



MAPPING CONSTRAINTS TO FUTURE MARINE FARMING IN THE AUCKLAND AND WAIKATO REGIONS.

STAGE ONE

October 2002

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Executive Summary

Rationale

Regionally and nationally there has been a recent dramatic upsurge of interest in expansion of marine farming activities. Significant social and economic benefits may be gained from marine farming activities, however, they may also cause significant adverse effects on coastal resources, and compromise other competing uses and values. The increased interest in expansion of marine farming activities was not anticipated when the ARC's Proposed Auckland Regional Plan: Coastal was developed. Consequently its current provisions with respect to aquaculture are no longer considered adequate for sound resource management. The government has recognised the importance of this issue nationally and has established a two-year moratorium on the processing of consent applications for new marine farms. One of the purposes of the moratorium is to allow time for regional analysis to update policy frameworks, including the identification of aquaculture management areas.

This report compiles available information relevant to this issue. It aims to distinguish areas of the coastal marine area where future marine farming would face greatest conflict from those where such conflict is likely to be avoided or minimised. The report presents results of stage one of a two-stage process for defining AMA's. Stage 1 information provided in this report and supporting maps is intended to provide a platform for focused consultation. A more detailed assessment of selected areas of lower constraint will be carried out in Stage 2. Ultimately stage 1 and stage 2 processes will lead to the identification of suitable aquaculture management areas for inclusion in the aquaculture variations to the Proposed Auckland Regional Plan: Coastal.

Method

The study area includes the coastal marine area of the Auckland region and the eastern boundary of the adjacent Environment Waikato region. The study area includes the entire Hauraki Gulf Marine Park area.

This report encompasses the Stage 1 component of the process where assessment is carried out a super-regional scale to identify broad patterns in the degree of constraint on marine farming. Broad areas of absolute constraint and those dominated by many overlapping constraints would be considered unlikely candidates for further consideration for future marine farming operations. Broad areas where constraints are either limited or absent would be identified for consideration in more detail.

A wide list of potential constraints to marine farming activities has been generated. Constraints cover commercial fishing and shipping activities, recreational pursuits including fishing and pleasure boating, resource consented activities including existing marine farming and sand dredging,

navigation and safety issues, visual amenity values, human health issues, cultural and heritage issues, water quality, and areas of ecological value and sensitivity. Available existing GIS information held by ARC was accessed, including information developed for the regional Policy Statement, the Proposed Regional Plan: Coastal, and the Regional Growth Strategy, or held by various departments including Environmental Management Heritage, and Planning. New information layers were developed and refined through consultation with representatives of various groups and organisations groups including; Ministry of Fisheries, Maritime Safety Authority, Department of Conservation, Auckland Health Care, Ministry of Agriculture and Forestry, Iwi, Community Groups, Territorial Local Authorities, Environmental Protection Groups, Recreational Boating associations and clubs, Marine Farming industry, Environment Waikato, Environment Bay of Plenty, Northland Regional Council, and Harbour Masters (RDC & ARC).

Information on constraints has been collected and a brief description of each provided in the text along with some comments, discussion and key questions for consideration. Discussion threads (indicated by arrow headed bullet points) can be followed where questions raised in the initial draft report have been partially or wholly clarified as consultation progressed. Available information on the spatial extent of each constraint has been compiled into a series of Geographical Information System (GIS) layers (themes). Information is captured at a range of levels of scale and accuracy. Simple 'metadata' is provided for each mapped constraint.

GIS spatial information on constraints has been grouped into related categories and presented as composite maps.

Analysis / Assessment

Constraints have been categorised by the degree of restriction they impose upon future marine farming activities. Stage 1 assessment constraints have been broadly categorised as either **Absolute** or **Critical**. Anything less than critical is not considered further during Stage 1. Constraints are then amalgamated into composite maps by category to allow patterns of constraint on a study-wide basis to become apparent.

Conclusions

- Available information on constraints to future marine farming activities within the study area have been collated and the degree of their spatial constraint plotted and stored in a geographical information system.
- Constraint information has been mapped by appropriate groupings and released for consultation purposes.
- Constraints have been broadly categorised into either Absolute or Critical groupings, and mapped.
- Patterns emerging from visual assessment of the mapped information have been used to identify areas of high constraint and areas where constraints appear to be comparatively low.
- Various knowledge gaps have been identified during the stage 1 assessment process. However, it was considered that adequate

information was available for assessment to continue and for stage 2 areas for further study to be identified.

- Areas within the Auckland region where marine farming is considered inappropriate have been identified and classified as 'absolute constraint' and 'no-go' areas.
- Areas have been identified in the Auckland region with potential 'limited opportunity' for expansion or movement of existing marine farming operations.
- 'Stage 2 study areas' for further investigation have been identified in the Kaipara Harbour and the Firth of Thames.

Study Limitations

The results of this stage 1 study are not intended to do more than provide broad direction for where future marine farming might be appropriate. This will be followed by more detailed investigations of stage 2 study areas. However, even after these investigations the resultant Proposed AMAs will only identify areas where future marine farming operations can reasonably be expected to be carried out without undue interference with other activities, uses and values.

This assessment will not replace the requirement for site-specific assessments of environmental effect relevant to individual (or collective) applications for marine farming resource consents. It will also not replace the need for monitoring of the potential effects of any resource consents granted for marine farming activities.

Completing Stage 2 Assessment

Stage 2

- Focus assessment effort on highest priority areas of lower constraint identified by Stage 1 process, including consultation feedback.
- Obtain more detailed information on constraints within priority assessment areas.
- Where practicable, obtain preliminary carrying capacity information.
- Identify potential AMA areas (size and location).

Following on from completion of stage 2 is notification of variation to the Proposed Auckland Regional Plan: Coastal containing AMAs for public submission.

Acknowledgements

This report, the accompanying maps and the GIS information layers could not have been created without the assistance of a number of people and organisations that deserve recognition and acknowledgement.

Within the ARC Neil Dingle provided specialist GIS capability, Sharlene Pardy (Policy Devlpt.) and Alan Moore (Coastal) provided guidance and review. Various comment and information was obtained from Philip Pannett (Policy Devlpt.), Hugh Leersnyder, Hans van der Wal and Quentin Smith (Coastal), Hans Swete, Bruce Goff and James McPetrie (MarOps), Maru Samuels (Iwi Relations), Chris Keenan, Shane Kelly, and Ken Becker (Research), Shona Myers, Robert Brassey, and Brenda Greene (Heritage).

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Recreational boating routes were provided by Richard Brown of the Auckland Yachting and Boating Association.

1 Introduction

1.1 Study Objective

Provide a first-cut regional scale assessment of potential aquaculture management areas by identifying, and where possible mapping, available information on the various constraints to future marine farming operations in the Auckland Region and Hauraki Gulf Marine Park.

1.2 Report Format

- **Section 1**

The Introductory section of this report presents background and rationale for completing the study, identifies the study area and sets out the main procedures used.

- **Section 2**

This section sets out collated constraint information of the resources, uses and values related to Social and Economic activities. This includes commercial and recreational fishing and boating, navigation and safety matters, visual amenity, public health, and cultural heritage matters.

A brief explanatory introduction to each subsection is provided along with a standard format 'metadata' summary of information included in the GIS layers and maps. Constraints are categorised as having absolute, critical or low relative constraint on future marine farming. Comments, questions and discussion relevant to each subsection follow this.

- Round bullet points indicate matters raised in the initial draft report.
 - Arrow headed bullet points indicate subsequent responses to these matters as consultation progressed.

- **Section 3**

The third section continues with presentation, summary and discussion of constraints information related to the Natural and Physical components of the environment. This includes physical characteristics of the study area such as bathymetry, hydrology, and sediment characteristics, along with biological factors such as information on fish, birds, marine mammals, and ecological sensitivity of coastal areas.

- **Section 4**

Simple broad-scale assessment of constraints is carried using interpretative maps that group constraints by category so that regional patterns in the level of constraint can be seen.

- **Section 5**

This final section summarises conclusions reached from assessment and interpretation of the available constraint information. Conclusions are relevant to the identification of areas where more detailed assessment might locate proposed aquaculture management.

1.3 Study Background/ Rationale

1.3.1 Proposed Auckland Regional Plan: Coastal Current Provisions

Marine farming is currently carried out at a number of locations in the Auckland Region (Mahurangi, Matakana, Kawau, Waiheke, Wairoa, Waimungu, Great Barrier and Kaipara). Most of these farms were established by the Ministry of Fisheries (MFish) under Fisheries legislation (Marine Farming Act 1971) prior to introduction of the Resource Management Act 1991 (RMA). A moratorium on the application for new marine farms exists for a large area of the Hauraki Gulf. This was established through Gazette Notices issued by MFish under the Marine Farming Act and applies until the Proposed Auckland Regional Plan: Coastal becomes operative.

The potential for both benefits and adverse effects from marine farming is recognised and discussed in chapter 22, Aquaculture, of the Proposed Auckland Regional Plan: Coastal. (see Appendix 1 for proposed issues, objectives, policies, rules, and other methods). At the time of PRP:C formulation the marine farming industry expressed little interest in greatly expanding their activities within the Auckland region. Consequently rules in the PRP:C propose that application for new marine farming activities be a discretionary activity (other than in Coastal Protection Area 1 [CPA1], or where it has potential to impact on Cultural Heritage Schedule 1 areas). More recently, however, regionally and nationally there has been a major upsurge in interest in marine farming with applications being received for much larger farm areas and in deeper and more exposed waters than previously thought viable.

1.3.2 Aquaculture Management Areas and Variation of the PRP:C

Current provisions of the PRP:C did not consider the potential scale, intensity or range of locations where marine farming might now be considered. Applications received by regional councils nationally include apparently speculative endeavours and application for marine farming has potential to become something of a loosely controlled 'gold rush'. The government has recognised the inability of current provisions to support sound resource management in the face of such a gold rush of applications. On 25 March 2002 the 'Resource Management (Aquaculture Moratorium) Amendment Act 2002' was enacted. This legislation imposes a two-year moratorium on new aquaculture in the coastal marine area while more appropriate plan provisions can be developed. It applied retrospectively from 28 November 2001. The Act also empowers regional councils to create Aquaculture Management Areas (AMAs). AMAs are zones where aquaculture can be undertaken with a coastal permit. Outside AMAs, aquaculture is prohibited.

Further amendments to the Resource Management Act are currently being developed by central government to flesh out details of AMA function and management. Specifics of this additional national legislation are still being finalised but the government is clear in proposing that sound management of marine farming will require the identification of AMAs. The ARC is

undertaking a variation to the Proposed Auckland Regional Plan: Coastal to introduce AMAs to the region.

1.3.3 Constraints Mapping, Categorisation and Assessment Approach.

This report provides a 'first cut' at collating information relevant to identification of broad areas that might have potential to include AMAs. The approach used is to identify the spatial extent of various competing uses, values, and qualities that could be compromised by the presence of marine farming (eg boating, swimming, fishing) or could constrain successful marine farming activities (eg water quality). The constraints identified are broadly categorised by the degree of constraint they pose to future marine farming. Categories used are; relative absolute, critical and low constraint. Low constraints are not assessed further. Absolute constraints are those uses or values that are considered incompatible with marine farming operations. Examples are designated 'prohibited anchorage' areas identified on marine charts, mooring areas and coastal protection areas designated in the PRP:C, and notified port-approach navigational channels. Reasons include that marine farming involves anchored structures that would interfere with safe navigation, would occupy the space required for mooring, that could damage the electrical and telecommunication cables many prohibited anchorages are designed to protect, and could damage the ecological values coastal protection areas aim to preserve. Critical constraints are those with at least some element of discretion about where or to what extent they might constrain future marine farming operations. Examples include navigation outside of key routes, where ships may be able to alter their routes to avoid marine farms, and fishing activity, that may be able to continue outside of marine farms (or may be enhanced by their presence).

This first cut assessment is carried out regionally at a fairly coarse scale in an attempt to identify areas where the level of constraint would significantly reduce the viability of future marine activities. Areas identified as absolutely constrained can be considered for elimination from future analysis. Remaining unconstrained areas, or areas with lower levels of constraint would then be considered for more detailed assessment in the next phase of AMA identification. Any such recommendations would first be verified as appropriate through consultation.

The degree of constraint upon future marine farming of the various resource uses and values presented in this report is somewhat dependent on the type of aquaculture considered (eg mussels, oysters, snapper, kingfish, paua, seaweed, etc). Nationally we have an increasingly sound understanding of the potential requirements and effects of oyster and mussel farming activities. However, we have much less information about the range of experimental or developing marine farming activities (eg kingfish farming, seaweed, sponge or seahorse farming). This study primarily focuses upon constraints that are likely to affect the viability of mussel and oyster farming activities. However, many of the absolute constraints are related to the physical presence of structures or uses (eg marine farming in main shipping channels) and are likely to be broadly applicable to all types of marine farming activities.

Constraint information is provided in both hard copy and electronic formats. Hard copies of the report include descriptive text and A3 sized maps (Appendix 2). The scale of the accompanying maps is large and they are intended to provide only an overview of constraint mapping results. Mapped information is also provided in electronic format (in '.pdf' format on CD) so that it can be examined in greater detail. Constraints' spatial data shown on the maps and discussed in the text is stored in the ARC's GIS system. The GIS medium is considered to provide a particularly useful reference data set in that it presents complex and detailed information in readily understood visual form and has great flexibility and powerful analytical capabilities.

1.4 Study Limitations

The results of this stage 1 study are not intended to do more than provide broad direction for where future marine farming might be appropriate. This will be followed by more detailed investigations of stage 2 study areas. However, even after these investigations the resultant Proposed AMAs will only identify areas where future marine farming operations can reasonably be expected to be carried out without undue interference with other activities, uses and values.

This assessment will not replace the requirement for site-specific assessments of environmental effect relevant to individual (or collective) applications for marine farming resource consents. It will also not replace the need for monitoring of the potential effects of any resource consents granted for marine farming activities.

1.5 Study Area Boundaries

1.5.1 Study Boundary

The study area shown in the maps is bounded to seaward by the Coastal Marine Area (12 nautical mile outer limit of the Territorial Sea). The study provides more detail for the Auckland region where the majority of the constraint information was available. However, substantial constraint information for the adjacent Environment Waikato area and limited information for the Northland Region is also included. This is particularly relevant for boundaries of the Hauraki Gulf Marine Park that is used to define the eastern limits of the study area.

1.5.2 Information from Waikato and Northland

Sustainable resource management of future marine farming in the Firth of Thames requires integration of information across the ecologically arbitrary regional boundary dividing the Firth. Reasonably consistent constraints information has been obtained for the Environment Waikato (EW) area of the Firth. Information available for the east coast area of EW is more limited.

Similarly, integrated management within the Kaipara Harbour will require consideration of information from both Auckland and Northland regions. To date no information has been obtained from Northland Regional Council.

2 Social and Economic Constraints

2.1 Commercial Fishing

2.1.1 Existing Marine Farms and Applications

2.1.1.1 Ministry of Fisheries Licensed Marine Farms

Theme Name: MoF Marfarm Licence (mof_licences.shp)

Data Source: Lease boundaries from legal survey plans (SO) in Licence records.

Date: various (depending on start date of lease)

Acknowledgements/ Licenses: public information

Coverage: regional for ARC

Scale/accuracy: data captured at least at scale 1:20,000, accuracy as for survey information.

Description: MFish licensed area of oyster farm leases in Mahurangi, Waiheke, Matakana, Wairoa, Kaipara, and mussel farms on Waiheke, Waimungu Point (Firth of Thames) and Great Barrier.

Degree of Marine Farming Constraint: Absolute constraint (existing farm precludes additional development in same location).

Comments Questions & Discussion:

- Marine Farming activities were licensed under the Marine Farming Act 1971 by Ministry of Fisheries prior to enactment of the RMA. Oyster farm leases in Mahurangi, Matakana, Waiheke, Kaipara, Wairoa, and mussel farms on Waiheke, Great Barrier and Waimungu point are shown.
- Note that the degree of development of the lease is not shown and marine farms may be fully utilised through to not developed or dilapidated. (eg the abandoned oyster lease at the top of Bon Accord harbour, Kawau).
 - Note that while existing legal MFish licensed areas have been included in the proposed AMA areas, lapsed licensed areas have not.
 - Note also that in some licensed areas farming is no longer practical in all parts due to siltation (eg several leases at Waiheke and Mahurangi). This effect can be explained in a number of ways. Originally selected sites may have been too high on the intertidal. Marine farming activity may have increased the rate of sedimentation below and beside the oyster rack structures. Siltation may be occurring within the large parts of the estuary due to sediment discharges from the catchment or redistribution of sediment already present. Significant siltation is known to be occurring in many estuaries (eg Mahurangi). However, clarification of the causes of siltation are likely to require case specific studies and are also likely to involve a combination of the above explanations. In several instances marine farmers have indicated a desire to give up landward sections of their existing leases in exchange for equivalent contiguous seaward areas.

- Note also that comparison of leased area plans with actual farm boundaries shown in geospatially referenced aerial photos shows that various farms may extend well beyond their licensed areas. The governments proposed RMA amendment is understood to require that all current licensed areas be deemed coastal permits and be included as AMAs in coastal plans. However, marine farming activity outside of licensed areas would not be covered by the deemed coastal permit and will not be considered as a proposed AMA unless it falls within an area thought to be appropriate for seaward shift or farm expansion.
- Should AMAs be preferentially located in places with existing marine farms (as per PRP:C policy on marina development. That is, keep 'compromised' areas localised where they already exist, and avoid their widespread distribution)?
 - This may be inappropriate where additional farming activity will increase conflict (eg; with safe navigation, where ecologically sustainable levels of phytoplankton depletion are likely to be exceeded, or where a very conservation status has been identified such as in Te Matuku Bay, Waiheke).
 - However, the principle is in keeping with apparent central government AMA philosophy (keep marine farming in defined areas rather than spread out over the region). Such grouping also has other potential benefits (eg; if associated infrastructure, such as wharves, roading, truck movements, processing factories, etc, are in groups rather than dispersed).
 - One primary determinant appears to be the degree to which existing marine farm sites would meet current zero based constraints assessment. If not, then expansion is unlikely to be appropriate.
 - Q: the assumption is that existing leases retain their rights at least until expiry of the current lease, even if constraints assessment identifies them as in heavily constrained area?
 - Proposed RMA amendment is understood to include 'grand fathering clauses' that require all existing legal marine farming licences be deemed coastal permits and be included as AMAs. Deemed permits are also likely to have rights of renewal. However marine farming activities assessed as inappropriate may not obtain renewed permits beyond some set timeframe.

2.1.1.2 Existing Regional Council Consented Marine Farms

Theme Name: RMA MarFarm Consents (rma_consents.shp)

Data Source: Resource consent details including SO boundary plans.

Date: 2002

Acknowledgements/ Licenses: public information

Coverage: regional for ARC

Scale/accuracy: Data captured at least at 1:50,000, accuracy undefined

Description: Marine Farming activities with existing resource consents granted by the ARC under the RMA. Limited to two mussel farms In Port Fitzroy area on Great Barrier Island.

Degree of Marine Farming Constraint: Absolute constraint (as per MFish licensed marine farms above)

Comments Questions & Discussion: see MFish licensed marine farms above

2.1.1.3 Marine_Farm_Boundary_Coromandel.shp

Theme Name: Marine_Farm_Boundary_Coromandel.shp

Data Source: The dataset has been compiled from survey data held by LINZ at the Hamilton Regional Office.

Date: Jan 2002

Acknowledgements/ Licenses: The dataset was created by Environment Waikato from existing LINZ survey information. As an Environment Waikato dataset, the following disclaimer applies;

DISCLAIMER: While Environment Waikato has exercised all reasonable skill and care in controlling the contents of this information, Environment Waikato accepts no liability in contract, tort or otherwise howsoever, for any loss, damage, injury or expense (whether direct, indirect or consequential) arising out of the provision of this information or its use by you.

Coverage: EW region east coast

Scale/accuracy: +/- 0.5 to 5m (100% accurate w.r.t. source)

Description: Marine Farming activities with existing consents operating within the EW east coast region. The Coromandel Marine Farms (mussels) are located on the Coromandel Peninsula from Waikawau in the south on the west coast to Port Charles at the top and down to Whitianga on the east coast.

Degree of Marine Farming Constraint: Absolute constraint (as per MFish licensed marine farms above)

Comments Questions & Discussion: see MFish licensed marine farms above

2.1.1.4 Applications for Regional Council Consent for Marine Farms

Theme Name: RMA MarFarm Applications (applications_shp)

Data Source: Resource Consent application details.

Date: 2000/01 and 2002

Acknowledgements/ Licenses: public information

Coverage: regional for ARC and including EW east coast applications.

Scale/accuracy: Data captured at least at 1:20,000, accuracy undefined.

Description: Applications to ARC and EW for marine farming and spat catching consents.

Degree of Marine Farming Constraint: Low or none depending upon the level to which the application processing has proceeded.

Comments Questions & Discussion:

- Applications received by ARC & EW for marine farming (and spat catching) activities are shown. This includes a series of mussel and one oyster farming applications in the Kaipara Harbour, mussel farming applications in and in Fitzroy Great Barrier, along with a large area of 'spat catching' applications in the Firth of Thames and several in Wairoa/ Pakihi Island area.

- Note the very much larger size of the spat catching areas applied for (eg in the Firth of Thames) compared to conventional marine farming leases in Mahurangi, Coromandel and Great Barrier.
- Q: Confirm level of constraint of different application types and status levels?
 - Confirmed.
 - Note that 'low to no' constraint means that the applications do not in themselves pose a significant impediment to an area being considered for AMA status.
 - One Kaipara Harbour application and one Great Barrier application were not caught by the moratorium, have been heard and the decisions are currently under appeal. Through agreement between the applicant and the ARC one substantial spat farming application in the Firth of Thames (FoT) not caught by the moratorium is on hold while detailed FoT studies proceed. Other application have been caught by the moratorium and are also on hold
- Q: Consider degree to which current applications identify an area of high industry interest for future marine farming ventures?
 - Discussions with industry have confirmed that the existence of a large number of applications in an area like the Firth of Thames clearly indicates a high level of industry interest in future marine farming within the area.

2.1.2 Commercial Fishing Activities

Information relevant to the spatial scale and intensity of commercial customary and recreational fishing activities in the study area has been sought from MFish. Similarly, information was sought on the location and spatial extent of areas important to sensitive or vulnerable life cycle stages of target fish species.

Unfortunately information on recreational fishing effort is very limited and customary fishing even more so. Commercial fishing activity is well monitored but only limited information is available in a format compatible with the constraint mapping procedure. Fishing return information for various quota managed species is collected. However, only some of the larger fishing activities are required to provide locational information more closely defined than simply nominating which of the broad quota management areas (QMA) their catch came from. This QMA information is adequate for MFish to sustainably manage harvesting of fish stocks (the basic management unit of concern for the quota management system (QMS)). However it is of limited use in determining the suitability of localised activities like the position and scale of potential AMAs. Even where detailed locational data does exist (eg for trawl fishing), information has not been analysed and summarised in a way that would make it suitable for inclusion in the constraints mapping analysis. (eg generating isobars of average relative fishing effort, intensity or catch). In instances where localised fisheries management issues require resolution MFish generally rely on public consultation processes to obtain detailed local information on fishing activities. This information is case specific, may be

somewhat subjective, and is not available on the super-regional scale of the constraints assessment.

Areas subject to commercial fishing restrictions have been included as they provide some broad scale information. In addition MFish officers subjectively identified the approximate location and scale of greatest commercial (and some recreational) fishing activity based on best professional judgement in order to ensure that this important suite of potential constraints was not completely missed from the stage 1 analysis. It is clear that the availability of more objective and detailed information on fishing activity across the study area is currently a significant knowledge gap of social (including Maori), economic, and ecological importance.

Central government has indicated that the proposed RMA aquaculture amendment will require an MFish decision on whether any proposed AMA is likely to have 'undue adverse effects' on access to fisheries. AMAs can not proceed if undue adverse effects are considered likely upon customary or recreational fishers, or if commercial fishers can not resolve effects through negotiation with potential marine farmers. The current information gap and requirement to rely on local consultation for detailed fishery information hampers attempts at broad scale constraints assessment that aims to reduce or avoid the delay, cost, and litigation associated with submissions, hearings, appeals, etc. Ideally such broad scale assessment would result in the early identification of potential AMA locations where fishery conflict issues are not likely to cause undue adverse effects. The lack of comprehensive fisheries information suitable for inclusion in the stage 1 analysis will have to either be addressed as part of stage 2 study area analysis, as part of an MFish undue effects analysis, or during the process of hearing submissions required for the proposed AMA variation to the RP:C.

Information on areas important for sensitive or vulnerable life cycle stages of important harvested fish species is available in various forms (eg MFish/NIWA survey data for plankton, fish eggs, larvae, spawning activities etc). Unfortunately much of this information has also yet to be summarised and presented in a form compatible with the constraints mapping procedure. It was considered inappropriate for ARC officers to try to summarise this specialised fisheries technical information. NIWA have indicated that if contracted they could provide relevant summarised information, but not within the stage 1 timeframe. As for fishery activities discussed above the relevance of these possible constraints to any proposed AMAs will have to be addressed either during stage 2 analysis, possibly as part of an MFish undue adverse effects assessment, or during the variation hearing process.

Potential conflict between marine farming and fishing activities includes both immediately obvious and more subtle components. Obvious constraints include interference with navigation and safety of fishing craft along with occupation of fishing space by marine farming structures. Less obvious but still generally localised to the area of marine farming is the potential modification of habitat caused by marine farm structures slowing water movement and shading the surroundings, and depositing shell and

pseudofaeces onto the substrate. More subtle potential effects on comparatively distant habitat may be caused by removal of food (phytoplankton and zooplankton) from the water column with flow-on effects on downstream consumers. It is also considered likely¹ that mussels at least are able to remove fish eggs and potentially yolk-sack larvae from the plankton. The potential flow-on effects, for example to the lucrative snapper fishery, of establishment of significantly increased marine farming activities in the Hauraki Gulf is currently not well understood.

It should also be noted that marine farming activities can have a localised beneficial effect upon various fisheries. For example the presence of mussel long lines over a soft substrate can provide substantial additional habitat, species diversity, abundance and biomass available to feeding fish. Marine farmers report substantial losses of small mussels to snapper. The structures may also provide a temporary refuge area for smaller fish, which tends to attract larger predatory species. To this extent marine farms may act in a similar way to shallow water fish aggregation devices. The existence of a marine farm does not preclude access for certain types of fishing and some fishers are known to target mussel farms as preferred fishing spots.

2.1.2.1 Commercial Fishery Prohibitions

Theme Name: Commercial Fishing Prohibitions

(Fish_Commercial_Prohibitions.shp)

Data Source: MFish, fisheries management legislation, gazetted notices etc.

Date: ~2000

Acknowledgements/ Licenses: MFish, public information.

Coverage: coverage includes the study area.

Scale/accuracy: Captured at ~1:50,000. MFish yet to confirm detailed accuracy of area boundaries (ie exact notified Lat/Long coordinates were not used to define all boundaries.)

Description: Areas where various commercial and non-commercial fishing activities are prohibited. Fishing activities included are set netting, scallop fishing, trawling, Danish seining, pair trawling, and various netting methods.

Degree of Marine Farming Constraint: Not applicable.

Comments Questions & Discussion:

- Information presented in this layer defines the areas where various types of fishing activity may be carried out. The primary means of managing fishing activities in these areas is through application of the quota management system (QMS). The QMS aims to provide for sustainable fishing by only allocating fishable quotas within a stock area up to the estimated maximum sustainable yield. Allocated quota is a tradable property right and is of great value. Management of conflict between various fishers is controlled by application of restriction/prohibition zones. However, the

¹ ARC TP 182 EW TR 2002/09 'Factors related to the sustainability of shellfish aquaculture operations in the Firth of Thames: a preliminary analysis.' N Broekhuizen, J Zeldis, SA Stephens, JW Oldman, AH Ross, J Ren, MR James. February 2002. NIWA report for ARC and EW.

QMS does not restrict commercial fishing activities within the permitted fishing areas, so establishment of AMAs within these areas has the potential to restrict fishers from catching their allocated quota. It should be noted that the different fisheries have different levels of usage of the areas within which they are permitted to take their quota. For example, given the almost ubiquitous distribution of some target species, trawling activities can be carried out almost anywhere where the water depth is suitable. In comparison set netting activity for yellow-bellied flounder is limited to shallow estuarine waters close to the coast because of the generally localised distribution of this species.

- Q: To what extent should the 'permitted fishing' areas (areas outside of where the various prohibitions apply for any specific fishing method) be considered to represent the area of constraint to future marine farming?
 - This suggestion was found to be impractical for constraint mapping purposes, as the resulting 'permitted fishing' areas were very large. Their relevance was difficult to interpret (eg lack of prohibition does not necessarily mean that a fishing method can realistically be applied or is practical).
- Q: how should the difference in the degree of constraint for different fishing methods be recognised?
 - Stage 1 analysis has not attempted to analyse the degree of constraint beyond absolute and critical distinctions.

2.1.2.3 Shellfish Fishery:

Theme Name: Shellfish Fishery (Fish_Shellfish.shp)

Data Source: MFish subjective assessment.

Date: 20002

Acknowledgements/ Licenses: MFish

Coverage: Focuses on the Auckland region and is incomplete for the EW region of the study area.

Scale/accuracy: Subjective MFish assessment captured at ~1:50,000.

Description: Known key areas where commercial, recreational, and customary fishing for oysters, scallop, cockle and mussels is carried out. Information is subjective (apart from scallop fishery commercial/recreational areas) and may be incomplete. Boundaries are subjective and provided for stage 1 discussion purposes only.

Degree of Marine Farming Constraint: Critical

Comments Questions & Discussion:

- Information presented in this layer subjectively identifies key areas where various shellfish fishing activity is carried out. Attempts have been made by MFish staff to draw subjective boundaries around the key areas of major resource usage. Scallop fishing information includes several localised areas identified by Fisheries regulations as prohibited to commercial use. Customary shellfish gathering information is limited to Whatapaka estuary which is also identified as a customary fishery area by the RP:C.
- GIS information can also be viewed by method or target species.
- A critical constraint rating is suggested as these are highly valued areas of limited distribution where significant marine farming activity would conflict

heavily with access to the valued resource as well as potentially negatively impact on the benthic habitat of the shellfish.

2.1.2.4 Rock Lobster:

Theme Name: Rock Lobster Fishery (Fish_rocklobster.shp)

Data Source: MFish subjective assessment.

Date: 20002

Acknowledgements/ Licenses: MFish

Coverage: focuses on the Auckland region and is incomplete for the EW region of the study area.

Scale/accuracy: Subjective MFish assessment captured at ~1:50,000.

Description: Known key areas where commercial and recreational rock lobster fishing is carried out (primarily cray-pot fishing).

Information is subjective and may be incomplete. Boundaries are subjective and provided for discussion purposes only.

Degree of Marine Farming Constraint: Critical

Comments Questions & Discussion:

- Information presented in this layer subjectively identifies key areas where rock lobster (crayfish) fishing is carried out. The focus appears to be on cray-potting as opposed to scuba diving collection of rock lobster. Attempts have been made by MFish staff to draw subjective boundaries around the known major areas of major resource usage.
- GIS information can also be viewed by method.
- A critical constraint rating is suggested as these are highly valued areas of limited distribution where significant marine farming activity would conflict heavily with the fishing activity and would potentially compromise the habitat.

2.1.2.5 Commercial Finfish Fishery :

Theme Name: Commercial Finfish (Fish_Finfish_Commercial.shp)

Data Source: MFish subjective assessment.

Date: 20002

Acknowledgements/ Licenses: MFish

Coverage: focuses on the Auckland region and is incomplete for the EW region of the study area.

Scale/accuracy: Subjective MFish assessment captured at ~1:50,000.

Description: Known areas where commercial line fishing, set netting, Danish seining, and trawling for various species of finfish is carried out.

Where possible, attempts have been made to identify the key areas for the various fisheries. Information is subjective and may be incomplete. Boundaries are subjective and provided for discussion purposes only.

Degree of Marine Farming Constraint: Critical

Comments Questions & Discussion:

- Information presented in this layer subjectively identifies areas where various commercial finfish fishing activities are carried out. Attempts have been made by MFish staff to draw subjective boundaries around the key areas of major resource usage. Major finfish species covered by the

identified fisheries includes snapper, trevally, kahawai, grey mullet, yellow belly flounder, yellow eyed mullet, king fish, dogfish, and eels.

- GIS information is also viewable by method and target species.
- A critical constraint rating is suggested, as these are highly valued areas where significant marine farming activity would conflict heavily with access to the fished resource. Marine farms also have the potential to compromise the habitat important to adult feeding, spawning, and to eggs, fry and juvenile fish.

2.1.2.6 Non-commercial Finfish:

Theme Name: Non-commercial Finfish

(Fish_Finfish_noncommercial.shp)

Data Source: MFish subjective assessment.

Date: 20002

Acknowledgements/ Licenses: MFish

Coverage: focuses on the Auckland region and is incomplete for the EW region of the study area.

Scale/accuracy: Subjective MFish assessment captured at ~1:50,000.

Description: Known areas where recreational and customary fishing for various finfish is carried out. Information is subjective and may be incomplete. Boundaries are subjective and provided for discussion purposes only.

Degree of Marine Farming Constraint: Critical

Comments Questions & Discussion:

- Information presented in this layer subjectively identifies areas where various recreational and customary finfish fishing activities are carried out. Attempts have been made by MFish staff to draw subjective boundaries around the key areas of major resource usage. Identified customary finfishing activity is limited to Pukaki- Waiokauri estuary which is also identified as a customary fishery area by the RP:C.
- GIS information is also viewable by method and target species. Methods covered include surfcasting, kite fishing, lining, and netting.
- A critical constraint rating is suggested, as these are highly valued areas where significant marine farming activity would conflict heavily with access to the resource. Marine farming also has the potential to compromise the habitat where adults and juveniles are found.

2.2 Resource Consented Activities

2.2.1 Marine Farming (see 2.1.1 above)

2.2.2 Sand Dredging/ Mining

Continued cost-effective access to sand resources is important to support construction and development in the region. Sand is primarily used in the manufacture of concrete. ARC has granted a number of resource consents for the extraction of subtidal sand resources in the Kaipara Harbour and off Pakiri beach.

Theme Name: Sand Dredging

(Sand_dredging.shp)

Data Source: ARC Resource Consent details.

Date: 2002

Acknowledgements/ Licenses: public information

Coverage: Regional ARC

Scale/accuracy: Captured at 1:50000. Kaipara and Pakiri consented sand extraction areas and application/ appeal areas. Data sourced from NIWA, Winstone Aggregates Ltd. and Mt Rex Shipping. Approximate location for larger application areas off Pakiri pending confirmation once consent process is complete.

Description: Kaipara and Pakiri consented sand extraction areas and application/ appeal areas.

Degree of Marine Farming Constraint: Critical for consented areas, low for appeal area.

Comments Questions & Discussion:

- Subtidal sand mining (dredging) does not require the permanent occupation of space by the dredge barges. However the location of marine farming activities in consented extraction areas would interfere with the ability of the dredges to operate and may 'lock away' the resource area below any anchored farm structures.
- Situation is somewhat analogous to the extent of competition with various fishing activities potentially imposed by establishment of new marine farming activities. Competition may be resolvable through negotiation if the dredging (or fishing) resource is spread across a large area and if marine farms would only disrupt access to a comparatively small portion.
- Q: what is appropriate degree of constraint for consented extraction activities and for applications (absolute, critical, low)?
 - Sand extraction activities are legally entitled to operate within consented areas. However it is possible that, through negotiation, marine farming activities and sand extraction might be able to work around each other to some extent. Consent sand extraction areas were treated as absolute constraints and application areas as critical constraints in stage 1. No certainty can be attributed to areas of application or those under appeal, so these have been treated as low constraint.

2.2.3 Structures

There are a great number of consented coastal structures. Most are comparatively small and occupy areas close to the shore. They include seawalls, bridge piles, stormwater outfalls, small wharves and jetties, boat ramps and boat houses, etc. It is considered that the constraint upon marine farming afforded by these consented coastal structures is adequately covered by coastal buffer offsets established for recreational, visual amenity, or water quality reasons. The locations of all ARC consented coastal structures is accessible to GIS so this information could be used in the second more detailed stage of AMA assessment if considered appropriate.

Exceptions to the general position given above include structures in marinas, port, airport and defence management areas, marine farms, and subtidal sewage outfalls that are all captured and discussed elsewhere in this report.

Discussion above considers existing structures that may constrain development of new marine farms either directly (physical presence of the structure) or because of activities necessarily associated with the function a structure (eg public boat ramps or port structures with their associated requirements for access and possibly open water space). It is also important to recognise that marine farming activities may require a range of coastal structures to operate. The marine farms themselves are structures that occupy space in the CMA. Infrastructure associated with marine farm operation also potentially requires structures extending into the CMA such as wharves, jetties, boat ramps, water intakes, holding or depuration ponds, etc.

2.3 Recreation

2.3.1 General Coastal Recreation

2.3.1.1 Popular Beaches

Auckland and Waikato beaches have icon status and the most popular can be considered of national importance due to the number of visitors each year (eg Long Bay >1 million visitors annually). Public surveys of key environmental issues regularly rate continued unimpeded access to unpolluted and ecologically healthy beaches amongst the region's highest priorities. Establishment of marine farms on or near to popular beaches could detract from their passive and active recreational value, interfere with recreational activities such as swimming and small craft use, generally impede access, alter local physical conditions leading to habitat change, and affect local ecology.

The location of popular beaches does not in itself define the spatial extent of potential constraint for marine farming. Stage 1 assessment uses the location of popular recreational coastal areas to identify sections of coastline where an indicative coastal offset buffer of ~500m is applied (see 2.3.1.4). The adequacy of the dimension of the coastal buffer to protect relevant uses and values is unconfirmed. The proposed 500m was based on advice from ARC's Maritime Operations (MarOps) section who consider that this would

encompass the area of sea where most recreational activities associated with beach activity is concentrated. This includes swimming/ bathing (generally <200m from shore), and localised use of small recreational craft such as canoes, jet skis, windsurfers, etc. A number of other small craft activities, including those operating further from the shore, are considered likely to have been adequately covered by recreational boating constraint themes (see 2.4.4).

It is recognised that the selection of a 500m coastal buffer is somewhat arbitrary, however, it is considered important to include at least some representation of this important constraint in the Stage 1 assessment. The dimension of this offset buffer is likely to remain somewhat subjective (However see NSC assessment of recreational boating activities offshore from East Coast Bays in the Rosedale STP outfall vicinity). Consultation is likely to be required to more accurately identify the spatial extent of this constraint in any localised area.

Note that the coastal offset buffer for recreational activities is different from that proposed for visual amenity (see 2.5). The general coastal recreation buffer is intended to represent the area of sea where the existence of marine farming activities would greatly interfere with relevant active recreational activities. In contrast the proposed coastal offset for visual amenity deals with passive amenity values (eg landscape). These two constraints may coexist and overlap for a given section of coast.

2.3.1.2 Other Popular Coastlines

Coastlines other than beaches are also popular for recreational pursuits that may be impacted by marine farming activities. Such activities include fishing off the rocks. Stage 1 assesses the spatial extent of marine farming constraint associated with these activities by generally including in the coverage of the general recreational coastal buffer. The buffer extends offshore from identified popular recreational areas including beaches and other coastal activities. Continued analysis of stage 2 areas would identify any areas overlooked in stage 1.

2.3.1.3 Proximity to DoC, Regional, City, or District Coastal Reserve or Park.

Coastal areas designated as reserves or parks can be considered candidates for assessment as popular coastal recreational areas. The proximity to such land uses was used as another factor helping to determine the extent of coast where the general coastal recreation buffer should apply. GIS themes showing the location of these parks and reserves have been included in the project (See 3.2 below).

2.3.1.4 General Coastal Recreation Buffer.

Discussion above under 2.3.1.1 to 2.3.1.3 should be considered in conjunction with this subsection.

Theme Name: Highuse_Buff500.shp

Data Source: ARC constructed coastal 500m offset from DCDB coastline

Date: 2002

Acknowledgements/ Licenses: none

Coverage: ARC region

Scale/accuracy: 500m offset is accurate (at ~1:10,000) from DCDB coastline but the spatial extent of this constraint is subjective and indicative.

Description: Constraint area associated with active coastal recreational activities in popular areas.

Degree of Marine Farming Constraint: Critical constraint

Comments Questions & Discussion:

- The degree of constraint on future marine farming imposed by the presence of active recreational activities is arguably either absolute or critical. The degree of constraint could reasonably be considered absolute if the buffer is only run along coastlines of the highest priority for recreational pursuits. The regional importance of areas such as popular beaches for recreation essentially removes any discretionary element (they will never be considered unimportant for recreational pursuits). Conversely, if a broader range of recreational importance was used to determine where the buffer should go (eg including regionally significant and only locally important areas) the average degree of constraint becomes more debateable and be better represented as critical rather than absolute.
 - Stage 1 assessment considers the constraint of the general recreational coastal buffer as critical. More detailed analysis would be carried to better define this constraint in stage 2 study areas if required.

2.3.2 Recreational Boating (see 2.4.4)

2.3.3 Recreational fishing

As discussed in section 2.1.2 above, information on the scale and intensity of recreational fishing activity in the study area is limited and subjective. Section 2.1.2.3 includes information on recreational shellfishing activities, section 2.1.2.4 on recreational rock lobster fishing, and 2.1.2.6 on recreational finishing activities.

2.4 Navigation and Safety

Navigation and safety issues potentially constrain future marine farming in a number of ways. Marine farming activities are expected to continue to involve the use of structures of some kind. These range from emergent rigid structures fixed to the seabed such as intertidal oyster racks, to more flexible and substantially subtidal structures anchored to the seabed such as mussel lines, fish cages, and so on. Installation of such structures in previously open areas of CMA affects public access within and through the area. Provision of adequate notification of the presence of consented marine farming structures (eg Gazetted notices and marine chart demarcation), along with provision of appropriate visual and radar warning markers, is also a navigation and safety

issue. Consideration of this issue provides a good example of the often conflicting consequences of attempting to satisfy competing constraint requirements. Increased visibility of marine farming structures to satisfy navigation and safety requirements adversely affects the level of impact marine farms have on natural character and visual amenity value of coastal areas. In fact, the necessary high visibility of effective navigational warning lights and markers on offshore mussel farms may also be their most visually obtrusive elements and have greatest impact upon landscape value.

2.4.1 Prohibited Anchorage Areas

Theme Name: Prohibited Anchorages (Anchor.shp)

Data Source: ARC's PRP:C, original data source from the regional coastal plan.

Date: PRP:C Sept 1999 version

Acknowledgements/ Licenses: ARC

Coverage: ARC region

Scale/accuracy: 1:10,000

Description: Areas where anchoring is prohibited due to the presence of a range of activities that could be disrupted by anchoring, or where anchoring is likely to pose significant navigational and safety problems. Areas enclosed may contain; telecommunication cables, electrical supply cables, main shipping channels, explosives transfer areas, airport exclusion area, etc.

Degree of Marine Farming Constraint: Absolute constraint

Comments Questions & Discussion:

- Prohibited Anchorage areas have been identified as areas where the presence of stationary vessels, or anchoring by such vessels, poses a significant risk to important infrastructure, significantly interferes with safe navigation, or poses a safety risk for ships or other activities taking place in the area. Location of future marine farms in these areas is clearly not appropriate.
- Q: is it sufficient to simply block out the no-anchorage zones or should we look to include a safety buffer around the prohibited anchorage areas?
 - Stage 1 assessment assumes that the designated prohibited anchorage areas have already incorporated sufficient buffer distances around key infrastructure etc to protect the relevant uses and values.

Theme Name: Airport Management Areas (Airmang.shp)

Data Source: ARC's PRP:C Sept 1999 Version.

Date: 1999

Acknowledgements/ Licenses: ARC, public information

Coverage: ARC region

Scale/accuracy: 1:10,000

Description: Areas identified in the PRP:C which are specifically managed for the purposes of ensuring public safety requirements for airport operations and for shipping are not compromised.

Degree of Marine Farming Constraint: Absolute constraint

Comments Questions & Discussion:

- Marine farming in the safety exclusion area would compromise the concerns fundamental to its establishment.
- Area has been combined with other prohibited anchorage and other absolute constraints during stage 1 assessment.

2.4.2 Naval Activities

2.4.2.1 HMNZ Devonport Naval Base.

Theme Name: Defence management areas (Defense_manage.shp)

Data Source: PRP:C Sept 1999 version and notified area boundaries.

Date: 1999

Acknowledgements/ Licenses: ARC, public information

Coverage: ARC region

Scale/accuracy: 1:10,000

Description: Areas identified in the PRP:C specifically for the management of Defence activities, encompassing an area of sea around the Devonport Naval Base.

Degree of Marine Farming Constraint: Absolute constraint

Comments Questions & Discussion:

- Note some areas important to Naval activity may also be included as prohibited anchorage areas (see 2.4.1 eg Whagaparaoa degaussing area)

2.4.2.2 Defence Exercise Areas

Theme Name: Defence Exercise Areas (Def_poly_15702.shp)

Data Source: PRP:C Sept 1999 version.

Date: 1999

Acknowledgements/ Licenses: ARC, public information.

Coverage: ARC region

Scale/accuracy: 1:10,000

Description: Areas identified as where defence exercises may be carried out.

Degree of Marine Farming Constraint: Absolute

Comments Questions & Discussion:

- The degree of constraint upon future marine farming activities imposed by the existence of defence exercise areas has yet to be verified. Some identified areas may carry significant safety concerns (eg bombing practice area at South Kaipara Head). However the exercise areas occupy large sea spaces and exercises may conceivably still be able to operate satisfactorily and safely if marine farming occupied parts of the identified zone.
- Q: verify the degree of constraint imposed by defence exercise areas and if all exercise areas carry the same degree of constraint?
 - New Zealand Defence Force has advised ARC that it considers all notified exercise areas to be absolutely constrained with regards to future marine farming activities. Reasons include the requirement for continued free and safe navigational access to exercise areas, and the potential use of live ammunition and explosives in these areas.
 - Note that the first draft map series made available on CDs in February 2002 only showed the outline of the exercise areas.

Revised maps show both the updated exercise areas as per their definitions in the Notice to Mariners Gazette 2002 and indicate their absolute constraint status.

2.4.2.3 Explosives Dumping Ground

The Maritime Safety Authority operates an east coast deep water marine disposal site for dredged material at the Auckland Explosives Dumping Ground southeast of Cuvier Island. However, this is beyond the regional boundary (territorial sea) and outside of the study area.

2.4.3 Commercial Shipping

2.4.3.1 Port Management Areas

Theme Name: Port Management Areas (Port_manage.shp)

Data Source: PRP:C Sept 1999 version.

Date: 1999

Acknowledgements/ Licenses: ARC, public information

Coverage: ARC region

Scale/accuracy: 1:10,000

Description: Areas identified in the PRP:C specifically for the management of port activities, encompassing an area of sea around main ports of Auckland and Onehunga.

Degree of Marine Farming Constraint: Absolute constraint

Comments Questions & Discussion:

- The management areas have been established through a statutory process involving significant public consultation. Unless under appeal or variation, the established boundaries can therefore be considered fixed for the duration of the Plan even though the PRP:C has yet to become operational.
- Port operational activities require unrestricted access for shipping access. Location of marine farms in the management area would be contrary to the fundamental rationale for its existence.

2.4.3.2 Main Commercial Vessel Routes

Theme Name: Commercial Ship Route (Shipping.shp)

Data Source: Marine Charts, Admiralty Sailing Directions, ARC Harbour Master.

Date: 2002

Acknowledgements/ Licenses: ARC, public information

Coverage: ARC region

Scale/accuracy: Indicative and approximate centreline taken from navigational charts where possible. Accuracy increases as navigational discretion decreases (eg accurate to ~+/- 10m in well defined port approaches).

Description: Approximate centreline of main shipping routes for commercial ships entering and exiting main and secondary ports of Auckland region.

Degree of Marine Farming Constraint: Absolute constraint in navigational bottle-neck areas (eg port approaches and narrow channel)

areas. Generally well marked on marine charts), critical constraint in areas where the exact route is less prescribed.

Comments Questions & Discussion:

- Routes within harbour limits are taken from navigational markers on marine charts and should be accurate. The main routes currently shown through the Hauraki Gulf beyond the harbour limits are based on ARC Harbour Master advice, the location of channels and water depth from marine charts, on MSA coastal routing guide and on the NZ Pilot.
- Note that some of the routes have not received detailed verification by checking against the NZ Pilot (eg the exit from the Manukau Harbour). However they are considered to be adequately representative for stage 1 analysis.
- Information used in stage 1 analysis is not intended to be used for navigational purposes.
- Note that inside harbour limits and pilotage areas ship movement is more strictly controlled than in areas further offshore. However, in the more open areas ships still hold to very similar routes that follow deep water, recognised sound navigational advice from the New Zealand Pilot, and comply with MSA's voluntary coastal routing code while still providing the most direct and cost-effective pathway.

Theme Name: Commercial Ship Buffer

(Shipping_buff_in.shp and Shipping_buff_out.shp)

Data Source: Marine Charts, Admiralty Sailing Directions, ARC Harbour Master

Date: 2002

Acknowledgements/ Licenses: ARC, public information

Coverage: ARC region

Scale/accuracy: Buffer is navigational area indicated by location of navigational markers given on marine charts in harbours and port approaches. Beyond these areas where the route is not so prescribed the buffer has been set at 1.5 nautical miles either side of the commercial ship route centreline discussed above.

Description: Navigational area required for continued safe passage by large commercial ships

Degree of Marine Farming Constraint: Absolute constraint in navigational bottle-neck areas (eg port approaches and narrow channel areas which are generally well marked on marine charts), critical constraint in areas where the exact route is less prescribed.

Comments Questions & Discussion:

- Q: is the proposed 3 nautical mile wide buffer around the shipping route centreline an appropriate buffer offset for marine farms?
 - Confirmed as appropriate by MSA.
- Q: Are the risks of marine farms and shipping to each other limited to navigational and safety issues or are discharges of sewage, bilge waters, oil spill, etc also a significant contamination risk to marine farm location?
 - Stage 1 assessment makes no allowance (outside of providing a navigational buffer zone) for any illegal discharges from ships. International conventions (MARPOL), and national legislation (Maritime Transport Act 1994, Resource Management Act 1991)

control such discharges restricting where, or if, such discharges are legal and the level of treatment required. Discharges of sewage from ships is discussed further in section 2.7.1 below

2.4.3.3 Navigational Aids.

Theme name: Various chart numbers (NZ533, NZ4314, NZ534, NZ532, NZ531, NZ4265, NZ52, NZ43).

Data Source: LINZ Hydrographical information (www.hydro.linz.govt.nz/charts/.tif format)

Date: Various.

Acknowledgements/ Licenses: LINZ, Hydrographers Office.

Coverage: ARC & EW regions

Scale/accuracy: As per marine charts.

Description: Geospatially referenced marine chart images

Degree of Marine Farming Constraint: partial or no constraint (navigational markers can be located within marine farms, and MSA requires navigational markers at farm boundaries for navigational safety reasons).

Comments Questions & Discussion:

- Digitised marine charts have been downloaded from the LINZ website and geospatially referenced and are used in GIS to aid analysis. Charts have not been included in the map series because of scale issues but have proved invaluable for accurate location of many navigation and safety themes.

2.4.3.4 Passenger Ferry Routes

Theme Name: Draft Ferry Routes (Ferry_routes.shp)

Data Source: ARC Transport Strategy.

Date: 1999

Acknowledgements/ Licenses: Public information

Coverage: ARC region.

Scale/accuracy: Indicative or representative ferry routes from specific departure and destination locations. Not intended to be an accurate presentation of navigational pathways.

Description: Subjective representative commercial passenger and vehicle ferry transport routes.

Degree of Marine Farming Constraint: Critical constraint presented in a representative and diagrammatic way.

Comments Questions & Discussion:

- Obtain accurate ferry route information if relevant to stage 2 assessments.

2.4.4 Recreational Boating

2.4.4.1 Yacht and Launch main Cruise Routes

Theme Name: Recreational Cruise Routes (Cruise_routes_polygon.shp)

Data Source: Richard Brown of AYBA.

Date: 2002

Acknowledgements/ Licenses: AYBA

Coverage: Study area

Scale/accuracy: Subjective and indicative captured at ~ 1 :50,000

Description: Representative main routes for cruising pleasure craft between main departure and destination points.

Degree of Marine Farming Constraint: Critical constraint but presented in a subjective and diagrammatic manner.

Comments Questions & Discussion:

- Recreational boating activity is a distinguishing feature of Auckland and the Hauraki Gulf. Yacht and launch traffic falls into predictable patterns. The bulk of vessels leave from common departure areas (eg marinas) and travel to popular destinations such as the Gulf Islands. In general cruising vessels take the shortest route between departure area and destination (wind, waves, and tide permitting). This theme represents the main navigational pathways taken by these vessels.
- Information presented in this theme is representative of major routes rather than attempting to accurately capture all details. The intention is to ensure that Stage 1 assessment includes provision for retention of safe passage along key navigational pathways. In addition Stage 1 should distinguish areas where the density of cruise routes is high from areas with lower density.
- Marine farming activity has potential to impede safe passage along cruise routes.
- It should also be recognised that outside of vessel traffic bottle neck areas (eg narrow channels, approaches to marina or mooring areas, etc) safe passage of recreational craft is not restricted to one narrowly defined route. This has potential to both increase and decrease the degree to which the theme adequately represents the spatial scale of constraint for marine farming activity. Cruising vessels, particularly tacking yachts, may require a considerable passage area (the location of which changes with weather and sea conditions). This increases the area of potential conflict between craft and marine farming. However, cruising vessels are able to change their path and navigate around dangerous areas such as rocks, reefs, and marine farms. This decreases potential conflict in that cruising routes are flexible and not spatially fixed.
- Stage 1 assessment takes the position that cruise routes are critical rather than absolute constraints.
- Q: Is it appropriate to consider cruise routes to represent absolute constraint in areas of high density?
 - Unlike commercial shipping routes insufficient information was available to allow distinction between high and lower importance cruise routes in stage 1 assessment. However, analysis of absolute and critical constraints identified 'no-go' areas which include some of the more heavily trafficked cruise routes.
- Pleasure craft activity on Manukau and Kaipara Harbours does not warrant inclusion as main cruising routes at the scale of activity represented by this theme.
- Obtain accurate cruise route information where relevant to stage 2 assessment.

2.4.4.2 Popular Cruising Destinations and Anchorages

Theme Name: Yacht Anchorage Words, and Yacht Anchorage Pointer (yacht_anchorage.dwg (annotation) and yacht_anchorage.dwg (line))

Data Source: 1996 ARC Recreational Boating Surveys

Date: 1996

Acknowledgements/ Licenses: ARC, public information

Coverage: Hauraki Gulf

Scale/accuracy: Indicative only, not intended to be used as an indicator of true spatial extent.

Description: Indicative location and key information relevant to popular cruise destinations in the Hauraki Gulf. Information limited to ARC region.

Degree of Marine Farming Constraint: not applicable (see below)

Theme Name: Cruise Destinations (Cruise_destinations.shp)

Data Source: Richard Brown of AYBA, ARC Recreational Boating Surveys and MarOps

Date: 2002

Acknowledgements/ Licenses: AYBA & ARC

Coverage: Study area.

Scale/accuracy: Subjective and indicative areas captured at ~1:50,000. Not intended to be spatially accurate.

Description: Indicative areas showing the approximate location and scale of destination anchorages.

Degree of Marine Farming Constraint: Critical constraint

Comments Questions & Discussion:

- Note that currently (April 25) not all Coromandel east coast destinations/ anchorages have been included.
- Destinations such as Coromandel and Waiheke, Kawau and Great Barrier Islands are popular because of their proximity to common departure points and because they offer safe anchorage and in some cases service facilities such as fuel and food retail.
- Destination popularity changes with season and with weather conditions. Anchorage usage may vary between major destinations (eg Kawau, Mahurangi Harbour, Great Barrier Island), between locations within a major destination (eg Port Fitzroy and Tryphena on Great Barrier Island), and between anchorages within a location (eg north or south side of Tryphena) dependant upon wind and wave direction and strength. The requirement for preservation of anchorages that are safe under a range of weather conditions should be considered during Stage 2 assessment.
- The degree of constraint imposed by cruise destinations and anchorages is considered to be critical rather than absolute because selection of cruise destinations is discretionary and anchorage and marine farming are not mutually exclusive (eg Mahurangi Harbour and Port Fitzroy contain oyster and mussel farms respectively as well as being regionally significant destinations/ anchorages). However, it should also be noted that competition for space between marine farming and recreational boating activities is often an issue of significant conflict when marine farming applications are considered.

2.4.4.3 Recreational Craft High Usage Areas

Theme Name: Recreational Craft High Usage

(Cruise_high_usage.shp)

Data Source: ARC MarOps

Date: 2002

Acknowledgements/ Licenses: ARC

Coverage: ARC region.

Scale/accuracy: Subjective and broadly representative areas captured at ~1:50,000.

Description: Areas of particularly high usage by recreational craft.

Degree of Marine Farming Constraint: Critical constraint

Comments Questions & Discussion:

- Cruise routes and destinations do not satisfactorily represent the fact that a massive fleet of local ships use areas of the Hauraki Gulf for recreational activities including; day trips, fishing trips, regattas, club racing, etc. These craft may be found across a wide area of the Hauraki Gulf but greatest concentrations can be found around the Gulf Islands close to the city centres, and around the more remote key pleasure-craft destinations such as Kawau and Great Barrier Islands.
- The popularity of these areas makes preservation of safe access a critical constraint for future marine farming. The somewhat subjective nature of the areas identified, the large area of sea covered, and the fact that at this scale marine farming and recreational boating do not have to be mutually exclusive activities, means that these areas cannot be considered absolute constraints. However, they should be considered indicative of locations where opposition to new marine farming activities from the boating public is likely to be extreme.

2.4.4.4 Marinas

Theme Name: Marina Management Areas (Marina.shp)

Data Source: PRP:C Sept 1999 version (chapter 23)

Date: 1999

Acknowledgements/ Licenses: ARC, public information.

Coverage: Study area

Scale/accuracy: ~1:10000

Description: Areas identified in the ARC PRP:C specifically for the management of marina activities.

Degree of Marine Farming Constraint: Absolute constraint

Comments Questions & Discussion:

- All existing marina management areas have been established through extensive public consultation. Marina activities have received all necessary resource consents to operate. Space, water quality, and access requirements (amongst others) make marine farming and marinas mutually exclusive activities that cannot practicably be considered to co-exist in the same location.
- If necessary detailed stage 2 assessment would consider additional related constraints that might extend beyond the marina boundary (eg to provide for access, and possible water quality constraints including sewage, bilge water, and antifoulants).

2.4.4.5 Mooring Management Areas

Theme Name: Mooring Management Areas (mooring management areas.shp, Mooring_areas_Waikato.shp, mooring_areas_proposed.shp)

Data Source: ARC's PRP:C Sept 1999 Version. Chapter 24. EW RP:C

Date: 1999 and 2000

Acknowledgements/ Licenses: ARC, EW

Coverage: Study area

Scale/accuracy: ~1:10,000

Description: Areas identified in the ARC & PRP:C and in the EW RP:C which are specifically managed for the purposes of providing adequate permanent or seasonal swing and pile mooring areas for recreational and commercial ships. Additional proposed mooring areas in EW are also included.

Degree of Marine Farming Constraint: Absolute constraint (except for proposed mooring areas which are critical)

Comments Questions & Discussion:

- Mooring management areas identified in the coastal plans have been established (subject to final settlement of any appeals in ARC) through a prolonged public consultation process. These areas will remain as currently identified in the plan until the plan is varied or revised. Note in EW the proposed changes to mooring areas indicated by the 'mooring_areas_proposed.shp' information. Consequently they are considered to be absolute constraints until we receive notification of such variation or review action.
- Q: should a buffer zone be established around the mooring management sites to provide for the degree of constraint that might be associated with the requirement for boats to gain access to and from the mooring areas, and the potential for human health effects to be associated with the presence of moored boats (eg discharge of sewage and bilge water, and leaching of antifoulant paints)?
 - No additional buffer has been included around the mooring areas given the scale of stage 1 assessment. Where and if relevant this issue will be included in more detailed stage 2 assessment.

2.4.4.6 Popular Boat Ramps (Access)

Theme Name: Boat Ramps (ramps_new.shp)

Data Source: Wisers Road Maps

Date: 2000

Acknowledgements/ Licenses: Wisers Road Maps

Coverage: ARC region.

Scale/accuracy: Point not polygon data. Indicative ramps location accurate at 1:10,000

Description: Popular boat ramps primarily used by the boating public.

Degree of Marine Farming Constraint: Not applicable, intended as an interpretative aid.

Comments Questions & Discussion:

- Boat ramps are not in themselves a constraint to marine farming activities. In fact they provide an important supporting infrastructure where marine farming vessels anchor, load and unload to transport trucks, etc.

- However, the presence of a popular boat ramp indicates the likely presence of large numbers of small craft accessing through and possibly operating in the general vicinity. The potential for competition for space increases as shipping density increases.
 - Not all major boat ramps in the study area have been captured. For example the popular boat ramp at Kawakawa Bay was not included. Given the scale of stage 1 analysis this is not considered to be a critical oversight. Missing detail will be captured and included in stage 2 assessment where and if relevant.

2.4.4.7 Small Pleasure Craft High Usage Buffer

Inclusion of a 500m coastal offset buffer to account for the high usage of near-shore areas by small recreational craft (jet skis, windsurfers, canoes, etc) follows the rationale described in section 2.3.1.4.

2.4.4.8 America's Cup Race Area

Theme Name: Americas Cup Racecourse (amcupracecourse.shp)

Data Source: ARC MarOps

Date: 1999

Acknowledgements/ Licenses: ARC, public information.

Coverage: Study area.

Scale/accuracy: captured at ~1:10000, accuracy undefined.

Description: Alternative race course areas established for Americas Cup competition.

Degree of Marine Farming Constraint: Critical

Comments Questions & Discussion:

- Americas Cup race course areas have been established with public input. Their importance during race periods is indicated by the proposal to shift the main commercial shipping route southwards from its current location in order to provide better clearance from the race area (Harbour Master pers. com.). Conceivably the race course areas could be considered as areas of absolute constraint. However, the race area is likely to remain necessary only for as long as New Zealand holds the cup. In addition alternative race course locations may be available.
- Realistically, location of marine farming in America's cup race areas is unlikely because of the presence of a number of additional constraints.

2.4.4.9 Special Activity Areas

Theme Name: Special Activity Areas (Special.shp)

Data Source: ARC's PRP:C Sept 1999 Version.

Date: 1999

Acknowledgements/ Licenses: public information

Coverage: ARC region

Scale/accuracy: ~1:30000

Description: Areas identified in the PRP:C which are specifically managed for the purposes of providing for such special activities as water ski lanes.

Degree of Marine Farming Constraint: Absolute constraint

Comments Questions & Discussion:

- Special activity areas identified in the PRP:C are few and are small in size. They have been established through extensive public consultation to fulfil recognised public use and value needs. Marine farming in the small areas identified is considered incompatible with their management objectives (and given their locations would probably not be practical in any case).

2.4.4.10 Boating Club course areas

Theme Name: Yacht Courses (Yacht_course.shp)

Data Source: Richard Brown of AYBA

Date: 2002

Acknowledgements/ Licenses: AYBA

Coverage: ARC region

Scale/accuracy: Subjective course locations captured at ~1:50,000.

Description: Areas identified by the AYBA as high usage course areas by local Auckland yachting and boating clubs.

Degree of Marine Farming Constraint: Critical

Comments Questions & Discussion:

- Note, equivalent course areas (if they exist) have not been identified for the Coromandel coast.
- An area of the coast extending from within the Waitemata Harbour, out into the Rangitoto Channel and up to the coast around Whangaparaoa is identified by this theme. Regular usage is made of the indicated sections of the coast by large numbers of craft from local boating clubs for the purposes of training, practice, and racing. Craft involved include small sailing dinghies, windsurfers, canoes, medium to large yachts, and powerboats.
- As for other recreational craft high usage areas it could be argued that the public usage of these areas and the disruption that would be caused by development of marine farms within them makes them candidates for absolute constraint categorisation. However it is considered that sufficient additional overlapping constraints exist in the general area (Rangitoto Channel and Waitemata Harbour) to make it an unlikely area for future marine farming. More consideration should be given to refining the boundaries of these areas in Stage 2 assessment only if prospective AMA areas are located close by.

2.5 Visual Amenity

2.5.1 Landscape

2.5.1.1 Coastline landscape rating

Theme Name: Landscape Value (lscp567.shp)

Data Source: ARC's PRP:C Sept 1999 Version. Appendix E

Date: 1999

Acknowledgements/ Licenses: ARC, public information

Coverage: ARC region.

Scale/accuracy: ~1:10000

Description: Diagrammatic representation (as a coloured strip paralleling the coast) of result of consistently applied coastal landscape

rating methodology. Only coastal landscapes exhibiting sensitivity of regional significance or higher are included.

Degree of Marine Farming Constraint: Not applicable. The 1000m coastal buffer below (2.5.1.2) provides the degree of spatial constraint associated with areas of high landscape sensitivity.

Comments Questions & Discussion:

- The landscape assessment procedure rates the coastal environment for landscape value (see following bullet points). This in itself is not a constraint for marine farming. The constraint is related to the degree that the presence of marine farms in the coastal areas associated with the rated landscape sections would change the ratings.
- The 1000m coastal buffer below (2.5.1.2) provides the degree of spatial constraint associated with areas of high landscape sensitivity.
- Landscape sensitivity information in this theme is taken from landscape assessments published in the Auckland Regional Policy Statement (ARPS) and the PRP:C. Appendix E of the PRP:C provides detail of assessment methodology. Landscape quality and/or sensitivity were rated between 1 (low) and 7 (high). Those rated '5' are classified in both the ARPS and the PRP:C as regionally significant landscapes. Those landscapes rated '6' or '7' are classified as being outstanding landscapes.
 - Outstanding landscapes are those that have the very highest value ratings in the Auckland Region. They tend to truly capture a sense of Auckland's unique identity and display both elements and a general composition that ensures a high level of visual impact (in a positive sense) and memorability. In some instances, part of the impact may also be derived from the scarcity of a particular landscape type, such as the major dune formations of South Kaipara Head. In general, such landscapes are also highly susceptible to modification. For such landscapes, management tends to focus on protection of the *status quo*.
 - Regionally significant landscapes are highly valued, but often for elements or features within them, rather than the whole. Alternatively, they may be landscapes which are highly valued and which are also unable to accommodate change without significant degradation of their character. Within such landscapes, development has to be managed to ensure that the key elements which contribute to landscape value are not degraded or disturbed. However the focus is upon integration and a marriage of existing and new use and development, rather than preservation.
- Note that landscape values do not necessarily capture areas of recreational importance such as beaches (ie high recreational value may not coincide with high landscape value). This means recreational (see 2.1.3.4) and visual landscape buffers are not 'double dipping'.

2.5.1.2 Visual Amenity Buffer

Theme Name: Visual Amenity - 1000 metres (visamen1000m.shp)

Data Source: ARC & EW

Date: 2002

Acknowledgements/ Licenses: ARC EW

Coverage: Study area.

Scale/accuracy: Subjective offset of 1000m applied accurately (at ~1:10,000) to the coastline.

Description: 1000m coastal offset buffer intended to indicate the approximate spatial extent of constraint upon future marine farming associated with protecting coastal visual amenity values.

Degree of Marine Farming Constraint: Critical constraint

Comments Questions & Discussion:

- Visual amenity value and the potential impact of marine farming upon it are somewhat subjective in that they are driven by personal opinion. It is clear that the introduction of a new visual element, such as marine farming structures, into the visual landscape has the potential to significantly alter its value. However, the direction (positive or negative) and magnitude of this effect remains personal and subjective. The degree of constraint is considered to be critical rather than absolute for stage 1 assessment because a final agreed objective distance has yet to be established.
- It is recognised that the available information does not adequately represent the potential visual amenity impact of marine farming activities on those viewing an area while en-route at sea, or anchored remote from a shore. Clearly, while separation of marine farms from the land may reduce their impact on the landscape for those viewing from the land, their presence may markedly intrude into the otherwise unmodified seascape visible to viewers at sea. No method has been identified to provide assessment of this factor.
- The 1000m visual amenity offset buffer has been applied to sections of ARC region coast on the basis of two main identified characteristics.
 - Sections of coast rated as having a landscape sensitivity (see 2.5.1.1) of regional significance or greater. The presence of marine farming activity adjacent to these areas is considered likely to appreciably degrade the coastal visual amenity value identified by the landscape rating.
 - Coastal areas adjacent to existing metropolitan urban area and proposed areas of future urban expansion identified by the Growth Forum. Marine farming ventures off these areas would have a high potential to affect public visual amenity values simply because of the presence a large resident population.
- A 1000m visual amenity offset buffer has been applied to the whole EW coast in the study area as discussed below.
- A 1000m width has been selected for the visual amenity offset buffer for several reasons.
 - This approach is consistent with that developed and applied by EW during its assessment of appropriate marine farming activities on the eastern side of the Firth of Thames². Adoption of a consistent approach across the regional boundary supports sound resource management policy where those boundaries are arbitrary with respect to visual amenity value.

² 'Marine Farming Study. West Coast of the Coromandel Peninsula. Discussion Paper for Consultation Purposes.' Worley Consultants Limited for Environment Waikato Regional Council. December 1996

- In the EW study a minimum offset distance of 1km was run parallel to the coastline. The key determinant for the offset was the visibility of marine farms (only mussel farms were under consideration) from the low elevation of the coastal roadway. A major source of impact on visual amenity was related to the visibility of navigational warning lights on the farm structures at night. Apparently during the day marine farm structures were considered not easily visible from the low-lying coastal road if offset seawards by ~1km.
- Note that recent Environment Court proceedings³ have identified far greater offset distances (up to 3 nautical miles or ~5.5 kilometres) required to satisfy visual amenity and natural character constraints in Tasman and Golden Bays. Also that the Wilson's Bay farms transpired to be visible from the road. The potential is therefore raised that the 1000m visual amenity offset buffer may be insufficient in some parts of the study area. Further consideration would have to be given to this matter during stage 2 assessment.

2.5.2 Natural character

Consistent information on the natural character of the study area is not yet available. No GIS theme layer for natural character could be included in the stage 1 constraints mapping. Currently ARC is working with MfE to develop and apply a standard objective methodology to determine numeric values for the level of Natural Character present in sections of the CMA. This information would be included in stage 2 assessment.

Note that constraints associated with natural character have the potential to significantly influence the overall pattern identified by stage 1 assessment. Natural character includes elements of both visual amenity and ecological values. In general natural character ratings can be expected to be high where human influence/ disturbance on the landscape and ecology is minimal, and low where the influence is greatest. That is, natural character rating is generally inversely correlated to human influence. Broadly speaking, greatest human influence is often associated with areas of greatest population density or use (ie influence parallels 'urbanisation'). But very many of the constraints discussed elsewhere in this report are greatest closest to areas of urbanisation. Their spatial extent shows a characteristic pattern of maximum constraint close to urban centres and along the coast but a notable lack of constraint offshore and in areas remote from population centres. Conversely natural character can be expected to broadly exhibit the reverse pattern of constraint, being lowest near to urban centres where the effects of urbanisation have modified the landscape and affected ecology, and highest offshore and in coastal areas remote from urban centres.

It is not clear how the absence from the stage 1 assessment of natural character information for the whole study area has influenced the selection of

³ 'Interim Report and Findings to the Minister of Conservation, the Tasman District Council, and Referrers on an inquiry into Aquaculture References to the Tasman District Council's Proposed Resource Management Plan.' Judge Environment Court (SE Kenderdine presiding) Decision No. 42/2001.

stage 2 study locations. However, stage 2 assessment will include this constraint component.

2.6 Natural Hazards

Natural hazards include such issues as erosion prone coastal areas, tsunami or large sea inundation, sea level rise and other climate change effects, etc. It is considered that these issues carry insufficient risk to greatly affect the stage 1 mapping of other key constraints and will not be included. The main potential effect is likely to be impact upon shoreline access, facilities, ports, coastal infrastructure, etc.

2.7 Public Health

Marine farming in New Zealand is currently dominated by cultivation of filter feeding bivalves (mussels and oysters). These shellfish feed by filtering passing seawater and retaining planktonic prey items. The particulate items retained by filter feeders may include human pathogens, such as bacteria and viruses, if human sewage is discharged into seawater around the marine farms. Compared to concentrations in the surrounding seawater, shellfish may accumulate comparatively high concentrations of pathogens and other contaminants (eg metals and synthetic organic compounds) because they efficiently filter particles from large volumes of water, and because they may preferentially bind and bio-accumulate certain toxins in their tissues. Key potential sources of public health risk for marine farmed shellfish include their exposure to discharge of human sewage from ships, leakage from domestic septic tank disposal fields, overflows from sanitary sewer drainage infrastructure, sewage treatment plant discharges, and contamination of stormwater discharges by various urban and rural activities.

Note that this report does not attempt to identify areas of risk or constraint associated with the presence of toxic algal blooms. These planktonic organisms are generally distributed across very large areas of sea (eg the recent west coast *Gymnodinium catenatum* outbreak), are unpredictable in occurrence, and are generally not associated with activities over which regional councils have any control. Their exclusion from the Stage 1 assessment is considered unlikely to detract from identification of areas of lower constraint for future marine farming activities. Toxic algal bloom presence could be included in Stage 2 assessment if required.

2.7.1 Discharge of Sewage from Boats

Note that this factor was not included in the stage 1 constraints mapping exercise. The following discussion provides the rationale for its exclusion.

Comments Questions & Discussion:

- Regional council's regional coastal plans become vehicle for application of a nationally consistent set of minimum requirements detailed in the Resource Management (Marine Pollution) Regulations 1998 [see reg. 11 (discharge of sewage in CMA) & 12 (discharge of treated sewage in CMA)].
 - Treated sewage discharge from ships is permitted >100m from a marine farm.

- Minimum offset distances required for discharge of untreated sewage from ships are >500m offshore (MHWS), in water >5m depth, and >500m from a marine farm.
 - Regional councils are empowered to require greater offset distances in their coastal plans, potentially closing bays or popular anchorages to discharge of untreated sewage.
- This factor is potentially a significant constraint for marine farming activities related to water quality, accumulation of pathogens and/or public health risk indicators in farmed species.
- Q: When considering the implications of this constraint it is important to note that the spatial extent of this theme would indicate an 'inverse' constraint. In contrast to the majority of other constraints considered, the area of sea within the boundary of the minimum offset requirements (eg >500m and >5m deep) is theoretically less constrained than that outside or beyond this boundary (because it is the area where untreated sewage is not permitted to be discharged). However, at least two telling arguments can be raised in support of not using the offset distances given in the regulations as a spatial indicator of marine farming constraints. First, it has yet to be verified that application of the minimum separation distances from marine farming for discharge of either untreated or treated sewage from ships will effectively avoid health risks for human consumption of farmed filter feeding species. Second, the regulations provide few, if any, effective tools for enforcement (ie the reg. lacks teeth).
- The potential importance of retaining access to water of reliably high quality has recently (Feb 2002) been graphically demonstrated by prolonged (~10 months) closure to harvesting of 18 oyster farms in Waikare Inlet, Northland in response to public health concerns. Gastrointestinal infections in Aucklanders consuming farmed oysters are thought to be linked to exposure of oysters to a number of possible sewage sources. These include sewage discharges from pleasure craft in the bay, sewage contamination of stormwater discharges from the land, and sewage treatment plant overflows.
- It is also obvious that the health risk associated with discharge of sewage from ships is not uniformly spread across the sea area outside of the minimum offset distances. A range of natural and physical factors modifies risk by altering potential exposure of filter feeding organisms to discharged pathogens. The degree of pathogen dilution, dispersion, and rate of die-off is affected by hydrology, which in turn is a function of such factors as water depth, seabed topography, currents, wave and wind exposure, etc. For example, given a consistent source the probability of exposure to pathogens, and therefore potential risk to human health, of farmed oysters is likely to have some broad inverse relationship with increase in the natural factors that maximise dilution and dispersion.
- The decision is to simply retain this information as a useful indication of one of several key factors influencing the suitability of water quality in an area for marine farming of filter feeding organisms. No attempt should be made at this broad regional scale of assessment to draw detailed constraint boundaries for discharge of sewage from ships. Instead the presence of other mapped constraints strongly linked to ship presence should be taken to potentially indicate a reduced suitability of an area for

significant expansion of future marine farming in the area. Such linked factors include; popular cruise destinations and anchorages and mooring management areas.

2.7.2 Poor or Degraded Water Quality

The quality of seawater in marine receiving environments is generally affected by the scale and nature of land-use activities in surrounding catchments that discharge freshwater runoff into them. Key exceptions may be significant coastal point source discharges from industrial or municipal wastewater treatment systems. Broadly speaking though, the potential for contamination of discharged freshwater increases as catchment land-use changes from undeveloped and forested catchment through agricultural and horticultural dominated rural land uses, through increased residential development of rural intensification (life style blocks), towards full urbanisation of catchments⁴. Contamination risk within urban catchments generally increases in parallel with increasing intensity of urban development. Note though that this relationship may be oversimplified for sources of pathogenic contamination (eg human sewage) where the risk of sewage leakage may first increase and then decrease as communities expand and shift from poorly operating septic tank treatment systems to well managed municipal systems.

Peak potential for turbidity and sedimentation effects within marine receiving environments tends to be associated with periods of expansion and development when land is exposed to erosion by earthworks. In the longer term the relative contribution of the ubiquitous urban stormwater contaminants (eg metals, hydrocarbons, and synthetic organic compounds) increases along a gradient from residential, through commercial, to industrial land uses.

A number of themes are provided relevant to existing, or potential future expansion, of urban land use and rural intensification (life-style block development or countryside living). These include 'Urban Areas', 'Metro (Metropolitan Urban Limit) Boundaries', and rural intensification areas discussed in section 3.1.1 below.

The potential risk to marine farming (and other) activities within the coastal marine area receiving urban and rural stormwater runoff is modified by the physical nature of the catchment and its receiving environment. For any fixed land-use scenario the ambient meteorological conditions, topography, substrate type and so on, modify runoff characteristics. Similarly, so do conditions within the marine-receiving environments that affect dilution, dispersion and retention of discharged contaminants.

An extensive body of local results from monitoring, investigation and pollution control work provides feedback on the condition of water quality in marine receiving environments. Investigations include studies of contamination sources, transport routes to the sea, effect upon water, sediment and shellfish quality, and impacts upon marine benthic ecology. Findings can be generically

⁴ ARC TP 132 'Year 2000 Summary Report – Baseline Water Quality, Stream, Lake and Saline Waters' September 2000. Stroud and Wilcock.

summarised and subjectively represented at broad regional scales as in the Auckland Regional Policy Statement maps (Map 5) of 'degraded and susceptible' areas of water quality. In essence, areas of degraded water quality are most commonly found in marine receiving environments below heavily urbanised catchments particularly where these drain to poorly flushed and low energy areas like sheltered estuaries and upper-harbour arms. Water, sediment and biota quality is less likely to be adversely affected where contaminants are discharged into diluting or dispersive water conditions such as high-energy coastal waters, main harbour areas, or strongly flushed areas experiencing strong currents.

2.7.2.1 Degraded or Susceptible Waters

Theme Name: Water Quality (water_quality.shp)

Data Source: Auckland Regional Policy Statement, Map 5.

Date: 2002

Acknowledgements/ Licenses: ARC

Coverage: ARC region

Scale/accuracy: Subjective, diagrammatic, indicative, broadly representative, captured at ~1:50,000.

Description: Broadly indicative synthesis of the findings from a wealth of substantiating results of fresh and saline water, sediment, shellfish and ecology monitoring, pollution control work, etc. Boundaries shown provide subjective average condition for water quality but are based on quantitative supporting information.

Degree of Marine Farming Constraint: Generally absolute for 'known degraded' and 'potentially degraded' waters and critical for most 'susceptible' waters.

Comments Questions & Discussion:

- Note that no water quality information for EW has been included in the stage 1 assessment. Currently available EW water quality information at this spatial scale is understood (EW officers advice) as only being likely to broadly distinguish between coastal (lower constraint) and estuarine or enclosed (higher constraint) waters (EW advice).
- Consider that, while sustainable marine farming requires reliable access to clean seawater, technological advancements may reduce this dependence for a range of contaminants that are depurated, degraded and eliminated by farmed organisms if they are moved into clean waters.
 - Note that this may only provide a partial solution to issues of potential water quality contamination for number of reasons. These include our continued uncertainty that we fully understand all public health and ecological risks associated with exposure to runoff from developed catchments, because not all contaminants of concern depurate or degrade within economically viable time frames, and because we are constantly revising and in some cases tightening our health standards and guidelines as our knowledge of public health risk increases.
- Note that the ARPS map included in the stage 1 assessment is not considered a reliable representation of the degree of water quality constraint to marine farming and is only included for indicative purposes. More detailed water quality information (eg through applying a similar methodology to that used by Auckland HealthCare for the NZ Shellfish

Quality Assurance Programme, sanitary survey reports of marine farming growing areas) was not available at the scale of the study area. Stage 2 assessment may further address this issue if and where appropriate.

- Categorisation of the ARPS water quality map used in stage 1;
 - Water quality is an absolute constraint in areas given as known water quality degradation zones,
 - is also an absolute constraint in areas given as potentially degraded, where these are close to urbanised catchments (eg off east coast bays),
 - and is a critical constraint in areas given as susceptible to water quality degradation, where contributing catchments are already urbanised or are likely to be urbanised or to experience significant increase in country side living in the next 50 years (as identified by the Growth Form).
- Note that arrows on the Water Quality constraint map indicate the approximate location of major sewage treatment plant discharges to water. Also note that some discharges have ceased since the map was drawn (eg several discharges into the upper Waitemata Harbour).
- Large discharges of treated wastewater have the potential to significantly degrade receiving seawater quality (for example reduction of the impact of MSPW effluent upon the north-eastern Manukau harbour has been a significant goal of the current ~\$450M treatment plant upgrade). Discharge of treated sewage into low diluting and dispersive harbour or estuary areas (eg Mahurangi) may impact on the ability of marine farms to meet public health or export requirements.
- Note also that water quality in areas comparatively remote from other sources of contaminant discharge may potentially be locally affected by discharge from long marine outfall structures.
- Note that water quality may also be locally degraded by numerous sanitary sewer and pump station overflows of untreated sewage, by sewage contamination of stormwater runoff, etc. It is suggested that the level of constraint on future marine farming imposed by these numerous small discharges is adequately captured and represented by the generic degraded and susceptible water quality theme.

2.7.3 Sediment Quality

A high percentage of key stormwater contaminants tend to adsorb to sediment particles that settle out in low energy marine receiving environments such as estuaries. Consequently the quality of muddy sediments in depositional areas below developed catchments tends to be degraded through enrichment with metals, hydrocarbons and synthetic organic compounds. Concentrations in surficial sediments tend to increase over time and may exceed thresholds above which adverse effects upon biota may occur. Compared to the scale of effect of discharges on seawater quality, degraded marine sediments tend to be found in similar areas but are generally more localised in extent. All other things being equal, this is because degradation of sediment quality requires depositional conditions that are generally present over only part of the area affected by the dispersing and diluting plume of a contaminated discharge.

2.7.3.1 Indicative Marine Sediment Quality

Theme Name: Sediment Quality (recenv_draft.shp)

Data Source: ARC interpretative map produced for Infrastructure Auckland.

Date: 2002

Acknowledgements/ Licenses: ARC

Coverage: ARC's near-shore urban coastal environment.

Scale/accuracy: Subjective, diagrammatic or indicative presentation captured at ~1:50,000.

Description: Indicative surficial sediment quality, ranked against ANZECC interim sediment quality guidelines, and diagrammatically presented as a coloured coastal strip of arbitrary width.

Degree of Marine Farming Constraint: Low constraint presented in a subjective and diagrammatic manner.

Comments Questions & Discussion:

- Recent (last 2-5 yrs) comparative sediment quality in the surficial layers (~ top 20-150mm) has been broadly grouped and ranked against ANZECC interim sediment quality guidelines. Very poor and poor sediment quality means one or more key indicator contaminants are present above guideline values where adverse effects may occasionally occur. Quantitative data used includes metal and PAH levels monitored by ARC's ongoing Marine Sediment Monitoring Programme, supplemented by numerous other issue or area focused ARC investigations and studies. Sediment quality in areas without existing analytical results is broadly interpolated from that present in neighbouring areas that are monitored, guided by application of generally accepted principles and rules. Spatial extent of the different rankings is subjective and intended to be indicative and broadly representative. Ranked information is diagrammatically presented as a coloured coastal strip of arbitrary width.
- Q: Is sediment quality a real constraint for marine farming?
Note that ARC's LTB monitoring programme for oyster quality in the Manukau harbour has verified that a gradient of increasing contamination of oyster flesh is found as we move from higher energy areas comparatively remote from urban discharges (Cornwallis) towards lower energy areas close to urbanised catchments (Grannies Bay). This pattern broadly parallels that of sediment contamination but is more reflective of the gradient in general harbour water quality. Bioavailability of contaminants adsorbed to sediment is modified by numerous factors, such as immobilisation by acid volatile sulphides, so elevated contaminant concentrations may not directly translate into toxicity or tissue burden. Marine farming of filter feeding organisms generally involves their elevation above the seabed where they are primarily exposed to water borne contaminants.
Note also that this sediment quality theme does not attempt to present the level of seabed contamination by pathogenic micro-organisms such as bacteria and virus that are included in the general water quality theme.
- For reasons presented above it is considered that the area of significant constraint on marine farming caused by urban discharges is better represented by the footprint of effect of 'degraded or susceptible water quality' (see 2.7.2.1).

2.7.4 Reverse sensitivity

Reverse sensitivity works contrary to the direction of assessment for most of the competing uses and values discussed in this report where their presence constrains future marine farming activities. Reverse sensitivity is used to describe the situation where the presence and requirements of continued marine farming become a key driver of the permissible level of other competing activities such as catchment development. Economically viable marine farming of filter feeding organisms is understood to require certainty of supply of good quality seawater. As discussed under Water Quality above, in general, certainty of sustained good quality seawater reduces as catchment development increases. Despite application of best management practices some deterioration of receiving environment water quality is expected inevitably to be associated with urbanisation of catchments above poorly flushed areas. An example of reverse sensitivity is when the level of urbanisation in such a contributing catchment requires to be restricted in order to meet management objectives for continued viable marine farming activities in the receiving environment. Sound resource management planning should seek to recognise at an early stage the future potential for such conflicting requirements. They should seek to ensure that management decisions made before development proceeds have considered the future implications for all potentially competing use and value requirements so as to avoid or minimise future surprises and conflict.

2.8 Cultural and Heritage Constraints

2.8.1 Tangata Whenua or Iwi Constraints

Tangata whenua have to a large extent been reluctant to use mapping to define the spatial extent of various matters of cultural and spiritual significance. This is understandable for several reasons. Mapping is a tool that does not lend itself well presentation of conceptual and geographically indistinct factors such as spiritual value. It is also important to recognise that creation of maps clearly identifying the location and extent of areas of Maori cultural importance (eg tapu, and kai moana sites) may promote their protection, but may also promote their exploitation by those insensitive to their cultural significance.

It is also important to note that Maori have recognised the potential social and economic benefits of well-managed marine farming activities. Various representative groups have established marine farms or have indicated their intentions by applying for the necessary resource consents. Clearly tangata whenua interest in a coastal area may have both positive and negative ramifications for future marine farming operations. Stage 1 consultation identified the need to obtain further information in this area. A working party was established with iwi representatives and a series of workshops were attended. The working party made considerable progress and produced written output. Unfortunately no mapping information was produced amenable to inclusion in the constraints mapping process.

Consequently only the few available sources of information, covered below, relevant to identification of the degree of constraint imposed by tangata

whenua cultural and spiritual values have been included in the stage 1 assessment.

2.8.1.1 Iwi Management Areas in Manukau Harbour

Theme Name: Tangata Whenua Management Areas (Maori_shp)

Data Source: ARC's PRP:C Sept 1999 Version. Chapter 2

Date: 1999

Acknowledgements/ Licenses: ARC, public information

Coverage: ARC Region

Scale/accuracy: 1:10,000 accuracy unspecified.

Description: Tangata Whenua Management areas in the Manukau Harbour established by the Waitangi Tribunal.

Degree of Marine Farming Constraint: Critical constraint

Comments Questions & Discussion:

- A critical rather than absolute constraint category was assigned as iwi have yet to indicate whether or not marine farming might be an option they wish to consider in these areas.
- The areas are small and make little difference to identification of overall patterns of constraint across the study area.

2.8.1.2 Cultural Heritage Protection Sites

Theme Name: Cultural Heritage Protection Sites (PRP:C Schedule 2) (archpro.shp)

Data Source: ARC's PRP:C Sept 1999 Version. Chapter 8

Date: 1999

Acknowledgements/ Licenses: ARC

Coverage: ARC region

Scale/accuracy: Point not polygon shape. Indicative of location not spatial scale of site.

Description: Indicative location of predominantly European cultural heritage buildings, places or areas, but also including some Maori archaeological sites, where it is recognised that modification and change (eg maintenance) may need to occur.

Degree of Marine Farming Constraint: Requires case by case assessment.

Comments Questions & Discussion:

- The spatial scale of constraint (if any) imposed by the existence of these cultural heritage sites is not well represented by the point data. Constraint may be absolute or critical depending upon the nature of the site, its size, location, and proximity to any potential marine farming areas, and the degree to which marine farming would affect the relevant site values. A case specific assessment would have to be carried out.
- At the super-regional scale of analysis the comparatively small size of these sites means they have little effect upon the overall pattern of constraint identified by stage 1 assessment.
- Additional investigation of the degree of constraint they impose could be carried out during stage 2 assessment if and where appropriate.

2.8.1.3 Cultural Heritage Preservation Sites

Theme Name: Cultural Heritage sites for Preservation (PRP:C Schedule 1) (archpre.shp)

Data Source: ARC's PRP:C Sept 1999 Version. Chapter 8

Date: 1999

Acknowledgements/ Licenses: ARC, public information.

Coverage: ARC region

Scale/accuracy: Point not polygon shape. Indicative of location not spatial scale of site.

Description: Predominantly European cultural heritage buildings, places or areas, but also including some Maori archaeological sites, where it is considered that modification should not occur.

Degree of Marine Farming Constraint: Requires case by case assessment.

Comments Questions & Discussion:

- As for cultural heritage protection sites.

2.8.2 General Cultural Heritage.

The ARC has developed a cultural heritage inventory database that includes details of the nature and location of sites of cultural heritage significance. The database covers a range of heritage values of importance to Auckland's history and culture including botanical heritage sites, sites of archaeological importance, and heritage structures. A subset of this database covers sites of maritime heritage significance. Such sites include sunken ship remains, icon structures such as Bean Rock lighthouse, etc.

2.8.2.1 Marine Cultural Heritage

Theme Name: Marine Cultural Heritage (chi_maritime.shp)

Data Source: ARC's Cultural Heritage Database.

Date: 2002

Acknowledgements/ Licenses: ARC, public information

Coverage: ARC region.

Scale/accuracy: Range of location accuracies depending on the nature and scale of the site.

Description: Indicative to accurate locations of sites of marine cultural heritage significance.

Degree of Marine Farming Constraint: Requires case-specific assessment because of the range of site types included.

Comments Questions & Discussion:

- Representativeness or accuracy of the point locations for the marine cultural heritage sites is variable dependant upon the nature and scale of the site. Subtidal sites such as sunken wrecks may not yet have been precisely located and ship remains may be spread over a considerable area. In contrast the precise location of relevant existing structures such as Rangitoto and Bean Rock lighthouses is known. The use of point rather than polygon shapes means that the mapped points are representative of the location not spatial extent of a site.
- Note that Marine Cultural Heritage sites include some located on land where sites of interest were associated with maritime activity (eg old inland

boat yards, ship remains buried in reclaimed areas like the Western Reclamation).

3 Natural and Physical Constraints

3.1 Physical

3.1.1 Existing and Proposed Future Landuse.

Arguably these themes should be grouped under the social and economic heading. However, they are included in the project primarily because of the way they explain or modify other constraints (eg visual amenity, water and sediment quality). Along with more conventional physical factors they therefore help to define the physical 'habitat'.

3.1.1.1 Metropolitan Urban Landuse

Theme Name: Urban Metro Limits
(metro.shp)

Data Source: ARC

Date: 24/6/99

Acknowledgements/ Licenses: ARC

Coverage: ARC region.

Scale/accuracy: ~1:1

Description: Statutory planning boundaries of the metropolitan urban area of Auckland Region.

Degree of Marine Farming Constraint: not applicable

Theme Name: Urban Areas (urban.shp)

Data Source: DCDB, Terralink (MUL and DCDB Coastline)

Date: 2002

Acknowledgements/ Licenses: Terralink, ARC

Coverage: National

Scale/accuracy: ~1:1

Description: Land use classified as 'urban' in the NZLRI database from 1998 satellite data coverage.

Degree of Marine Farming Constraint: not applicable

Theme Name: Urban expansion (Expansion.shp)

Data Source: ARC, Regional Growth Forum – derived from DCDB

Date: 2000

Acknowledgements/ Licenses: ARC

Coverage: ARC region

Scale/accuracy: Accurate (1:5000) capture of Growth Forum conceptual output. Requires refinement and validation through sector planning and structure plan development.

Description: Areas identified by the Regional Growth Forum where urban expansion is anticipated within the next 50 years (to 2050).

Degree of Marine Farming Constraint: not applicable

3.1.1.2 Rural Intensification (Lifestyle Development)

Lifestyle block development is a feature of rural development in Auckland's peri-urban areas. It generally involves the subdivision of farm lots into smaller lifestyle blocks and is often associated with a significant increase in population density, development of supporting infrastructure (houses, access, service centres, etc), and a change in the nature of discharges from the land. The Regional Growth Forum identified a number of areas where rural intensification is expected in the next 50 years. However these areas are indicative and detail of the scale and nature of rural intensification awaits sector planning and structure plan development.

Theme Name: Rural Intensification (Countryside.shp)

Data Source: ARC, Regional Growth Forum.

Date: 2000

Acknowledgements/ Licenses: public information, ARC

Coverage: ARC region.

Scale/accuracy: Accurate (1:5000) capture of Growth Forum conceptual output. Requires refinement and validation through sector planning and structure plan development.

Description: Areas identified by the Regional Growth Forum where rural intensification is anticipated within the next 50 years (to 2050).

Degree of Marine Farming Constraint: not applicable

3.1.2 Currents and Bathymetry

Water movement and current strength is a key determinant of habitat characteristics, modifies dilution and dispersion (eg of pollutants, nutrients, and availability of planktonic food), and potentially affects the practicability of marine farming. Various possible sources of relevant information exist at the spatial scale of the stage 1 assessment (for example a 750m grid Hauraki Gulf hydrological model). This information is relevant to the selection of sites suitable for various marine farming methods. However suitable summary information was not available to include in the stage 1 assessment. In any case its availability was not considered vital to stage 1 assessment. Possible stage 2 study areas were first identified from consideration of the patterns of all other identified and mapped constraints. Then general knowledge of currents along with other relevant factors was used to select the final study areas. More detailed current information will be considered during assessment of stage 2 areas.

As for current, bathymetry, or water depth, may be both a practical limiting factor for marine farming activities, but may also ameliorate the impact of various constraints. Various sources of this information exist (eg depth contours on marine charts, see 2.4.3.3). However, like hydrological information, spatial data sets for bathymetric information were not considered vital to effective stage 1 assessment.

3.1.3 Water Quality (see 2.7.2)

Section 2.7.2 (Degraded or susceptible waters) considers the degree to which adverse effects upon water quality from land based activities might constrain marine farming activities. Such constraints are largely confined to a coastal

waters close to the shore. However, in addition to clean water, marine farming activities also require access to water containing adequate nutrients and supporting a suitable biomass of phytoplankton and zooplankton (food). Such factors are influenced by season and longer period weather patterns (eg El Nino Southern Oscillation). It may be possible to access information from sources such as NIWA and satellite imagery of chlorophyll levels, which provides this information on a super-regional scale. However this information has not been included in stage 1 assessment.

Other factors of relevance to water quality and food supply include sea surface temperature. Potential theme information awaits preliminary output of NIWA/MfE modelling exercise for Hauraki Gulf as part of MfE's Marine Environment Classification project. Long Term average and peak sea surface temperature information is likely to be available for the Gulf.

3.1.4 Substrate Type

Seabed substrate is a key determinant of habitat characteristics. Sensitivity to marine farm activities and potential impacts may be linked to habitat type and nature of the substrate. For example deposition of organic detritus onto the seabed may have less effect where it settles on a similar muddy substrate rather than modifying a sandy or rocky habitat. Substrate type, particularly sediment type may be predictable once currents and wave exposure are known, Preliminary output from NIWA/MfE's Marine Classification project in the Hauraki Gulf may provide representative average and extreme theme layers for wave height and orbital velocity. Various charts and maps have also been produced by NIWA (formerly Oceanographic Institute) that summarise main substrate types across large portions of the study area. This reference information is not in itself a constraint and has not been included in the stage 1 assessment.

3.2 Ecological

Marine farming has the potential to effect ecological values of the coast. Effects can be direct, such as smothering of benthic biota and change in seabed habitat below marine farms caused by discharges of pseudofaeces, shell, and organic material, or alteration of habitat and community structure due to insertion of new habitat complexity and substrates, new organisms, and food or competitor biomass. Effects may also be indirect, such as depletion of planktonic food items by marine farms leading to a change in energy flows through local food webs and change in the sustainability of local macroinvertebrates, fish and birds. In some circumstances various effects may be considered positive by parts of the community where they favour preferred conditions such as attracting predatory snapper. However, in circumstances where the conservation, protection or preservation of existing ecology is considered appropriate many of the potential effects adversely affect ecological conditions.

The habitat distribution and biological community structure of much of the seabed in the study area has yet to be mapped. This is due to the difficulties in obtaining accurate habitat assessment and detailed biological community information in subtidal areas. Much of what we know about the ecology of the

study area is restricted to investigations carried out in comparatively small areas often close to the coast. The themes discussed below present some of limited available information that can be included in the stage 1 assessment for this potentially important constraint.

3.2.1 Parks and Reserves

3.2.1.1 Department of Conservation Reserves

Theme Name: Department of Conservation (DOC.shp)

Data Source: Department of Conservation.

Date: Shapefile created 1999 from data collected in 1995.

Acknowledgements/ Licenses: DoC

Coverage: ARC region.

Scale/accuracy: ~1:10,000

Description: Location and spatial extent of designated park or reserve land areas under Department of Conservation management control.

Degree of Marine Farming Constraint: not applicable

Comments Questions & Discussion:

- Arguably, the presence of a DoC reserve or park on land close to the coast affects the level of various constraints upon future marine farming in adjacent coastal waters. Some of these coastal areas will be captured by other themes (eg popular recreational areas of the coast, and the associated offset buffer). This theme is included in the project to aid interpretation and is not in itself a spatial constraint on future marine farming.

3.2.1.2 Regional Parks

Theme Name: Regpark.shp

Data Source: ARC

Date: 2001

Acknowledgements/ Licenses: ARC

Coverage: ARC region.

Scale/accuracy: 1:10,000

Description: Location and spatial extent on land of regional parks managed by ARC.

Degree of Marine Farming Constraint: not applicable.

Comments Questions & Discussion:

- Similar argument for inclusion as 3.2.1.1 Doc parks above. Note that some of the more popular beaches in the region are also regional parks (eg Long Bay).

3.2.1.3 City and District Open Space

This theme is not included in the project but is available on ARC GIS.

Information includes all zoned public open space areas identified in city and district plans. This includes coastal open space and some of the most popular beaches in the region.

- Similar principal as 3.2.1.1 Doc parks above.

3.2.1.4 Marine reserves

Theme Name: Marine Reserves

Data Source: ARC PRP:C, DoC

Date: 1999

Acknowledgements/ Licenses: ARC DoC

Coverage: ARC region.

Scale/accuracy: 1:10,000

Description: Gazetted Marine Reserves and Marine Parks in the Auckland region.

Degree of Marine Farming Constraint: Absolute constraint

Comments Questions & Discussion:

- Note PRP:C Coastal Protection Areas (3.2.2.5) also identify all marine reserve and park areas as areas of sensitivity.
- Marine farming and marine reserve objectives are mutually exclusive, hence the 'absolute constraint' status.
- The Reserves Act is currently under review and potential broadening of the range of activities that might be permitted within a reserve is being considered. Conceivably there may be a time in the future when marine reserves are not considered an absolute constraint on marine farming, however, such a controversial development is unlikely to occur in the near future.

3.2.2 Biological Resources and Sensitivity

3.2.2.1 Fish

In addition to harvesting information, MFish, NIWA, and other agencies hold other data relevant to the sustainable management of various fish species. This may include information on the habitat requirements and distribution of important life cycle stages of various fish stocks (eg breeding and spawning grounds, nurseries and refuge areas, feeding areas). Sustainable management of fish stocks requires consideration of potential impacts upon all sensitive life cycle stages. Unfortunately this information is not currently available in a format suitable for inclusion in the stage 1 assessment. The importance of this issue will be assessed for stage 2 study areas if suitable information is available.

3.2.2.2 Shellfish & Other Marine Life.

As discussed above for finfish, information relevant to the broad distribution and abundance of various other forms of sea life is held by various agencies. MFish holds information on natural shellfish populations of commercial or recreational importance (eg scallops, pipi, mussel, paua, cockle, tutatua, etc) for some areas. However, surveys at the super-regional scale are rare and theme coverage may be patchy. Various detailed ecological surveys have been completed in specific subsections of the coast. A range of detailed benthic habitat and ecology maps are available in GIS format for areas such as the Waitemata Harbour, Long Bay embayment, Mahurangi Harbour, Whangateau Bay, 'Whitford' embayment, Pahurehure Estuary, etc. These do not allow generation of a consistent GIS theme layer across the study area and are considered too detailed for Stage 1 assessment. However they will

potentially provide invaluable information if Stage 1 assessment identifies any of the areas they cover as appropriate for Stage 2 assessment.

3.2.2.3 Sea Birds

Department of Conservation compiled information on Sites of Significant Wildlife Interest (SSWI). Large 'Areas of Significant Conservation Value' (ASCV) were identified by DoC based upon SSWI and other relevant information. Roosting, breeding, and feeding areas important to various birds formed a major component of identification of areas as SSWI. ARC holds the SSWI spatial coverage information in GIS format. However, development of coastal protection areas (CPA) in the PRP:C used SSWI and ASCV information during identification of ecologically sensitive areas. CPA's are considered to adequately provide for this factor in Stage 1 assessment.

3.2.2.4 Mammals

Whales, dolphins and seals navigate through, and feed and play within the study area. Marine Farming has the potential to affect these activities. Unfortunately, little information in a format suitable for inclusion in the constraints assessment has been obtained to date. DoC has provided copies of a submission on marine mammal use of the Rangitoto Channel that it recently presented during a hearing of the resource consent applications by the Ports of Auckland Limited to dredge the channel. The report confirms that marine mammals are common in the Hauraki Gulf but does not provide information that allows areas of high usage to be distinguished from areas of low usage.

DoC has recently produced a report on extensive research into dusky dolphin behaviour and apparent effects of mussel farming in Admiralty Bay ('Habitat use by dusky dolphins in the Marlborough Sounds: Implications for aquaculture and fisheries management.' Markowitz et al. 2002). Research findings include that actual dolphin presence may greatly exceed that apparent to casual observation, that proposed mussel farms would occupy preferred habitat for the dolphins, and that dolphins tend not to use this habitat once mussel farms have been established. Implications for constraint mapping in Auckland and Waikato regions have yet to be established.

3.2.2.5 Coastal Protection Areas

Theme Name: Areas of Significant Conservation Value (ascv.shp)

Data Source: ARC's PRP:C Sept 1999 Version. Chapter 2

Date: 1999

Acknowledgements/ Licenses: ARC, DoC

Coverage: ARC region

Scale/accuracy: Point not polygon shape. Indicative location only.

Description: Generally large coastal areas identified by DoC as being of significant conservation value primarily due to their high biological productivity, their role as nursery and feeding area for fish and birds, or because of other ornithological or botanical values.

Degree of Marine Farming Constraint: Variable for any location because of the generally large size of ASCVs, refer to CPAs instead.

Comments Questions & Discussion:

- Note that EW have used the ASCV areas to define the equivalent of ARC's Coastal Protection Areas (see below).
- The Department of Conservation has identified a number of large coastal areas of particular significance for their conservation value (ASCVs). This national scale analysis predated the development of ARC's PRP:C. More detailed scale assessment has been carried out as part of the development of the PRP:C and appropriate management provisions to ensure protection of these areas from adverse effects have been included (see CPAs below).

Theme Name: Coastal Protection Area 1 (small sites)
Data Source: ARC's PRP:C Sept 1999 Version. Chapter 2
Date: 1999
Acknowledgements/ Licenses: ARC
Coverage: ARC region
Scale/accuracy: Point not polygon shape showing location of small sites (1:10,000)
Description: Location of small CPA-1 sites that would not otherwise show at the scale of mapping used in the PRP:C (1:30000 to 1:50000).
Degree of Marine Farming Constraint: Absolute constraint

Theme Name: Coastal Protection Areas (cpall.shp and ascv_coromandel.shp)
Data Source: ARC's PRP:C Sept 1999 Version. Chapter 2 and EW RP:C
Date: 1999
Acknowledgements/ Licenses: ARC & EW
Coverage: Study region
Scale/accuracy: Accurate boundaries captured at ~1:10,000
Description: Coastal Protection Areas (CPA) for ARC, and Areas of Significant Protection Value (ASCV) for EW, that are of regional national or international significance due to their ecological, landform or geological values. ARC's CPA-1 areas are most vulnerable to adverse effects, while ARC's CPA-2 areas are somewhat more robust.
Degree of Marine Farming Constraint: Absolute constraint in ARC's CPA-1 areas and in EW's ASCV, Critical constraint in CPA-2 areas.

Theme Name: RCP submissions
Data Source: ARC's PRP:C Sept 1999 Version.
Date: 1999
Acknowledgements/ Licenses: ARC
Coverage: ARC region
Scale/accuracy: Area relevant to appeals captured at ~1:10,000
Description: Locations where CPA designations in the PRP:C have been appealed.
Degree of Marine Farming Constraint: Not applicable (effect is to reduce the certainty of the relevant degree of constraint in CPA areas where appeals remain unresolved).

Comments Questions & Discussion:

- ARC's PRP:C identifies areas that are of regional national or international significance due to their ecological, landform or geological values. These Coastal Protection Areas (CPA) are divided into two groups on the basis of their inherent value, size and degree of vulnerability.
 - CPA-1 areas are most vulnerable to adverse effects. They include rare habitat types, particularly pristine ecotones, and nesting and roosting areas for threatened and endangered bird species including both international migratory and local endemic species. Management provisions within CPA-1 areas aim to avoid or minimise the potential for disruption and damage to these vulnerable areas.
 - CPA-2 areas are generally more robust than CPA-1 areas but are still more deserving of special management provisions than the remaining general coastal management area. CPA-2 areas include main intertidal banks of the Regions harbours and estuaries that are key feeding grounds for threatened and endangered bird species, regionally important areas of coastal vegetation, and representative subtidal habitat areas.
- ARC's PRP:C sets out management policy for the two protection area categories. Chapter 22 of the PRP:C specifically deals with aquaculture. Rules in the proposed plan prohibit aquaculture (marine farming) in CPA-1 areas (rule 22.5.3), but make it discretionary in CPA-2 areas (rule 22.5.2). Consequently CPA-1 areas have been assigned an absolute constraint rating while CPA-2 areas have been rated as critical constraints.
- Note that CPA-1 & 2 areas were identified as being of regional or greater significance. Remaining areas of coast may still include ecological factors of local significance also deserving of special consideration. However, it is considered that CPA areas provide information at the appropriate scale for Stage 1 assessment. The ecological or geological vulnerability of remaining areas would be considered during detailed stage 2 assessment and in even finer detail as part of resource consent applications for marine farms.
- Note that CPA-1 and 2 areas define boundaries for areas of significance and vulnerability., it is not certain that buffer zones were included in the definition of these areas to protect them from any adverse effects that might be associated with activities in neighbouring areas of the coast of lower sensitivity. This is particularly relevant for the more vulnerable CPA-1 areas. For example, marine farming of filter feeding animals has the potential to strip planktonic food items out of the water column and create a food-deficient shadow across surrounding habitat areas. This has potential to stress organisms in adjacent areas that rely on planktonic food, and to cause flow-on effects through the food chain. The current assessment procedure simply uses the CPA boundaries to define the spatial extent of constraint. Where and if relevant for stage 2 analysis it may be appropriate to consider applying a safety buffer around any CPA-1 areas that are located close to broad zones where the presence of other constraints is comparatively low.
- EW's ASCVs have been taken directly from EW's Regional Coastal Plan maps. They are considered to be equivalent to ARC's CPA-1 areas.

3.2.3 Marine Farming Requirements and Effects

Marine farming activities are only practicable and sustainable within a range of physical and biological conditions. Farmed species characteristics, limitations of current technology, logistical constraints and so on limit the areas where marine farming is likely to be successful. Factors such as water quality, siltation rate, phytoplankton abundance, current speed, wave exposure, access to shoreline facilities and ancillary infrastructure, and so on, affect the suitability of an area for marine farming. As far as practicable these issues have been incorporated in the stage 1 assessment themes discussed above. Marine farms also have the potential to both positively and negatively affect the nature of the habitat around them through increased habitat heterogeneity and attraction of grazers and predators to the available farmed biomass, phytoplankton depletion, sedimentation, smothering of benthic habitat and biota, etc. The degree of importance of such effects upon other resource uses and values is dependant on such factors as the nature, location, and scale of marine farming operations. The overall objective of the work of which this report is only a part, is determination of the appropriate location and scale of future marine farming activity. Stage 1 assessment set out to identify areas where conflict between potential marine farming and other competing uses and values can be avoided or minimised. The methodology uses the spatial extent of the competing uses and values, or the likely spatial extent of constraint upon potential marine farming their protection might impose. More detailed consideration of the requirements of marine farms themselves or the potential scale of their effect on local values and uses will be used to first during selection of stage 2 study areas, then during stage 2 assessment.

- Note that ARC and EW have commissioned NIWA to study the carrying capacity of the Firth of Thames for shellfish farming activities. A report on the first phase of this work has been received⁵ which identifies a range of issues relevant to sustainability of marine farming ventures. Continued investigation is required before a thorough understanding can be obtained for the Firth.

⁵ ARC TP 182 EW TR 2002/09 'Factors related to the sustainability of shellfish aquaculture operations in the Firth of Thames: a preliminary analysis.' N Broekhuizen, J Zeldis, SA Stephens, JW Oldman, AH Ross, J Ren, MR James. NIWA report for EW & ARC.

4 Assessment

4.1 Stage 1 Assessment

Stage 1 constraint mapping has resulted in the production of a series of summary and interpretative maps.

Constraints are grouped into related categories and their spatial extent is displayed in the map series shown in Appendix 2 and briefly described below.

Constraints are also grouped under either absolute or critical categories and mapped. The combined absolute and critical presentation is used as the interpretive tool to identify broad patterns of constraint within the study area. Potential areas for stage 2 studies are identified along with 'no-go' areas where future marine farming is considered inappropriate. Areas where only 'limited opportunity' for movement or comparatively minor expansion of existing farming operations is considered appropriate are also identified. Final stage 2 study areas selected from the range of possible study areas are also shown. This interpretive information summarises the output of stage 1 assessment and is also mapped and displayed in Appendix 2 and briefly described below.

4.1.1 A3 and Digital Map Series

Note: for those using the digital version of this report, some of the PDF format maps on the compact disc are quite large and take some time to open or to print. Constraint information is provided in both hard copy and electronic formats. Hard copies of the report include descriptive text and A3 sized maps (this section and Appendix 2). The scale of the accompanying maps is large and they are intended to provide only an overview of constraint mapping results. Various details of interest to readers may not be easily distinguishable on the hard copy (eg existing marine farm areas). Mapped information is also provided in electronic format (in '.pdf' format on CD) so that it can be examined in greater detail.

4.1.1.1 Marine Farming (& sand extraction) Activities (Marfarm.pdf)

This map shows the location of MoF and RMA approved marine farming activities and of RMA applications in the study area. The previous extent of EW restriction for mussel farming along the western side of the Coromandel coast is also shown. The extent of this prohibition, the results of a reference to the Environment Court, has changed during the stage 1 assessment period through a consent order process. Marine farming is now prohibited through the whole of the CMA of the Waikato region with the following exceptions. Exceptions are: Wilson's bay marine farming zone, current marine farms which get a RMA coastal permit, fish aggregation devices and spat catching buoys, experimental shellfish structures and intertidal oyster farms.

Consented (Kaipara and Pakiri) and consent application (Between Pakiri, Cape Rodney and Little Barrier) areas for sand extraction are also shown on this map.

Consented marine farming activities can be seen to be comparatively small and mostly clustered in several locations (Mahurangi, Waiheke, Great Barrier, Coromandel coast and Firth of Thames). The existing 'aquaculture management area' at Wilson's Bay (Firth of Thames) is noticeably different in generally being further from the shore and comprising a concentration of many small farms within one management area.

Applications for resource consent for marine farming or spat catching are also shown. Most noticeable is the large area covered by spat catching applications in the Firth of Thames. Applications in the Kaipara Harbour also stand out while those on Great Barrier Island are harder to identify amongst the existing marine farms at this scale. On EW's east coast a cluster of applications can be seen around the Mercury Islands and out from the peninsula east of Mercury Bay, Whitianga.

4.1.1.2 Navigation and Safety Issues (Navsafety.pdf)

This map shows factors relevant to navigation and safety for all types of shipping. Themes shown include licensed marine farming areas and applications, prohibited anchorage areas, mooring and marina, port, defence and airport management areas, defence exercise areas, key commercial and recreational shipping routes, recreational cruise destinations and high use areas, recreational 500m coastal buffer, etc.

Even at this coarse scale of assessment it is clear that key shipping navigational and safety constraints occupy a large area of space across the study area. Navigation and safety issues are clearly a significant potential constraint for future marine farming activities.

4.1.1.3 Commercial and Naval Shipping Issues (Commship.pdf)

This map shows themes related to commercial shipping. Information presented is a subset of that presented in 4.1.1.2 above. Themes include Commercial shipping routes and buffers, draft ferry routes, defence exercise areas, port and defence management areas. Aside from defence exercise areas it can be seen that main commercial navigational routes cover a comparatively small portion of the total available water area.

4.1.1.4 Recreational Boating Issues (Recship.pdf)

This map shows themes related to recreational shipping activities and is also a subset of that presented in 4.1.1.2. Themes include mooring and marine management areas, recreational cruise routes and destinations, Americas cup and yacht club race courses, etc.

4.1.1.5 Commercial, Recreational and Customary Fishing (fishing.pdf)

This map shows themes related to recreational, commercial and customary fishing activities. Themes include non-commercial, and commercial finfishing

by method, shellfishing and rock lobster fishing by fishery, and marine farming.

As discussed in this report the information presented here only shows a simple overview of key fishing activities as suitable accurate detailed information was not available. However, the map serves to illustrate that significant fishing activity of one kind or another takes place over most of the study area. Fishing must be considered a major potential constraint for future marine farming activities.

4.1.1.6 Fishing Restrictions (fishing_restrict.pdf)

This map shows areas of prohibition under MFish regulations for various fishing methods, target species, and seasons within the study area. Fisheries management aims to sustainably manage fish stocks through application of the Quota Management System, but also requires such restrictions to manage localised depletion and competition between fishers. The map does not in itself show constraint to future marine farming activities but, in conjunction with the previous map (4.1.1.5), helps to illustrate the comprehensive coverage of fishing activities across the study area.

4.1.1.7 Visual Amenity Value (Visamen.pdf)

This map shows themes related to visual amenity values. Themes shown include the 1000m visual amenity buffer, landscape value, and a range of existing and future land-use factors that may affect visual amenity. These factors include location of regional parks and DoC estates, existing urban areas, metropolitan urban limits, areas of proposed rural intensification, areas of proposed urban expansion. By definition (see 2.5 above) the visual amenity buffer hugs the coastline and overlaps to fill in narrow harbour and estuarine areas. Despite presentation of a somewhat arbitrary buffer distance the map does illustrate how future marine farming activities remote from the coast would not be greatly affected by this constraint. Note though the comment in section 2.5.1.2 about how this excludes visual impact on those viewing from ships remote from the land. Conversely the map also shows how those close to the shore, including many conventional farming operations, are or would be affected.

4.1.1.8 Water Quality (Waterqual.pdf)

This map shows themes relevant to water quality issues. Themes includes areas of actual or potential water quality degradation, susceptible areas and treatment plant outfall locations from ARPS maps. They also include a range of existing and future land-use factors that may affect water quality (urban areas, metropolitan limits, areas of rural intensification, areas of urban expansion).

The information shown in the map is only broadly indicative of water quality issues but serves to illustrate that proximity to urbanised areas, particularly where dilution and dispersion is poor, is associated with increasing unreliability of access to the good water quality conditions required for viable operation of many marine farming activities.

4.1.1.9 Sediment Quality (sedqual.pdf)

This map shows themes relevant to sediment quality issues. Themes include sediment quality and a range of existing and future land-use factors that may affect sediment quality (urban areas, metropolitan limits, areas of rural intensification, areas of urban expansion). The map is included for reference and to support discussion presented in the text which concluded that water quality adequately covers the potential influence of this constraint on future marine farming operations.

4.1.1.10 Ecological Value (ecoval.pdf)

This map shows themes relevant to ecological values. Themes shown include ASCVs, Coastal protection areas (CPA-1 & 2), and marine reserves. As discussed in the text the available information is largely restricted to areas close to the coastline and is heavily slanted towards identification of habitats of importance to wading birds.

Consequently the available information presented in the map allows a somewhat misleading conclusion that ecological constraints to future marine farming activities are largely absent from broad open-water portions of the study area. In reality the apparent absence of constraint offshore is more an indication of our current lack of knowledge of what is out there and how unique, vulnerable or sensitive it might be, than confirmation of a lack of potential constraint.

4.1.1.11 Cultural Heritage (cultural.pdf)

This map shows available themes relevant to cultural issues. Themes shown include tangata whenua management areas, marine cultural heritage sites, marine reserves, cultural heritage places and areas for protection and preservation.

As discussed in the text this map is recognised as being deficient in many areas due to the current unavailability of suitable constraints information.

4.1.1.12 Absolute Constraints (absolute.pdf)

This is an interpretive map showing the themes classified as absolute constraints to future marine farming activities. All themes have been coloured red to simplify stage 1 interpretation.

The map shows that, aside from the prohibited anchorage areas and defence force exercise areas, identified absolute constraints are predominantly located close to the coastline.

4.1.1.13 Critical Constraints (critical.pdf)

This is an interpretive map showing the themes classified as critical constraints to future marine farming activities. All themes have been coloured blue to simplify stage 1 interpretation.

The map shows that most of the study area is covered by one or more critical constraints. The map makes no distinction between the many critical constraints with regard to the degree of constraint that they impose upon

future marine farming activities. It also does not distinguish between areas where with single or multiple critical constraints are present. Analysis of the relative degree to which areas were covered by various critical constraints was considered. This may have provided distinction between varying degrees of critical constraint and allowed for weighting of the relative degree of constraint criticalness. However, given the limited coverage and necessarily subjective nature of some of the constraints information this was considered to be unjustifiably complex. A simple visual assessment was used instead.

4.1.1.14 Absolute and Critical constraints (absolute_critical.pdf)

This interpretive map shows combined absolute (red) and critical (blue) constraints. This map provides the basis for simple visual assessment of where constraints to future marine farming activities are apparently many or few. The map allows broad patterns in the distribution of constraints across the study area to be identified. Note that while stage 1 assessment has included constraints information across ARC and EW regions, identification of potential stage 2 study areas is limited to sites within the Auckland Region.

The shortcomings of some of the information contained in the assessment have been discussed in the text. Progressing with stage 1 assessment despite the acknowledged information gaps is considered justifiable since any final study areas identified will receive further detailed investigation during stage 2 of the assessment process. Allocation of proposed AMAs in any stage 2 area would only proceed where available information indicated this was not likely to be accompanied by significant irreversible adverse environmental effects. It is also considered important that we make good use of the 2 year (from November 2001) moratorium period provided by the RMA amendment. The perfect data set where all potential constraints have been definitively identified and mapped is unlikely to ever be available. Given the likely time frame for variation of the RP:C to be fully completed and the inevitability that submissions in support and opposition will be received irrespective of how well potential sites are investigated, the stage 1 assessment is considered adequate to identify potential stage 2 study areas leading to identification of AMAs for public consideration.

Considering the available constraints information a number of patterns emerge. Most of the study area is covered by one or more constraints. A similar general conclusion was reached by MFish leading up to their imposing of the previous moratorium on new marine farming within most of the Hauraki Gulf. However, a number of notable exceptions can be identified. Few constraints are identified along the west coast of the ARC region, offshore along the east coast of the study area, in the Firth of Thames, and in the Kaipara harbour. It is recognised that in part this may be due to a shortage of information on fishing activity, ecological value, and natural character, and Maori constraints in these areas.

Several areas are highly constrained with multiple overlapping absolute and critical constraints. Such areas include the Waitemata Harbour, northern Manukau, and areas of the Auckland's east coast approximately from Orewa to Maraetai.

4.1.1.15 'No Go', 'Limited Opportunity' and Possible Stage 2 Study Areas (poss_go_all.pdf).

This map visually summarises the preliminary results of the interpretation discussed above. This map was used during consultation and deliberation leading to the identification of final stage 2 study areas.

'No-Go' areas: Areas that are classified as absolutely constrained are by definition not appropriate for consideration as stage 2 study areas. In addition the map shows straight-sided blocks filled with diagonal red lines which are indicative of the areas where future marine farming ventures are unlikely to be considered acceptable. These are heavily constrained areas where both absolute, and a large number of critical constraints have been identified.

Irregular sided areas filled with horizontal purple lines ('Limited opportunity areas') are early very broad indications of the sort of locations where ARC might consider limited expansion of existing marine farms or possibly creation of small AMAs to allow development of some small new marine farms. The identified areas contain some existing marine farms where localised expansion might have minimal adverse environmental effects. The areas were intentionally very preliminary and intended to only capture the broad concept for further refinement.

Smooth circles or ellipses filled with light green colour ('possible stage 2 areas') broadly identify locations of apparent low constraint for consideration for further investigation.

Consultation was undertaken with the marine farming industry to identify which if any of the identified possible stage 2 areas were of interest to them. Stage 2 assessment was considered inappropriate in areas where the industry expressed no likely future interest (eg where logistics, physical factors and productivity issues may exclude marine farming activities). This process resulted in the elimination of possible study areas on the west coast and in the central, north and eastern areas of the Hauraki Gulf. Further assessment of the remaining areas resulted in the final selection of two stage 2 study areas.

- Kaipara Harbour; relatively few constraints have been identified by the current mapping exercise. Marine farming applications have been received for both mussels and oysters.
- Firth of Thames; relatively few constraints have been identified by the current mapping exercise. An 'AMA' already exists on the EW side of the Firth at Wilson's Bay, and mussel farming is occurring at Waimangu Point on the ARC side. A large number of applications for spat farming have also been received in the area. Detailed ecological carrying capacity assessment is currently proceeding in this area.

4.1.1.16 Final Stage 2 Areas (final_stg2_area.pdf).

Final areas identified by the process discussed under 4.1.1.15 are shown in this map. The two stage 2 study areas in the Firth of Thames and Kaipara harbour are broadly indicated by green ellipses. Purple 'Limited Opportunity' areas have been reduced to better indicate where the appropriateness of this category will be further assessed. No Go areas remain unchanged.

4.2 Stage 2 Assessment

Stage 2 in the process of defining aquaculture management areas (AMAs) will involve more detailed assessment of the broad areas identified by Stage 1. These areas will exhibit comparatively low constraints for future marine farming activities. Their priority for Stage 2 assessment will be increased where they are also considered desirable areas of expansion by the marine farming industry. The ultimate goal of Stage 2 assessment is to define potential (AMAs) for inclusion in the PRP:C. Proposed AMAs will become part of a variation to the PARP:C. This variation will be publicly notified in accordance with the first schedule of the RMA.

Stage 2 assessment will:

- Focus assessment effort on highest priority areas identified by Stage 1.
- Obtain more detailed information on constraints within these areas.
- Define potential AMA areas within the broad areas of lower constraint.
- Allow AMA to provide for progressive marine farming development over the life of the Plan (~10 years) up to a maximum size and intensity that lies within the sustainable carrying capacity of the local environment.
- Acknowledge the limitations of the stage 1 & 2 assessments and that conclusions will not replace the need for case-specific assessment of environmental effects for resource consent applications.
- Take a precautionary approach in the absence of accurate ecological carrying capacity information so that selected AMA size may be considerably smaller than the theoretical maximum.
- Note, carrying capacity estimates are expected to require detailed investigation and verification before actual development of marine farms could be approved in any AMA.
- Carefully monitored progressive development of marine farms within AMAs is therefore likely to be required rather than immediate complete development.

5 Conclusions

- Available information on constraints to future marine farming activities within the study area have been collated and the degree of their spatial constraint plotted and stored in a geographical information system.
- Constraint information has been mapped by appropriate groupings and released for consultation purposes.
- Constraints have been broadly categorised into either Absolute or Critical groupings, and mapped.
- Patterns emerging from visual assessment of the mapped information have been used to identify areas of high constraint and areas where constraints appear to be comparatively low.
- Various knowledge gaps have been identified during the stage 1 assessment process. However, it was considered that adequate information was available for assessment to continue and for stage 2 areas for further study to be identified.
- Areas within the Auckland region where marine farming is considered inappropriate have been identified and classified as 'absolute constraint' and 'no-go' areas.
- Areas have been identified in the Auckland region with potential 'limited opportunity' for expansion or movement of existing marine farming operations.
- 'Stage 2 study areas' for further investigation have been identified in the Kaipara Harbour and the Firth of Thames.

Appendices

Appendix 1 Coastal Plan Policy

Proposed Auckland Regional Plan: Coastal Aquaculture Chapter 22, Issues, Objective, Policies, and Rules.

22.2 ISSUES

- 22.2.1 Aquaculture is an industry of increasing social and economic importance to the local, regional, and national economy. The farming of fish or shellfish also provides an important food resource, and assists in reducing pressure on the natural fish and shellfish stock.
- 22.2.2 A high standard of water quality and its continued maintenance is necessary to achieve the sustainable management of the coastal marine area and is required for the establishment and carrying out of aquaculture.
- 22.2.3 Aquaculture is a developing and dynamic industry, where considerable potential exists to cultivate a variety of marine fauna and flora. The effects of farming “new species”, or new types of farming methods, are to a significant extent unknown or untested in the Auckland Region.
- 22.2.4 The structures associated with aquaculture, and the changes that often result to the foreshore or seabed beneath farmed areas, can detract from the natural character, ecology and landscape quality of the coastal marine area. The space occupied by these structures may also conflict with other users of the area, particularly where farms are located in water which is used intensively for recreational purposes.
- 22.2.5 The washing down and cleaning of harvested aquatic species in the coastal marine area can have an adverse effect on water and sediment quality, and on the naturally occurring coastal flora and fauna.
- 22.2.6 The cumulative effect of aquaculture activities, particularly in areas where farms are concentrated, may have the potential to adversely affect recreation, amenity, natural character and ecological values of the coastal marine area.

22.3 OBJECTIVE

- 22.3.1 To provide for appropriate aquaculture in the coastal marine area while avoiding, remedying, or mitigating adverse effects on the coastal environment.

22.4 POLICIES

- 22.4.1 Aquaculture shall be avoided where it will modify, damage, or destroy:
- a any Coastal Protection Area 1 identified on the Plan maps; or
 - b any site, building, place or area scheduled for preservation in Cultural Heritage Schedule 1.
- 22.4.2 The relevant provisions of Part III: Values, Chapters 3 to 9 shall be considered in the assessment of any aquaculture proposal.
- 22.4.3 Notwithstanding Policy 22.4.2 conventional oyster and mussel farming is considered appropriate where the farm:
- a is subject to a current lease or licence under the Marine Farming Act 1971; and
 - b has been established in accordance with the lease or licence; and
 - c complies with all the terms and conditions of the lease or licence.
- (NB: This policy gives particular recognition to existing lawful farms which may seek a coastal permit rather than apply for a extension of term to their lease or licence.)
- 22.4.4 Aquaculture shall generally be considered inappropriate where it is proposed to be located within;
- a significant mooring and anchorage areas or in the recognised routes of travel, or navigation channels which are used to access these areas; and
 - b areas which have a high recreational use and amenity value; and
 - c areas which will interfere with public access particularly to highly used areas.
- 22.4.5 Any applicant for a coastal permit for aquaculture shall be required to demonstrate that any associated land-based activities which are to be located in the coastal environment, (including access from the water to the land, processing facilities, and waste disposal, including shell) are permitted by the relevant

district plan, or the necessary resource consent applications have been sought or obtained.

- 22.4.6 Any proposal to farm Pacific Oysters shall demonstrate as far as practicable that the farming operation will not initiate, or exacerbate any existing problems, with their uncontrolled colonisation of surrounding natural areas.
- 22.4.7 A precautionary approach shall be taken in the assessment and management of aquaculture which proposes using species or techniques of cultivation which have not been tried in the Region previously, and where any actual or potential effects are not fully known.
- 22.4.8 The use of vehicles along the foreshore as the means of attaining access to an area used for aquaculture, shall be considered inappropriate unless it can be demonstrated that there are no land or water based alternatives, and that the adverse effects are minor and temporary.
- 22.4.9 Any discharges to the coastal marine area associated with aquaculture, including waste or wash water, shall ensure after reasonable mixing that the following adverse effects, are avoided as far as practicable:
- a the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; and
 - b any conspicuous change in the colour or visual clarity of the receiving water; and
 - c any emission of objectionable odour; and
 - d any significant adverse effects on aquatic life.
- 22.4.10 The disposal of shell, racks, or other material associated with aquaculture in the coastal marine area shall be avoided.
- 22.4.11 Aquaculture activities should generally be consolidated within parts of the coastal marine area, particularly in areas where aquaculture activities are established, unless the number of farms or activities located within an area will result in an adverse cumulative effect.
- 22.4.12 Notwithstanding Policy 21.4.11, new aquaculture or significant expansion of existing aquaculture shall be considered inappropriate in the Mahurangi Harbour.
- 22.4.13 In assessing the cumulative effects of aquaculture proposals, regard shall be had to:

- a the actual or potential effects from existing areas leased or licensed under the Marine Farming Act 1971, regardless of whether these areas have been developed or not, in addition to other development or use of the coastal marine area; and
- b whether the cumulative visual impacts from the aquaculture proposal are less, by concentrating development in the same locality as other aquaculture developments rather than having a number of farms scattered throughout a locality or the coastal marine area.
- c whether the actual or potential cumulative physical and ecological effects of concentrated aquaculture in any one area can be mitigated through alternative methods or locations in the coastal marine area.

22.5 RULES

Limited Discretionary Activities

- 22.5.1 Conventional oyster or mussel farms holding a current lease or licence which seek a resource consent (rather than an extension of term to their lease or licence under the Marine Farming Act) subject to the following standards and terms:
 - a the farm has a current lease or licence under the Marine Farming Act 1971; and
 - b the farm is established in accordance with any lease or licence; and
 - c the farm complies with all terms and conditions of any lease or licence under the Marine Farming Act at the time of making a resource consent application under the RMA.
- 22.5.1.1 The ARC will restrict the exercise of its discretion under Rule 22.5.1 to the following matters:
 - a the condition and maintenance of any structures; and
 - b the effects of sedimentation or accumulation of organic or inorganic matter associated with the farm; and
 - c Policies 22.4.5, 22.4.9 and 22.4.10 of this chapter; and
 - d navigation and safety matters; and
 - e the duration of the consent; and
 - f monitoring of the consent.

An application for a resource consent will be considered without notification or the need to obtain the written approval of affected persons, in accordance with section 94(1A) of the RMA unless, in the opinion of the ARC, there are special circumstances justifying notification.

Discretionary Activities

- 22.5.2 Aquaculture which is not provided for as a Limited Discretionary Activity and which is not a prohibited activity.

Prohibited Activities

- 22.5.3 Aquaculture in any Coastal Protection Area 1.
- 22.5.4 Aquaculture that would modify, other than for the purpose of maintaining intrinsic heritage values, damage, or destroy any site, building, place or area scheduled for preservation in Cultural Heritage Schedule 1.

22.6 OTHER METHODS

- 22.6.1 The ARC will liaise with the Ministry of Fisheries,. DOC and the Maritime Safety Authority in respect of farms subject to leases and licences under the Marine Farming Act 1971, and in processing consents for aquaculture.
- 22.6.2 The ARC will liaise with appropriate representatives of shellfishing and fishing industry organisations in respect of aquaculture issues.
- 22.6.3 The ARC will liaise with territorial authorities to facilitate integrated management of aquaculture activities, particularly in terms of access, waste disposal and land based facilities.
- 22.6.4 The ARC will, as needed, conduct recreational boat surveys to establish the intensity and timing of recreational boat use in the Hauraki Gulf, and will monitor the effects of aquaculture on recreational use and navigation, particularly at Great Barrier Island where a number of new marine farms are being established. The ARC may, as necessary, undertake surveys in conjunction with DOC and territorial authorities.
- 22.6.5 The ARC will liaise with the Ministry of Fisheries , the Aquaculture Industry, research institutions, and other regional councils on studies being undertaken, and will undertake research on the effects of aquaculture on the coastal marine area.
- 22.6.6 The ARC will undertake research which can be used as the basis for appropriate provisions to be included in both regional and district plans to avoid, remedy, or mitigate the adverse effects of

land use on water quality. This is particularly relevant in areas where aquaculture is an established activity, such as in the Mahurangi Harbour. The ARC will liaise with territorial authorities on the outcomes of any research and the effects of land-based activities on water quality.

- 22.6.7 The ARC will seek the opportunity to comment on applications to the Minister of Fisheries for extensions of term of existing leases and licences granted under the Marine Farming Act 1971. The ARC will generally oppose the extension of term of leases or licenses where:
- a the leased or licensed site has not been developed within 2 years of the lease or licence being granted; or
 - b substantial progress has not been made on developing the farm; or
 - c the farm has been poorly maintained or managed, and is having significant adverse effects on the environment.
- 22.6.8 Where an aquaculture proposal requires a resource consent for associated activities on land in the coastal environment and a hearing is required, a joint hearing with the appropriate territorial authority will be sought.
- 22.6.9 The ARC will advise the Hydrographic Office of all new aquaculture approved in the coastal marine area.
- 22.6.10 The Maritime Safety Authority will be notified of all new aquaculture applications that are received by the ARC.

Appendix 2: Constraint Summary and Assessment Maps

**Appendix 2.1 Marine Farming (& sand extraction) Activities
(Marfarm.pdf)**

App 2.2 Navigation and Safety Issues (Navsafety.pdf)

App 2.3 Commercial and Naval Shipping Issues (Commship.pdf)

App 2.4 Recreational Boating Issues (Recship.pdf)

App 2.5 Commercial, Recreational and Customary Fishing (fishing.pdf)

App 2.6 Fishing Restrictions (fishing_restrict.pdf)

App 2.7 Visual Amenity Value (Visamen.pdf)

App 2.8 Water Quality (Waterqual.pdf)

App 2.9 Sediment Quality (sedqual.pdf)

App 2.10 Ecological Value (ecoval.pdf)

App 2.11 Cultural Heritage (cultural.pdf)

App 2.12 Absolute Constraints (absolute.pdf)

App 2.13 Critical Constraints (critical.pdf)

App 2.14 Absolute and Critical constraints (absolute_critical.pdf)

App 2.15 'No Go', 'Limited Opportunity' and Possible Stage 2 Study Areas (poss_go_all.pdf).

App 2.16 Final Stage 2 Areas (final_stg2_area.pdf).