exceeds 20 m, which is relatively deep for large amounts of light dependent species.

#### *Introduction of pests and diseases*

120 MFish considers the risk of any diseases that occur as a result of the application site affecting fisheries resources in the region is low. However, MFish considers the spread of *Undaria* in Bay of Plenty poses a risk to the sustainability of fisheries resources in the region.

121 The high density of cultured mussels on marine farms structures and those that collect on the seabed beneath the farm enhance the risk of disease. However, outbreaks of disease among farmed shellfish in New Zealand are uncommon. Based on the low incidence of disease in mussels in New Zealand and the observed good health of farmed mussels, Cawthron considered it is very unlikely that any disease that occurs as a result of the application site development in the Bay of Plenty would adversely affect the fisheries resources in the region.

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<sup>7</sup> A mussel longline is similar to a porous fence in that the length and depth are large compared to the thickness of the longline. The drag on porous fences varies considerably with the angle of the flow.

122 However, MFish is concerned the large scale of the proposed activities could enhance the spread of the invasive aquatic weed *Undaria (Undaria pinnatifida)* in Bay of Plenty. Natural spread of *Undaria* via spore dispersion is thought to be limited to hundreds of metres in most situations. Vegetative dispersion from the application site is unlikely because the density of plant material would sink to unsuitable depths for colonisation. Therefore, spread of *Undaria* is unlikely through natural means as land is roughly 6 km away. However, a mussel farm would result in visits by servicing vessels and the introduction of mussel farm gear to the area, potentially increasing the opportunity for pest transfer. Since it is unknown if *Undaria* has yet spread to the Bay of Plenty region, MFish seeks to avoid increased potential for the spread of this species.

123 For consideration of management option to avoid the spread of *Undaria*, see section *Options to Avoid, Remedy or Mitigate Adverse Effects*.

#### *Effects on heterogeneity of local populations*

124 MFish considers stocking marine farms with green-lipped mussel spat sourced from the wild or from hatcheries is likely to pose a low risk to the genetic diversity of the wild green-lipped mussel populations of New Zealand.

125 The applicant intends to use Kaitaia or locally caught spat as the predominant spat source for the farm; both of which are from the northern population group of green-lipped mussels. The northern population includes mussels from the North Island, as well as those from Golden and Tasman Bay, Port Gore and the Marlborough Sounds. Cawthron stated the most recently available research indicates that the likelihood of the genetic contamination of local Bay of Plenty mussel stocks occurring through the seeding of the application site with Kaitaia spat would be very small to non-existent because mussels from both the Bay of Plenty and Kaitaia are from the northern population group.

126 Research on the genetic profile of green-lipped mussels in New Zealand suggests transferring green-lipped mussel spat (from hatcheries and other areas around New Zealand) to marine farms would not significantly alter the genetic profile of wild green-lipped mussel populations because:

- ◆ Green-lipped mussel farming is currently localised in New Zealand, therefore most wild green-lipped mussel populations are not exposed to reproductive material from farmed mussels.
- ◆ There is no evidence of the wild green-lipped mussel population showing a decline in population fitness, even though mixing of some wild and farmed green-lipped mussel populations has possibly occurred.
- ◆ Most mussel farmers harvest their stock before spawning; therefore chances of breeding events between wild and farmed populations are low.

127 MFish considers stocking marine farms with green-lipped mussel spat sourced from the wild or from hatcheries is likely to pose a low risk to the genetic diversity of the wild green-lipped mussel populations of New Zealand for the reasons listed above.

## *Effects on associated and dependent species*

### *Seabirds*

128 MFish considers the risk of direct effects of the application site on seabirds is low. Cawthron states there are no colonies or rare or endangered bird species in the vicinity of the application site. The proposed farm would be submerged and direct effects to seabirds are likely to be minimal.

129 Some submitters stated the application site would provide additional food and roosts for birds. However, the basis for these claims was not evident. MFish is aware marine birds roost on marine farm buoys but does not have any scientific evidence the marine farm would provide additional food source for marine birds.

### *Marine mammals*

130 MFish considers adverse effects of the application site on local marine mammals could result from either entanglements of large whales or measurable alterations to the availability of food for cetaceans.

131 About 20 species of marine mammals are known to frequent Bay of Plenty. They are as follows: (1) Fur seals, Leopard seals, Elephant seals, (2) Mysticetes: Blue, Fin, Sei, Bryde, Minke, Humpback, and Southern Right whales, (3) Odontocetes: Sperm, Bottlenose, Beaked, Pilot, False Killer whales, Dusky, common (long-beaked, short-beaked), and Bottlenose dolphins. Some of these species are known to occur close to shore and have been seen near the application site in Bay of Plenty.

132 Many cetaceans use echolocation for navigation and foraging. As such, odontocetes are most likely able to identify the boundaries of the marine farm structures, minimising the risk of entanglement. However, it is currently unknown whether Baleen whales (including Brydes and Southern Right whales<sup>8</sup>) use vocalisation in the same manner as odontocetes use echolocation. If Baleen whales lack the ability to acoustically map the surrounding environment, the risk of entanglement with the marine farm structures along favoured migration routes poses a large risk to many of these species. In 1996, a Brydes whale was found dead after entanglement in a spat catching farm off the coast of Great Barrier Island.

133 Although the application site is within the continental shelf region, Southern Right whales have been sighted within 5 nm of the shore in Bay of Plenty. Brydes whales are also commonly seen in the vicinity of White Island, roughly 40 km to the north of the application site (Eastern Seafarms Limited 2004). Because of the endangered nature of these species, potential entanglement-related deaths of one Brydes or Southern Right whale would have a larger impact on the sustainability of the species than more common cetaceans.

134 The application site also has the potential to affect cetacean feeding behaviour. Studies of the effects of aquaculture on marine mammals have shown Dusky dolphins cooperatively herd schooling fish; marine farms act as a physical barrier to this foraging behaviour (Markowitz et al 2004). Also, because dolphins use echo location to acquire food, non-biological targets, such as mussel lines in the water column, may produce echoes that may mask those emanating from the

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<sup>8</sup> Brydes whales are considered critically endangered in New Zealand waters; Southern Right whales are considered endangered.

intended prey. Acoustic noise from boats harvesting mussels may also adversely affect cetaceans. Therefore, the area of the application site may result in a decrease in feeding area or efficiency. The subsequent impact of the application site on marine mammals, though, depends on the importance of the area to their overall feeding and the size of the site in relation to their homing range.

135 The applicant provided evidence from Martin Cawthorn, a marine mammal and deepwater fisheries specialist. Cawthorn stated that while a variety of marine mammals are likely to pass through or around the application site, installation of an offshore farm at the proposed site would not have a significant adverse effect on marine mammals of the Bay of Plenty. However, MFish is concerned Martin Cawthorn's assessment of effects based on previous history of entanglement does not address specifics of this application site. The application site is potentially the largest and furthest offshore farm in New Zealand and is in a region important to marine mammals (including endangered species). Most marine farm development to date has been small scale development in inshore regions.

136 Additionally, the Department of Conservation has recently recommended aquaculture development in Bay of Plenty should be excluded from the shore seaward for 6 km, corresponding roughly with the 30 – 40 m depth contour. The recommendation is made for the protection of nursing right whales, Bryde's whales, common dolphins and their nursing calves, and for foraging bottlenose dolphins (Baker 2004). Although this application site is further seaward than 6 km, it still spans the 30 – 40 m depth contour. Consequently, MFish considers the potential for an adverse effect is larger than that anticipated by Martin Cawthorn because of the uniqueness of the large offshore application site.

#### *Turtles and sharks*

137 A submitter also raised concerns about other sea creatures such as turtles and sharks. MFish currently has no information about the effects of marine farming on turtles or sharks. However, MFish is aware a leatherback turtle was recently found in a spat catching farm in Golden Bay. It is still unknown whether entanglement in the spat catching structures was the cause of death.

#### *Effects of spat catching*

138 The applicant has also applied to catch spat at the application site but has not provided a risk assessment for spat catching. While spat catching would have a similar effect on fisheries resources as described above for mussel farming, over-seeding of spat (spat detaching and accumulating on the seafloor) is known to occur in other parts of New Zealand. Over-seeded spat can have adverse effects on local fisheries resources, but without knowing the extent of spat catching occurring at the site, MFish cannot determine how severe these adverse effects would be at this time.

#### *Discussion of effects on the sustainability of fisheries resources*

139 Due to the size of the application site, MFish considers significant impacts on the sustainability of fisheries resources are likely. MFish acknowledges some of the effects of the application site may adversely affect the sustainability of fisheries resources, while others may be beneficial. Any adverse effects caused by the application site, though, may have further consequence because the application site is in an area that appears to be important to fishstock biomass and distribution. And, as the size of the application increases, so does the uncertainty in predicting effects on the sustainability of fisheries resources. At this time, effects of marine

farming (particularly large-scale developments) on the food chain, schooling of target or prey stocks, and the overall sustainability of fishstocks are generally unknown.

140 Depositions from the application site and the introduction of structures and mussel culture in the water column have the potential to significantly alter fishstock biomass and distribution in the region. Deposition from the site would change the benthic community structure, potentially impacting the feeding behaviour of demersal fish species. Cawthron also stated demersal and pelagic fish would also be attracted to the fouling organisms and additional food sources associated with the mussel farm structures. If a large redistribution of the existing finfish populations occurs, as suggested by Cawthron, large amounts of finfish may be affected.

141 Cawthron suggests an offshore marine farm may be beneficial to abundance of fishstocks by acting as a marine protected area (MPA). Numerous recreational and customary fishers have also expressed the opinion the marine farm would act like a marine reserve and enhance local fishstocks. However, recent International News and Analysis on Marine Protected Areas caution against promising higher fishery yields from MPAs – MPAs do not necessarily promise an increase in overall fishery yield (MPA News 2005). At present, conflicting conclusions show we cannot predict what the effects of marine reserves might be for any given species. Although the marine farm may provide refuge from fishing (like a marine reserve) for specific species, large amounts of uncertainty remain when trying to anticipate effects of a marine farm on fishstocks. Due to the size of the application site, shifts in the distribution of fishstocks are likely; the degree of this shift, though, is unknown.

142 Changes in fishstock biomass and distribution could then alter fishing activity in the region. Although aquaculture and fish harvesting activities may only physically take place over well-defined areas (actual farm area, trawl ground, etc), the effective footprint of these activities can be vast, owing to the time scales of growth and reproductions in pelagic environments, which equates to significant spatial scales (Gibbs 2004). The impact of the application site, then, is not limited to the area under the application site and the surrounding benthic and pelagic footprints. Impacts also include the homing range for fishstocks affected by the farm and all areas where fishing effort would consequently be altered due to the farm's placement in currently used fishing grounds. With the scale of commercial fishing activity currently occurring in the area of the application site, this could put additional pressure on rebuilding fishstocks, such as snapper.

143 Commercial fishing from the application site would most likely shift further north along the east coast of the North Island, which would increase fishing pressure in areas where considerable commercial fishing already takes place. Additionally, if the fishstocks are attracted to the farm from a particular distance around the farm, then this represents a loss of fishable area from the fishery equal to this attraction range for the farm, also increasing fishing pressure onto smaller areas. MFish recognises, however, if fish are attracted to the application site, it could be beneficial to preserving fishstocks within the farm area by providing refuge from commercial fishing.

144 Additional adverse effects from the application site may also affect fisheries resources in Bay of Plenty. The application site may impact nutrient availability for naturally occurring fish populations through changes in nitrogen levels and alterations to wave and currents. As more and more mussels are introduced into the natural ecosystem, at least some of the nutrients must be diverted through the mussel culture if yield is to be produced. Consequently, fewer nutrients are available for other parts of the ecosystem. At the application site, this would imply decreasing (or altering) nutrient availability for upper trophic levels, including finfish species. Zooplankton consumption may also impact nursery grounds for snapper and trevally.

145 Furthermore, the application site may have adverse effects on marine mammals in Bay of Plenty by from either entanglements of large whales or measurable alterations to the availability of food for cetaceans. However, MFish is unable to quantify the extent of any of these adverse effects at this time.

146 The information presented in this report is the best information available at this time, but there is some uncertainty in the information. The adverse effects likely to result from development of the application site carry considerable uncertainty in both the occurrence and consequence of the effects. Where information is uncertain, unreliable or inadequate, decision makers should be cautious as outlined in s 10 of the Fisheries Act 1996. Because of the large amounts of uncertainty regarding potential effects of a large marine farm in an area that appears important for fisheries resources, MFish cannot be satisfied the application site, in its entirety, would not have an undue adverse effect on the sustainability of fisheries resources.

147 Cawthron recommends implementing a monitoring programme because of the scale of the activity and the current lack of defensible scientific studies to support the predicted impacts. MFish must, however, be satisfied that development of the application site would not constitute an undue adverse effect on the sustainability of fisheries resources as they exist at the time of the application.

### ***Evaluation of the Effects of the Activity on Fishing***

148 Marine farming can affect fishing by:

- ◆ modifying habitats important to fisheries resources (addressed in the previous section), or
- ◆ impeding access to fisheries by creating a physical barrier to fishing.

MFish considers the effects of marine farming on commercial, recreational and customary fishing for all marine farming permits.

#### *Effects on commercial fishing*

##### ***Finfish fisheries***

149 This section of the report is arranged as follows:

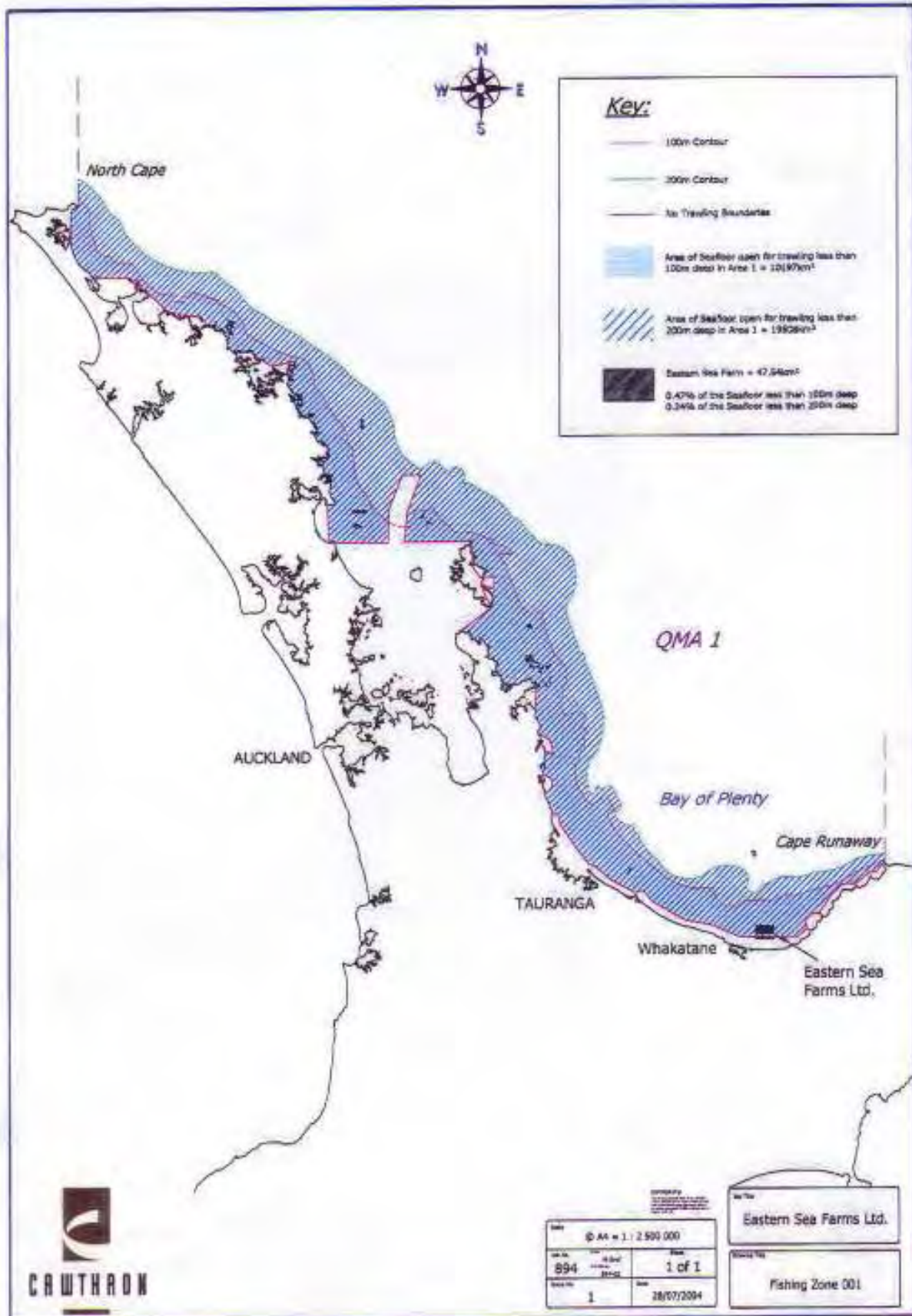
- ◆ Placement of the application site in relation to existing fishing grounds
- ◆ The degree to which the application site would lead to the exclusion of fishing
- ◆ Loss of catch due to the proposed farm
- ◆ Alternative sites
- ◆ Additional costs to fishers
- ◆ Cumulative effects of previous marine farm approvals
- ◆ Other concerns raised by commercial fishers.

### ***Fisheries Management Area 1***

150 The Bay of Plenty is part of Fisheries Management Area 1 (FMA1), which extends from North Cape to Cape Runaway (See general FMAs map provided in Appendix 9). Bay of Plenty is also made up of statistical areas 090 and 010 (See general statistical areas map provided in Appendix 10). The application site is in statistical area 010.

151 MFish catch effort data shows the largest catches in Bay of Plenty are jack mackerel, English mackerel, skipjack tuna, kahawai, trevally, snapper, bluenose and tarakihi. The dominant fishing methods are purse seining, Danish seining, bottom trawling and bottom longlining.

152 The application site would occupy a very small proportion of the fishable area in FMA1 (Figure 4). Within FMA1, the application site would occupy 0.47% of the inshore fishing grounds shallower than 100 m in depth and 0.24% of the inshore fishing grounds shallower than 200 m in depth.



**Figure 4.** Map showing the location of the application site and available inshore fishing grounds in FMA1 (Cawthron 2004).

## ***Placement of the application site in relation to existing fishing grounds***

### *Use at the site*

153 Fishers state the application site is within an established trawl fishing ground, referred to as the Eastern Bay of Plenty coastal mixed trawl fishery. The main species targeted are snapper and trevally. Gurnard, tarakihi, John Dory and various bycatch species are also caught.

154 The Pagrus Auratus Company state eight core trawl vessels operate routinely in the area. Other vessels trawl on a more intermittent basis. Western Bay Fishing estimated, along with their trawler, 11 other trawlers and Danish seines work the area of the application site on a regular basis. Sanford state five purse seine vessels, two bottom trawl vessels, and a long-line vessel have traditionally operated in statistical area 010.

155 Most vessels fishing at the site are based out of Tauranga. Sanford states some vessels from Auckland have also fished at the site. MFish records show no trawlers operate out of Eastern Bay of Plenty.

156 The main fishing method used at the site is bottom trawling. MFish catch effort data shows considerable fishing effort using bottom trawling in the area of the application site (Figure 5). MFish catch effort also shows some Danish seining occurs at the application site (Figure 6).

157 Sanford states they have fished the area of the application site using the purse seine method, particularly for skipjack tuna. However, MFish catch effort information does not show any purse seine effort in the area of the application site from those that reported using latitude and longitude coordinates.

158 Fishers state the site is trawled generally over the summer months. Western Bay Fishing states they fish there approximately 6-8 months out of the year. Mr. Strongman states he fishes using a Danish seine at the site in winter months (May to September).

159 Cawthron also stated commercial trawling activities have physically disturbed a majority of the soft sediment seabed habitat in Bay of Plenty, including the seafloor under the application site.

**Figure 5.** Count of bottom trawl fishing occurrences in Bay of Plenty from 1999 – 2004. Note the data is limited to fishing events that reported latitude and longitude coordinates.

**Figure 6.** Count of Danish seine fishing occurrences in Bay of Plenty from 1999 – 2004. Note the data is limited to fishing events that reported latitude and longitude coordinates.

### *Catch at the site*

160 Trawl surveys suggest most species caught at the site are distributed throughout Bay of Plenty. However, catch effort information shows the area of the application site is important for commercial fishing. Maps of MFish catch effort information for gurnard (GUR), John Dory (JDO), snapper (SNA), tarakihi (TAR) and trevally (TRE) are provided in Appendix 11.

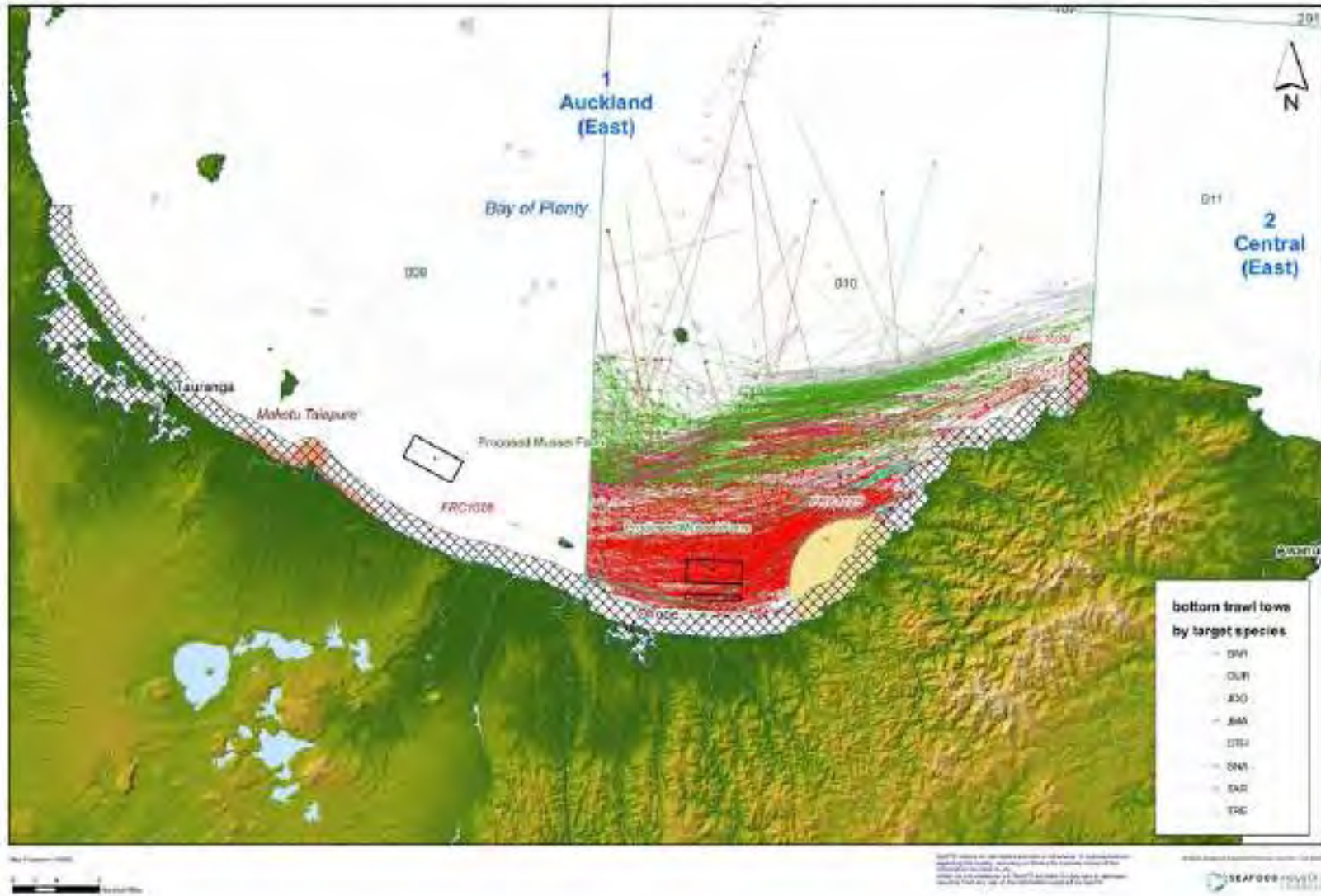
161 MFish does not routinely collect quantitative data from commercial fishers about the use of the application site. For the most part, MFish catch effort information is not detailed to the scale of a single marine farm. Most information held by MFish about commercial fishing effort is based on catch effort reporting on statistical areas (See Appendix 10). Latitude/longitude reporting is only required for vessels greater than 28 m in length, unless specifically requested by MFish. Most vessels said to be fishing at the application site are smaller vessels and are therefore required to report on statistical area only. Fishing behaviour can be quite different between large and small vessels—smaller vessels generally fish more in the inshore areas than mapping of MFish catch effort data often represents.

162 Cawthron assessed commercial fishing activity at the site for the applicant. Cawthron suggests commercial finfishers presently extract around 10-25 tonnes annually from the application site, which represents around 0.6% of landing from statistical area 010. Commercial fishers, however, state they catch considerably more fish at the application site than Cawthron suggests.

163 The Pagrus Auratus Company states the Eastern Bay of Plenty coastal mixed trawl fishery is the most economically efficient area for the catch of snapper and associated species in the Bay of Plenty in the summer months. A very high proportion of all catch effort for this coastal species mix is from the Eastern Bay of Plenty coastal mixed trawl fishing grounds. However, no quantitative data was provided.

164 Sanford similarly states the area of the application site is a very important and productive fishing ground. Sanford provided maps of fishing effort and catch from 1990-2005 for various species. These maps show considerably more effort and catch in the inshore area of statistical area 010 (including the area of the application site) than the northern region, as shown by a map of the bottom trawl tows by target species below (Figure 7). For the remaining maps, refer to submission S153 in Appendix 7. From 1990 - 2005, Sanford state they caught over 300 tonnes of snapper and 29 tonnes of trevally trawling at the application site. This does not include trevally caught by seining at the site.

## Bottom Trawl Tows by target Species 1990-2005



**Figure 7.** Map of bottom trawl tows for Sanford vessels in statistical area 010 by target species, 1990 - 2005. Map provided by Sanford Limited.

165 Western Bay Fishing estimate they have caught roughly 10.5 tonnes per year of trevally, snapper, tarakihi, gurnard and John Dory within the application site boundaries. They estimate they catch an additional 6 tonnes of bycatch (including flounder, kahawai and dogfish) each year. These estimates are only for tows that have started and finished in the application site boundaries, it does not include tows that passed through the application site, of which they estimate would be another 10 tonnes for all species caught. Western Bay Fishing also provided maps of fishing effort and catch. For copies of the maps, refer to submission S149 in Appendix 7.

166 Mr. Strongman states he catches roughly 10 tonnes of snapper per month. It is not clear whether this is exclusively caught in the area of the application site, but based on MFish catch effort information it is unlikely. He does, however, state he's caught up to 4 tonnes of tarakihi and 3 tonnes of gurnard and flatfish from the area of the application site.

### ***Would the application site lead to the exclusion of fishing***

167 Marine farm structures (both surface and subsurface) can create a physical barrier to fishing. If the application site were approved, trawling and seining would be prevented within the farm. In addition, fishing would not occur close to the boundaries of the proposed farm due to the risk of entanglement.

168 Fishers suggested trawling would not occur in the immediate area of the application site as trawl vessels need additional space to set and haul nets. Based on maps provided by commercial fishers, it appears the application site would likely shorten or interrupt a variety of currently used trawl lines. If fishers could not fish within 50 m of the site boundaries, the total area inaccessible to fishers would increase to 50 square kilometres. Western Bay Fishing estimated they would lose about 1/6<sup>th</sup> of their prime fishing depth if they have to adjust tows due to the placement of the application site.

169 Fishers did not state whether they would fish in the space between the southern and northern sites. If commercial fishing does not occur between the sites, the application site would remove 66.5 square kilometres of fishable area, increasing to 68 square kilometres with a 50 m buffer. This equates to roughly 4% of the area fishers say is fishable in 010 (1,680 square kilometres).

170 Although finfish are mobile animals, commercial fishers don't simply follow fish around to catch them. If this were the case, the effects from the placement of a marine farm would hinge on the migration of fishstocks through the actual bounds of the farm. Most often, fishers return to the same fishing grounds because those areas have historically produced reasonable return for effort. Since the area of the application site is one of the primary harvest areas in the region, regardless of whether the farm causes recruitment or displacement of the fishstocks, a historically fished area would no longer be usable.

171 Fishers could use other methods to catch finfish, such as longlining, which would not be affected to the same degree as trawl or seine fishing. Although longlining would not likely occur within the boundaries of the farm, it could occur much closer to it. But, the catch per unit effort is likely to go down and costs are likely to go up. Additionally, some fishstocks currently caught at the application site are unlikely to be caught longline fishing.

### ***Loss of catch due to the proposed farm***

172 Although the application site is in an area used by commercial fishers, MFish considers the loss of catch caused by the application site would be minimal with respect to the overall fishstocks.

173 As most catch effort information MFish collects is based on reporting in statistical areas, the following assessment looks at commercial catch in statistical area 010.

174 Cawthron state the application site covers only 0.55% of the total area in statistical area 010. Assuming even distribution of fishstocks, the application site would then remove 0.55% of the commercial finfish landings from 010.

175 Alternatively, Sanford states the area of the application site equates to 2.87% and 4.09% of the fishing grounds for snapper and trevally respectively in statistical area 010<sup>9</sup>. However, the area of the application site is particularly important for finfish catches in statistical area 010. Sanford state it is therefore not correct to state, ‘that if the proposed farm proceeds fishers will only be excluded from approximately 4% of the fishing ground’.

176 Based on the information provided by fishers, MFish estimates these fishers catch roughly 60 tonnes of finfish from the area of the application site per year. This equates to roughly 13 kg of catch per hectare per year. Assuming even distribution of fishing effort and fishstocks throughout the fishable area in FMA1, the average catch per hectare per year would be about 4 kg or 8 kg for less than 100 m and 20 m depth contours respectively. This suggests the area of the application site is an above average fishing ground in FMA1.

177 Maps of commercial fishing effort for particular methods and species (Appendix 11) similarly show more than 4% of fishing events in statistical area 010 likely occur in the area of the application site. However, MFish is unable to quantify the total catch from the area of the application site as a percentage of the available fishing grounds or fishstock.

178 Based on the placement of the application site in the Eastern Bay of Plenty coastal trawl fishery, the application site may impact on important fishing grounds within statistical area 010. However, MFish catch effort information shows statistical area 010 only contributes a small proportion of the overall fishstock catch for the key species named as being caught at the application site (Table 3).

**Table 3.** MFish catch effort information (1999 – 2004).

Species	TACC (tonnes)	Average catch in QMA per year (tonnes)	Average catch in 010 per year (tonnes)	% of fishstock catch from 010	0.15% of total QMA catch per year* (tonnes)	0.23% of total QMA catch per year* (tonnes)	Total catch per year from application site -- site equals 0.55% of 010*	Required catch from the site for loss of 5% of fishstock (tonnes)
GUR1	2288	975	53	5%	1	2	0.3	53
JDO1	704	370	16	4%	1	1	0.1	20
SNA1	4500	4001	384	10%	6	9	2.1	192
TAR1	1399	1259	325	26%	2	3	1.8	65
TRE1	1507	1051	103	10%	2	2	0.6	51
ALL 5	10398	7657	881	12%	11	18	4.8	383

\*even distribution of fishing effort and fishstocks

179 Table 3, by assuming fishing effort and fishstocks are evenly distributed, does not incorporate the importance of the area of the application site to the established trawl fishery. It does, however, show the large scale of difference between the total catch per year from the application site at even distribution (4.8 tonnes) and if the application site removed about 40% of

<sup>9</sup> The bottom trawl and purse seine method fishable area of statistical area 010 for snapper is defined by Sanford as water from 20 – 150 m deep. The fishable area for trevally is from 20 – 100 m deep. These are the depth ranges where snapper and trevally have traditionally been caught by Sanford.

the fishing in statistical area 010 (383 tonnes). The best available information suggests the overall impact of the application site on total catch would be somewhere between these numbers.

### *Alternative sites*

180 MFish considers alternative sites are available for commercial harvest in FMA1. However, fishers know the most lucrative areas based on historical knowledge; they fish to maximise returns. So, costs will almost always go up if fishers are forced out of a good area and the area is maximally utilised.

181 Water depth and substrate type are two factors that determine where species occur and where they can be caught. Fishers state available fish habitat and fishing grounds in Bay of Plenty both prevent alternative areas being fished. Western Bay Fishing provided a map of available fishing areas in Eastern Bay of Plenty, showing various areas of foul ground and closures (refer to submission S149). The map shows the application site would remove a significant part of the fishable area in the region.

182 Sanford state it is not possible to move effort from the area of the application site because other locations are being sustainably utilised. Sanford also state all alternative locations where snapper and trevally can be caught are currently being fished. Transferring effort from the application site may cause localized depletion from over fishing other areas that are currently being fished.

183 However, spatially, fishers could still fish throughout most of Bay of Plenty and the northern areas of FMA1<sup>10</sup>. But if fishers have to go elsewhere, costs would likely increase. Fuel, wages, location of landing ports, transport, fishing gear and concentration of fish impact on the costs of relocating fishing effort. Additionally, movement of vessels further to the north beyond Mercury Island would also result in increased competition with trawl vessels from northern ports.

184 Catch per unit effort also impacts costs of running a commercial fishing operation. The Pagrus Auratus Company state the application site would displace fishers from a highly economically efficient area to fish into a lesser efficient area. The area of the applications site provides reasonable return for effort.

185 Coastal trawl fishers also have developed catch history, catch knowledge and quota portfolios based on their history of fishing in a particular area. There would be additional costs of catch balancing and quota purchase or ACE leasing if fishers were displaced from the application site.

186 MFish believes, though, that quantifying costs to the entire trawl fishery would be merely speculative because costs are extremely variable between each vessel. Size of the vessel, fishing gear available, ACE, target fishstocks and skill of the skipper are only a few of the factors impacting on the overall costs of running a commercial vessel. As such, additional costs imposed on fishers as a result of the application site is a qualitative measurement for the decision maker to consider.

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<sup>10</sup> Fishers cannot move south beyond East Cape because this is a separate fisheries management area and requires different fishstock quota and ACE.

## ***Cumulative effects***

187 Previous marine farm development along the east coast of the North Island is generally in areas closed to commercial trawling and seining. MFish considers it unlikely marine farm development in FMA1 has had cumulative effects on these fisheries.

## ***Consultation***

188 Some commercial fishers raised concerns about the initial consultation process for the application. Fishers commented that the process did not provide adequate notification of public meetings, adequate information, or sufficient time for stakeholders to provide feedback. MFish acknowledges that the consultation process for marine farming permit applications is new to the Bay of Plenty region. However, MFish believes we have fulfilled our obligation under the Fisheries Act 1983 and s 12 of the Fisheries Act 1996. The consultation process for this application is the same process that has been followed for other marine farm permit applications throughout the country. The applicant's information was made available at five locations throughout Auckland and the Bay of Plenty, or sent at stakeholder's request. Stakeholders also have the opportunity to comment again following this preliminary decision.

## ***Discussion of effects on commercial finfishing***

189 Approval of the application site would cause a disruption to the trawl fishery in Bay of Plenty. The overall adverse effect, though, is unknown.

190 In summary, the area of the application site is used for commercial fishing. The best evaluation of catches show sizeable quantities of catch likely come from that area. Based on how commercial trawlers use the Eastern Bay of Plenty area, the placement of the marine farm would likely shorten or interrupt currently used trawl lines. The impact of the farm on the total commercial catch for each fishstock, though, is difficult to quantify.

191 MFish catch effort information and submissions from commercial fishers show the application site is in a productive area for commercial trawl fishing in Bay of Plenty, even though the application site equates to very little space in the overall FMA1 trawl fishery. Fishers say only a portion of the Bay of Plenty is truly available for commercial harvest of inshore species; the area of the application site is one of the most productive and most efficiently used fishing grounds by inshore commercial fleets in the region.

192 Regardless of the efficiency of the site, loss of access to the area of the application site would remove a historically fished area. And, since commercial fishing is undertaken for profit, costs will almost always go up if fishers are forced out of a good area. Because the application site is on the southern end of FMA1, the most probable alternative areas for commercial fishing are western Bay of Plenty or further up the coast. However, the small vessels fishing at the application site would face increased costs if they have to shift effort up the coast. This would also likely increase fishing pressure in other areas.

193 MFish is further concerned about impacts on the sustainability of commercial fishstocks due to alterations in fishers' behaviours, particularly if the application site leads to increased attraction or decreased recruitment of commercially harvested species. Fishing activity is directly impacted and determined by the biomass and distribution of the fishstocks being targeted. The consequences of marine farm development on the overall fishstock therefore depend on the scale of development,

the importance of the area to the overall fishstock biomass and distribution, and fishing effort in the area.

194 Aquaculture and commercial fishing activities may only physically take place over well-defined areas (actual farm areas, trawl ground, etc.). However, the effective footprint of these activities can be vast, owing to the time scale of growth and reproduction in pelagic environments, which equates to a significant spatial scale (Gibbs 2004). At present, effects of marine farming (particularly large scale developments) on the food chain, schooling of target or prey stocks, and the overall sustainability of fishstocks are generally unknown.

195 If fish are attracted to the application site, it may be beneficial to preserving fishstocks by providing refuge for fish from commercial fishing. But, studies of marine protected areas (which also preserve fishstocks by providing refuge from fishing) suggest additional recruitment into the fishery is unlikely. Therefore, this could constitute an adverse effect on commercial fishing in the region by decreasing the total amount of fish available for harvest in the fishery.

196 The Fisheries Act 1996 requires the Minister to maintain stocks at or above a level that can produce MSY<sup>11</sup>, and therefore  $B_{MSY}$ <sup>12</sup>. If marine farm development impacts on  $B_{MSY}$ , this would cause an adverse effect of fishing by reducing the TACC or through further regulatory measures. If MFish allocation of sea space for marine farm development caused a decrease in  $B_{MSY}$ , depending on the size of the decrease, this could constitute an undue adverse effect. Since the SNA1 fishstock is a rebuilding fishstock, increasing fishing pressure in smaller areas may impact on the sustainability of the fishstock. Other fishstocks, such as trevally, are considered to be at a sustainable harvest level. Although a reduction in MSY is less likely, the degree when adverse effects become undue is difficult to define when considering qualitative and anecdotal information.

197 A large degree of caution will be required when deciding this application. MFish recognises much of the information available for this assessment is anecdotal, fishers have a vested interest in opposing the application, and there is no information to definitively support or refute fishers' claims. Even the assessments made using catch effort information depend on reporting by fishers. Still, the information presented in this report is the best information currently available to the delegated decision maker. Where information is uncertain, unreliable or inadequate, decision makers should be cautious as outlined in s 10 of the Fisheries Act 1996. The decision maker must be satisfied there would not be an undue adverse effect; they do not need to be satisfied there would be. This is an important distinction that, under the inevitable conditions of complexity and information uncertainty, will favour existing users.

198 Consequently, due to the large amount of uncertainty regarding effects of the application site on commercial fishstocks, and the level of commercial fishing taking place in the area of the application site, MFish cannot be satisfied the activities contemplated by the application site, in its entirety, would not have an undue adverse effect on commercial fishing.

### ***Rock lobster fishery***

199 As discussed under the section *Evaluation of the Effects of the Activity on the Sustainability of any Fisheries Resource*, MFish considers development of the application site could provide area

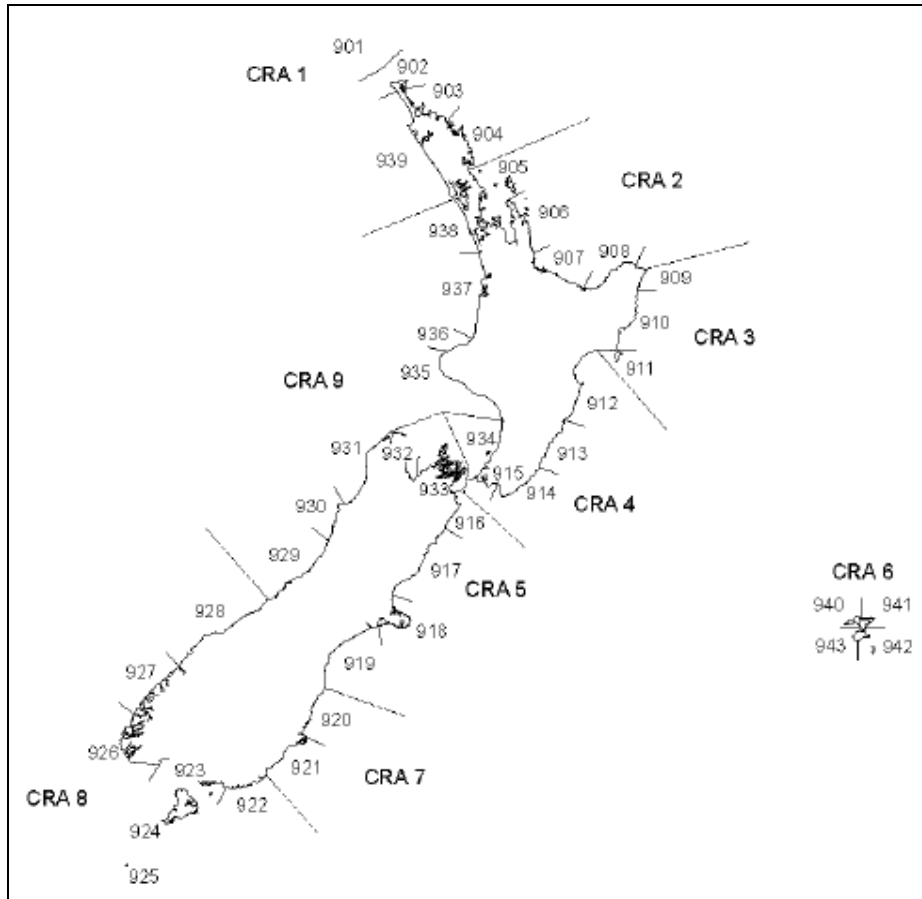
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<sup>11</sup> Maximum sustainable yield (MSY) is the largest average annual catch that can be taken over time without reducing the fishstock's productive potential.

<sup>12</sup>  $B_{MSY}$  is the average stock biomass or level corresponding to MSY.

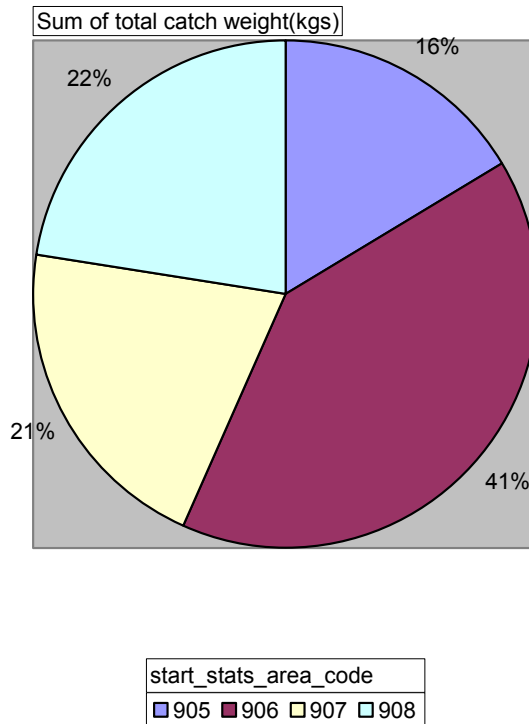
for settlement of pueruli. Impacts on puerulus settlement may alter recruitment into the rock lobster fishery in Bay of Plenty.

200 Bay of Plenty is part of the CRA 2 rock lobster fishery. The CRA 2 quota management area extends from Waipu to East Cape and is made up of statistical areas 905 – 908 (Figure 8).



**Figure 8.** Rock lobster statistical areas.

201 The application site is located in statistical area 908, which has contributed roughly 22% of the annual CRA 2 catch over the last 5 years (Figure 9).



**Figure 9.** Catch distribution in CRA2 1999-2004 by statistical area (from MFish catch effort data).

202 Using Booth's puerulus settlement estimate of one puerulus per metre of backbone, the application site could remove<sup>13</sup> roughly 2,600 tonnes of rock lobster from the fishery. MFish considers puerulus settlement is unlikely to occur at such a high rate at the application site. Additionally, this scale of impact on the commercial fishery would be highly unlikely, particularly because the TACC is only 236 t.

203 Using the estimate that puerulus densities rarely exceed one larva per 500 m<sup>3</sup> (Booth et al. 2006), the application site would remove roughly 16 t of rock lobster from the fishery<sup>14</sup>. Sixteen tonnes is about 30% of catch in statistical area 908 and 7% of the TACC in CRA 2. MFish considers this is a much more reasonable estimate of potential impacts on the CRA 2 fishery. This calculation was done using the 'worst-case scenario' (density of one puerulus per 500 m<sup>3</sup>), so impacts would be less than 16 t, though how much less is difficult to determine with the currently available information.

204 As stated previously, MFish considers the application site could impact on the rock lobster population in Bay of Plenty. Although the current catch levels in CRA 2 appear to be sustainable, the sustainability projections should be considered cautiously because the uncertainty of future recruitment has more impact short-term on projected biomass (MFish 2002b). Settlement of puerulus at the application site may be putting additional pressure on the stock that does recruit to the inshore fishery, with adverse consequences on future recruitment.

205 Also, recent stock assessments for New Zealand rock lobster fisheries have suggested that recruitment to the stock can vary considerably and can have a significant effect on the magnitude of vulnerable biomass and hence catch per unit effort (CPUE). Therefore one possible consequence of

<sup>13</sup> Given the offshore nature of the farm and the unsuitable habitat for crayfish under the site, together with the inability (under 67J of the Fisheries Act 1983) of the applicant to relocate rock lobsters to inshore areas, MFish considers puerulus settling at the application site are unlikely to recruit into the commercial fishery.

<sup>14</sup> See Appendix 12 for explanation of calculation.

increased puerulus settlement at the application site would be an increase in operational costs to fishers if CPUE is reduced.

206 The applicant provided a copy of the “Memorandum of Understanding between Eastern Sea Farms Limited and CRA2 Rock Lobster Company (CRA 2)” in the *Application to the Ministry of Fisheries by Eastern Seafarms Limited*. However, the NZ Rock Lobster Industry Council stated the memorandum was rejected by CRA2 and should not form part of the submission (Pers comm. Daryl Sykes, 28 October 2005). Because the memorandum was not signed by both parties, MFish has not included the memorandum in the assessment of effects on the rock lobster fishery.

207 In their submission to the Ministry of Fisheries, the New Zealand Rock Lobster Industry Council requested a condition be placed on the marine farming permit that requires the application to recover and relocate juvenile rock lobster that settle on the farm. A permit condition under s 67J of the Fisheries Act 1983 cannot authorize the taking of undersize fisheries resources for sustainability or enhancement purposes. As such, MFish must assess the adverse effects of development of the application site on the rock lobster fishery without taking into consideration potential enhancement of the fishery.

208 MFish considers the application site would likely cause adverse effects on the rock lobster fishery through alterations in fishery recruitment (puerulus settlement or increased fishing pressure on the fishstock) or decreased CPUE. At this time, though, the level of severity of puerulus settlement on the application site is unknown. As the size of a marine farm increases, so does the potential for significant adverse effects on the inshore rock lobster fishery. As with commercial finfishing, due to the large amount of uncertainty regarding effects of the application site on commercial rock lobster fishing, MFish cannot be satisfied the activities contemplated by the application site, in its entirety, would not have an undue adverse effect on commercial fishing.

### *Effects on recreational fishing*

209 MFish considers the application site is used by recreational fishers but the proposed farm is unlikely to have considerable adverse effects on recreational fishing at the site.

210 MFish recognises much of the information submitted from recreational fishers for this assessment is anecdotal and that submitters may have a vested interest in their support or opposition to this application. Also, individual perspectives expressed in the submissions are not necessarily a reflection of broader interests. While fishers provide valuable first-hand or practical knowledge, most submissions received for this application were not supported by any other information. Still, the anecdotal knowledge held by stakeholder groups is often the only information available to MFish when assessing marine farming permit applications and is recognised as an important element in the problem solving process.

211 Fishers suggest use at the application site is variable but does occur quite often. Diary surveys show a lot of recreational fishing occurs in SNA1, in particular in Hauraki Gulf and Bay of Plenty. In fact, Area 1, which includes Bay of Plenty, is the most popular recreational fishing region in New Zealand.

212 The main species caught at the site include snapper, kahawai, gurnard, tarakihi, trevally, and kingfish. Most fishers use a handline or rod while anchored. Some fishers also troll and gill net at the site. Fishers suggest catches at the site are reasonable, but the recreational fishing isn't any better or worse at the site than many other places in Eastern Bay of Plenty.

213 Most fishers stated the application site would not affect, or would benefit, their recreational fishing. However, the Opotiki Aquaculture and Fishing Group suggest the application site would affect recreational fishing activity. Popular and productive drift fishing methods would no longer be practical at the site. Alternatively, fishing from a fixed position would then create the potential to snag an anchor on the marine farm structures. Kingfish and snapper are also well known for taking a line around a structure in order to break free, so a change of fishing gear and techniques would be called for.

214 MFish considers that although some fishing methods would be altered by the application site, the amount of catch likely to be affected would be small. Fishing could still occur within and close to the boundaries of the farm. Gear entanglement would be a risk, but the navigational channels between marine farm blocks would provide extra room for recreational fishing. Additionally, numerous alternative fishing spots are available in Eastern Bay of Plenty for the same fishstocks if fishers choose not to fish at the application site.

215 Many submissions stated the application site would enhance local fishstocks and therefore increase fishing opportunities in the area. Some submitters also suggest the application site may act as a marine reserve. On the other hand, the Opotiki Aquaculture and Fishing Group raised concerns that if the farm does provide an improved recreation fishing opportunity, this could increase fishing pressure or negatively impact neighbouring fishing areas. Fisheries resources, including these issues, have been addressed under *Evaluation of the Effects of the Activity on the Sustainability of any Fisheries Resource*.

216 MFish recognises differentiating between recreational and customary fishing is difficult because some fishing out of Opotiki is done to supplement whānau diets. MFish welcomes comments from submitters if they feel their submission has been misrepresented.

#### *Effects on customary fishing*

217 MFish considers customary fishers fish at the application site but that development of the farm would unlikely have adverse effects on their customary use and management.

218 Submissions from Whakatohea iwi state the area of the application site is within the mana whenua, mana moana of Whakatohea and is enshrined in Whakatohea tikanga me nga kawa. The proposed farm incorporates three traditional fishing grounds; Te Hira, Whitau and Perapera. However, these fishing grounds are no longer targeted. Fishers state there are cultural values associated with fishing at the site but their customary management would most likely be enhanced by the application site.

219 Customary fishers stated the fish at the site using rod or handline, longline and free dive methods. Fishers catch snapper, kahawai, tarakihi, gurnard, mango, flounder and trevally. Most fishers stated the application site would not affect, or would benefit, their customary fishing. Additionally, numerous alternative fishing spots are available for the same fishstocks if fishers choose not to fish at the application site.

220 The majority of submissions stated the application site would enhance local fishstocks and the overall food chain in the area. Some submitters also suggest the application site may act as a marine reserve. Fisheries resources, including these issues, have been addressed under *Evaluation of the Effects of the Activity on the Sustainability of any Fisheries Resource*.

### ***Options to Avoid, Remedy or Mitigate Adverse Effects***

221 The Chief Executive, or delegated decision maker, may issue a marine farming permit with conditions considered necessary or desirable to avoid, remedy, or mitigate adverse effects on fishing or the sustainability of any fisheries resource, under s 67J(10) of the Fisheries Act 1983.

222 MFish is concerned about adverse effects on commercial fishing specifically and, more particularly, on the sustainability of fisheries resources because the area of the application site appears to be important for fishstock biomass and distribution. A reasonable way to mitigate potential adverse effects would be to reduce the total area occupied by the marine farm. Doing so reduces the number of structures (and consequently quantity of dropper lines) in the water column and total area of Bay of Plenty likely to be affected by the marine farm.

223 MFish is satisfied development of 3,800 ha, equating to 984 longlines, would not have an undue adverse effect on any fisheries resource. Reducing the size of the application site would lessen the potential adverse effects of:

- ◆ changes in fishstock biomass and distribution
- ◆ zooplankton consumption
- ◆ entanglement of marine mammals with the marine farming structures
- ◆ puerulus settlement on marine farming structures
- ◆ commercial fishing activity in FMA1.

224 MFish also considers there is less risk of significant adverse effects to fishing and the sustainability of fisheries resources at the application site by localising effects to one site versus impacting two. The two sites both have considerable benthic and pelagic footprints (as modelled by Cawthron). Localising effects to the 3,800 site not only reduces effects by 950 ha, but also by the area of the benthic and pelagic footprints of the southern site.

225 A reduction in the total developed area would decrease the extent of stocked structures and deposition likely to cause alterations in fishstock biomass and distribution. The application site would also have a lesser impact on nutrient cycling and availability by reducing the number of structures in the water column and total surface area for drag. Decreased quantities of mussels in the water column would further reduce the risk of zooplankton consumption by farmed mussels.

226 MFish also recommends using the northern site of the application to maximise the inshore area for marine mammals. The Department of Conservation has recently recommended aquaculture development in Bay of Plenty should be excluded from the shore seaward for 6 km, corresponding roughly with the 30 – 40 m depth contour. The recommendation is made for the protection of nursing right whales, Bryde's whales, common dolphins and their nursing calves, and for foraging bottlenose dolphins. Since the southern site of the application is very close to this region, MFish therefore recommends using the northern site for marine farm development. Additionally, the marine farm structures would then be localised into one area, versus spread over two areas, reducing potential effects on marine mammals.

227 The New Zealand Rock Lobster Industry Council has requested a condition be placed on the marine farming permit that requires the application to recover and relocate juvenile rock lobster that settle on the farm. A permit condition under s 67J of the Fisheries Act 1983 cannot authorize the taking of undersize fisheries resources for sustainability or enhancement purposes. At this time,

a reasonable way to mitigate potential effects on rock lobster fishers would be to reduce the area on which puerulus could settle.

228 Adverse effects on commercial fishing would also be reduced by reduction of the size of the application site. MFish recommends using the outer site so that impacts to commercial fishing are localised, versus spread between two farm areas. Using only the northern site reduces fishable area by roughly 40 square kilometres whereas using the entire site would have reduced fishable area by roughly 50 square kilometres. If fishers did not use the area between the two farms, fishable area would have been reduced by roughly 68 square kilometres. Also, by limiting the structures to the northern site, the inshore region of the Eastern Bay of Plenty trawl fishery is still easily accessible, even if less efficiently used during some times of the year.

229 MFish considers spat catching at the application site may occur if an approved adaptive management plan is implemented. If a spat catching permit were issued over the whole area, large quantities of shellfish could fall to the seafloor, adversely affecting fisheries resources in the area. Without further assessment of risks associated with the scale of development at the application site, MFish can only be satisfied spat catching would not have an undue adverse effect on any fisheries resource by managing risks through an adaptive management plan.

230 MFish believes that there are various options available that would avoid, remedy or mitigate adverse effects on fishing by the proposed application site. However, at this time, MFish has not received information from the applicant or commercial fishers suggesting what levels of mitigation would be appropriate or required for the application site – MFish is open to suggestions from both parties. At this time, though, MFish is satisfied the decreased size of the application site would mitigate the adverse effects identified.

## **Part E: Conclusion**

### ***Are the effects on fisheries resources undue adverse effects?***

231 Because of the large amounts of uncertainty regarding potential effects of a large marine farm in an area that appears important for fisheries resources, MFish cannot be satisfied the application site, in its entirety, would not have an undue adverse effect on the sustainability of fisheries resources.

232 MFish accepts that adverse effects may occur as a result of marine farm development. Because of the size and offshore location of the application site, MFish has had to rely on theoretical information to assess potential effects of this application site on the sustainability of fisheries resources. As the size of marine farm development increases, there is a corresponding increase in uncertainty of predicting potential effects of the farm on the sustainability of fisheries resources. Due to the size of the application site, MFish considers impacts on the sustainability of fisheries resources are likely.

233 The application site may impact nutrient availability through alterations to wave and currents, changes in nitrogen levels and the uptake of plankton; and due to the complexities of the marine environment, the impact of the application site is not limited to the area under the application site and the surrounding benthic and pelagic footprints. Yet, overall effects of marine farming (particularly large scale developments) on the food chain, schooling of target or prey stocks, and the overall sustainability of fishstocks are generally unknown.

234 However, MFish is satisfied the development of the northern 3,800 ha, equating to 984 longlines, would not have an undue adverse effect on fisheries resources for the following reasons:

- ◆ The application site is located over a small proportion of mainly soft sediment habitat in the Bay of Plenty. The seabed likely to be affected by the application site is flat, featureless soft sediments. It is likely the substrate beneath the application site has already been affected by trawling activity.
- ◆ While localised phytoplankton depletion is likely to occur at the site, water column modelling suggests development would generally be sustainable.
- ◆ Localising the marine farm structures into one large 3,800 ha block would minimise effects on:
  - nutrient cycling and availability by reducing the number of structures in the water column and total surface area for drag.
  - zooplankton consumption by decreasing the total number of farmed mussels in the water column.
  - depositional effects by reducing the total benthic area exposed to deposition, therefore decreasing potential effects to fishstock biomass and distribution.
  - rock lobster recruitment by reducing the area occupied by structures in the water on which puerulus can settle.
- ◆ Limiting marine farming structures to the northern site would lessen effects on nursing right whales, Bryde's whales, common dolphins and their nursing calves, and for foraging bottlenose dolphins.

### *Are the effects on fishing undue adverse effects?*

#### Customary fishing

235 MFish considers customary fishers fish at the application site but is satisfied the activities contemplated by the application would not have an undue adverse effect on customary fishing. Submissions from Whakatohea iwi state the area of the application site is within the mana whenua, mana moana of Whakatohea and is enshrined in Whakatohea tikanga me nga kawa. Fishers state there are cultural values associated with fishing at the site but their customary management would most likely be enhanced by the application site.

#### Recreational fishing

236 MFish considers recreational fishers fish at the application site but is satisfied the activities contemplated by the application would not have an undue adverse effect on recreational fishing. MFish considers that although some fishing methods and total catch effort would likely be altered by the application site, fishing could still occur within and close to the boundaries of the farm. Additionally, numerous alternative fishing spots are available in Eastern Bay of Plenty for the same fishstocks if fishers choose not to fish at the application site.

## Commercial fishing

237 Due to the large amount of uncertainty regarding effects of the application site on commercial fishstocks, and the level of commercial fishing taking place in the area of the application site, MFish cannot be satisfied the activities contemplated by the application site, in its entirety, would not have an undue adverse effect on commercial fishing.

238 MFish accepts that marine farm development will adversely affect commercial fishing in the area of the application site. MFish also recognises impacts to fisheries resources would directly impact commercial fisheries; the large size of the application site in an area heavily used by commercial fishers may put pressure on the fishstocks being harvested.

239 However, MFish is also satisfied development of the northern 3,800 ha would not have an undue adverse effect on fishing, for the following reasons:

- ◆ Use of the northern site would reduce the loss of fishable area for commercial fishers by compacting the marine farm structures instead of spreading them over two separate areas.
- ◆ Spatially, the application site would equate to only a small proportion of the total fishable area in statistical area 010 and FMA1.
- ◆ MFish is satisfied development of the application site, as proposed in the previous section, would not have an undue adverse effect on the biomass and distribution of commercial fishstocks. MFish is also, therefore, satisfied that changes in fishers' behaviours in response to development of the application site would not put undue pressure on the sustainability of fishstocks being harvested.
- ◆ Fishers fishing at the application site would face additional costs with fishing elsewhere. However, MFish considers these costs would not be prohibitive because only a proportion of the total annual catch in FMA1 is currently harvested from the recommended area. Additionally, much of the Eastern Bay of Plenty trawl grounds would still be accessible, even if less efficiently used.

## Part F: Recommendation

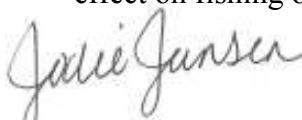
240 I recommend you make a preliminary decision to:

### Marine Farm Permit Application C18-1037:

- a) **Approve** the northern 3,800 ha, equating to 984 longlines, of application C18-1037 by Eastern Sea Farms Limited on the grounds that you are satisfied, at this time, that the activities contemplated by the application would not have an undue adverse effect on fishing or the sustainability of any fisheries resource, subject to the following condition:
- i) The permit holder must abide by the current Mussel Industry Environmental Code of Practice.
- b) **Decline** the remaining southern 950 ha, equating to 328 longlines, of application C18-1037 by Eastern Sea Farms Limited on the grounds that you are not satisfied, at this time, that the activities contemplated by this part of the application would not have an undue adverse effect on fishing or the sustainability of any fisheries resource.

### Spat Catching Permit Application C18-1038:

- a) **Approve** the northern 3,800 ha, equating to 984 longlines, of application C18-1038 by Eastern Sea Farms Limited on the grounds that you are satisfied, at this time, that the activities contemplated by the application would not have an undue adverse effect on fishing or the sustainability of any fisheries resource, subject to the following condition:
- i) Spat catching can occur only if a Ministry of Fisheries approved Adaptive Management Plan is implemented.
- b) **Decline** the remaining southern 950 ha, equating to 328 longlines, of application C18-1038 by Eastern Sea Farms Limited on the grounds that you are not satisfied, at this time, that the activities contemplated by this part of the application would not have an undue adverse effect on fishing or the sustainability of any fisheries resource.



**Jodie Jansen**  
Fisheries Analyst  
Ministry of Fisheries  
Date: 09/03/2006

### Preliminary Decision to Approve

AGREE/ DISAGREE / AGREE AS AMENDED (strike out two)



**Daniel Lees**  
Aquaculture Manager  
Ministry of Fisheries

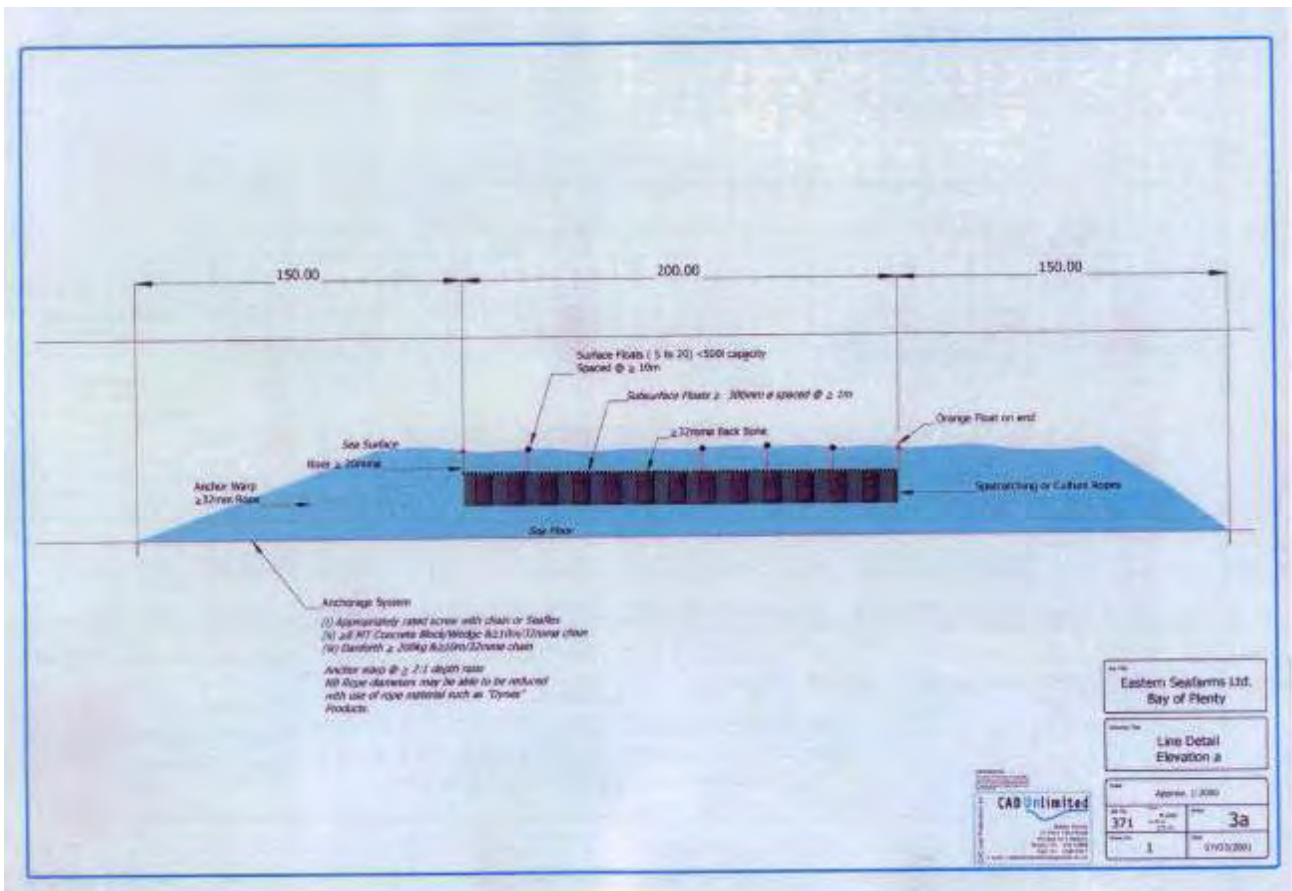
Dated this \_\_\_17\_\_\_ day of \_\_\_March\_\_\_ 2006

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# Appendix 1. Structures diagram for C18-1037 & C18-1038



## **Appendix 2. Plans for staged development of the application site**

### Appendix 3. Glossary of Scientific Terms

Adverse effect	A change that is unfavourable or otherwise harmful as a consequence of the proposed aquaculture activity.
Application site	The area occupied by the proposed application. The application site should contain all structures that will be used by the activity including all anchors and buoys.
Associated and/or dependent species	Any non-harvested species taken or otherwise affected by the taking of any harvested species, including farmed stock and spat.
Bathymetry	The measurement of the depth of bodies of water.
Benthic species	Animals, plants, or other organisms living on or within the seafloor sediments (see infauna and epibenthos).
Biological diversity	The variability among living organisms, including diversity within species, between species, and of ecosystems.
Carrying capacity	The total number of individuals of a population that a given environment can sustain.
Chart Datum	A standardised tidal measure, where 0 m Chart Datum refers to a water level so low the tide will seldom fall below it. The datum usually adopted is about 0.3 m below mean low water spring. Height above Chart Datum can be calculated from tables provided in the New Zealand Nautical Almanac (published annually by LINZ).
Contaminant	Any physical, chemical, biological, or radiological substance or matter that has the potential to have an adverse effect on the environment that it encounters.
Coordinates	Latitude, longitude, and height on an ellipsoid; an accurate calculation of a position on the earth.
Culture method	Methods and techniques used to grow farmed stock eg, suspended culture using rafts or buoys, rack culture, sea cages.
Demersal	Fisheries resources living close to the seabed.
Deposit feeders	Organisms that feed by ingesting particles of sediment and metabolising organic matter in or on the particles.
Discharge	Any input into the environment derived from the aquaculture activity. Discharges may include both solid and liquid material.
Ecological investigation	A scientific examination of the physical characteristics and fisheries resources in an area, and the effect a proposed activity will have on them.
Effects footprint	The area over which the proposed activity would have a noticeable effect on the existing environment. For example, a hydrodynamic effects footprint would include the area surrounding the farm within which the existing hydrodynamic regime is affected.

Ensuring sustainability	Ensuring sustainability means: a) Maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations; and b) Avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment.
Epibenthic species	Animals, plants, or other organisms growing on the seafloor.
Exotic species	Any species not native to New Zealand.
Faecal matter	Excreted animal waste products.
Farm production	An estimate of the annual biomass produced by an aquaculture activity. This figure is often reported as tonnes per hectare per year.
Fisheries resource	Any one or more stocks or species of fish, aquatic life, or seaweed.
FRIA	Fisheries Resources Impact Assessment; an assessment of the effects of the proposed activity on the sustainability of fisheries resources.
GAP analysis	An evaluation of existing knowledge of a particular subject to identify if and where information is lacking; used to guide subsequent investigations.
Habitat	An area containing a characteristic physical property where different organisms live.
Heterogeneity	Natural variation in genetic makeup, usually adapted to local environments.
Hydrodynamics	The study of fluids in motion; for the purposes of a FRIA, the movement of water in the marine environment. Includes current speed and direction, tidal regimes and other water movements.
Infaunal species	Animals living within the seafloor sediments.
Intertidal	The area between high and low watermarks.
Nitrification	The oxidation of ammonia to nitrate in the substrate.
Pelagic	Fisheries resources that inhabit the water column.
Phytoplankton	The plant and plant-like portion of all small organisms floating or drifting near the surface of the ocean. Phytoplankton are the principal primary producers (photosynthetic) in marine communities, and therefore the basis of all subsequent biological production.
Plankton	See phytoplankton and zooplankton.
Pseudofaeces	The particles filtered from the water column by bivalve molluscs that are not incorporated into the digestive system; larger particles are wrapped in mucous prior to expulsion.
Quadrat	A sampling unit of defined area; typically 1 m <sup>2</sup> or 25 cm <sup>2</sup> .
Qualitative	A non-numerical description of a particular parameter.
Quantitative	A numerical description of a particular parameter.
Random sampling	A system of sample collection in which locations are chosen in an unpredictable manner and without any bias; locations are chosen without reference to any environmental gradients, and frequently assigned using a random number table or generator.

Receiving environment	The local habitats, flora, fauna and water body that would potentially be affected by new inputs to the system from an activity.
Redox	The transition zone between the aerobic layer anaerobic layer in the sediment.
Remedy	Correct or aid in the recovery of the environment from any effect or damage caused by operation.
Sediment	Particulate material that accumulates on the seafloor.
Semi-quantitative:	This type of description provides some indication of the relative abundance of different species or habitats present. Such descriptions may include ranked or ordinal-scale measures of abundance (eg, species A is more abundant than species B, which is more abundant than species C, etc), and as such, may be amenable to non-parametric statistical analysis.
Shoreline	Where the land meets the sea. Generally described by the position of mean high water springs (mean high water mark when the tides are at their greatest).
Species	A coherent group of morphologically similar organisms capable of successfully producing offspring.
Species richness	The number of species in a particular area or sample; not equivalent to ‘species diversity.’
Stocking density	A measure of the number of farmed organism present per unit area or volume.
Structure	Any artificial object placed into the marine environment to aid in the process of marine farming.
Substrate	Base on which organisms live. For example, soil.
Swell	A smoothly undulating ocean wave that is the result of wave dispersion and that is transported with little energy loss across long distances.
Transect	To divide by cutting transversely; for the purposes of a FRIA, an imaginary line or series of lines drawn through the application site or adjacent area upon which ecological investigations are focussed.
Unwanted organism	Marine species listed as ‘unwanted’ under section 164c of the Biosecurity Act 1993.
Water body	An area of defined size from which information is gathered in a qualitative or quantitative manner ie, a bay, inlet, firth, gulf, estuary, fiord, sound, coastline etc where the application site is proposed.
Zooplankton	The animal and animal-like portion of all small organisms floating or drifting in the ocean. Includes both small organisms and the early life-stages (gametes and larvae) of some larger organisms.

## Appendix 4. Scientific Peer Review Summary Report

# MINISTRY OF FISHERIES SCIENCE GROUP

### *MARINE FARM APPLICATION - SCIENTIFIC REVIEW Of Fisheries Resources Impact Assessment Report*

Applicant Information	
Applicant	Eastern Seafarms Ltd
Application No/Coastal Permit No.	C18-1037; C18-1038
Date of Review	Jan 05
Location	Opotiki
Farm/Extension area	New Farm 3800ha, 950ha
EIS prepared by	Cawthron
Date of Survey	2003

The science group has reviewed the FRIA report entitled:

1. 'Eastern Seafarms Ltd marine farming permit application', completed by Cawthron on behalf of Eastern Seafarms Ltd in support of their marine farm permit application C18-1037 & C18-1038. All accompanying appendices have also been reviewed.

In regards to:

1. Hydrodynamics of the area (*alterations to wave and current action*)
2. Depositional impacts (*discharge of wastes and contaminants, benthic effects footprint*)
3. Impacts on sustainability of aquatic environment and fisheries resources<sup>←</sup> (*uptake of plankton, changes to nutrient cycling, effects on associated and dependent species*)
4. Biofouling and Biosecurity (*effects of providing structures that support new communities, introduction of pests and diseases*)
5. Water clarity and light availability
6. Options to avoid, remedy or mitigate any undue adverse effect on fisheries resources or the aquatic environment.
7. Source of Stock

After reviewing the FRIA report (including methodologies used and analysis of data and relevant information), accompanying documents and other relevant literature (where appropriate) the science group **believe** Cawthron have made a **fair, adequate and robust assessment** of the:

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<sup>←</sup> For the purposes of this report the terminology 'aquatic environment and fisheries resources' includes rare and endangered and associated and dependent species

- Implications that alterations to the hydrodynamic parameters may have on the aquatic environment and fisheries resources<sup>←</sup>
- Depositional impacts the farm development may have on the aquatic environment and fisheries resources.
- Impact the farm development may have on the sustainability of the aquatic environment and fisheries resources.
- Potential biofouling or biosecurity risks the proposed farming operation could initiate.
- Impact the farm development may have on the water clarity and light availability of the marine environment at the site
- Impact the source of stock may have on the genetic integrity of wild mussel populations in the area.
- Potential biosecurity risks the source of stock could impose on the aquatic environment and fisheries resources
- Options to avoid, remedy or mitigate any undue adverse effect on fisheries resources or the aquatic environment, as set out in the proposed Adaptive Management Plan.

The science group note:

- Collection, recording, reporting and analysis of data appears' to be scientifically adequate and robust.
- Modelling scenarios used throughout the report appear to be scientifically adequate and robust (*including fisheries abundance and distribution models, plankton depletion models, and benthic deposition zone models*).

If you have any queries please contact Julie Hills

Regards Jules

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<sup>←</sup> For the purposes of this report the terminology 'aquatic environment and fisheries resources' includes rare and endangered and associated and dependent species

**Appendix 5. NIWA Bay of Plenty trawl surveys: distribution and catch rates (kg/km<sup>2</sup>) of major species, 1983 – 1999.**

## **Appendix 6. List of Stakeholders Invited to Comment on Application**

## **Appendix 7. Copies of Submissions Received During Initial Consultation for Application**

## **Appendix 8. The Potential Effects of Marine Farms on the Fisheries Environment**

Marine farms can affect the sustainability of fisheries resources. Physical, chemical and biological changes to the aquatic environment are caused: (a) by the introduction of artificial structures, (b) by introducing farm stock (usually bivalves) along with their maintenance and harvest, and (c) as a result of the new communities that naturally colonise the introduced structure. Effects may be isolated and/or cumulative. The following effects on fisheries resources are considered for each application (see 'A Guide to Preparing a Fisheries Resource Impact Assessment' (MFish, 2002).

### *Discharge of wastes and contaminants*

The discharge of fine-grained organic particles and live mussels, shell litter and other biota settles below and beyond the marine farm at rates that depend on species, stocking density, depth and current flows. Over time, increased sedimentation and organic enrichment can change habitats and communities, reducing the species diversity (Forrest, 1995; Mattsson & Linden, 1983). Although deposition from marine farms has little impact on mud or silt habitats, it can cause significant damage or even destruction to habitats with coarser substrates such as sand, pebbles, cobbles and rock (Forrest 1995). As a result, species adapted to the coarser substrate may be lost.

### *Effects of providing structures that support new communities*

The local marine ecosystem (species abundance and diversity, habitats) may be altered by the establishment of artificial structures through the impact of new artificial communities on existing natural ecosystems. Marine farms can alter the aquatic environment by providing structures to support other communities, thereby changing community composition and increasing biomass. The new communities that establish may interact with existing communities in the aquatic environment in some manner, potentially affecting fisheries resources. The nature of these changes is highly debatable (Bohnsack, 1989).

One result may be changes to predator-prey interactions. Concentrations of predatory species such as spotties, leatherjackets and eleven-armed starfish have been seen within marine farms (Cole, 2002). Increased predator populations may impact upon local fisheries resources, especially following harvest when food at the farm is limited.

### *Uptake of plankton*

Plankton depletion and reduced availability of plankton in the water column are a function of both uptake by the mussels and the impeding of water flow within and around the farm. Due to the artificially high concentration of farmed mussels, this depletion can affect natural communities and neighbouring marine farms. If the system is already at carrying capacity, a decrease in abundance and condition of other phytoplankton-feeders may be seen. (Carrying capacity is the total number of individuals of a population that a given environment can sustain). Localised depletion of phytoplankton resources within marine farms has been demonstrated (Grange & Cole, 1997), but a debate exists over the degree of impact of mussel farms on zooplankton resources (Robinson et al., 2002). The effects of marine farms on plankton levels (on both an individual farm and cumulative basis) are a high priority for research.

### *Changes to nutrient cycling (within the sediment layer and water column)*

Bivalve shellfish are filter feeders and remove plankton and other organic matter from the water column. Some of this organic matter is ingested and converted to tissue by the shellfish. The rest is waste (faeces and pseudofaeces) that is released as soluble nutrients into the water column, or as

organically enriched particulate material deposited on the seafloor (Forrest, 1995). The likely effects of marine farming on nutrient cycling include excretion of nutrients in more bioavailable forms, concentration of nutrients in biodeposits below farms, and loss of nutrients due to harvesting.

Good water circulation minimises the impacts associated with the potential concentration of nutrients due to marine farming by (a) distributing and diluting soluble nutrients over a wide area, and (b) encouraging oxygen and nutrient exchange between the benthos and the water body. Water movement is relatively high in most areas where marine farming occurs in New Zealand, and hence nutrient cycling has been little affected by marine farming. However, marine farming in some situations has altered nutrient concentrations. For example, Kaspar et al. (1985) measured elevated concentrations of ammonium and sulphides below a mussel farm in the sheltered waters of Kenepuru Sound.

Existing literature suggests that the proportion of nutrients removed by marine farming through harvesting is relatively insignificant with respect to the total available nutrient load (MacKenzie, 1998). However, where large-scale bivalve cultivation occurs in a coastal embayment, cumulative effects could pose a significant threat to nutrient load and therefore the availability of nutrients to natural populations and existing marine farms.

#### *Alterations to wave and current action*

Physical objects in the water column can cause changes to water flow and speed. Marine farm structures can increase drag on water, reducing current flow within farms and increasing velocity under the farm (Ogilvie, 2000). As the subtidal communities found inshore from marine farms are adapted to varying degrees of wave intensity, interposing a marine farm between open water and a subtidal community may reduce wave and current action, causing changes in species composition within the existing community. Currents carry food (phytoplankton) and oxygen to marine farms and other communities, remove wastes, and affect sedimentation rates. An increase in phytoplankton uptake by mussels may take place due to the slower movement of water through the farm, and therefore may reduce food availability to the subtidal ecosystem inshore of the farm. On the other hand, water column mixing may increase nutrient availability (e.g. nitrogen) to plankton and stimulate growth. Canterbury University is presently investigating these topics. For an accurate assessment of effects of marine farming on the sustainability of fisheries resources, the hydrodynamics of the area must be understood.

#### *Changes to water clarity and light availability*

Water clarity may be increased immediately downstream of mussel farms due to the removal of particulate matter (Cole, 2002). Conversely, changes to current speed around structures may increase turbulence resulting in the re-suspension of sediment in the water column. A change to the clarity of the water column will affect light penetration to the underlying environment, potentially changing community composition and predator-prey interactions based on vision, for example.

Marine farm structures and the communities they carry can shade adjacent areas, thereby decreasing light needed for photosynthesis. This would affect algae communities in particular.

#### *Introduction of pests and diseases*

Marine farm activities (movement of gear, stock and spat) are a known potential vector for transporting unwanted and exotic species to new localities around New Zealand. The invasive Asian kelp *Undaria pinnatifida* is an exotic species whose spread is partially attributed to the movement of marine farm material. The concern about the introduction of exotic and unwanted

species is the potential for these organisms to migrate from the farm and colonise the surrounding natural environment, causing changes to existing communities. Undaria, for example, is highly competitive and known to invade established communities and suppress the growth of other species through overcrowding, fast growth and year round reproduction (Battershill et al., 1998).

Marine farm activities are also a potential vector for transporting diseases and parasites around New Zealand. It is therefore important to ensure that farmed stock comes from a healthy source. In addition, the artificially high densities of farmed stocks increases the risk of a potential diseases or parasite outbreak (Cole, 2002). The concern is that diseases and parasites may spread to wild populations and between existing farms. For example, densities of farmed mussels in the Marlborough Sounds and the frequency of transfer of material and vessels among sites are such that any disease or parasite outbreaks are likely to spread rapidly.

#### *Effects on the heterogeneity of local populations*

There is a risk of introducing new genetic material when new organisms are released into the environment. This may affect the genetic distinctiveness of local wild populations. Some research is currently underway at the Cawthron Institute, Nelson into producing a 'super mussel' [*sic*]. If released into the Sounds, these laboratory-bred mussels could cross breed with existing stock and result in a hybrid less able to survive in natural conditions.

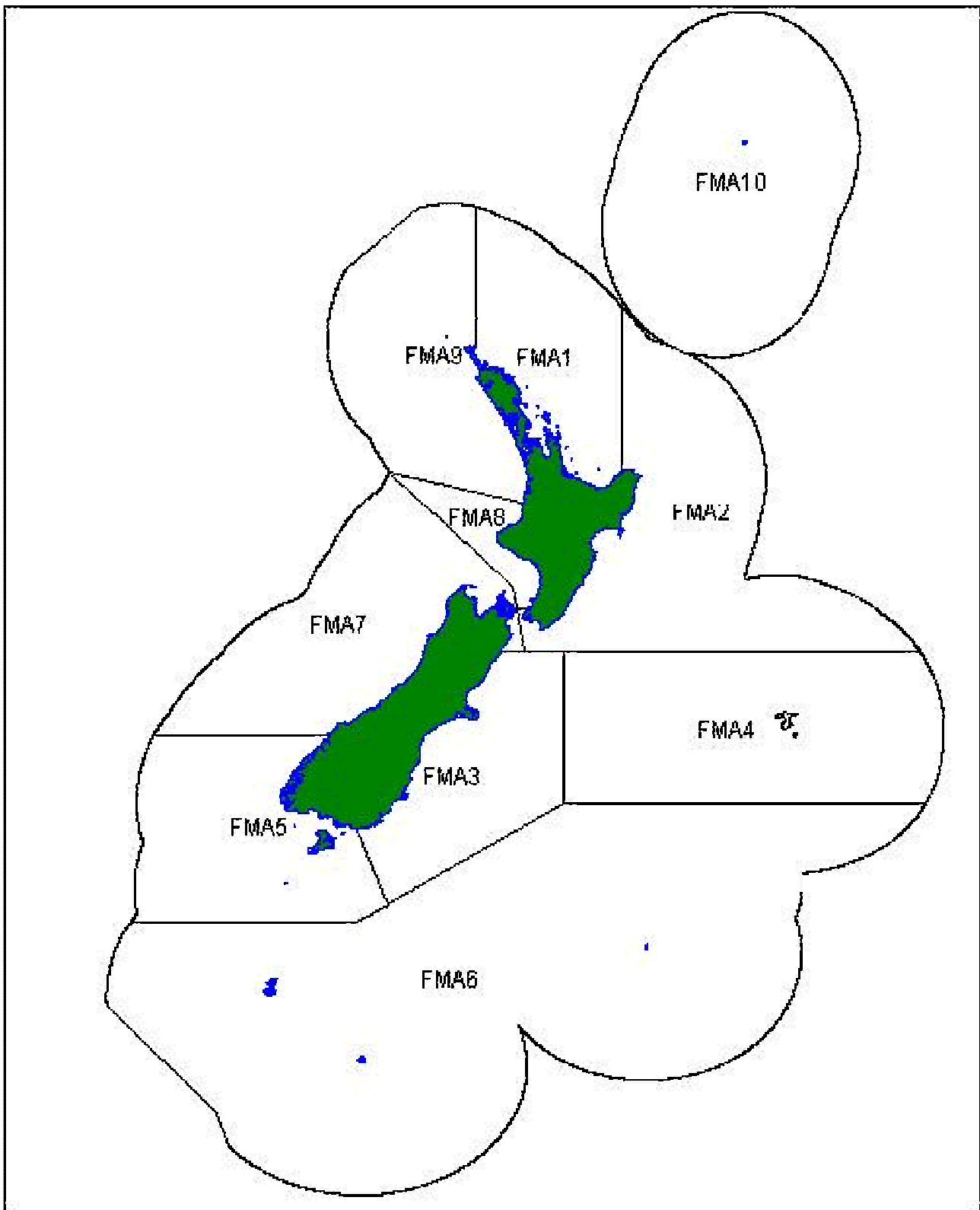
#### *Effects on associated and dependent species*

Marine farms may have effects on associated and dependent species (for example, sea birds, marine mammals) as they may be a food source for some species, or may block access to food sources for other species, e.g. king shags feeding on flatfish or dolphins feeding on fish. Structures may be favoured by some species (shags appear to use farm buoys as perching sites).

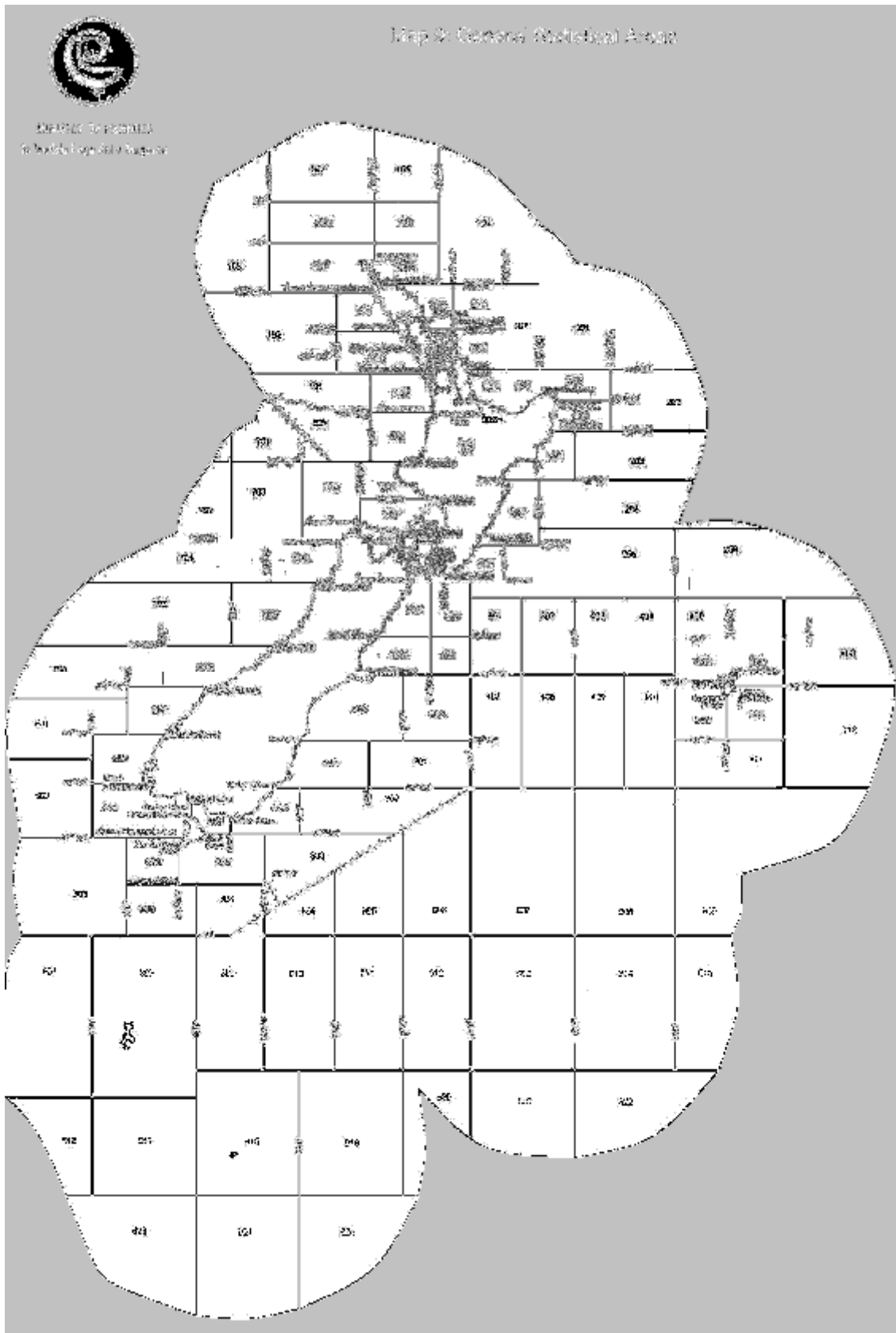
*Other relevant effects* allows the decision maker to consider specific relevant considerations particular to the application.

Precise data are lacking on most of the effects described above for *any* marine farm area and it is difficult to make statements about these effects with any certainty. Patterns of phytoplankton availability, changes in wave and current action, and the role of marine farms as refugia are hotly contested topics. Furthermore, effects are a function of local conditions, including the presence and concentration of other farms in the area under question. Assessments of impacts must be made on the best information available, taking into account potential risks where information is uncertain, unreliable and inadequate.

## Appendix 9. General Fisheries Management Areas map



## Appendix 10. General statistical areas map



**Appendix 11. Maps of MFish catch effort information for GUR, JDO, SNA, TAR, and TRE. (MFish considers these maps are commercially sensitive and will not be released publicly.)**

## Appendix 12. Calculation of puerulus settlement at application site

$$\text{Equation 1: } 5,248 \text{ km of longline} \times \frac{1 \text{ puerulus}}{\text{ha}} \times \frac{500 \text{ g}}{\text{puerulus}} = 2,624 \text{ tonnes}$$

$$\text{Equation 2: } 16 \text{ farmblocks} \times \left( \frac{1000\text{m} \times 2000\text{m} \times 10\text{m}}{500\text{m}^3} \right) = 640,000 \text{ pueruli}$$

$$\frac{1 \text{ tonne}}{40,000 \text{ pueruli}} \times 640,000 \text{ pueruli} = 16 \text{ tonnes}$$

*Assumptions:*

1. Stocked structures hang 10 m deep.
2. 40,000 result in one tonne of harvestable rock lobsters (from MFish stock assessments).