

**DRAFT**

**SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT**

**FOR**

**A MODIFICATION TO NET PEN DESIGNS WITHIN THE  
EXISTING PRODUCTION CAPACITY AND FARM LEASE AREA  
FOR KONA BLUE'S OFFSHORE OPEN OCEAN FISH FARM  
OFF UNUALOHA POINT, KONA, HAWAII**

**PREPARED FOR:**

**Land Division,  
Department of Land and Natural Resources**

**PREPARED BY:**

**Kona Blue Water Farms, LLC  
P.O. Box 4239, Kailua-Kona, HI 96745**

**Dated : January 2nd, 2009**

## **PREFACE**

A previous application to double the capacity of the Kona Blue Water Farms offshore fish farm operation (CDUA HA-3443, 2007 Final Supplemental Environmental Assessment) was contested, and was withdrawn by the applicant.

Kona Blue now plans to change to more efficient and secure net pen designs. Some flexibility in the net pen configuration is also being requested, to allow for research and development and ongoing refinements. Production will either be maintained at current levels, or scaled back. This revised Draft Supplemental EA therefore requests no expansion of size of the lease, and no increase in production capacity.

The company is hereby applying for permission to remove most or all of the existing eight submersible Sea Station cages (each 3,000 cubic meters in capacity) on the offshore Kona farm, and to replace them with two larger net pens (“Production Net Pens”, either on the surface or submersible, each up to 7,000 cubic meters in capacity), and up to three other net pens (“Nursery and Research Net Pens”, either surface or submersible, with no one of these cages greater than 7,000 cubic meters). The overall production capacity of the farm will remain the same (around 24,000 cubic meters).

There will be no more than five net pens in the modified array. The Production Net Pens will be either of the ‘PolarCirkel’ form (robust, three-ring HDPE plastic surface net pens), or else larger versions of the existing Sea Stations (submersible net pens with steel rims and a central steel spar), which will be covered with either strengthened Dyneema® mesh or hard plastic Kikkonet mesh. The size, form and design of the two or three Nursery and Research Net Pens are as-yet-unspecified – either smaller PolarCirkels, modified Sea Stations, Aquapods (rigid framed spherical net pens) or other pen designs and materials that will present no entanglement risk to marine mammals.

The company’s original permit had previously approved the use of two surface nursery net pens.

At the request of the OCCL Administrator, this Supplementary EA will “also revisit comments received for the withdrawn CDUA HA-3443 and address comments (especially those from the Division of Aquatic Resources and NOAA Marine Fisheries Service) as applicable to this new proposal” (letter from Sam Lemmo, dated October 27<sup>th</sup>, 2008).

There were three comments by agencies on the withdrawn Draft Supplemental EA, which were addressed prior to filing of the Final Supplemental EA in 2007. These were :

1. State Department of Health, Environmental Planning Department, Kelvin Sunada, Manager, pointed out that Kona Blue does have a current NPDES permit, but that a modification will need to be approved prior to any expansion of production. The permit

modification application must be submitted 180 days prior to “commencement of the discharge”, but is not a condition of the CDUA approval.

2. State Department of Conservation and Resource Enforcement (DOCARE – 18), Reggie Lee, expressed the concern that the “area is properly lighted with navigational lights – especially during night hours”. A request by Kona Blue for a Department of the Army Section 10 permit for installation of appropriately lit lease area perimeter marker buoys has been approved by NOAA and ACOE. These perimeter marker buoys are now installed.
3. County of Hawaii Planning Department, Planning Director Chris Yuen, pointed out the expanded grow-out facility is located outside of the SMA and County jurisdiction. There is still a requirement for SMA review and permitting for any expanded support facilities or activities to be conducted within the areas of Kawaihae and Honokohau Harbors.

Copies of these Agency comments are Appended (Appendix 1).

These conditional permit requirements were already addressed in the 2007 Final Supplemental EA (see pages 1 – 2, below). There has therefore been no modification, addition or deletion in these regards from the 2007 Final Supplemental Environmental Assessment, to this 2009 Draft Supplemental Environmental Assessment, below.

Comments from the Division of Aquatic Resources and NOAA Marine Fisheries Service were received after the date of submittal of the 2007 Final Supplemental EA.

Copies of these Agency comments are Appended (Appendix 2).

Comments from Dan Polhemus, DAR Administrator and Jeff Walters, HIHWNMS Co-Manager (dated February 20<sup>th</sup>, 2008) address staff concerns with the interactions between bottlenose dolphins (*Tursiops truncatus*) and “divers, fish stock, and structures associated with the ... fish farm...”

The recommendations contained in that letter have been largely implemented, with ongoing weekly reports continuing to be supplied to HIHWNMS, DAR and NOAA, along with photographs of the dolphins for recording of distinguishing marks. In addition, Kona Blue has worked with HIHWNMS, DAR and NOAA to attempt to secure Federal funding for a UH Hilo student to conduct third-party monitoring of the dolphins.

Furthermore, as presented in an email from Kona Blue to HIHWNMS, DAR and NOAA staff (dated 9/21/08, from Neil Sims, President), the proposed testing of surface net pens offers the potential to significantly reduce the attractant nature of the farm. “ ... Surface cages will obviate the need for divers entering or exiting through zippers, hence no (escaped fish from) leakage (through the zippers). The Kikkonet is highly resistant to predators, and so should prevent (escapes from breaches in the mesh). ... In addition, we will not need to have divers dragging mort bags (mesh bags containing dead fish) through the water, so that additional attractive

nuisance will be removed. Indeed, very little diving will occur outside of the cages, so there will be notably less chance for diver-dolphin interaction.”

Comments from Chris Yates, Assistant Regional Administrator of NOAA’s Protected Resources Division (dated February 4<sup>th</sup>, 2008) requests that “a revised diagram and narrative be provided with details showing the exact number of moorings as well as any other lines which may pose an entanglement risk to protected marine species”. The diagrams and descriptions in this Supplemental EA are provided to the fullest and best of our abilities. Precise details are difficult to stipulate, as mooring requirements may need to be modified as exigencies warrant. The primary concern of marine mammal entanglement is addressed throughout the 2007 Draft Supplemental EA, and the text below. The overarching conclusion is that there has been no marine mammal entanglement over the almost 4 years of operation of the farm, and the modifications that are requested here further reduce the likelihood of any such entanglement, by reducing the number of net pens and the number of mooring lines, and using only rigid plastic mesh, hardened Dyneema® or similar robust or taut material.

Yates’ letter also claims that the “repeated interactions with bottlenose dolphins .... is not adequately disclosed” in the 2007 Draft Supplemental EA. However, this comment ignores the five month time gap between the compilation of the 2007 Draft Supplemental EA, dated September 10<sup>th</sup>, 2007, and the submission of Yates’ letter in February, 2008. Dolphin abundance at the farm site increased significantly over this five month period. Kona Blue had provided the reports to NOAA documenting this increase. These are the reports that are quoted in the letter as evidence of the increased abundance.

Yates’ letter claims that “6 or 7 (animals) have actually taken up residence” on the site. This is a distortion that is not based in any evidence. In October-November, 2008, for example, there were dolphins present at the farm site for some or all of the day on 65% of the days. (From 10/22/08 to 11/24/08, dolphins were present for some period of time on 22 out of 34 days, as per the Marine Mammal Report from Kona Blue to NOAA, dated 11/26/08). On 35% of days, then, there were no dolphins reported as observed on the site. On only one day were six dolphins present. Most other days there were one or two present.

Kona Blue has discussed our proposed modifications to the net pens and the farm array with David Schofield, of PIRO’s PRD. We believe that the PRD now appreciates the proposed reduction in the number of net pens, the reduced risk of marine mammal entanglement or net pen breach with use of hard plastic Kikkonet mesh or hardened Dyneema®, and the surface net pen potential improvements: the reduction in leakage from divers entering cages through zippers, and the reduced presence of divers outside of the net pens. We believe that these changes proposed here should reduce the attractant nature of the farm, and therefore should result in fewer dolphins around the net pens on fewer days.

Dan Polhemus, DAR Administrator, provided 14 pages of comments (dated March 3<sup>rd</sup>, 2008) on the 2007 Draft Supplemental EA. The first series of comments (I. Overall Comments), are

concerned with the “proposed shoreward expansion of (the) operation (and) expansion ... in both scale and capacity” (p. 4). However, as noted above, this revised 2009 Draft Supplemental EA requests no expansion of size of the lease, and no increase in production capacity. There is also no shoreward expansion of the lease or farm area. These comments are therefore not germane to this revised proposal presented here.

Many of the second series of comments from DAR (II. Specific Issues of Concern Regarding the CDUA, starting on p. 4) have been addressed in previous responses to DAR through OCCL. These were addressed in Kona Blue’s letters to the OCCL Administrator dated December 2nd, 2005 (responding to Dave Gulko’s letter dated November 18<sup>th</sup>, 2005), and again May 28th, 2007. Excerpts from Kona Blue’s earlier responses are presented in gray shading, amongst the pointwise responses below:

1. Aquatic Invasive Species (AIS) Issues. DAR comments that “cage surfaces provide an open substrate which can ... encourage growth of AIS ...”.

This reduced number of net pens will mean a lessening of the surface area for such growth. Any potential impacts will therefore be reduced. Kona Blue still feels compelled to “refute the presumption that our open ocean fish farm might be a significant source of colonizing plants or animals for invasive species onto “adjacent coastal areas”. Our farm site is a half-mile from shore; as described in our final EA, the currents in this area are almost invariably long-shore. There is therefore little likelihood of these (anchor) lines becoming a major factor in the dispersal dynamics of any invasive species, when there is so much other available substrate on uncolonized substrate closer to shore, throughout the entire coastline.

The whole underlying principle of open ocean aquaculture is that we are moving out offshore to mitigate such potential impacts. ”

2. Phase Shifts. DAR expresses concerns for “ecological phase shifts associated with eutrophication of benthic habitats caused by fecal, excess feed, and cage epifauna”.

The maximum biomass held on the farm will not increase, and may actually see a reduced number of net pens and biomass of fish. The present production levels (around 500 tons / year) have had no significant impact on benthic habitats, as evidenced by the extensive quarterly reporting. (Benthic monitoring reports and benthic drop-camera video footage available on Kona Blue’s web-site <http://www.kona-blue.com/emonitoring.php>).

3. Native Species. We are requesting that moi (*Polydactylus sexifilis*) be the only additional species that is added to our permit. Any moi or other species grown on the farm site will only be from native Hawaiian populations.

Kona Blue continues to conduct hatchery and grow-out research on the imperiled Giant Grouper (*Epinephelus lanceolatus*). This species is native to Hawaii, but has been driven to virtual extirpation. At some point, some stock enhancement program is probably

justified for this species. It most certainly should be afforded some measure of protection by the State. However, this permit modification request does not consider the future offshore culture potential for this species. Any future such request will be directed through the appropriate channels, for full review and input.

4. Escaped Fish. We expect there to be significantly reduced risk of breaches in the net pen webbing from use of the rigid plastic Kikkonet or hardened Dyneema® that is proposed here. Any other mesh that is used on the Nursery and Research Net Pens will first be approved for use by NOAA’s marine mammal specialist (in PIRO PRD) to ensure that there is no risk of marine mammal entanglement, and that the risk of breach is minimal. We expect there to be no ‘leakage’ of fish through net pen zippers on the surface pens, as divers will enter and leave the surface net pens from above the water line.
5. Ciguatera. DAR requests “assurances ... that these systems would not eventually serve to concentrate the dinoflagellate responsible for ciguatera” (p 8).

Part of the rationale for the change to larger Sea Stations or surface net pens is that this will allow more automation, and more efficient and more regular cleaning, which will further reduce macroalgal biofouling. There are almost no herbivorous fish found around the farm site.

Furthermore, our Kona Kampachi® has been extensively tested by UH SeaGrant, and found to be free from ciguatera. This is one of the advantages of culturing this species, rather than fishing wild stocks.

6. Anchoring systems. DAR listed a range of potential impacts on the substrate and increased AIS from the anchors used to hold the net pens in place. DAR had made almost identical comments to an earlier proposal from Kona Blue for deployment of additional anchors (Dave Gulko’s letter dated November 18<sup>th</sup>, 2005).

We had responded previously to these comments with the following:

- (a) As described in our Final EA, the area beneath our farm site is exclusively coarse sand. There are no benthic macrofauna in the farm area, and so there are no additional “direct (or) indirect impacts from the ... anchors” on such fauna.

We are not able to monitor or mitigate in any way any potential invasive species growth on these anchors. ...

The statement that these anchors “will disturb a natural benthic public resource and prevent its use in it’s (sic) natural state” reflects a very poor understanding of the overall conditions in which we are working. These waters are over 200 ft deep, the substrate is coarse sand ... The public resource occupied by these anchors is miniscule, and there is no current use that we are preventing.

There is no lead used in the anchors - they are steel. There are no cables used in the moorings – only galvanized chain and taut, low-stretch rope.

7. Depth and Currents. The concerns from DAR are not clear on this point.

All of our monthly and quarterly monitoring shows clearly that the farm operation is not having any measureable impact on water quality. All of our quarterly benthic monitoring data suggests that the farm is having no significant impact on the substrate beyond the immediate footprint of the net pens. (See Kona Blue’s web site <http://www.kona-blue.com/emonitoring.php>). These modifications will result in fewer net pens, and either the same or reduced levels of fish biomass.

8. Disease.

Sampling of wild kahala around the farm site has shown that there is no significant increase in parasite abundance resulting from the farm operations. The change proposed here to the hard plastic Kikkonet mesh or hardened Dyneema® should allow for skin flukes to be more readily controlled on the farm, as the net pens will be able to be cleaned regularly by automation, or by workers standing on the rim of the net pens. The present Sea Stations require SCUBA divers to clean the net pens, with a minimum crew of three divers needed for insurance and safety reasons. This is inefficient use of manpower, and means that nets cannot be kept as clean as they might with surface net pens. This proposal should therefore see a reduction in prevalence of skin flukes and other ectoparasites on the farm.

9. User overlap. DAR expressed concerns with competing user groups.

The data on recreational use of the farm lease area was provided in the original Final EA, which was accepted in 2004. There has been no increase in use of areas surrounding the farm site since then, except for increased troll fishing around the perimeter of the farm, because of the aggregative effects of the farm structures on fish. This is a positive benefit, rather than a detriment. The changes proposed here will result in surface cages occupying more of the ocean’s surface area, and some impact on the view plane, but as the submersible cages are already frequently raised to the surface, these changes are not a significant deviation from present usage of the farm area. These impacts are discussed in more detail, below.

10. Re-stocking issues. DAR expressed concern that “to date, little if any re-stocking has ever occurred to compensate the State for the loss of a very threatened (and protected) native population (the Hawaiian black-lip pearl oyster) for the exclusive use of that commercial business”.

This complaint about Kona Blue’s parent company is not considered germane to this requested permit modification. For the record, however, all collecting of *Pinctada margaritifera galtsoffi* broodstock by Black Pearls, Inc. was conducted under a DAR

collecting permit. Over a period of some 10 years of research, Black Pearls, Inc. released several billion fertilized eggs into the ocean at Keahole Point, to allow for natural restocking of this imperiled native oyster. Black Pearls, Inc., did not commercially farm the native Hawaiian pearl oyster.

11. Run-off issues. DAR questions the definition of “run-off”, and claims that the term should be used to describe the effluent waters down-current of the net pens.

There is no “run-off” from an open ocean fish farm. EPA and Hawaii Clean Water Branch regulations draw clear distinctions between effluent and run-off. Again, there is no measureable impact on water quality from the farm operations. (See effluent and zone-of-mixing water quality data on Kona Blue’s web site <http://www.kona-blue.com/emonitoring.php>). In any case, this request does not seek to increase the size, capacity or extent of the operations, and so any imagined impacts would be reduced.

Section IV. DAR Permit Recommendations in the DAR comments (pp 11 – 14) are also dealt with following DAR’s pointwise itemization:

- a. AIS. Kona Blue already allows site visitation by all authorized individuals and agencies. It is ludicrous to ask Kona Blue to report to DAR “any unknown organism of any sort found to be associated with, on, underneath or within ... this project”. Biofouling is comprised of highly diverse flora and fauna. Our intent – through these proposed changes – is to find means of more efficiently controlling biofouling, rather than identifying it.
- b. Frequency of Permit Amendments. As a fledgling industry, developing innovative new technologies, we need to be able to adapt our farm structures and operations to meet exigencies as they arise, and to be able to refine the farm configuration and practices. Kona Blue accepts that some State oversight is required, but we also ask for some consideration – the lengthy process involved in CDUA preparation, submission, departmental review and public review does not lend itself well to the flexibility that is required for a new, innovating industry. Permit amendments are required for each and every modification to our farm site array, or our net pen arrays. We are therefore requesting here that the permit conditions be broadened to allow for flexibility in the form of Production, Nursery and Research net pens. The two Production Net Pens will be either Sea Stations or PolarCirkels, totaling no more than 14,000 cubic meters. We also request up to three Nursery and Research Net Pens, but that there not be any specific constraints as to size, number (up to three net pens), form, mooring or mesh type on these Net Pens, so long as the design and the mesh type meet with the written approval of NOAA’s marine mammal specialist (in PIRO PRD) to ensure that there is no risk of marine mammal entanglement. The total net pen capacity on the farm will not exceed the present capacity of 24,000 cubic meters. This flexibility will then allow for the necessary ongoing research and development work with innovative net pen designs, without taking up Departmental staff time or causing permit delays with repeated requests for permit modifications each time a new net pen is to be tested, modified or removed.

- c. Phase Shifts/Nitrification. Kona Blue already conducts quarterly benthic monitoring around the farm site. At present production levels of 500 tons / year, there has been no significant change in indicator species abundance or community composition. This permit modification request, if approved, will see no increase in farm biomass, and will probably result in a significant reduction in production. We are thereby requesting here (and in our NPDES renewal application) that the frequency of the benthic sampling work be reduced to annually, or that the requirement for quarterly sampling be limited to the video monitoring work only.
- d. Native species. Kona Blue is hereby requesting that moi (*Polydactylus sexifilis*) be the only additional species added to our permit. Any moi or other species grown on the farm site will only be from native Hawaiian populations.
- e. Escaped fish. DAR's request that "escapes ... be identified and neutralized efficiently and effectively" is not practical. Unless and until Kona Blue begins to stock selectively-bred fish into net pens offshore, then there is neither a risk to the wild stock gene pool, nor a risk to the ecosystem from escapes. Kona Blue presently limits stocking to fish from F2 parents. No fish stocked offshore are selectively-bred. Any escapes that survive are therefore essentially contributors to stock enhancement. Again, however, the rationale for the changes proposed here is largely to reduce the potential for leakage and breaches through use of the rigid-plastic Kikkonet on the surface net pens, or hardened Dyneema® on the Sea Stations.
- f. CIGUATERA. UH Seagrant has already conducted these trials. No further testing is necessary.
- g. ANCHORING. It is ludicrous to request that "no metal ... be used as anchoring material" (p 13). It is hard to comprehend what DAR believes that we should instead use, if not metal. Each anchoring spot is already fixed by GPS co-ordinates. No further benthic monitoring is warranted.
- h. DEPTH AND CURRENTS. Kona Blue already conducts an extensive quarterly benthic monitoring program which has shown that there is no significant impact from the farm on the substrate. The monitoring requirements should therefore be reduced to once per annum. If some quarterly monitoring is still required, it should simply be for video observations.
- i. DISEASE. Kona Blue already conducts ongoing monitoring of pests and parasites attached to wild kahala that are collected from around the farm for use as broodstock. The proposal for an extensive monitoring program of "targeted fish species and other fish species known to associate around the cages or nearby habitats" (p. 13) is oppressively broad.

Our existing permit conditions and Federal regulations already proscribe any use of prophylactic antibiotics, hormones, or "novel chemical elements" in the food.

The substance of the two contested cases that opposed the granting of the 2007 Final Supplemental EA were specifically that (a) the State was not empowered to grant additional lease extensions over ceded lands, and (b) that there was inadequate environmental monitoring data to substantiate the request for increased production capacity. Neither of these complaints are germane to this revised request. No modification is being requested to the existing lease. No increase in production capacity is being requested here.

It is worthwhile also noting that an oral question raised at the hearing to take public comments on the 2007 Draft Supplemental EA was to the effect of ‘If Kona Blue is so environmentally friendly, why is their fish not listed on the Monterey Bay Aquarium’s Seafood Watch Guide?’ The response at the time, by Kona Blue’s President, Neil Anthony Sims, was that Kona Blue had requested that the MBA’s Seafood Watch Program undertake an evaluation of our farm operations, but that MBA did not certify individual farms. Since then, MBA’s Seafood Watch staff have visited the Kona Blue site, in the course of preparing a report on yellowtail (*Seriola* spp.) culture worldwide. This report ranks “US Farmed Yellowtail” as a “Good Alternative”. This is the first time that Monterey Bay has ever ranked any net pen farm in the ocean as anything other than “Red – Avoid”. Kona Kampachi® is the only US Farmed Yellowtail, and Kona Blue is the only US yellowtail farm. The Final Report is now available on line, at [http://www.montereybayaquarium.org/cr/cr\\_seafoodwatch/content/media/MBA\\_SeafoodWatch\\_FarmedYellowtailReport.pdf](http://www.montereybayaquarium.org/cr/cr_seafoodwatch/content/media/MBA_SeafoodWatch_FarmedYellowtailReport.pdf). Kona Kampachi® is now listed on the Monterey Bay Aquarium’s Seafood Watch Sushi Guide as a “Good Alternative”.

----- /// -----

# TABLE OF CONTENTS

<u>List of Figures</u> .....	xiii
<u>List of Tables</u> .....	xv
<u>List of Acronyms and Abbreviations</u> .....	xvi
<b><u>EXECUTIVE SUMMARY</u></b> .....	<b>XVII</b>
<b>1. CONSULTATIONS AND STATUS OF PERMITS</b> .....	<b>1</b>
1.1 PERMITS AND APPROVALS .....	1
1.1.1 <i>Federal</i> .....	1
a. U.S. Department of the Army Permit .....	1
1.1.2 <i>State</i> .....	1
a. Conservation District Use Application .....	1
b. National Pollutant Discharge Elimination System Permit .....	2
c. DOH Solid Waste Permit .....	2
d. Special Management Areas and Shoreline Setback .....	2
e. Aquaculture License .....	2
1.2 AGENCIES, CITIZEN GROUPS AND INDIVIDUALS CONSULTED .....	2
1.2.1 <i>Meetings and community consultations</i> .....	2
<b>2. PRELIMINARY DETERMINATION</b> .....	<b>4</b>
<b>3. THE RATIONALE FOR OPEN OCEAN FISH FARMING</b> .....	<b>7</b>
3.1 THE ECONOMIC OPPORTUNITY .....	7
3.1.1 <i>The Broad Perspective: the imperative for offshore aquaculture</i> .....	7
3.1.2 <i>Open ocean fish farming – the new frontier</i> .....	7
3.1.3 <i>The opportunity: Kona as a center for innovative ocean aquaculture</i> .....	8
3.1.4 <i>The Challenges in Hawai`i</i> .....	9
3.1.5 <i>The Solution: surface net pens, rigid webbing, and greater operational flexibility</i> .....	10
3.2 THE ENVIRONMENTAL BENEFITS .....	13
3.3 SITE SELECTION .....	14
3.3.1 <i>Criteria</i> .....	14
<b>4. PROJECT DESCRIPTION</b> .....	<b>16</b>
4.1 TECHNICAL AND OPERATIONAL CHARACTERISTICS .....	16
4.1.1 <i>Location and extent of the lease area</i> .....	16
4.1.2 <i>Farm operations</i> .....	17
4.2 ECONOMIC CHARACTERISTICS .....	21
4.2.1 <i>Economic impacts of the amended operations</i> .....	21
4.2.2 <i>Impacts on the market</i> .....	22
4.3 SOCIAL CHARACTERISTICS .....	22
4.3.1 <i>Public use of offshore ocean space</i> .....	23
4.3.2 <i>Demonstration of offshore aquaculture in Kona</i> .....	23
4.3.3 <i>Research, training and extension opportunities</i> .....	25
4.4 ENVIRONMENTAL CHARACTERISTICS .....	25
<b>5. ALTERNATIVES</b> .....	<b>28</b>
5.1 ALTERNATIVES EVALUATED .....	28
5.2 NO ACTION ALTERNATIVE .....	29
<b>6. ENVIRONMENTAL SETTING</b> .....	<b>31</b>
6.1 WATER QUALITY .....	31
6.1.1 <i>Existing water quality monitoring programs</i> .....	31
6.1.2 <i>Currents</i> .....	31
6.2 BIOTA .....	32
6.2.1 <i>Terrestrial biota</i> .....	32

6.2.2 <i>Marine biota</i> .....	32
Benthic and Fish surveys .....	33
Dolphins .....	33
6.2.3 <i>Rare, threatened or endangered species</i> .....	34
6.3 RECREATION .....	34
6.4 NOISE AND AIR QUALITY .....	35
6.5 AESTHETICS.....	35
6.6 CULTURAL RESOURCES AND PRACTICES .....	35
6.7 LAND USE AND ENVIRONMENTAL COMPATIBILITY .....	36
6.7.1 <i>Current usage</i> .....	36
6.7.2 <i>Submerged lands issues and the public trust</i> .....	36
6.7.3 <i>Public perceptions of ocean use</i> .....	36
<b>7. POTENTIAL IMPACTS AND MITIGATION .....</b>	<b>37</b>
7.1 IMPACTS DURING CONSTRUCTION.....	37
7.2 LONG TERM IMPACTS.....	37
7.2.1 <i>Water quality</i> .....	37
Monthly Monitoring and NPDES Permit requirements .....	37
Pest Management, Therapeutant Treatments and Effluent Monitoring.....	38
7.2.2 <i>Biota</i> .....	39
a. Flora .....	39
b. Terrestrial fauna .....	39
c. Marine biota .....	40
Marine Benthic Organisms .....	40
Fishes .....	40
Dolphins .....	41
Sharks .....	42
d. Rare, threatened or endangered species .....	43
Humpback whales.....	44
Mitigation measures.....	45
Marine Mammal Monitoring Plan .....	47
7.2.3 <i>Recreation</i> .....	47
7.2.4 <i>Noise and air quality</i> .....	49
7.2.5 <i>Aesthetics</i> .....	49
7.2.6 <i>Cultural practices and traditional resources</i> .....	50
7.2.7 <i>Land use and environmental compatibility</i> .....	50
a. Current usage .....	50
b. Submerged lands issues and the public trust .....	50
7.2.8 <i>Cumulative impacts</i> .....	51
7.2.9 <i>Irreversible and irretrievable commitment of resources</i> .....	51
7.2.10 <i>Summary of operating constraints</i> .....	51
<b>REFERENCES .....</b>	<b>55</b>

## **List of Figures**

- Figure 1 : Existing offshore fish farm site and primary fishing areas** **Page 15**  
The existing site is well inside of both the 100 fathom (200 m) trolling ledge along the “grounds” offshore of Keahole Point, and the 40 fathom (80 m) ono lane. Reef fishing and ‘opelu ko’a are found well inshore of the proposed site, along the edge of the reef, in waters up to 120 feet deep (40 m). Fishing grounds for ‘opelu at night are usually deeper than 40 fathoms (80 m).
- Figure 2 : Existing Mooring Array, and Grid Dimensions - Plan view** **Page 18**  
Number of net pens will be reduced from current eight to a maximum of five.  
The submerged grid will remain at around 30 ft (9 m) beneath the surface.
- Figure 3 : Production Net Pens**  
The farm will replace the eight existing SS3000 (either 2,800 or 3,200 cubic meters) with two Production Net Pens of up to 7,000 cubic meters, and up to three other Nursery Net Pens or Research Net Pens. The Production Net Pens will be either Polar Cirkels (Figure 3a), or modified Sea Station 6200s (Figure 3b). Net pens will be tied into the existing grid. A series of buoys and weights will ensure that the anchor lines are perpetually taut, to avoid entanglement by marine mammals.
- Figure 3 a: PolarCirkel with HDPE pipe rim, Kikkonet mesh, and weight ring** **Page 19**
- Figure 3 b : Submersible SS6200 Sea Station net pens** **Page 20**
- Figure 4 : Frequency of tagged tiger shark occurrences at Kona Blue farm site.** **Page 42**  
Five tagged sharks were recorded over an 11 month period, with the most frequently occurring shark being present three times over a two month period.
- Figure 5 : Typical Humpback whale sighting patterns around the Big Island of Hawaii** **Page 45**
-

## **LIST OF APPENDICES**

The 2007 Draft Environmental Assessment provides appendices on water quality monitoring data, around the farm site, currents in the area of the farm, benthic and fish communities on the reef directly inshore of the site, the substrate type and benthic community in the farm area, and the recreational uses of the farm area. As these parameters are not affected by the modifications proposed in this Draft EA, these appendices are not presented here. The reader is referred to the 2007 Draft EA on the company's website:

[http://www.kona-blue.com/download/DRAFT\\_EnvironmentalAssessment.pdf](http://www.kona-blue.com/download/DRAFT_EnvironmentalAssessment.pdf)

### **APPENDIX I :**

**DRAFT MANAGEMENT PLAN, APPENDED TO CDUA APPLICATION**

### **APPENDIX II :**

**MARINE MAMMAL MONITORING REPORT**

### **APPENDIX III :**

**LISTING OF SELECTED RECENT PRESS ARTICLES  
AND PUBLICATIONS ON KONA BLUE**

List of Tables

	<u>Page No.</u>
TABLE 1: SALIENT ISSUES FOR OPEN OCEAN FISH FARMING IN HAWAII	x
TABLE 2: SIGNIFICANCE CRITERIA, FINDINGS AND ANTICIPATED DETERMINATION FOR EACH CRITERION	5
TABLE 3: SUMMARY OF OPERATING CONSTRAINTS	65 - 67

---

## List of Acronyms and Abbreviations

ACOE	- Army Corps of Engineers
ADP	- Aquaculture Development Program, a division of DOA
BPI	- Black Pearls, Inc.
CDUA	- Conservation District Use Application
CII	- Cates International, Inc.
CWB	- Clean Water Branch, a division of the State Department of Health
DAR	- Division of Aquatic Resources, a division of DLNR
DBOR	- Division of Boating and Ocean Recreation, a division of DLNR
DLNR	- Department of Land and Natural Resources
DOA	- State of Hawaii Department of Agriculture
DOH	- State of Hawaii Department of Health
EA	- Environmental Assessment
EPA	- Environmental Protection Authority
FAA	- Federal Aviation Authority
FAD	- Fish Aggregating Device
FONSI	- Finding of No Significant Impact
HIHWNMS	- Hawaiian Islands Humpback Whale National Marine Sanctuary
HOARP	- Hawaii Offshore Aquaculture Research Project
HRS	- Hawaii Revised Statutes
KIA	- Kona International Airport
MHI	- Main Hawaiian Islands
NPDES	- National Pollutant Discharge Elimination System
NELHA	- Natural Energy Laboratory of Hawaii Authority
NMFS	- National Marine Fisheries Service, a division of NOAA
PIRO	- Pacific Islands Area Office, an office within NMFS
PRD	- Protected Resources Division, within PIRO
NOAA	- National Oceanographic and Atmospheric Agency
NWHI	- Northwest Hawaiian Islands
OHA	- Office of Hawaiian Affairs
OSWM	- Office of Solid Waste Management, a division of DOH
OTEC	- Ocean Thermal Energy Conversion
UH	- University of Hawaii
UHSG	- University of Hawaii Sea Grant Program
WHAP	- West Hawaii Aquarium Project
ZOM	- Zone of Mixing

## **EXECUTIVE SUMMARY**

Kona Blue Water Farms, LLC, is hereby applying for a modification to the existing CDUP over a portion of the offshore waters adjacent to the Natural Energy Laboratory of Hawaii Authority and the Keahole-Kona International Airport under Chapter 190 D, Hawaii Revised Statutes (HRS), as amended. The purpose is to allow the existing net pens to be replaced with a more efficient and secure net pen design, and for some provision in the permit conditions to allow new net pen designs and configurations to be tested. No change is being sought to the existing ocean lease area or boundaries, and no expansion of production capacity is requested. If Kona Blue cannot implement these changes, the company will not be able to reach profitability.

The existing 90 acre lease area presently accommodates a total of eight submersible Sea Station net pens. The company requests permission to replace these to allow us to accommodate two surface net pens for production (the “Production Net Pens”), plus a combination of up to three other surface or submersible net pens to be used as nursery pens, and for research and development of new pen designs or new species culture methods (the “Nursery and Research Net Pens”). The Production and Nursery Net Pens will be either (a) modified Sea Stations, with strengthened Dyneema® mesh or Kikkonet mesh, or (b) PolarCirkel-style thick-walled HDPE rims, with rigid plastic Kikkonet mesh. The Research Net Pens will be either PolarCirkels, Sea Stations, Aquapods, or other steel or plastic frame net pens that are engineered to withstand the sea conditions on the site. The mesh material on the Research Net Pens will be either Dyneema® (currently used on the Sea Stations) or other similar low-stretch, taut-mesh material, or else rigid plastic Kikkonet or Aquagrid, or other similar metal or plastic.

The original permit conditions had approved two smaller surface net pens, of around 15 m diameter. The two Production Net Pens will each be around 30 m in diameter. The Nursery and Research Net Pens will not exceed 30 m in diameter.

The two existing mooring grids (each holding 6 and 2 net pens) will remain largely unchanged. The net pens will continue to only occupy an area of around 8 acres, at the center of the lease. The remainder of the lease will continue to be occupied only by taut mooring lines and anchors. Some minor modifications may need to be made to the mooring grid, such as extension of compensator buoys on the corners of the grid squares to the surface, to hold the grid at the correct depth during periods of strong current. This may then allow ballast weights and pendant lines to be removed from most of the corners of the grid squares. The number of ballast weights and pendant lines will also be further reduced as the existing Sea Stations are removed.

This Draft Supplemental Environmental Assessment (EA) assesses the present environment and current human activities in the existing fish farm area. It reviews alternative actions, and recommends the project proceed because of the relatively minor impacts that have been demonstrated by the project so far, the insignificant impacts that are expected from these proposed modifications, and the economic and environmental benefits to be gained from improved efficiency of production of sustainably-grown, high-value seafood.

There have been minimal impacts from the existing fish farm operation. Given the depth of water, the bare sand substrate beneath the farm, the high rate of water exchange through the area, the distance to any nearby reef areas, and the fact that the proposed changes will result in the same or reduced farm capacity, implementation of these changes will result in unchanged or reduced impacts on water quality and benthic ecosystems.

There will be almost no additional impact on public activities in the area resulting from these changes. The depth of water is well beyond the limits of normal recreational diving. Almost all present diving and reef-fishing activities are confined to the reef shelf, around half a mile inshore from the net pens at the center of the lease area. Most present offshore fishing activity is centered along the 100 fathom drop-off, along the south-western edge of the shelf, almost 3 nautical miles to the south and west of the proposed net pens. There is no significant bottom relief in the area, and most of the substrate is medium to coarse sand.

Public access to the lease area will be no different than that to the existing lease, except for the exclusion of the public from the ocean surface area that may be enclosed by the surface net pens. The public will be permitted to traverse and fish by trolling, handlining or drop-netting throughout the lease area. However, for safety, worker efficiency and liability reasons, anchoring, SCUBA-diving, snorkeling or swimming by the public will continue to be precluded in the lease area. For worker safety, public boat traffic in the area around the net pens is requested to continue to be “Slow – No Wake”.

We will continue to culture only native Hawaiian fish species on the fish farm. The primary species for culture will be Kona Kampachi™ (also known as kahala, or *Seriola rivoliana*). Kona Blue may also culture amberjack (the other kahala species, *S. dumerili*), mahimahi (*Coryphaena hippurus*), and possibly Pacific threadfin (*Polydactylus sexifilis*).

This assessment largely restates the similar assessment conducted for the earlier proposal to double the farm capacity, which had requested permission for doubling the size of the individual net pens, and increasing the size of the lease. There were no written public comments received during the public comment period. The agency comments received on the 2007 Draft Supplemental EA are responded to above, and these concerns are reflected in the amended proposal presented here.

The table below summarizes the salient issues for open ocean fish farming in Hawaii, based on public comments from Kona Blue’s meetings with the community, and responses to other fish farming proposals in Hawaii. The determination for each issue, and relevant page in this document, is also presented in this listing of preliminary consultation concerns.

TABLE 1 : SALIENT ISSUES FOR OPEN OCEAN FISH FARMING IN HAWAII

<u>ISSUE OR CONCERN RAISED BY THE PUBLIC</u>	<u>ANALYSIS, DETERMINATION, MONITORING AND MITIGATION</u>	<u>PAGE NO.</u>
Deterioration of water quality down-current of farm	Strong currents in open ocean provide rapid assimilation. Independently collected data from Kona Blue’s existing farm indicates no measurable impact on water quality. Effluent limits are established. Ongoing monitoring is required under Federal law, through an NPDES. This proposal will result in similar or reduced effluent loading, as biomass will be the same or less.	36-38
Accumulation of fish feces under net pen, or on nearby reefs and beaches	Independent data from Kona Blue’s existing site indicates no significant impacts on the benthos beyond the immediate cage area. The depth of water and currents diminish any impact of settled solids on the benthos. Coarse sand substrate and benthic detritivores assimilate any inputs. Ongoing monitoring is a required condition of the current permit. This proposal will result in similar or reduced substrate loading.	39
Accumulation of excess feed under net pen	The benthic data from Kona Blue’s existing site indicates minimal impact. Careful farm management – diver and video-monitoring of feeding – serve to minimize excess feed losses. Coarse sand substrate and benthic detritivores assimilate any inputs. Ongoing monitoring will be a required permit condition. This proposal will result in similar or reduced substrate loading, and surface net pens will reduce potential for excess feeding.	39
Offshore farm will negatively impact wild fish stocks	Kona Blue has, and will continue to culture only native species in its offshore pens. Additionally, all fish cultured in Kona Blue’s offshore pens have been and will be hatchery-reared, not wild-caught. There have been no negative effects on wild fish stocks reported from or linked to Kona Blue’s site. Kikkonet mesh and surface net pens could reduce potential for ‘leakage’ and escapes.	39–40
Humpback whales will be either attracted or repelled by the net pens, or entangled in mesh	Kona Blue has encountered no significant whale interactions on its existing site. The lease area is not heavily frequented by humpbacks, compared with other areas of the Kona Coast. Entanglement cannot occur in Dyneema® or Kikkonet rigid plastic net pen mesh. All anchor lines will be kept taut. Ongoing monitoring will be a required permit condition.	43–46
Dolphins will be disturbed by net pens or entangled in mesh	Kona Blue has encountered no significant spinner dolphin interactions on its existing site. Bottlenose dolphins presently frequent the farm site, but implementation of this proposal could see a significant reduction in the attractant nature of the operation, with reduction in escapes, and limited diving outside	40-41, 46

	of the surface net pens. Entanglement cannot occur in Dyneema® or Kikkonet rigid plastic net pen mesh. All anchor lines will be kept taut. Ongoing monitoring will be a required permit condition.	
Sharks will be attracted to net pens, leading to attacks on people and dolphins	Kona Blue has recorded only rare instances of tiger sharks around its existing farm; probably related to seasonal migrations. Additionally, Kona Blue experiences regular sandbar shark sightings under its pens, at depths, related to the fish aggregating effects of the pens and mooring. Use of the hardened Dyneema® or Kikkonet rigid plastic net pen mesh should further reduce attractant nature of the farm, and reduce or eliminate breaches in the mesh.	41-42
Fish farm conflicts with fishing activity	Lease area depth (180 to 200 feet or 54 m – 61 m deep) is too deep for reef fishing or spear fishing. No fishing for Kona crab and laenihi (nabeta) occur in this area because of strong currents. No ‘opelu ko’a are located in the proposed farm lease area. Fishing boats trolling the farm perimeter take advantage of the aggregative effects of the farm. This is a benefit to fishing activity, rather than a negative impact.	46-48
Fish farm conflicts with other recreation	There is no recreational use of this lease area, beyond fishing boats trolling the farm perimeter. Dive boats and other vessels may occasionally transit through the site, but this passage is not and will not be significantly impeded. The surface cages will present a visual impact, but there is already a semi-permanent feed barge located on the farm site, and current practices rely on regular raising of the Sea Stations to the surface.	46-48

A finding of no significant impact (FONSI) is anticipated. Findings to support this determination based on established “Significance Criteria” (Chapter 200, HAR) are :

(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource?

No. There will not be an irrevocable commitment to loss or destruction of any natural or cultural resource. The offshore area contains no resources that would be significantly affected. Production of Kona Kampachi™ from the existing offshore fish farm has provided a continuing supply of sashimi-grade fish, in face of restrictions to tuna longlining and the opakapaka/ehu bottomfish fishery.

(2) Curtails the range of beneficial uses of the environment?

No. Earlier surveys indicated that the presence of the farm would not curtail the range of beneficial uses of the environment. There was no pre-existing recreational or subsistence use of the proposed lease area. The presence of the farm may actually increase the beneficial uses of the environment, by providing for improved trolling catches in the area around the farm, from the fish aggregating effects of the pens. The proposed change to surface Production Net

Pens will result in some minor increase in visual impact of the farm operation, but this is not significant. The original permit conditions had also approved two smaller surface cages.

- (3) Conflicts with the State's long-term environmental policies or goals and guidelines?

No. The Kona Blue operation exemplifies realization of the State's long-term environmental policies and goals by moving towards more sustainable use of marine resources. The original project was one of the first tests of the amended ocean leasing law (Chapter 190 D HRS), which was specifically crafted to allow a sustainable ocean-based commercial aquaculture industry to develop in the State. This proposal actually reduces the potential impacts from the operation by reducing the number of net pens and possibly reducing the attractant nature of the farm to bottlenose dolphins. The proposed project is consistent with the environmental policies established under Chapter 344 HRS.

- (4) Substantially affects the economic or social welfare of the community or state?

No. The project modifications will result in some greater efficiency of the offshore operations, and this will therefore result in some reduced employment in the offshore divers and crew. These numbers will not be significant. Without some changes in net pen form or configuration of the array, Kona Blue cannot reach profitability. If these proposed changes are approved, then the farm could continue to provide a consistent supply of high quality fish to restaurants and the public. The project will not substantially detract from the economic or social welfare of the community or State.

- (5) Substantially affects public health?

No. The continuing availability of fresh fish will likely have some positive impact on public health. The project will otherwise not substantially affect public health.

- (6) Involves substantial secondary impacts such as population changes or effects on public facilities?

No. No substantial secondary impacts will be involved.

- (7) Involves a substantial degradation of environmental quality?

No. There will be no substantial degradation of environmental quality associated with the changes to the project. There will possibly be reduced impacts on water quality and benthic fauna, as the overall fish biomass will either stay the same, or be reduced. There will also probably be reduced attractant nature of the operation to bottlenose dolphins, with less likelihood of escapes, and reduced diving by farm workers outside of the net pens.

- (8) Cumulatively has a considerable effect on the environment or involves a commitment for larger actions?

No. Data from the existing operation indicates that there is no measurable impact on water quality, and no significant impact on the benthos beyond the immediate cage area. There is no other possible mechanism for any cumulative effect. Implementation of the proposed project does not involve any commitment for larger actions. The project is described in its entirety in the document.

- (9) Substantially affects a rare, threatened or endangered species or its habitat?

No. Data from the existing operation affirms that the farm operations do not cause any substantial detriment to any rare, threatened or endangered species or its habitat. Humpback whales, monk seals and turtles may all transit through the farm area, but the net pens will not represent a significant barrier to movement of marine mammals or reptiles, and there is negligible risk of entanglement in the taut-line mooring system. These changes will probably reduce the likelihood of escapes, and reduce diving by farm workers outside of the net pens, with consequently reduced attractant nature of the operation to bottlenose dolphins.

(10) Detrimentially affects air or water quality or ambient noise levels?

No. None of the emissions from the farm vessels or equipment have, or are anticipated to have, a substantial effect on air or water quality. Any noise generated by the changes, even during construction phase, will be insignificant compared with the noise from the adjacent Kona International Airport.

(11) Affects or is likely to suffer damage by being located in an environmentally sensitive area?

No. The open ocean site is over 180 feet (54 m) deep, with strong currents and coarse sand substrate. The farm will not impede movement or otherwise disturb the spinner dolphins that move through the area each morning to their resting area in the shallow waters of Makako Bay. The nearest coral reef lies directly inshore from the existing farm site, but normal currents are long-shore (generally north-south).

(12) Substantially affects scenic view planes or vistas?

No. The proposed changes will permit up to surface net pens as Production Net Pens, and up to three surface net pens as Nursery and Research Net Pens. (Some of these pens may alternatively be submersible Sea Stations). There is already some impact on the view plane, as the submerged grow-out pens presently on the farm site are regularly raised during the day (sometimes several at any one time), to allow for easier and safer working by the offshore crew divers. The original permit for the farm allowed for two smaller surface net pens, and these were in operation at the farm site from early 2005 until late 2006. There is also a currently-permitted semi-permanent 74 ft feed barge located on the farm site. All of these considerations reduce the impact that these changes will have on the existing scenic view planes and vistas. These changes will not be a significant impact on the view plane, given the existing land use of the Kona International Airport and the ponds at the Natural Energy Laboratory of Hawaii Authority.

(13) Requires substantial energy consumption?

No. Insubstantial amounts of energy are used to power the boats and equipment.

# 1. CONSULTATIONS AND STATUS OF PERMITS

This section outlines the regulatory issues and coordination associated with Kona Blue's proposed amendments to the open ocean fish farm in the Unualoha Point area of the Kona Coast. Regulatory issues include amended permits and concurrence with a number of Federal, State and County regulations. Consultation for the prior request for doubling the size of the net pen capacity and the production volumes from the farm had included scoping meetings with a range of state and federal agencies, and the public. The few concerns that had been raised against the requested expansion (see the Preface, above) are all addressed within this revised request.

## *1.1 PERMITS AND APPROVALS*

Permitting procedures follow Chapter 190 D, HRS, as amended, and other relevant laws.

### 1.1.1 Federal

#### a. U.S. Department of the Army Permit

The Rivers and Harbors Act, Section 10, requires that a Department of the Army (DA) permit be issued for any activity that obstructs or alters navigable waters of the U.S. This project will require the removal of the existing net pens, and deployment of the two larger Production Net Pens, and up to three additional Nursery and Research Net Pens. Permanent moorings for the net pens and boats will be reduced in number, but will be modified. As such, an amended Section 10 authorization will be required as part of the DA permit application.

The U.S. Army Corps of Engineers (ACOE) is responsible for administering and granting DA permits. The criteria for issuance of a modified DA permit are similar to those for issuance of an EA. At the discretion of the ACOE, the modified DA permit can be processed and issued concurrently with other permits.

### 1.1.2 State

#### a. Conservation District Use Application

Chapter 183C HRS and HAR 13-5 pertain to obtaining permits for any use of lands in the Conservation District. The Conservation District Use Application (CDUA) process is managed by the Land Division of DLNR. The OCCL Administrator has stated that a new CDUA is required, and that "A Departmental permit shall be required. However, the Chairperson may determine that the scope of the proposed use or the public interest may require a Board permit once we review the proposal." (letter from Sam Lemmo to applicant, dated 10/27/08).

b. National Pollutant Discharge Elimination System Permit

The State Department of Health Clean Water Branch (DOH-CWB) requires a revised National Pollutant Discharge Elimination System (NPDES) Permit and Zone of Mixing Permit (ZOM) under the Federal Clean Water Act, Section 402, HAR 11-55. This applies specifically to discharges of point sources of pollutants into surface waters of the U.S. All aquaculture projects – including offshore net pen culture – are considered point-sources. A renewed NPDES permit application has been submitted to CWB, and is currently under consideration. This application stated that Kona Blue was requesting modifications to the net pen array, but that these changes would not impact effluent or other NPDES concerns, and may actually reduce the potential for environmental impacts. No additional amendments to the NPDES application are therefore warranted.

c. DOH Solid Waste Permit

The farm intends to continue to either sell fish whole, or conduct all processing on land, in certified processing plants. Solid waste disposal will therefore be the responsibility of the processor, wholesaler or purchaser.

d. Special Management Areas and Shoreline Setback

Use of the area is not subject to County Special Management Area (SMA) permit requirements.

e. Aquaculture License

An Aquaculture License is required for commercial culture of a State regulated species under Chapter 187A-3.5 HRS and Sections 13-74-43 and 13-74-44 HAR. The DLNR Division of Aquatic Resources and DOA ADP are the coordinating agencies.

*1.2 AGENCIES, CITIZEN GROUPS AND INDIVIDUALS CONSULTED*

1.2.1 Meetings and community consultations

(a) Compilation of the 2007 Draft Supplemental Environmental Assessment

Kona Blue's principals spent over sixteen months discussing the company's aspirations for expansion of their offshore operation, in a series of informational, briefing and consultative meetings with the community and Federal and State bureaucrats throughout 2006 and 2007. Details of these consultations are provided in the corresponding section in the 2007 Final Supplemental EA (see

[http://www.kona-blue.com/download/DRAFT\\_EnvironmentalAssessment.pdf](http://www.kona-blue.com/download/DRAFT_EnvironmentalAssessment.pdf)). There were no written public comments submitted on the 2007 Draft Supplemental EA. There were several objections raised at the public hearing to obtain input on the 2007 Draft Supplemental EA. Two contested cases were filed against the request for permission to double the production capacity of the operations and expand the lease area. The application was subsequently withdrawn by the applicant. This request for modifications to the permit takes into consideration all comments submitted during the original consultations, and also addresses the concerns that were raised by those filing the contested cases.

-----

## 2. PRELIMINARY DETERMINATION

The proposed changes – a reduction in the number of net pens, and changes in the form and materials used in the construction of the net pens - will not have any significant effects in the context of Chapter 343 HRS and HAR 11-200-12. Therefore a finding of no significant impact (FONSI) is anticipated.

A brief summary of findings to support this determination follows (Table 2). Chapter 200, HAR, establish “Significance Criteria” to be used as a basis for identifying whether significant environmental impacts will occur. These criteria are addressed in more detail below.

TABLE 2 : SIGNIFICANCE CRITERIA, FINDINGS AND ANTICIPATED DETERMINATION FOR EACH CRITERION

Significance Criteria	Does Project meet Criterion?
1. Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.	No
2. Curtails the range of beneficial uses of the environment.	No
3. Conflicts with the State’s long-term environmental policies or goals and guidelines.	No
4. Substantially affects the economic or social welfare of the community or state.	No
5. Substantially affects public health.	No
6. Involves substantial secondary impacts such as population changes or effects on public facilities.	No
7. Involves a substantial degradation of environmental quality.	No
8. Is individually limited, but cumulatively has a considerable effect on the environment or involves a commitment for larger actions.	No
9. Substantially affects a rare, threatened or endangered species or its habitat.	No
10. Detrimentally affects air or water quality or ambient noise levels.	No
11. Affects or is likely to suffer damage by being located in an environmentally sensitive area.	No
12. Substantially affects scenic view planes or vistas.	No
13. Requires substantial energy consumption	No

Significant environmental impacts are deemed to occur if any of the following hold true :

- (1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.  
There will not be an irrevocable commitment to loss or destruction of any natural or cultural resource. The offshore area contains no resources that would be significantly affected. Production of Kona Kampachi™ from the existing offshore fish farm has provided a continuing supply of sashimi-grade fish, in face of restrictions to tuna longlining and the opakapaka/ehu bottomfish fishery.
- (2) Curtails the range of beneficial uses of the environment.  
Surveys indicate that the proposed action will not curtail the range of beneficial uses of the environment (see 2007 Draft EA). There was virtually no recreational or subsistence use of the lease area prior to establishment of the farm.
- (3) Conflicts with the State's long-term environmental policies or goals and guidelines.  
This project exemplifies realization of the State's long-term environmental policies and goals by moving towards a more sustainable use of marine resources. The original project was one of the first tests of the amended ocean leasing law (Chapter 190 D HRS), which was specifically crafted to allow a sustainable ocean-based commercial aquaculture industry to develop in the State. This proposal furthers and extends application of that law. The proposed changes to the project are consistent with the environmental policies established under Chapter 344 HRS.
- (4) Substantially affects the economic or social welfare of the community or state.  
The proposed changes to the project will not result in any significant economic effects. The increased efficiency of operations will result in some reduced employment in the offshore crew. However, by affording Kona Blue the chance to become profitable, these amendments could also provide more secure employment for the remaining employees. The project will also continue the consistent supply of high quality fish to restaurants and the public. The project will not substantially detract from the economic or social welfare of the community or State.
- (5) Substantially affects public health.  
Continued availability of fresh fish will likely have some positive impact on public health. The project will not otherwise substantially affect public health.
- (6) Involves substantial secondary impacts such as population changes or effects on public facilities.  
No substantial secondary impacts will be involved.
- (7) Involves a substantial degradation of environmental quality.  
There will be no substantial degradation of environmental quality associated with the project. There will be negligible impacts on water quality and benthic fauna.

- (8) Cumulatively has a considerable effect on the environment or involves a commitment for larger actions.

Data from the existing operation indicates that there is no measurable impact on water quality, and no significant impact on the benthos beyond the immediate cage area. There is no other possible mechanism for any cumulative effect. Implementation of the proposed project does not involve any commitment for larger actions. The project is described in its entirety in the document.

- (9) Substantially affects a rare, threatened or endangered species or its habitat.

Data from the existing operation affirms that the proposed project will not cause any substantial detriment to a rare, threatened or endangered species or its habitat. There are potential benefits to be gained by the reduction in attractive power of the farm to bottlenose dolphins, through reduced escapes and less diving activity outside of the net pens. Humpback whales, monk seals and dolphins may all transit through the farm area, but the net pens will not represent a significant barrier to movement of marine mammals, and there is negligible risk of entanglement in the rigid plastic mesh or the taut-line mooring system.

- (10) Detrimentially affects air or water quality or ambient noise levels.

None of the emissions from the farm vessels or equipment have a substantial effect on air or water quality. Any noise generated by the project, even during construction phase, will be insignificant compared with the noise from the adjacent Kona International Airport.

- (11) Affects or is likely to suffer damage by being located in an environmentally sensitive area.

The open ocean site is over 180 feet (54 m) deep, with strong currents and coarse sand substrate. The farm does not impede movement or otherwise disturb the spinner dolphins that move through the area each morning to their resting area in the shallow waters of Makako Bay. The nearest coral reef lies directly inshore from the farm site. There is a deep water reef downcurrent of the farm, offshore from Mahaiula Bay (3 miles downstream under an North-setting current), and other coral reef on Keahole Point (around 1 mile to the south, downstream under a South-setting current).

- (12) Substantially affects scenic view planes or vistas.

The proposed changes will permit up to two surface net pens as Production Net Pens, and up to three surface net pens as Nursery and Research Net Pens. These changes will not be a significant impact on the view plane, given the existing land use of the Kona International Airport and the ponds at the Natural Energy Laboratory of Hawaii Authority. The original permit for the farm allowed for two smaller surface net pens, and these were in operation at the farm site from early 2005 until late 2006. There is also a currently-permitted semi-permanent feed barge located on the farm site. All of these considerations reduce the impact that these changes will have on the existing scenic view planes and vistas.

- (13) Requires substantial energy consumption.

There will be insubstantial amounts of energy used to power the boats and equipment.

-----

### 3. THE RATIONALE FOR OPEN OCEAN FISH FARMING

#### *3.1 THE ECONOMIC OPPORTUNITY*

##### 3.1.1. The Broad Perspective: the imperative for offshore aquaculture

While the demand for seafood increases, capture fisheries around the world are collapsing from over fishing, or are static. In the U.S., closures or buyback schemes to reduce effort have effectively shut down once-productive fisheries for Atlantic tunas and swordfish, the groundfish of Georges Bank and other Northeast fisheries, Pacific Coast anchovies, albacore, and more recently, rockfish. Other environmental concerns for endangered species or marine mammals have seen closures or limitations placed on fisheries for shrimp in the Gulf of Mexico, purse seining for tuna in the Pacific, and longlining for tuna and swordfish in Hawaii and the U.S. Pacific. Currently, over 80% of the seafood consumed in the U.S. is imported, and more than half of those imports are from farmed sources.

Aquaculture offers the only viable solution to the growing demand for sustainable, healthy sources of protein for human consumption. Fish farming reduces exploitative pressure on already-depleted wild stocks, supports the growth of coastal and rural industries, and yields a product that is low in saturated fat, and high in protein. The annual contribution of aquaculture to global aquatic production is now almost equal to that of wild catch (42% vs. 58%, FAO, 2006). In 1985, aquaculture represented only 5% of US fish consumption, yet today that figure stands at above 30%. Growth is rapid, and is projected to increase in pace. The Department of Commerce has set a goal of a five-fold increase in U.S. aquaculture production value, to \$5 billion, by 2025.

Domestic aquaculture production using existing methods or species cannot keep pace. Almost all U.S. production is from freshwater species; the only marine species cultured in any quantity are salmon and striped bass, both of which are anadromous (freshwater spawning). The recent development of open ocean culture systems and hatchery methods for marine fish offers a great opportunity for expansion of aquaculture in offshore regions, in an environmentally sustainable manner. Offshore fish culture in the U.S. stands now on the cusp of tremendous potential growth. However, many species with high market demand (tunas, snappers, groupers) cannot be consistently produced in the hatchery. Other fish, which can be commercial hatchery-reared (gray mullet, milkfish, moi), have low prices or small niche markets.

##### 3.1.2. Open ocean fish farming – the new frontier

Advancement of marine fish culture in the U.S. was previously limited by two principal constraints – grow-out technology, and the available species. Limitations in grow-out technology have, up to now, kept most fish farm operations confined to inshore, protected areas, or to land-based tank systems. Land-based or inshore fish farm proposals often encounter legal and policy hurdles, vociferous opposition, and onerous monitoring and reporting requirements. These have

been strong disincentives to any prospective fish farmer or investor, and limit the growth potential for the industry.

In the last few years, there have been dramatic advances in the legal and engineering fields, which have opened up the new fish farming frontier of offshore areas. New submersible net pen systems have been pioneered by OceanSpar, LLC, of Washington State (maker of the “Sea Station™”), and Ocean Farm Technologies, Inc., of Maine (maker of the new “Aquapod™”). These new technologies are undergoing continuous refinement, and are now able to increase the scale of individual net pen units. In addition, existing surface pen technology has been significantly improved, with more engineering experience, more robust designs, and hardier materials. A number of new surface net pen systems are now in use in highly-exposed sites throughout Europe. Norwegian WaveMaster® and Aqualine® net pen systems have been in use for many years, facing the North Sea and the North Atlantic. These new technologies have dramatically increased the workable extent of ocean farming, by providing seaworthy platforms for grow-out of fish in exposed offshore environments.

### 3.1.3 The opportunity: Kona as a center for innovative ocean aquaculture

Kona Blue is a leader in the fledgling open ocean aquaculture industry in the U.S. The original company – Black Pearls, Inc. (BPI) – worked in sustainable pearl farm development in Hawaii, the South Pacific and South East Asia. Recognizing the potential for marine fish hatchery expansion, BPI’s founders began work in 2001 on innovative marine fish hatchery techniques under an Advanced Technology Program grant from NIST/Department of Commerce.

Kona Blue was the first company to ever produce several high-value marine fish species in the hatchery, such as opakapaka, or rosy snapper, and the flame angelfish. Kona Blue was the first in the world to successfully rear the golden trevally (*Gnathanodon speciosus*) in the hatchery. We were also the first to ever report successfully rearing any species in the entire grouper genus of *Cephalopholis*, producing over 3,000 roi, or peacock grouper (*Cephalopholis argus*). Of the eight different species that Kona Blue was able to rear in the hatchery, however, none were comparable to *Seriola rivoliana*, or Kona Kampachi™. This native, deepwater species had no competing commercial or recreational fishery, was amenable to hatchery production, showed excellent growth rates and feed conversion ratios (a measure of feed utilization efficiency) and – best of all – provided superb sashimi and excellent, buttery cooked fillets.

At the same time as the company was pursuing this hatchery and market research, Kona Blue began the process through state and federal permitting for the original offshore farm site, off Unulaoha Point. After an extensive three-year process of consultation and consensus-building with the community, Kona Blue was granted the requisite State and Federal permits for the original offshore farm in March, 2004. Full financing for the venture was obtained in October, 2004. The offshore operation began deployment in February, 2005, and first fish were harvested offshore in September, 2005. Since then, production has grown to where Kona Blue has been harvesting up to 25,000 lbs of sashimi-grade Kona Kampachi™ per week.

Kona Kampachi™ has quickly become widely recognized throughout the US as an exemplar of an environmentally-sound, open-ocean grown, high-grade product. It has broad market reach, in sushi bars, white table-cloth restaurants, and in higher end retail outlets, such as Whole Foods (in California) and Central Market (in Texas). The high quality of Kona Kampachi™ and the sustainable offshore culture techniques which produce it have been highlighted in major newspapers, such as a Seattle Post-Intelligencer, cover story entitled “Guilt Free Fish Farming”; National Public Radio; and national magazines such as Fortune Magazine (“The Wonder Fish” April, 2008) and Men’s Journal (“The Perfect Fish”, June, 2008). Links to more articles and broadcasts are available on our web site: [www.kona-kampachi.com](http://www.kona-kampachi.com).

At the same time, Kona Blue has reached out to environmentalists and the conservation community to engage them in discussions on the issues surrounding offshore aquaculture, and the future of fish farming. The Monterey Bay Aquarium’s Seafood Watch Program recently accorded Kona Blue the honor of ranking US farmed yellowtail (of which Kona Kampachi® is the only present example) as a “Good Alternative” on their Sushi-Guide wallet card (Miranda and Peet, 2008). This is the first time that any fish farmed in the ocean has ever been ranked by MBA as anything other than “Red – Avoid”. Through the Ocean Stewards Institute, we are also now working with World Wildlife Fund and other NGOs to create rigorous worldwide standards for certification of offshore farmed species (World Wildlife Fund, 2008).

#### 3.1.4 The Challenges in Hawai`i

Even with all these successes, however, Kona Blue remains unprofitable. The company is pioneering culture of a new species, with an innovative mooring and net pen system. Some flexibility and adaptability is needed to find the right formula for success. We believe that we cannot continue to operate at this site, given the current farm configuration. To be able to continue operating at this site, we therefore need to change the farm array, to allow for greater operational efficiency and more flexibility.

The eight submersible net pens currently in use mandate an onerous requirement for divers to undertake almost all of the tasks on the farm. Insurance and OSHA requirements dictate the following: that divers do not enter a submerged net pen unless it has been raised to the surface; that divers do not exceed 60 ft depth: and that at least three commercially-certified divers be present whenever one diver enters the water. Divers also have to swim outside of the net pens to enter or leave a pen. This presents an attractant to the bottlenose dolphins that are now frequently found on the farm site.

The Dyneema webbing on the Sea Station net pens has also proven to be somewhat susceptible to predator attack. In addition, fish can ‘leak’ from inside the net pen as divers enter or exit the submersible net pens through a zipper. These occasional ‘leakages’ provide further conditioning stimuli for the bottlenose dolphins.

The present form of the Dyneema webbing has also proven difficult to keep clean, because of the reliance on diver-operated high-pressure jet net cleaners. This has meant that biofouling on the

webbing has been difficult to control, and has resulted in reduced water flow through the net pens, and has led to compromised fish health.

In high currents, the smaller submersible net pens are difficult to feed efficiently, and sometimes cannot be raised to the surface. The current strength and direction cannot be anticipated at the Kona site, as the currents are not tidally driven, but are instead driven by offshore gyres. These gyres are largely governed by wind and water movement patterns through the Alenuihaha Passage. This convolution of current forces results in frequent and unpredictable disruptions to work on the farm site, as increased strength or changes in direction of the current directly impact the divers' work. On several instances, harvests have not been able to be completed because strong currents kept divers from entering the water, or prevented the submerged net pens from being raised to the surface.

We believe that the only way for Kona Blue to achieve profitability for our Kona operation is by reducing our reliance on SCUBA divers. We can only do this by either (a) increasing the automation and the scale of the Sea Stations, or (b) moving to robust surface pens.

### 3.1.5 The Solution: larger Sea Stations, or more robust surface net pens and rigid webbing

By moving to larger scale Sea Stations, many of the diver functions are immediately rendered more efficient. The new Sea Station 6200s that may be deployed at the site may also be equipped with more sophisticated cameras and other monitoring and management tools, to further reduce diver requirements, and improve the overall functionality of the net pen.

Larger size surface net pens also significantly reduce the need for SCUBA divers in farm operations. Kona Blue's operation was originally permitted for two surface cages on the company's farm site, but the earlier experiences with these pens (over about one year, from mid-2005 to mid-2006) were not satisfactory. These cages were under-engineered by the Canadian cage-manufacturing company, they had nylon netting material, and they were not able to be adequately protected from predators.

Kona Blue now believes, however, that these concerns with surface net pens can be resolved by using PolarCirkel-style cage rims, with Kikkonet mesh netting. PolarCirkels are a brand of Norwegian surface net pens owned by AKVA – the biggest fish farm equipment company in the world. These net pens are engineered to withstand North Sea and North Atlantic storms. They are made of thick-walled, durable HDPE piping, with sufficient floatation and strength so that they will not kink, nor be pulled under by strong currents. These net pens also have very heavy weight rings, so that the cages will not deflect (flatten out) in high currents.

Kikkonet mesh netting is a hard plastic chain-link material that is highly predator-resistant and easy to clean in-situ. As the Kikkonet is rigid, it also offers negligible risk of entanglement of marine mammals. The material is highly durable, having been used on net pens in Japan for over 28 years, with almost no loss in filament strength over that period of time.

The black monofilament of Kikkonet is smooth, and fouling resistant. The surface net pens will be able to be cleaned simply by having a worker stand on the rim of the cage, and lower a cleaner-head from the surface, on a rope, or on a pole. By therefore regularly cleaning the cage netting, Kona Blue expects to be able to reduce biofouling, and thereby significantly improve overall fish health, and reduce the frequency – or eliminate entirely – the need for therapeutic bath treatments of the fish. This should also result in fewer fish mortalities. The size of the Kikkonet mesh on the proposed Production Net Pens (40 mm square sides) will create very low drag, and very little deflection in high current. The twine surface area of the two Production Net Pens proposed here is only 18% that of the present eight Sea Station 3000s, with consequently significantly less drag, and less surface area for biofouling or attachment of parasite eggs.

Surface cages would also be safer for offshore farm workers, with dramatically less SCUBA diving required. Cage cleaning, harvesting, and removal of most mortalities could all be accomplished without SCUBA diving. Most of the SCUBA diving the crew would need to undertake would be inside the surface cage, with a maximum depth of just 10 m, and with direct access to the surface. This would further increase the safety of the diving practices on the farm. Because divers will be able to enter and exit the cage directly from the surface, the ‘leakage’ through the Sea Station zippers will also be eliminated, thereby removing the presumptive primary attractant for the bottle-nose dolphins.

This proposal therefore requests permit modifications to remove most or all of the eight submersible Sea Station net pens on the Kona Blue offshore farm site, and to replace them with two Production Net Pens (either Sea Stations or PolarCirkels), and a total of no more than three surface or submersible Nursery and Research Net Pens (either Sea Stations, PolarCirkels, Aquapods, or other, similar rigid frame and rigid mesh designs).

No Production Net Pen (either PolarCirkel or Sea Station) will be great than 30 m diameter, or of more than 7,000 cubic meters volume. The overall farm configuration will have a total volume of 24,000 cubic meters – i.e. the same as the current farm array (each of the eight existing Sea Stations is around 3,000 cubic meters, for a total of 24,000 cubic meters culture volume). Kona Blue expects to be able to sustain current levels of production (around 20,000 lbs per week) from a single nursery Net Pen and two Production Net Pens, simply by being able to better manage the use of this available space.

Kona Blue proposes to install the two Production Net Pens in the existing mooring array on the site, lying on opposite ends of the main grid, along the E-W axis of the grid. The Nursery and Research Net Pens will also be installed in various locations on both grids, and may be moved as needed. The company plans for experienced Ocean Spar or AKVA engineers to complete the full hydrodynamic modeling of this change-over, once approval is obtained to make this change. One or two of the existing Sea Stations may remain on the site, for research purposes. However, the company plans on selling the remaining Sea Stations, as soon as possible after this proposal is approved, and would promptly remove them from the water

The purpose of the Research Net Pens is to accommodate the need for adaptive refinement and ongoing testing that is essential for progress in any new industry. By allowing this research and

development to happen here expeditiously, this approval would encourage Hawaii's ongoing leadership in open ocean aquaculture. The Research Net Pens will be either modified PolarCirkel-style rims, or modified Sea Stations, or submersible Aquapods or other similar proven net pen design. The materials will be either rigid plastic, such as Kikkonet or Aquagrid®, metal mesh, or taut-stretched webbing such as Dyneema® or similar. Prior to deployment of any of the Research Net Pens the design and webbing of the net pen will be approved in writing by the PIRO PRD as offering no significant risk for marine mammal entanglement. The total culture volume of the Nursery and Research Net Pens will be such that the maximum net pen volume on the farm will not exceed that of the present array (i.e. an aggregate of 24,000 cubic meters).

There is sound precedent for the request for use of surface net pens. The original Draft EA, back in 2004, had requested an array of three Sea Stations and three surface grow-out cages. There had not, at the time, been any strenuous objections to the use of surface cages. (refer to comment letters responding to the 2003 Draft EA, available on Kona Blue's website: [www.kona-blue.com/permitapplication.php](http://www.kona-blue.com/permitapplication.php). The 2003 Final EA, also accessible through the same website, also describes the reasons why the company then made the modifications to the application to six submersible Sea Stations, and two surface Nursery Net Pens). The one remaining, valid concern to surface net pens that was expressed in the original round of meetings and in the public comments had been in regard to the request by the company for an exclusive lease 'buffer' area around the surface net pens. Kona Blue is not requesting any such exclusive lease area around these surface net pens that are proposed here, for this permit modification.

The company hopes that in light of this precedent, and with the precedent of the two surface cages in the original permit, that approval for this modification might be obtained expeditiously. It is a financial imperative for Kona Blue that these changeovers be implemented in the soonest possible timeframe.

Kona Blue intends to continue to use the farm site solely for production of Kona Kampachi™ (*Seriola rivoliana*). In addition, however, at some future stage, Kona Blue may conduct grow-out trials on the site with the 'other' kahala species (*S. dumerili*, or amberjack), as well as mahimahi (dorado or dolphinfish, *Coryphaena hippurus*), and possibly moi (*Polydavctylus sexifilis*, Pacific threadfin) If any of these grow-out trials prove promising, then we would possibly scale up to commercial production of these species.

Kona Blue's performance to date has demonstrated that there is strong market demand for open ocean grown, hatchery-reared, sashimi-grade fish across the U.S. To meet the projected growth in demand, Kona Blue has increased our Kona Kampachi broodstock in tanks at our hatchery and research facilities at the Natural Energy Laboratory of Hawaii Authority (NELHA). The company has also completed construction of improved larval rearing facilities at the NELHA facility. Kona Blue now holds over 140 spawning broodstock, and has successfully reared over 1,000,000 larvae that have been transferred to the open ocean net pens. This represents a tremendous boost in sustainable fish farming – producing sashimi-grade product without reliance on any fish taken from Hawaiian waters (apart from the original broodstock).

### 3.2 THE ENVIRONMENTAL BENEFITS

The principal environmental benefits to be gained from this modified net pen array are improved, more efficient and safer production of Kona Kampachi®. By allowing the company to become profitable, this modified array will sustain and reinforce the benefits of reduced commercial fishing pressure on wild fish stocks. By allowing flexibility in the permit conditions, this will also allow for innovation and ongoing research to provide for further refinements.

The decreasing catch volume and decreasing average size of fish caught in the bottomfish fishery has caused considerable concern in Hawaii, in the Federal fisheries administration, and among other U.S.-affiliated Pacific Islands countries. By 1996, only 20% of the onaga catch in the main Hawaiian Islands (MHI) had previously spawned; similar declines were evident among other species stocks. These species' biological characteristics make them vulnerable to recruitment over-fishing; NOAA Fisheries staff estimate that an onaga attains maturity at about 4.1 years of age, at a size of 66 cm. With Federal and State data indicating significant overfishing of these stocks, increased regulation became imperative. In June, 1998 new legislation went into effect, established limits on fishing gear, bag limits, registration of bottomfishing craft, and restricted fishing areas (up to 20% of the bottomfish grounds was placed off limits) for the commercial and recreational fishery.

Further restrictions are still needed. Over the last two summers, the State declared all bottomfish fishing closed for the summer period from May 1<sup>st</sup> to September 30<sup>th</sup> for 2007, throughout the entire island range. DLNR has indicated that this seasonal closure may need to be repeated for coming years, as well, before there is any measurable improvement in stocks. The majority of high-value species consumed in Hawaii already are imported from other areas, such as the South Pacific and South East Asia. With the closure of the local fisheries for this five month period, there is even greater pressure on these less-well-regulated, remote fish stocks. Alternative, sustainable sources of high quality marine fish are needed to meet the shortfall in Hawaii.

Expanded open ocean aquaculture and its attendant marine fish hatcheries will also aid in the eventual development of the technology and capacity for reef restocking programs, to supplement fish recruitment to the reef. Kona Blue has also hatchery-reared over 13,000 juvenile ulua (Giant trevally, *caranx ignobilis*) in the hatchery, and made them available to the State's Division of Aquatic Resources for research into stock enhancement efficiencies. The ulua is the signature species of the recreational shoreline fishery throughout the island chain, and again, would be an ideal candidate for reef restocking. Kona Blue has also pioneered the development of hatchery techniques for Hawaii's imperiled deep water snappers, being the first company in the world to rear any of the Eteline deep water snappers (such as opakapaka, or the Rosy Snapper, *Pristipomoides filamentosus*). As the marine fish culture industry grows further, these techniques could be further refined to allow for stock enhancement of some or all of these valuable, vulnerable species.

In addition, if this proposal is approved, Kona Blue will examine the potential for conducting eco-farm tours of the hatchery and the offshore farm site. At the moment, this is not considered viable because the Sea Stations are usually submerged. With possible deployment of surface net pens, however, there is greater potential to engage the public, and to educate them on the benefits of sustainable, environmentally sound open ocean fish farming.

Further, Kona Blue will continue to pay a portion its gross revenues to the State, as lease payment. These monies have been directed into the Special Land and Development Fund for planning research and development of the aquaculture industry, which is intended “for aquaculture purposes”, and administered by the Land Board. It may be possible to direct some of these funds to projects in Kona for restocking, marine education, or other marine conservation efforts. A 20% portion of these funds are payable to the Office of Hawaiian Affairs.

### 3.3 SITE SELECTION

#### 3.3.1 Criteria

The original farm lease site was selected using the following criteria :

1. The site was in a deep-water area, with well-mixed oceanic environment that will naturally mitigate potential environmental impacts and present less exposure to storm or wave damage.
2. There was little or no public use of this area. The farm site lies between the limits of normal recreational SCUBA-diving (around 120 feet) and the normal depths for offshore trolling for ono (wahoo, *Acanthocybium solandri*).
3. The site afforded some protection from both Kona storms and the strong trade winds. The proximity to shore also allows for telemetry links to shore for farm control and security.
4. There was ready access from Honokohau Harbor, which provides support facilities such as slips, fueling, and land for staging of equipment and feed.
5. The site was directly offshore from the Kona International Airport and NELHA, and as such its use for commercial aquaculture is consistent with the adjacent land uses.

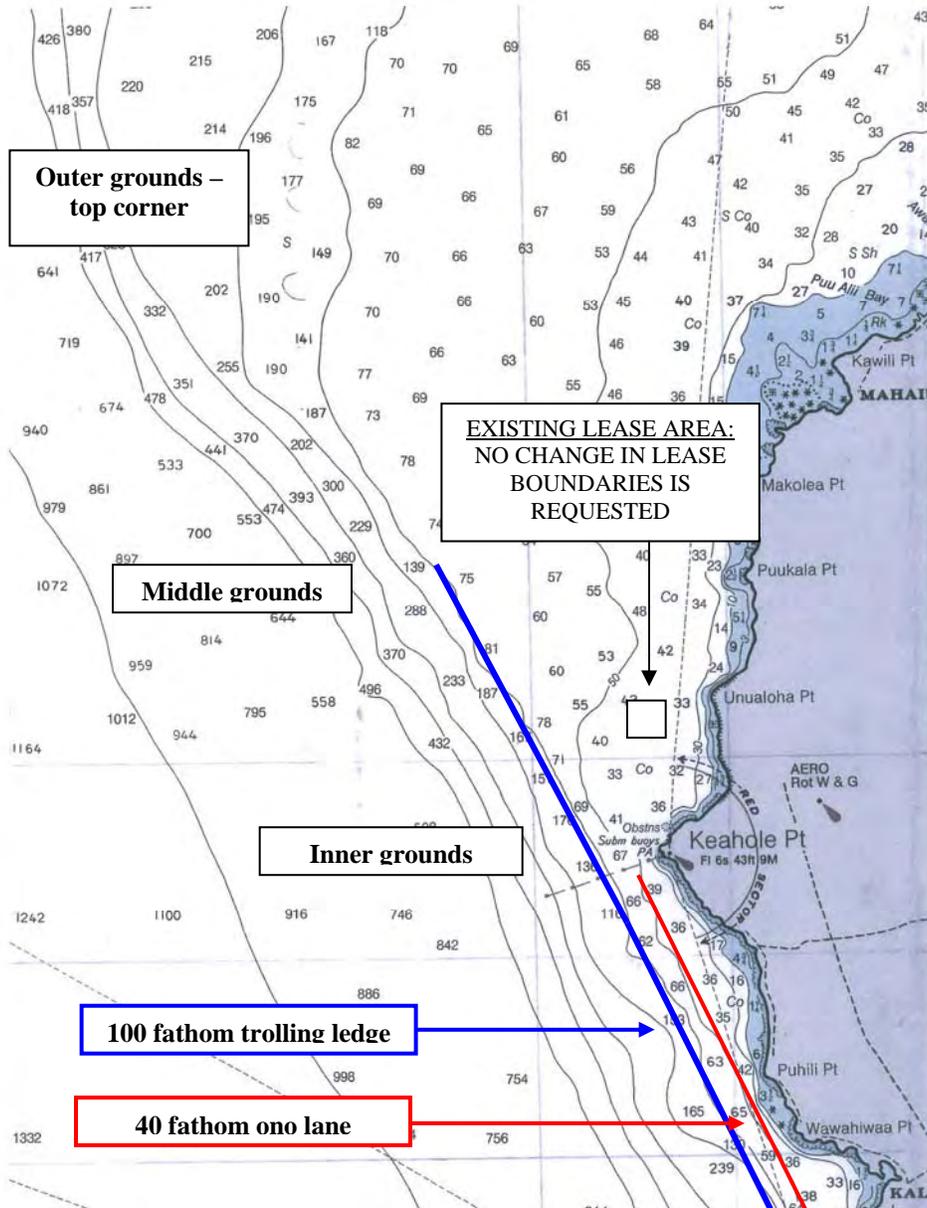
All of these primary criteria still hold as valid rationales for the decision to remain at the existing site. This request for modification to the Kona Blue permit does not seek to alter the farm site, or the lease area in any way, and solely requests operational changes to the permit.

Fishermen regularly troll lures through the outer area of the existing farm lease; there is no available data on catch rates within the lease area, but anecdotal evidence suggests that the existing farm does indeed result in improved catches. Only on rare occasions will fishermen troll close to the mooring grid; this can result in a lure becoming entangled on the grid lines, and the loss of some of the fishing gear. Kona Blue staff have tried to encourage fishermen to keep a

reasonable distance from the grid, both to prevent such gear loss, and for the safety of divers in the water. Most fishermen appear to appreciate the guidance offered by the company’s staff.

**Figure 1 : Existing offshore fish farm site and primary fishing areas**

The existing site is well inside of both the 100 fathom (200 m) trolling ledge along the “grounds” offshore of Keahole Point, and the 40 fathom (80 m) ono lane. Reef fishing and ‘opelu ko’a are found well inshore of the proposed site, along the edge of the reef, in waters up to 120 feet deep (40 m). Fishing grounds for ‘opelu at night are usually deeper than 40 fathoms (80 m).



(Note: Dimensions and location of area are indicative only – precise latitude and longitude of the lease area is included in the text.)

## 4. PROJECT DESCRIPTION

### 4.1 TECHNICAL AND OPERATIONAL CHARACTERISTICS

#### 4.1.1 Location and extent of the lease area

(Please refer also to Appendix V : Draft Management Plan, for more details).

Kona Blue is proposing no changes whatsoever to the maximum production capacity and lease area of its existing fish farm operation in the waters adjacent to the Natural Energy Laboratory of Hawaii Authority (NELHA) and the Keahole-Kona International Airport (KIA). The existing farm site lies south-west of Unualoha Point.

The site is a rectangle, with a total area of 90 acres, and sides of 2,000 ft and 1,800 ft (long axis running N-S). The corners of the rectangle are defined by the following latitude and longitude co-ordinates :

<u>Lease corner</u>	<u>Latitude</u>	<u>Longitude</u>
North-east	19° 44.716'	156° 03.589'
South-east	19° 44.420'	156° 03.589'
South-west	19° 44.420'	156° 03.884'
North-west	19° 44.716'	156° 03.884'

The depth at the center is approximately 210 ft. The outermost area of the lease is used almost solely for mooring lines. The net pens are all concentrated towards the center of the lease area (see Figure 2), within two mooring arrays: one containing six net pens, and the other containing two net pens and the feed barge. The closest distance from the edge of this central grid array to shore is approximately 2,600 ft, or almost half a mile to the northeast, to Unualoha Point.

Negotiated exclusivity is requested to remain in force over the lease area. This means that for liability, insurance and safety reasons no unauthorized anchoring, SCUBA-diving or swimming would be permitted through the lease area. Transit, trolling, hoop-net fishing and hook-and-line fishing would be permitted through the outer lease area, away from the grid array. The applicant also requests permission to possibly conduct eco-tours of the farm site, which may allow authorized, guided boats to be permitted to moor onto the farm grid, and for authorized, guided individuals the use of snorkel diving or SCUBA gear in certain locations and at certain times, and under certain conditions, as yet to be determined by the applicant.

No more than five net pens will be moored on the site at any one time. Total net pen capacity will not exceed the present capacity of 24,000 cubic meters. All net pens will be of approved design (either Polar-Cirkel style, improved Sea Stations, Aquapods, or similar), and made of approved webbing materials (either hardened Dyneema®, Kikkonet, Aquagrid, or other rigid plastic mesh, or metal mesh or taut nylon). All net pens will be moored into the existing grid.

The net pens either be moored on the surface (in which case they shall be lit according to Coast Guard regulations) , or else will be submerged 20 – 30 feet beneath the surface for most of the time, and will only be raised to the surface for fish transfers, harvests, net pen cleaning, or other operations.

Some modification to the grid may be required, such as removal of pendant lines and ballast anchors beneath the existing Sea Stations and the grid corners, and addition of compensator floats at the surface on some of the corners of the grid, to prevent the grid from being pulled below the surface during strong currents.

The net pens will be anchored into the soft substrate using the existing anchors and concrete block weights, in an array similar to that shown in Figure 2. A series of buoys and weights will ensure that the anchor lines are perpetually taut, to eliminate any risk of entanglement by marine mammals. Bridles from the mooring grid corners will attach to the net pen rims, to hold the net pens in place in each grid square. All components of the net pen array will be engineered by the net pen manufacturers to withstand the storm and surf conditions observed for this site.

Any emergent structures on the farm, such as the feed barge or lease area marker floats, will be marked with Class C navigation lights (amber or yellow flashing, visible up to one nautical mile distant), as required by the Coast Guard at the existing farm site (CWO Wayne Wallace, *in litt.*, 10/15/01)

#### 4.1.2. Farm operations

(Please refer also to Appendix 1 : Draft Management Plan, for more details).

The primary advantage of the proposed amendment to the permit is to allow the farm operations to become more efficient. The existing 8 Sea Station net pens will be replaced with two Production Net Pens, and no more than three Nursery and Research Net Pens. The maximum capacity of the farm site will remain unchanged, at a total of around 24,000 cubic meters.

The farm will continue to be serviced by a semi-permanent feed barge / security platform vessel (the F.V. Kona Kampachi II, 74 ft in length, which has been deployed on-site since October, 2007). With the change-over to larger Sea Stations or surface PolarCirkels for the Production Net Pens, the feeding, video monitoring, security telemetry and other functions will be conducted more efficiently. Kona Blue is also partnering with Lockheed Martin to develop technologies to perform some of these tasks remotely. The Kona Kampachi II is supplied with feed, fuel and other materials from Honokohau Harbor on a weekly basis. A separate harvest boat – the 74 ft long F.V. Kona Kampachi - transports harvested product back from the farm site to the harbor. Several other smaller work boats are also used to support net pen and grid maintenance and cleaning, and other tasks. These boats will continue to work out of Honokohau Harbor. Farm work vessels are powered by commercially-available outboard or inboard motors. Boat designs provide maximum utility combined with good safety. Fuel supplies are purchased as needed from the commercial fuel dock at Honokohau Marina, or through other fuel wholesalers.

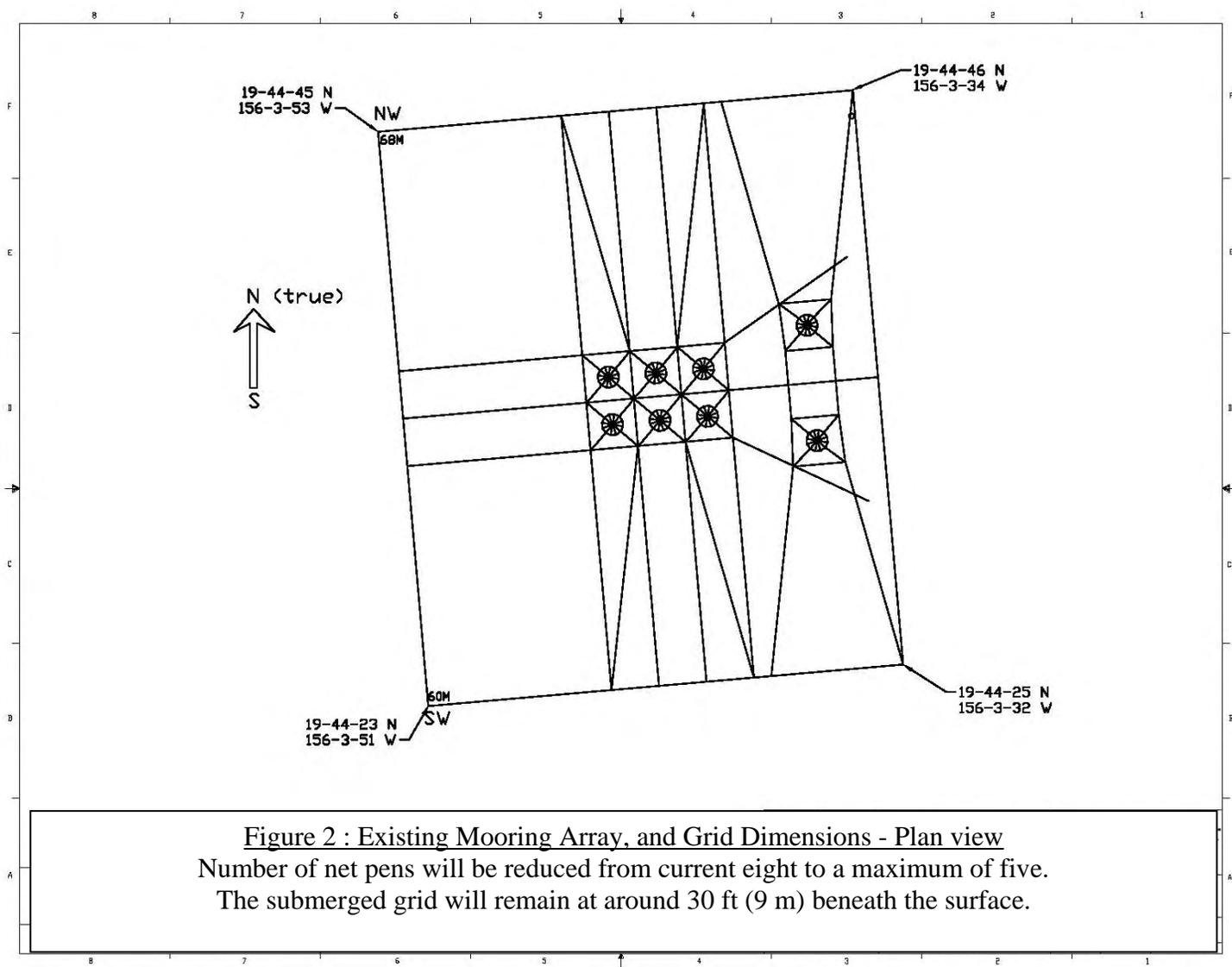


Figure 2 : Existing Mooring Array, and Grid Dimensions - Plan view  
 Number of net pens will be reduced from current eight to a maximum of five.  
 The submerged grid will remain at around 30 ft (9 m) beneath the surface.

Figure 3 : Production Net Pens

The farm will replace the eight existing SS3000 (either 2,800 or 3,200 cubic meters) with two Production Net Pens of up to 7,000 cubic meters, and up to three other Nursery Net Pens or Research Net Pens. The Production Net Pens will be either PolarCirkels (Figure 3a), or Sea Station 6200s (Figure 3b). Net pens will be tied into the existing grid. A series of buoys and weights will ensure that the anchor lines are perpetually taut, to avoid entanglement by marine mammals.

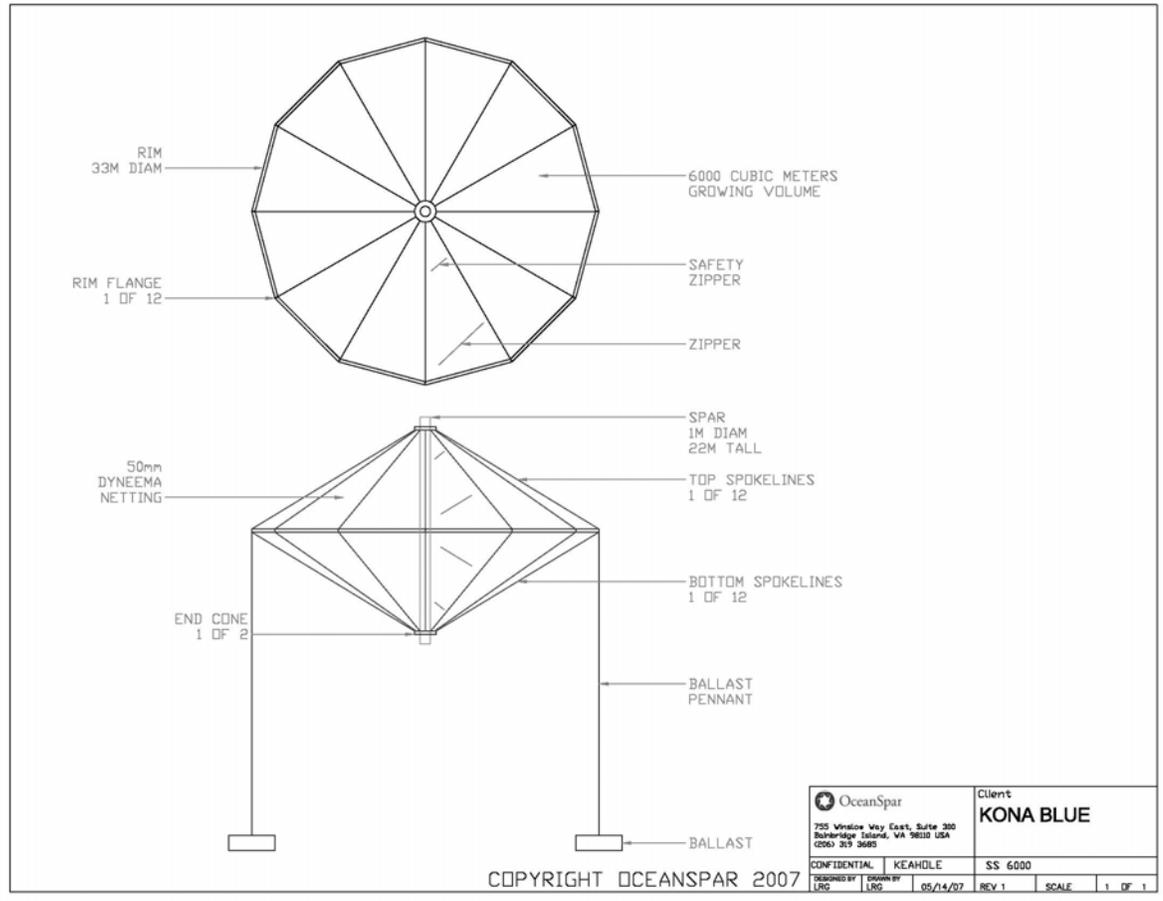
Figure 3 a :

PolarCirkel with HDPE pipe rim, Kikkonet mesh, and a heavy steel or pipe weight ring



Figure 3 b :

Submersible SS6200 Sea Station net pen, with central steel spar and steel rim.



The daily activities on the farm primarily consist of feeding the fish in the pens. This will be accomplished more efficiently with larger Production Net pens. In surface net pens, the crew will be able to monitor surface activity during feeding, as well as using underwater video cameras. Video cameras inside the net pens are used to relay visual images to the operators on the feed barge. This enables the feed operators to regulate feed to ensure that no feed is wasted, and that excess feed does not fall below the net pen.

Any mortalities are removed either by divers, or with a dip-net from the surface rim. With the submersible net pens, divers must first raise the net pen to the surface, then enter and leave through a zipper. With the surface net pens, divers can enter directly from the water surface. Carcasses are disposed of as solid wastes in the county land-fill.

Fish are harvested into an ice-brine slurry, to quickly and humanely kill the fish with a minimum of damage. Fish are all transported whole, in ice-brine, to land-based wholesale facilities or appropriately certified kitchens, for sale or other handling prior to packing and shipping. No fish processing occurs at sea during the harvests. Disposal of solid wastes is the responsibility of the wholesalers or other purchasers of the fish.

The company is also working with Lockheed Martin to develop the capacity to continuously monitor the site remotely by electronic surveillance. The farm security network under development may include passive submarine hydrophones, active sonar and other tracking devices, and radar for monitoring nearby surface boat traffic. The Federal Aviation Authority and the State Airport Authority in the Department of Transportation will review all security equipment, to ensure that there is no conflict with airport operations.

Support activities for the existing operation are presently based out of Honokohau Harbor, where a half acre of State land under a revocable permit accommodates containers for feed storage, gear storage areas, a closed workshop area, restroom and office. No expansion of these support facilities is anticipated as part of this request.

## *4.2 ECONOMIC CHARACTERISTICS*

### 4.2.1 Economic impacts of the amended operations

The more efficient farming operations will most directly impact the local economy through reduced employment amongst the Kona Blue offshore crew. The Kona Blue operation currently employs a total of 33 professional and semi-professional workers, down from a previous high of 49 employees six months ago. Of these, 29 are residents of the Big Island, an additional 2 are residents in Oahu, and 2 are resident in California.

By increasing the efficiency of offshore operations, however, the company expects to be able to attain profitability. This therefore has the ongoing direct economic benefit of maintaining employment locally for staff in the hatchery and grow-out operations, and in supportive industries. Without these changes, Kona Blue will probably need to shut down production in Hawaii, with consequently greater overall impacts on employment, secondary support industries, and seafood availability. By continuing operations, the farm will be able to continue to support other local businesses that supply the wide variety of materials necessary to build and maintain the operations. In addition, fish cultured on the farm will continue to supply the restaurant trade, as well as the wholesale and retail fish trade, and processing, packing, trucking and airfreight industries.

The anticipated scale of the proposed farm operation will be either the same or reduced from the present production capacity. The two Production Net Pens will each be around 7,000 cubic meters (around two times the volume of a single Sea Station 3000s). At a maximum density of farm stock of around 30 kg per cubic meter, and an annual production cycle of twelve months for each cohort, each net pen could therefore produce around 175 tonnes of Kona Kampachi™ each

year. The two Production Net Pens then, might together yield a maximum of around 350 tonnes annually, down from the current level of around 500 tonnes in 2008. These production estimates may also be augmented by additional fish produced in the Research Net Pens.

Revenues from the operation are based on an assumed price per pound for fresh product of \$4.00 (\$8.00/kg). Total revenue from the reduced farm operations is therefore projected to be around \$3.5 million per year.

#### 4.2.2. Impacts on the market

Kona Blue intends to continue to concentrate on the restaurant and wholesale trade. As such, the company will not directly control the retail price of fish. The greatest market-based benefit to be gained from the amended permit to allow continuation of this project is in providing a consistent supply of high quality, Hawaiian marine fish. This is particularly true in light of the bottom-fish fisheries closures in summer of 2007 and 2008.

This amended permit will enable Kona Blue to be able to continue to supply our trademarked Kona Kampachi™. This sashimi-grade, high-end product is currently destined for sushi restaurants and white table-cloth restaurants. Our fish is presently served in Hawaiian sushi bars, as well as at Merrimans, Alan Wong's Hualalai Grill at the Four Seasons, and Mauna Kea Resort. A smaller proportion of our product is also moved through high-end retail outlets, such as Central Markets in Texas, and through the local Costco and KTA stores.

Because commercial fishing of all high quality fish around the main Hawaiian Islands has been increasingly regulated, and is now greatly diminished, the main competition in the market is the existing high level of imports of deep bottom snappers from elsewhere in the Pacific and Southeast Asia. The production of fresh, local farmed product can possibly substitute for these imports.

### *4.3 SOCIAL CHARACTERISTICS*

The amended permit for the operations at the Kona Blue fish farm could sustain local employment in offshore aquaculture at some reduced level. We anticipate an eventual staffing level of around 14 full time professional, semi-professional, and laborer positions in the reduced-scale project. These positions are primarily in farm and hatchery operations, and provide continuing, stable income in a fisheries-related industry.

Continued offshore fish farming will also maintain some diversity to the economic base in the Big Island, and provide some greater degree of immunity to the fluctuations brought about by the heavy reliance on the visitor industry in the State. Fish farming offers the capacity to strengthen the maritime support industries in rural coastal areas, such as dock facilities and boat maintenance, marine supplies and engineering, and fish wholesalers, processing, packing and freighting.

#### 4.3.1 Public use of offshore ocean space

If approved, this permit modification will allow for some proportion of the two Production Net Pens and the three other Nursery and Research Net Pens to be surface net pens. This will represent some divergence from the present array of eight Sea Station net pens that are submerged beneath the surface for most of the time. However, the existing Sea Stations are still raised to the surface for harvesting or net cleaning, or for divers to work on or in the cages, or to use sunlight for drying and cleaning the net materials. On any day, therefore, there may be one or more Sea Stations raised to the surface for some or all of the day. The conversion then to a farm array with, say, two surface Production Net Pens, and possibly three or four surface net pens all together, does represent an increased use of ocean surface, and some greater impact on the view plane.

The ocean surface within the farm mooring array, however, is not actually used by the public. Boats transiting through the farm area do not pass through the mooring grid area in the center of the lease, and fishermen prefer to troll around the outside of the grid, to avoid entanglement in the farm mooring lines when they hook a fish. The presence of surface net pens at the center of the lease area therefore does not represent any significant impact on existing use of the area.

There is no request for exclusive use of the lease area surrounding the net pens, apart from that already applied on the existing farm lease area. These conditions state that there will be no anchoring of boats permitted within the entire farm site, because of the risk of entanglement of anchors in the mooring array for the net pens, and that SCUBA-diving and swimming activities are not permitted around the mooring lines or net pens, or anywhere within the lease area. State law decrees that the company must accept all liability for any accidents or injuries that occur within the lease area, and it is not possible to obtain insurance for unrestricted public access to the lease site. Again, however, these waters are deep, and are presently not used for such activities; hence this loss of access does not represent a significant impact on the public. Some guided access by the public to the farm site may be developed under the auspices of the eco-tours that will be explored if this permit is approved. These paid tours will allow for separate insurance policies to cover participants during these activities on the farm site.

In taking this permit modification request action, Kona Blue continues to extend our trust that Kona's fishermen and divers will, in the main, respect the fish pens as private property, and that pilfering, vandalism, or reckless endangerment of property, health or safety will not become a significant problem. There has been no evidence of tampering with the feed barge / security platform in the 15 months since it has been on the surface on the farm site. Through our partnership with Lockheed Martin, we also intend to significantly improve surveillance capabilities on the farm site, which should act as further deterrence.

#### 4.3.2 Demonstration of offshore aquaculture in Kona

Implementation of this project – and eventual profitability of the Kona Blue operation - will demonstrate the economic and social gains that open ocean aquaculture can bring to Hawaii. It also reinforces the positioning of Kona as an ideal site for environmentally sound, pioneering aquaculture, and adds to the wider allure of the State as a center for innovative and sustainable

marine industries. As a demonstration, this project exemplifies and affirms the possibilities for diversified agriculture, producing high-end products that aid in the brand building of “Hawaii” and “Kona”. Since the foundering of the plantation economy, throughout the islands, there has been a need for economic diversification that takes advantage of our geographic position, our entrepreneurship, and our traditional linkages with the ocean. The refinements proposed here to this project now further underscore how open ocean aquaculture can fulfill that need.

Amending the ocean leasing law during the 1999 State legislative session caused much comment from State agencies and the public. Legislative committee members and many of those who testified at the hearings recognized that the future for ocean aquaculture in Hawaii required a “user friendly” permit/lease regime, to test the feasibility and impacts of such leases. The request presented here in this CDUA extends some flexibility to the company, with two possible Production Net Pen and Nursery Net Pen forms (either surface PolarCirkels or submersible Sea Stations) and in the form and materials of the three Nursery and Research Net Pens. For companies to be able to effectively pursue the necessary research and development, some broader permit conditions are considered necessary, and appropriate.

Interest in ocean aquaculture continues to be strong among policy-makers and private aquaculture entrepreneurs (see listing of press articles and publications, Appendix VI, in Final 2007 EA). However, the general public has limited experience with the issues, impacts and benefits from ocean farming in the nearshore or offshore environments. This is especially true in Kona, where the community wants sustainable, socially- and culturally-appropriate use of marine resources. The amended ocean leasing law was specifically crafted to provide a clear mandate from the legislature for the State to assess the impacts of ocean leases on the environment and the public.

This is part of the rationale for Kona Blue’s desire to explore some form of eco-tour of the company’s operation. Opening the facility to the public, in the form of guided tours of the hatchery and offshore farm site, lectures and video presentations on the global and generational challenges presented by marine resources management, and sampling of Kona Kampachi® and other open ocean raised products might be able to add further to Kona Blue’s bottom line. More importantly, however, such tours could be an invaluable outreach and education program, and could help the Kona community and the American consumer to better understand the potential benefits of open ocean aquaculture. Surface net pens may even be amenable to having tour participants snorkel inside the net pen with the fish – an experience that is unique, exhilarating, and which can help transform individual opinions on open ocean fish farming. Allowing tour participants to witness first-hand the vigor and health of the fish, the clarity of the water, and the other environmentally-friendly attributes of the operation could prove to be a tremendous marketing tool for Kona Kampachi, and a great draw for tourists to Kona.

Amendment of this project here will further demonstrate the benefits that offshore fish farming brings, reaping the rewards from the far-sighted commitments of the legislature, locally-based marine biologists, and the Hawaiian investment community. The realization of this potential can also create more awareness of the employment and business opportunities, and could help support the education and training aspirations in the marine sciences or maritime industries.

#### 4.3.3 Research, training and extension opportunities

Establishing Kona Blue as an innovative and (eventually) profitable operation will also further promote aquaculture research and development, will increase the profile of Hawaii as a site for innovative ocean aquaculture, and will open up opportunities for training and extension work, to broaden the benefits from these developments. By supporting a continued level of offshore aquaculture expertise among Hawaii's workers, this project will support the future growth of this industry in the State. It will also enable Hawaii to leverage a greater role in the expanding Pacific aquaculture industry, and across the world.

Kona Blue already has established working relationships with Hawaii Institute of Marine Biology, U.H. Manoa, Oceanic Institute, and UH Hilo. This project will further underscore the opportunities in Hawaii for such collaboration, and will foster closer industry-academia relationships.

#### *4.4 ENVIRONMENTAL CHARACTERISTICS*

Environmental impacts associated with the project are generally negligible and benign. The proposed project site is the same as the existing operation, offshore from State land at NELHA, with additional state land of the Kona International Airport further inshore. The nearest private facility is Cyanotech Corporation's *Spirulina* algae production ponds, and Cellana's new algal biofuels research facility.

The physical and biological attributes of the existing environment in the area of the proposed amendments to the farm are described in detail below (Section 4). The area's topography and oceanography are distinguished by the depth of water; the deep sand substrate; the strong currents through the area; the exposure to high winter surf and strong trade winds; and the adjacent shoreline of a narrow coral bench reef with a steep basalt (lava) cliff. A few black sand beaches also lie along the coastline, to the north of the site, but these are little used, except by recreational fishermen. The existing uses of the proposed farm lease area itself are negligible, because of its depth, the paucity of fish, and the barren benthos.

There are almost no measureable impacts on water quality around the farm or on the substrate beyond the immediate area beneath the net pens. With the strong long-shore currents, and the deep water and sand substrate, these impacts will continue to be minimal. With no planned increase in production, fewer net pens and more efficient operations, there will be even less likelihood of any cumulative or other future impacts. The soft substrate presently supports only a small number of holothurians and other detrital feeders. Their numbers will likely stay the same or decrease somewhat, as the farm is reduced in production scale and increased in efficiency of operation. Evidence from the grab-sample analyses and video observations beneath the existing farm operation, all affirm that there have not been any significant changes in the macrobenthic community composition. Although some increased levels of dissolved organic nitrogen were expected to occur in the immediate vicinity of the net pens of the existing operation, the water quality monitoring shows no such consistent pattern.

The existing farm lease area also lies one mile inside the southern boundary of the Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS). The Sanctuary boundary runs directly west of Keahole Point, and humpbacks are known to frequent the entire Kona coast area in winter. Information from National Marine Fisheries Service, experience from the existing operation, and reports from other fish farming areas, indicate that neither the existing farm, nor the amended farm array will interfere with the movement of the humpback whales, beyond the immediate and obvious exclusion from the waters inside the net pens. Some concerns have been expressed with the potential for entanglement of whales in the mooring lines of the net pens. Examination of entanglement records from elsewhere, however, shows that most events occur in slack net mesh (such as drift nets or fish weirs), slack vertical lines (such as crab pot or lobster pot floats), or surface lines (such as long-lining gear). With heavy mooring gear, and taut lines and mesh, the potential for entanglement is considered negligible (Celikkol, 1999; Wursig and Gailey, 2002; see also Section 5.2.2 d, below).

Although there is insufficient evidence to determine whether the presence of the cages may have an effect on humpback whale movements, results from the existing farm operation suggest that, at a minimum, there is no definitive pattern of whales either avoiding, or being attracted to the cages. Whales are occasionally seen within the lease area. On one instance, the farm workers witnessed a humpback on the surface inside the mooring grid array; the animal appeared to negotiate its path between the net pens and mooring lines with ease. Moreover, these proposed changes will actually reduce the number of mooring lines, ballast lines and bridle lines in the water, compared with the existing operation. This reduction in mooring lines will mean a concomitant reduction in potential impacts on marine mammal movements.

Although other Federally-listed species are known to occur in the area, neither the existing farm, nor the proposed amended operational plan, presents any potential detrimental impact on these animals. Leatherback and Green Sea Turtles and Monk Seals may occasionally stray into these deep-water areas. As with humpback whales, however, the taut-line mooring system and stiff-mesh net pens will prevent animals from becoming entangled. Monk Seals have been observed at the existing farm operation on two occasions, both in association with escape incidents from the nylon mesh nets on the surface nursery pens that were previously in use at that site. (These nylon mesh surface net pens were removed in 2006, as Kikkonet was, at that time, not yet available outside of Japan.) On each of these occasions, the Monk Seal was preying on the small, escaped Kona Kampachi™, but once the school was decimated, the Monk Seals moved away. A radio tag allowed movement of one monk seal to be tracked from the Unualoha site one day, to a beach on Maui the following day, clearly affirming that the animal did not take up residence, or become conditioned to the availability of escapees.

Makako Bay, almost a half mile to the south of the existing farm, is frequented by large schools of spinner dolphins (*Stenella longirostris*), on nearly a daily basis. These animals usually follow a daily pattern of movement, from the Makalawena shelf area to the north, along the reef edge to the shallow areas in Makako Bay, where they rest for some time during the middle of the day. There were some concerns expressed about the potential for the existing farm operation to interfere with the spinner dolphin patterns of movement or resting habits. There is no evidence to suggest that this has been the case. There have only been several occasions over the almost four years of operation offshore when divers or workers on the farm site have witnessed spinner

dolphins coming anywhere near the net pens. The proposed larger Sea Stations, Aquapods or surface net pens will not impede the usual pattern of spinner dolphin movement towards Makako Bay, nor will they affect the resting pattern of the dolphins (refer to Section 5.2.2 c for detailed analysis of biotic interactions).

Over the last two years, the existing farm operation has demonstrated a propensity to attract Bottle-nose Dolphins (*Tursiops truncatus*). No bottle-nose dolphins were previously present on the farm site, but the animals have begun to appear regularly at the site since about October, 2006. Current patterns of dolphin movement can be best characterized as one or two animals, every day or so, with occasional instances of groups of up to seven or eight animals. There is no regularity to the animals' appearance on the farm site: they may be present all day, or only in the morning, or only in the afternoon. The animals appear to be preying on 'opelu and other wild fish around the net pens, and will quickly attack any escapee that may 'leak' out of a zipper as divers enter or leave a net pen. Dolphins will also attempt to interact with divers as they move from boats to net pens. However, no one individual animal has taken up residence, and the overall long-term impacts on the animals is difficult to discern at this stage. These proposed amendments to the operating plan also should help to alleviate the attractive nature of the farm to the dolphins, by reducing the potential for catastrophic escapes, and for leakage escapes, and – if surface net pens are deployed - by significantly reducing the amount of time that divers need to operate outside of the net pens.

-----

## **5. ALTERNATIVES**

### *5.1 ALTERNATIVES EVALUATED*

The criteria for selection of the present farm site have been detailed in past EAs (2003 Final EA, 2007 Final EA). As this CDUA is for precisely the same site as the existing operation, these details are not re-examined there.

Over the past two years, Kona Blue has been exploring the potential to expand our farm production capacity, by either expanding to larger sites, further to the north, or expanding on the existing site, which would have required extending the lease area towards the East to accommodate larger anchors. These various proposals were, at different times, discussed at length with the Kona community. There was some concern that greater proximity to the nearshore reef area could lead to some impacts on the coral reef community. There was also some diffuse concern about increasing the number of net pens on the farm.

The most recent proposal put forward by Kona Blue (2007 Final EA) therefore retained the same number of net pens (eight Sea Stations), but doubled the size of the Sea Stations, to allow a doubling of farm production capacity. This involved consolidating the farm into a single mooring grid, with the net pens closest to the east actually being moved further away from the shoreline. The number of mooring lines was also reduced. However, to improve the holding power of the anchors for the larger net pens, some of the anchors were to be re-set closer to the reef area, and this necessitated an expansion of the lease area by around 13 acres.

Although there were no written public comments submitted on the 2007 Draft Supplemental EA, two contested cases were filed against this proposal. These objected to the lease expansion on the grounds that (i) the lease expansion involved lease of ceded lands by the State to the applicant, and (ii) there was not yet sufficient environmental information available to justify an expansion of the operation. Rather than commit financial and manpower resources to rebutting these claims, Kona Blue withdrew the application. The company has concluded that it is more important to first develop and demonstrate a more efficient farming technology than to strive for profitability through increasing the scale of operations.

This revised application therefore now requests: no increase in the number of net pens; no relocation or increase in the size of the lease area; no increase in production capacity; no movement of net pens closer to the nearshore reef; and a reduction in the number of bridle lines and ballast lines. The only major modification to the permit requested here is to allow for more efficient and larger Production Net Pens, and for some flexibility - within well-defined parameters - for design and materials of the Nursery and Research Net Pens. These modifications in the Production Net Pen array will hopefully allow Kona Blue to attain an efficient and (eventually) profitable operation. The Nursery and Research Net Pen array will allow us to begin to develop some of the alternative net pen designs and functions that will allow this industry to grow in an economically viable and environmentally friendly manner.

This request therefore represents the outcome of an ongoing dialog with the Kona community as to which alternatives would be considered acceptable. Every other alternative has been thoroughly examined. No other alternative is considered economically viable.

## *5.2 NO ACTION ALTERNATIVE*

The No Action option is not recommended. If no action is taken, and Kona Blue remains obligated to use the existing Sea Station net pens, then the company will be compelled to halt production in Hawaii. The investors in Kona Blue cannot continue to put money into an operation that is not profitable, and that offers no potential for future profitability.

There are economic benefits that accrue from continued operation of offshore aquaculture in Kona, and eventual demonstration of offshore fish farming as a profitable venture. There are diverse benefits to be gained, around Hawaii's continued leadership in this fledgling industry from the continued demonstration of innovation and environmentally-sound aquaculture. There are also long-term environmental and public health benefits from providing alternative, sustainable sources of omega-3 rich seafood. To take no action would be to lose all these benefits. This would be an abrogation of responsibility by Hawaii for self-sufficiency and sustainability in food fish resources.

If the option of No Action is taken, this would significantly discourage any further investment or development of offshore aquaculture in Hawaii, and would probably halt any further research or development efforts in this area. There then would be only two alternatives: continued development of land-based marine fish farming, or relocation to the mainland or foreign grow-out locations by Hawaii companies.

Land-based marine fish farms are very capital intensive, energy intensive, and highly mechanized. They are therefore only suitable for high-value marine fish. They also only offer limited employment and development opportunities to the community. Further reliance on expansion of shore-based fish farms would also require commitment of valuable shoreline property; available land within the Natural Energy Laboratory of Hawaii Authority boundaries is now almost entirely committed to other projects, and locating at some other waterfront site in Hawaii would be very expensive. The long-term global sustainability of land-based fish farming is also questionable, given the reliance on fossil fuels to drive the generators to pump the water.

To relocate open ocean fish farm operations to overseas locations would represent both a lost opportunity, and a failure to fulfill a responsibility. Hawaii is presently one of the leading centers of open ocean fish farm technology development. This presents an opportunity to take a commanding position in the impending growth of this industry.

Our responsibility as an island culture, with a strong sense of self-reliance and sound resource management, is to assume some of the duties for supplying some of our food, and for supporting economic growth. If open ocean fish farming is not to develop in these islands, then where should it? If we are not going to grow our own fish, then who should we ask to grow it for us?

There are significant health and environmental concerns to relying on overseas seafood production. Other jurisdictions do not share the U.S.'s strict regulation of chemical use in aquaculture, nor do they mandate the extensive monitoring for environmental impacts. To rely on other countries to produce our seafood for us is to potentially expose American consumers to toxins or chemicals that would not normally be permitted in U.S.-produced seafood. It is also asking other countries to accept the environmental impacts of a less-regulated industry, so that we might have our seafood, and eat it too.

Kona Blue believes that the people of Kona and Hawaii are committed to equitable and fair trade, in a global sense. We have the waters and the technology and the investment which allow us to produce a nutritious, healthful seafood product with negligible environmental impacts. If we want to see sustainable seafood grown properly, throughout the world, then we should lead by example.

-----

## 6. ENVIRONMENTAL SETTING

The waters offshore from Unualoha Point, within the depth profile for the existing fish farm operation (200 – 220 ft), are not utilized extensively by the community. These waters do not represent a unique asset, as they are comparable to similar offshore areas all along the Kona coast. Therefore, any impacts by the project on the environment in the immediate area, and the broader Kona marine environment, should be minimal. In all likelihood, as the proposed amended farm array and operating plan represent a reduction in the number of net pens, and either the same, or reduced production capacity, there will be fewer impacts than the present minimal impacts.

### *6.1 WATER QUALITY*

#### 6.1.1 Existing water quality monitoring programs

The water quality monitoring program at the existing site provides the best available baseline data. Monthly measures are taken of ammonia and turbidity (the two most relevant water quality parameters for fish farming) at three depths (surface, mid-water - 50 ft deep, level with the submerged net pens, and at the bottom) and at a total of seven stations (two control stations upcurrent, one effluent station immediately downcurrent of the net pen with the greatest biomass, and four Zone of Mixing stations 4,000 feet downcurrent). Quarterly measurements are also taken for a range of other parameters. These water quality data are all available on the company's web site (<http://www.kona-blue.com/emonitoring.php>). These data are definitively clear - there is no discernible difference between water quality parameters at the upcurrent control sites, and the effluent and zone of mixing sites downcurrent. These results confirm that there is no measureable impact on water quality from the existing farm operations.

#### 6.1.2 Currents

General water movement patterns at the existing farm site are governed by the currents past Keahole Point (the western-most point of the Big Island of Hawaii). Kona Blue principals have observed these currents for over 18 years, while working directly adjacent to the Point, or on the existing farm site, and the following summarizes these observations.

The current in this area usually runs from south to north. Under this strong N-setting current, water is deflected by Keahole Point, and a gyre (circular current) develops to the north of Keahole Point. The strength of this gyre, and the distance from shore to the center of the gyre are governed by the strength and angle of the current. Under very strong N-setting currents, the gyre extends well north of the Unualoha area, and the proposed farm site would be subject to either gently North-setting or a South-setting counter-current. Under moderate to light N-setting currents, the gyre is weaker, and the water moving over the farm moves towards the North. Under all S-setting currents, the water over the existing farm site area moves unimpeded towards the South. These patterns therefore suggest that the two points of first impact downstream from

the proposed site will be either Keahole Point, around 1 mile to the south of the site, or the Mahai'ula-Makalawena shelf area, around 3 miles to the north.

Authoritative current data is available for the Keahole Point area from a monitoring program conducted by the Look Laboratory of Oceanographic Engineering in 1979, and is presented in detail in prior EAs (2003 Final EA and 2007 Final EA).

An S4 current meter has been deployed at the existing farm site over several periods since 2004 (see 2007 Final EA). This shows regular peak current speeds of over 50 cm/sec (about 1 kt), and current headings were either generally to the North (predominantly) or to the South.

## 6.2 BIOTA

Relevant biota can be divided into three types: terrestrial biota; marine biota; and rare, threatened or endangered species. The effects of the proposed project amendments on rare, threatened or endangered species or their habitats are considered independently, in light of the regulatory requirements of the Migratory Bird Treaty Act and the Endangered Species Act.

### 6.2.1 Terrestrial biota

The proposed project will not significantly impact any terrestrial biota such as seabird populations. The proposed farm area itself is infrequently used as a foraging area by seabirds. Observations indicate that most seabird activity in the area is confined to the fishing “grounds”, which extend to the northwest of Keahole Point.

### 6.2.2 Marine biota

In general, the deeper waters of the existing farm support a highly limited benthic community and fish faunal assemblage. The few marine plants or animals within the proposed lease area are mostly pelagic – either planktonic algae, or free-swimming open-water fishes. These biota are, by definition, non-residents, and are not significantly impacted by the current farming activities.

Benthic infaunal sampling and video drop-camera observations have confirmed the depauperate nature of the benthos. It is likely that there are some scattered resident fishes, such as laenihi (nabeta, *Xyrichtys* spp) although their populations are clearly low, and no fishing activity has been observed in this immediate area. A school of ulua (*Caranx ignobilis*) is usually resident around the net pens during the day-time. Opelu (*Decapterus macarellus*) and wild kahala (*Seriola rivoliana*) schools are also regularly found around the net pens.

Fouling on the net pens and the anchor lines includes macroalgae, bivalves (several species of mussels and oysters: *Pteria* and *Pinctada* spp), corals (*Pocillopora* and *Porites*), sea urchins (primarily *Echinothrix calamaris*) nudibranchs (*Stylocheilus longicauda*) and sponges. These all settle out of the plankton onto the farm structures, and their presence does not represent any significant or even measureable reduction in the available recruits to the nearby coral reef area.

### *Benthic and Fish surveys*

A comprehensive survey of marine biota was conducted on the reef directly adjacent to the existing farm lease area, just south of Unualoha Point (see 2003 Final EA and 2007 Final EA). An intensive survey was conducted of the benthic biota of the fringing reef crest in this area. This survey used protocols identical to those employed by the DAR West Hawaii Reef Management Task Force Survey, with a series of four transects of 25 m x 2 m, extended parallel to the reef crest, immediately mauka of the seaward edge of the reef. Video footage was made of these transects, and digitized for selection of random points on the video frames. By using these protocols, this survey work added further information to the DLNR monitoring program, and also allowed the entire data set from West Hawaii to be used as the controls for the farm site.

### *Dolphins*

The shoreline areas of Makako Bay and Ho'ona Bay, south of Unualoha Point, are also frequented by spinner dolphins (*Stenella longirostris*). Because of marine mammal protection concerns (legal, cultural, and public policy issues), the existing status of dolphins in the area and the potential impacts from the farm operation were reviewed extensively in prior EAs (see 2007 Final EA, Section 5.2.2 c). However, there is no evidence of any interaction whatsoever between spinner dolphins and the farm operation, and these concerns are not reviewed here.

Bottlenose dolphins (*Tursiops truncatus*) are now present around the net pens on a regular basis. Kona Blue staff monitor and report on dolphin activity to HIHWNMS and NOAA's PIRO PRD. A recent activity report is attached as Appendix 2. The bottlenose dolphins are probably attracted to the farm site by a combination of (i) the presence of the midwater structures acting as a Fish Aggregating Device and the associated fish community that is present around the net pens; (ii) the occasional provisioning from 'leakage' escapes when divers enter or exit a net pen, and from the rare larger escape incidents when predators have breached the existing Dyneema nylon webbing on the Sea Station net pens, and (iii) interaction with divers outside of the net pen, as the divers move about the farm from boat to net pen and back.

It appears that no single individual bottlenose dolphin has taken up permanent residence at the farm site. There are no animals present on the farm site on around one-quarter to one-third of days. Even when animals are present, they are often only there for part of the day, rather than the entire day. In October-November, 2008, for example, dolphins were present for some period of time on 22 days out of 34 days (see Appendix 2: Marine Mammal Report from Kona Blue to NOAA, dated 11/26/08). There were dolphins present at the farm site, therefore, for some or all of the day on 65% of the days. On 35% of days, then, there were no dolphins reported as observed on the site. On only one day were six dolphins present. Most other days there were one or two animals were present for some portion of the day.

Other dolphin species may be found in and around the proposed farm lease area, but are usually most commonly seen on the 'grounds'. Spotted dolphins (*Stenella attenuata*), rough-toothed dolphins (*Steno bredanensis*), and false killer whales (*Pseudorca crassidens*) have all been observed on the 'grounds', or in other offshore waters of the Kona Coast.

### 6.2.3 Rare, threatened or endangered species

Four species of marine animals that occur in Hawaiian waters have been declared threatened or endangered and are under Federal jurisdiction. The threatened green sea turtle (*Chelonia mydas*) is common in the nearshore waters of the main Hawaiian Islands. The endangered hawksbill turtle (*Eretmochelys imbricata*) is infrequently found in Hawaiian waters. The principal nesting site for the green turtle is in the Northwest Hawaiian Islands, on French Frigate Shoals (Balazs, 1980). No turtles have been observed in the area of the farm site, but it is possible that they occasionally transit through the site.

The Hawaiian Monk Seal (*Monachus schauinslandi*) occurs rarely in the main Hawaiian Islands, but has only been observed around the existing net pens on two occasions. On each occasion, the Monk Seal stayed around the farm area overnight, and then left. Monk seals are also occasionally seen in the Mahai'ula – Makalwena area of the Kekaha Kai State Park.

Populations of the endangered humpback whale (*Megaptera novaeangliae*) winter in the Hawaiian Islands, and the project site lies within the boundaries of the Hawaiian Islands Humpback Whale National Marine Sanctuary. The southern boundary of the sanctuary runs due west of Keahole Point, about 1 mile to the south of the project site. Humpback whales occur frequently over the winter months in the Kona Coast area, and may traverse through the project site.

### **6.3 RECREATION**

The existing farm site lies offshore from the Natural Energy Laboratory of Hawaii Authority, and the Kona International Airport, and as such, encounters little shore-based recreation. The heavily used public recreation area of Kekaha Kai State Park (Mahai'ula) lies more than three miles further to the north.

A survey of recreational activity in the general area, north of Keahole Point was conducted prior to the farm installation, from August to September, 2001, in conjunction with the original farm site environmental assessment (Appendix III, Black Pearls, Inc., Final Environmental Assessment, 2003). The survey covered two months of summer conditions, which was considered the best means of ensuring that the data represented the heaviest use of the area, rather than some period of less-intensive use. The results of this survey have been reported in detail in earlier EAs (2003 and 2007). The overarching finding of the survey was that the area is only used for transit: of the 150 observations made over the 61 consecutive days of the survey, only one boat was seen within the farm site – a boat transiting through the area. Most activity in the general Keahole-to-Unualoha area was recreational dive boats and commercial dive tour operations along the reef and shoreline south of Unualoha Point (directly inshore from the proposed farm site), and in Makako Bay itself.

Observations by the Kona Blue staff on the existing farm site suggest that this trend continues - the only use of the waters for the outer area of the farm lease area site is again, transit. Fishing boats now occasionally troll lines close to the central net pen area, to try to take advantage of the

aggregative effects of the net pens. There are no records of catch rates around the farm, but anecdotal evidence indicates that catches are primarily ono (wahoo, *Acanthocybium solandri*), with infrequent catches of ahi (yellow-tuna, *Thunnus alalunga*).

#### 6.4 NOISE AND AIR QUALITY

Ambient noise levels are most heavily impacted by the site's proximity to the Kona International Airport. Air quality varies, depending on the amount of vog in the air. On days of strong trade winds – predominantly over winter - a general northerly wind pattern results in negligible levels of vog. On days of weaker trade winds – generally more frequent over summer – a more southerly air flow brings vog-laden air from Kilauea volcano around and up to Kona on a southerly air stream, created by the adiabatic convection currents along the lee of the island. Usually the air is clear, dry and cooler in the mornings, with offshore winds predominating.

#### 6.5 AESTHETICS

The aesthetic value of the proposed project amendments must be considered in light of both the intrinsic value of open ocean space, and the nearby shoreline activities. The waters south of the existing farm, near Keahole Point and towards the “grounds” to the northwest, are valued by the community for the big game fishing. Shoreline activities include recreational diving and fishing along the nearshore fringing reef. The properties along the adjacent shoreline consist of the Kona International Airport, and the commercial aquaculture operations at NELHA. The farm site is also visible from the residential area mauka of the airport.

#### 6.6 CULTURAL RESOURCES AND PRACTICES

The farm lease area is too deep for free-diving or SCUBA diving activity, except for ‘blue-water’ spearfishing. Usually, however, such activities are conducted close to a point or drop-off, rather than over bare sand substrate around 200 ft deep. There are no significant benthic plant or animal populations, and there are virtually no benthic or pelagic fishing activities in this depth range. Kona crabs and nabeta are the only benthic resources that occur on sand bottom at this depth, but informants suggest that the currents are too strong for any significant fishing effort this close to Keahole Point.

The only potentially-impacted cultural resource that was cited during extensive discussions with community and kupuna groups for the original farm site was the ‘opelu ko’a (‘holes’ or schooling places for mackerel scad – *Decapterus macarellus*) that occur in the general region. These concerns have been discussed at length in prior EAs (2003 and 2007).

Prior to the 1801 lava flow that inundated the area, Keahole was the site of the largest fish pond in the Hawaiian islands. The Pai’ea pond (reputedly King Kamehameha’s favorite pond) was approximately three miles long and one-half mile wide; canoes were used to traverse from one side to the other. Kona Blue's hatchery is located at NELHA, on basalt created by the lava flow

of 1801, and the farm site is directly offshore from where Pai’ea once stood. Fish farming could therefore be considered historically and traditionally appropriate to the area.

## *6.7 LAND USE AND ENVIRONMENTAL COMPATIBILITY*

### 6.7.1 Current usage

The site is current used for open ocean fish farming. The site presently offers no other special environmental or public benefit to the community, beyond the relatively rare instance of use by recreational boats traversing the area.

### 6.7.2 Submerged lands issues and the public trust

The farm site constitutes part of the ceded lands trust, since all submerged lands are ceded lands. The 1999 amendments to the Ocean and Submerged Lands Leasing law (Chapter 190D HRS) directly addressed the issue of Office of Hawaiian Affairs’ share of the lease revenues, by stipulating that the designated 20% of lease payments should be due to OHA.

### 6.7.3 Public perceptions of ocean use

The public perceptions of ocean access and ownership in Hawaii are an amalgam of two conflicting cultural traditions. The legal regime has, up to now, been largely based on the ancient western concept of Mares Librum – Freedom of the Seas, or the ocean as a common property resource. The traditional Hawaiian concepts of land-use and ocean-ownership practices were related to the principles of the ahu-pua’a, fishponds, and the konohiki fisheries. This provided for ownership of ocean resources, and was recognized as a sustainable, efficient means of managing the ocean, and reducing conflicts.

The 1999 amendments to the Ocean and Submerged Lands Leasing law (Chapter 190 D HRS) were the first major step to view the oceans as a resource that could be occupied and sustainably utilized, rather than simply exploited. This represents a sea change in the legislative and community thinking. It could be interpreted to represent a shift in current policies away from the Western Mares Librum ideas towards the more traditional Hawaiian concept. It might also reflect increasing recognition – evident in increased regulation and licensing of fishing activities in the state - that open-access fisheries, and unrestricted access to the ocean does not appear to provide sufficiently for effective management of ocean resources.

-----

## 7. POTENTIAL IMPACTS AND MITIGATION

### 7.1 IMPACTS DURING CONSTRUCTION

Primary impacts during farm construction will be minimal. The existing Sea Station net pens can be largely dismantled on-site, and towed back to Honokohau Harbor and disassembled in the NE corner of the harbor mouth. This is the same location that was used during assembly of the net pens, which was accomplished with no disruption to public activities in the harbor.

There will only be minimal reconfiguration to the existing mooring grids that enclose the net pens and the feed barge. No additional anchors will be installed, and existing ballast weights and mooring lines will be removed along with the Sea Stations. These changes will have no impact on the soft sediments of the substrate.

The new net pens will be constructed according to manufacturer's specifications and instructions, launched in either Honokohau or Kawaihae Harbor, and then towed to the site – a distance of, respectively, either 5 nautical miles or 26 nautical miles. Once in position, the net pens will be attached to the grid array.

There will be a very slight risk of pollution from spills of fuel, oil, or hydraulic fluids from the boats used in removing the anchors and the existing net pens, or in deploying the new net pens. However, this risk will be no greater than for any other boat in Kona waters. Standard precautions and Coast Guard regulations for working on the ocean will be adhered to during the towing and deployment operations.

### 7.2 LONG TERM IMPACTS

#### 7.2.1 Water quality

The two new Production Net Pens will together be stocked with around one-third of the number of fish that could be stocked into the existing eight Sea Stations. Even if three Research and Nursery Net Pens are installed to equate with the present total farm culture capacity of 24,000 cubic meters, there will be no increase in production or standing biomass on the farm site. There is, therefore, no potential for any deleterious impacts on water quality, beyond the existing imperceptible effects of the present array.

#### *Monthly Monitoring and NPDES Permit requirements*

The project is currently undergoing renewal of its National Pollutant Discharge Elimination System (NPDES) Permit. This will consist of approvals and ongoing oversight by the federal Environmental Protection Authority (EPA), with a long-term water quality monitoring program under the supervision of the State Department of Health Clean Water Branch (CWB). This

program will be run solely at the farming company's expense, adhering to established protocols and standards, and will be designed to detect any impacts on water quality from the farm.

As there has been no discernible effect on water quality from farm operations, then the company has requested that the frequency of routine monitoring be reduced from monthly to quarterly. The full extent and frequency of such sampling will be determined during the NPDES permitting process, by CWB in consultation with EPA.

Kona Blue will continue to make all routine water quality monitoring data available through the company's web site (<http://www.kona-blue.com/emonitoring.php>).

Kona Blue will continue, where possible and practical, to honor the commitments to the community made during the original permitting process discussions. These include :

- Use objective, third party experts to collect the water quality samples.
- Use local water quality laboratories – such as NELHA Water Quality Lab, or local private laboratories - for conducting the sample analysis.
- Place copies of all monthly water quality monitoring at local repositories, such as DAR office at Honokohau, or the NELHA library, so that local residents can review this data.
- Provide reasonable access to Federal, State and County officials for monitoring and oversight purposes.

#### *Pest Management, Therapeutant Treatments and Effluent Monitoring*

Kona Blue presently employs an integrated pest management strategy as part of our open-ocean farming practices to optimize fish health, reduce interactions or minimize impacts on wild fish stocks, and reduce any potential environmental impacts from therapeutant use. All of the components of the company's integrated pest management strategy for external parasite management comport with the draft Organic standards for aquaculture that are under consideration by the National Organic Standards Board, and USDA. All therapeutant use is conducted under additional oversight of US Fish and Wildlife Service (USFWS), and Food and Drug Administration (FDA).

As with most farmed animals, *Seriola rivoliana* is often subjected to small external marine pests – skin flukes or gill flukes – that attach themselves to the fish. These flukes do not pose any risk to human health, and do not detract from the quality of the product, but may cause irritation to the fish. If left unchecked, the flukes can become a health problem for the animal, as the fish rub themselves on the netting to ease the irritation. Kona Blue uses occasional treatments of dilute hydrogen peroxide solution (at effective dosage rates of 200 - 300 ppm) to control levels of skin flukes and gill flukes among the fish in the net pens. Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) breaks down very rapidly in sunlight to form oxygen and water. Hydrogen peroxide is also considered an acceptable Organic aquaculture treatment under the draft USDA Organic aquaculture guidelines.

Under the permits in place at the existing site, such therapeutant use must demonstrate that there is no risk to the fish under treatment, or to the environment or human health. Any continued use

of therapeutants in the proposed amended net pen array will follow the same, strict legal requirements for oversight as currently practiced: authorization will be required by the State Department of Land and Natural Resources through the Department's Office of Conservation and Coastal Lands, with the compliance and monitoring oversight by the State Department of Health's Clean Water Branch under the NPDES permit, with Federal EPA oversight, and additional oversight by USFWS and FDA.

Monitoring of the effluent from any bath treatment at 100% concentration is mandated under the "Whole Effluent Toxicity" (WET Test) section of the NPDES permit. Results to date from the existing farm operation suggest that there are no significant environmental impacts from the use of the hydrogen peroxide. Effluent monitoring for WET tests is now conducted by Nautilus Laboratories in San Diego. Results from these bioassays using larval fish (Pacific topsmelt, *Atherinops affinis*) confirm that there is no significant difference in the rates of larval fish survival between control samples taken 4,000 ft upcurrent of the net pen, and samples taken of the whole effluent (100% concentration of the bath treatment water) at the conclusion of the bath treatments. Given the results to date from the existing operation, therefore, it is anticipated that even if the bath treatments continued at the present level of frequency, and under the current protocols, there would be no measureable impact on the pelagic or benthic communities, or the surrounding water quality.

However, with the reduction in the number of net pens, a reduction in the surface area-to-volume ratio of the remaining net pens, the improved surface material characteristics and rigidity of the hardened Dyneema or monofilament Kikkonet webbing mesh (which make it easier to clean), and the improved access for offshore crew to regularly clean the surface nets or to invert the Sea Stations, we expect to be able to break the skin fluke life-cycle in the next generation of net pens. We therefore expect to see a dramatic reduction in the prevalence of skin flukes on the farmed fish, and therefore a concomitant reduction in the frequency of therapeutic bath treatments.

### 7.2.2 Biota

#### a. Flora

There are no terrestrial flora in the existing lease area. The potential for increased organic loading in the substrate and detritus from cleaning of the net pens may result in some increased growth of benthic algae – possibly filamentous green algae – over a limited area underneath and immediately downcurrent of the net pens, but this will not be a significant impact. These potential impacts will also be reduced with the proposed amendments here leading to no increase or a probable reduction in biomass on the farm, reduced surface area for macroalgal fouling, and increased frequency of cleaning to control the fouling on the net pens.

#### b. Terrestrial fauna

The proposed amendments would not impact terrestrial fauna. This area is not considered important for birdlife, and any impacts will be insignificant.

### c. Marine biota

#### *Marine Benthic Organisms*

The reduction in the number of net pens, reduction in the surface area-to-volume ratio of the remaining net pens, the smooth surface of the hardened Dyneema or rigid Kikkonet, and the increased efficiency and frequency of cleaning all indicate that there will likely be a significant decrease in the amount of marine benthic fauna that settle on the net pens themselves, and on the substrate beneath the net pen. There will be no increase in fouling of the anchor lines; indeed, this will be marginally reduced, as the number of mooring lines will also be reduced, in proportion to the number of net pens.

The macrofaunal biofouling on the net pens and mooring lines all settle out from the plankton, and their presence does not portend any measurable impact on adjacent communities. Grazing and browsing fishes may remove some of this biofouling, but farm workers will regularly scrape or clean the occluding fouling from these surfaces. Some of this fouling will fall to the bottom, and become part of the general benthic processes of detritivores and decomposers in the soft substrate. Through the more regular cleaning that will be possible with the approval of the surface net pens, or improved ability to invert the new Sea Stations, the frequency of cleaning can significantly increase. This means that the total biomass and particle size of the biofouling on net pen mesh and mooring lines will be less. The total organic loading on the benthos will therefore be reduced, and the particles will be more readily re-suspended in the currents, meaning that there will be even less overall impact on the substrate than is presently occurring.

There will also be no change – or even a reduction – in the risk of impact on the benthic biota, as the biomass of fish will remain the same, or be reduced. The surface net pens or larger Sea Stations will also ensure that feeding is more efficient, resulting in less uneaten food falling through the bottom of the net pens, or being blown through the sides of the net pens during high current events. Any subtle changes in the benthic community that may have occurred in the past will therefore be even less discernible. The potential for benthic impacts to have any effect on more sensitive shallow water habitats will also be unchanged, or further reduced.

#### *Fishes*

The existing operation does have an aggregative impact on some species of fish in the area, but this is considered neither deleterious nor significant. It is therefore highly unlikely that the change in net pen size or form, or the reduction in the number of net pens, will result in any additional impacts, or any change in the degree of significance of these impacts.

Fish are attracted to the site for a number of reasons: the fouling on the net pen, the occasional release of small quantities of uneaten food from the net pen, and the aggregative nature of objects in open water (as for Fish Aggregation Devices). Based on the evidence from the existing Kona farm, the resident fish species around the net pen may vary over time. The current farm site in Kona is mainly frequented by deep water or pelagic species, such as mackerel scad ('opelu:

*Decapterus macarellus*), rainbow runners (kamanu, *Elegatis bipinnulatus*), false albacore tuna (kawakawa: *Euthynnus alletteratus*) ulua (giant trevally, *Caranx ignobilis*), and wild kahala (*Seriola rivoliana* and *S. dumerili*).

Concerns about potential negative impacts of escaped fish are often cited as one of the reasons for objections to fish farming. However, this issue is usually only relevant where non-native fish are cultured in areas where escapes might become established or compete with local species, such as Atlantic Salmon in the Pacific Coast of Canada. Kona Kampachi®, by contrast, is native to the waters of Kona. In addition, Kona Blue recognizes that the innovative net pen engineering that we are pioneering means that there is some possibility of escape incidents over the initial proving period. In consideration of this, Kona Blue has deliberately not applied any selective breeding in the hatchery, and has not used broodstock beyond F2 (i.e. all broodstock are either wild-caught, first- or second-generation captive-reared). There is therefore no significant difference in the genetic make-up of the fish inside the net pen from the fish in the wild. This reduces any potential impact from escapes to merely direct ecological impacts. Given the heavy predation that has been witnessed on escaped Kona Kampachi®, the long-term survival and reproductive success of any escapees is probably marginal.

In addition, the underlying rationales for the change to the hardened Dyneema or Kikkonet mesh include the need to improve the predator resistance of the mesh, and to also reduce the ongoing 'leakage' that is experienced as divers enter or leave through the underwater zippers. These proposed changes should therefore reduce the likelihood of both ongoing escapes, and catastrophic net pen breaches.

### *Dolphins*

The proposed reduction in the number of net pens, the reduced risk of marine mammal entanglement or net pen breach with use of hard plastic mesh, and (for surface net pens) the elimination of leakage from divers entering cages through zippers, and the reduced presence of divers outside of the net pens, should all reduce the attractant nature of the farm to the bottlenose dolphins. If these proposed changes are as effective as Kona Blue anticipates, then there should result in fewer bottlenose dolphins around the net pens on fewer days. At a minimum, there will be less potential for interaction between the bottlenose dolphins and divers or farmed fish, as there are fewer net pens to tend.

Kona Blue will continue with the ongoing monitoring and reporting of marine mammal activity around the farm site, and is collaborating with HIHWNMS staff, PIRO PRD staff, and UH Hilo faculty to develop a more robust third-party on-site monitoring program, and to obtain funding for such research and educational activities. This data collection should then allow, going forward, an assessment of the impacts of the changes in form of net pens and mesh material.

The pattern of migration by spinner dolphins (*Stenella longirostris*) through the area suggests that the proposed amendment to the fish farm operation will not interfere in any discernible manner with the animals' movements. The proposed farm modifications have no direct overlap with the main spinner dolphin rest area in Makako Bay, and should have no impact on these animals. The relatively small physical structures of the farm do not inhibit the movement of the

animals to their offshore feeding sites. The rigid plastic webbing on the proposed net pens represents no entanglement threat to the spinner dolphins.

### *Sharks*

A detailed description of the experience on the farm managing sharks has been presented in the prior 2007 Final EA. The single overarching aspect of shark interaction with the existing fish farm site has been the general lack of shark presence around the net pens. For the first eight months of operation, only one fleeting shark sighting occurred: a small tiger shark. There are generally brief influxes of tiger sharks (mano: *Galeocerdo cuvier*) to the area in the months of September and October of each year. Most of the animals at this time appeared individually, or in pairs, with a range of sizes from 8ft to 15ft in length, and appear to not take up residence on the farm site. This is further confirmed by data from the DAR shark transponder receiver station on the farm site: tiger sharks only very infrequently pass by the site, and rarely do they show any interest in the operation. From July, 2006 to May, 2007, there were a total of eight (8) records of tagged tiger sharks in the Kona Blue farm area. None of these sharks took up residence. One animal passed by the farm site three times in two months, another animal was recorded twice in two months, and three other animals had single records. (Figure 4).

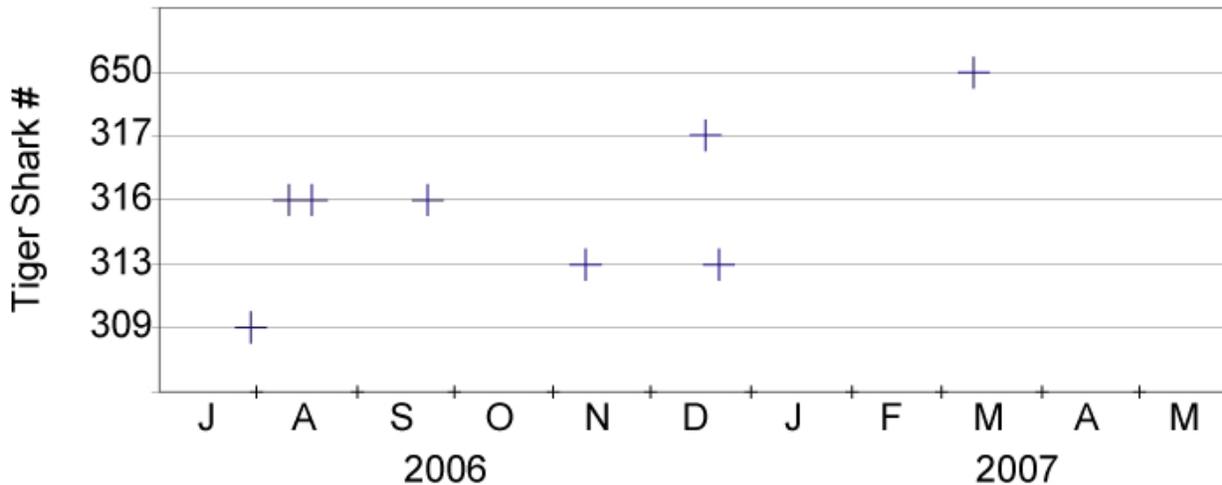
There have also been sightings of sandbar sharks (mano: *Carcharhinus plumbeus*) around the net pens. Initially, these were rare (none in the first year of operation), but since October, 2006, the frequency of sightings and number of sandbars has increased. These animals are usually seen in small groups (one to four sharks), below the net pens at depths of over 100 ft. They rarely rise up to the level of the net pens. Because these animals are more secretive, and cannot readily be distinguished by any markings, it is unclear if these are always the same individuals, or if they represent a larger population of animals that periodically move through the area.

In the period from June to August of 2008 there were a series of breaches of varying sizes in the Dyneema® webbing, resulting in escape incidents from primarily two of the existing Sea Station net pens. Breaches were sealed immediately on discovery. Escapees were heavily preyed upon by ulua and bottlenose dolphins, and no reports were obtained from divers or fishermen of any *Seriola* being noted along the nearshore waters near Keahole Point. The discrete timing of these breaches suggests they were probably due to a single predatory animal. While the incidents ceased early in September, the evident vulnerability of the present form of Dyneema® to attack, and the risk of further conditioning of the bottlenose dolphins added impetus to the plans by Kona Blue to change to a more secure webbing material. A hardened Dyneema is now under development by Ocean Spar – manufacturer of Sea Stations. Kikkonet has been used in *Seriola* culture in Japan for over 25 years, and has been successfully used in crocodile and shark-infested waters by a sea-cage barramundi farmer in North Queensland, Australia. We therefore anticipate that the use of Kikkonet webbing will reduce mesh breaches to negligible levels – possibly approaching zero. This will then significantly reduce the attractant nature of the escapes to the bottlenose dolphins.

Figure 4 : Frequency of tagged tiger shark occurrence at Kona Blue farm site.

Five tagged sharks were recorded over an 11 month period, with the most frequently occurring shark being present three times over a two month period. No animals took up residence, or showed any strong site affinity.

Abacus plot showing dates (blue crosses) on which five transmitter-equipped tiger sharks were detected at Kona fish farming cages



Overall, the evidence from the Kona Blue site confirms that there will be no negative impacts from any aggregating effects of the new net pens on sharks. With fewer net pens, unchanged or reduced biomass in the net pens, and easier retrieval of mortalities from the surface net pens, we expect that there will be a reduction in the attractant nature of the operation to sharks.

d. Rare, threatened or endangered species

There are two conceivable ways for open ocean fish farming to have a significant negative impact on rare, threatened or endangered species: the project may present a significant obstruction to animal movements, or the animals may become entangled in the net pens or moorings. However, the history to date with the existing operation in Kona, and the history of open ocean aquaculture operations elsewhere around the globe, combined with the relatively small size and the specific attributes of the taut moorings and proposed rigid mesh webbing all suggest that the risk of such negative impacts is negligible. The reduction in the number of net pens, the number of mooring lines and ballast-weight moorings, and the Dyneema or Kikkonet mesh material that are all part of these proposed modifications should all further reduce the likelihood of any impact on rare, threatened or endangered species.

Monk seals and sea turtles occur in the area infrequently, and move erratically, with no defined migration through the existing farm site.

The evidence to date suggests that Kona Kampachi™ escapees do not present a significant, persistent attractant to monk seals. The nylon nets used on the two smaller surface nursery pens that were deployed in 2005-2006 caused some concern with potential entanglement for monk seals because of the loose, pliable netting of these structures, and the large mesh that was used in the ‘predator nets’ (in an attempt to reduce the number of breaches in the nylon webbing from predator attacks). The threat of entanglement from the predator nets was a large part of the reason why Kona Blue decided to remove these surface pens. Since their removal, no monk seals have been seen at or near the existing farm site.

The Kikkonet mesh, however, is very rigid, and resilient. It therefore does not require a predator net to protect the surface pen. There is only one single net on each net pen, with a maximum mesh opening of 40 mm. The rigid nature of the webbing means that a marine mammal or other animal cannot roll in loose webbing, or catch a fluke, claw or tooth in the pliable weave. The Kikkonet, therefore, does not represent an entanglement risk to marine mammals or other rare, threatened or endangered species.

### *Humpback whales*

The Kona coast area is frequented by humpback whales during the winter. The area north of Keahole Point lies within the boundaries of the Hawaiian Islands Humpback Whale National Marine Sanctuary. The whales move throughout the general area, usually following a longshore track (north to south, or vice-versa). There is no evidence to suggest that the proposed changes to farm operation will represent either an attractive nuisance or a deterrent to whale movement. The farm as presently configured does not appear to inhibit whale movements; on one instance, a humpback whale was observed inside the grid of the existing farm operation. Kona Blue employees observed the animal surface within one of the grid squares where there was, at that time, no cage. The animal broke the surface, spouted, then submerged and moved towards the east (inshore), evidently moving between the net pen and the mooring lines with ease.

The distance of around half-mile from the inshore side of the net pens to the shoreline offers ample room for the whales to move around the eastern end of the existing and proposed farm structures. There is also no chance for any funneling or bottleneck effect on whale movements past the net pens.

While the surface pens would exclude whales and marine mammals from the specific body of water enclosed by the net pens, this area is highly insignificant. Concerns about the reduction in whale habitat by the existing project were previously expressed by HIHWNMS and DLNR/DAR officials. However, it would appear from data on whale abundance in the area that the waters in the vicinity of Keahole Point are not as heavily frequented by the whales as other waters of the Sanctuary, further to the north (Figure 5). In any case, the observations above suggest that the mooring lines do not appear to represent an exclusion from the habitat, any more than an anchor line from a boat. The only real loss of habitat for the whales is therefore the waters within the net

pen from which they are excluded. A vessel of similar size would have an identical habitat displacement effect.

The total available habitat in the Sanctuary cannot readily be calculated, and so it is difficult to determine the percentage of habitat loss from the entire Sanctuary. However, the percentage of habitat lost from, say, one kilometer of Sanctuary waters can be estimated. The maximum of five net pens (two Production Pens, and up to three Nursery and Research Net Pens) proposed here will together occupy a total volume of around 24,000 m<sup>3</sup>. One kilometer of Sanctuary waters (measured along the coastline), of an average depth of, say, 50 fathoms (around 100 m), and of a width (from coastline to 100 fathoms) in this area of around 5 km equates to a total volume of 500 million m<sup>3</sup>. The loss of habitat from the presence of the net pens is therefore less than 0.005% of the available habitat in this 1 km of the Sanctuary Coastline. The loss of habitat is equivalent in volume to the loss of habitat from the displacement of a 24,000 ton vessel.

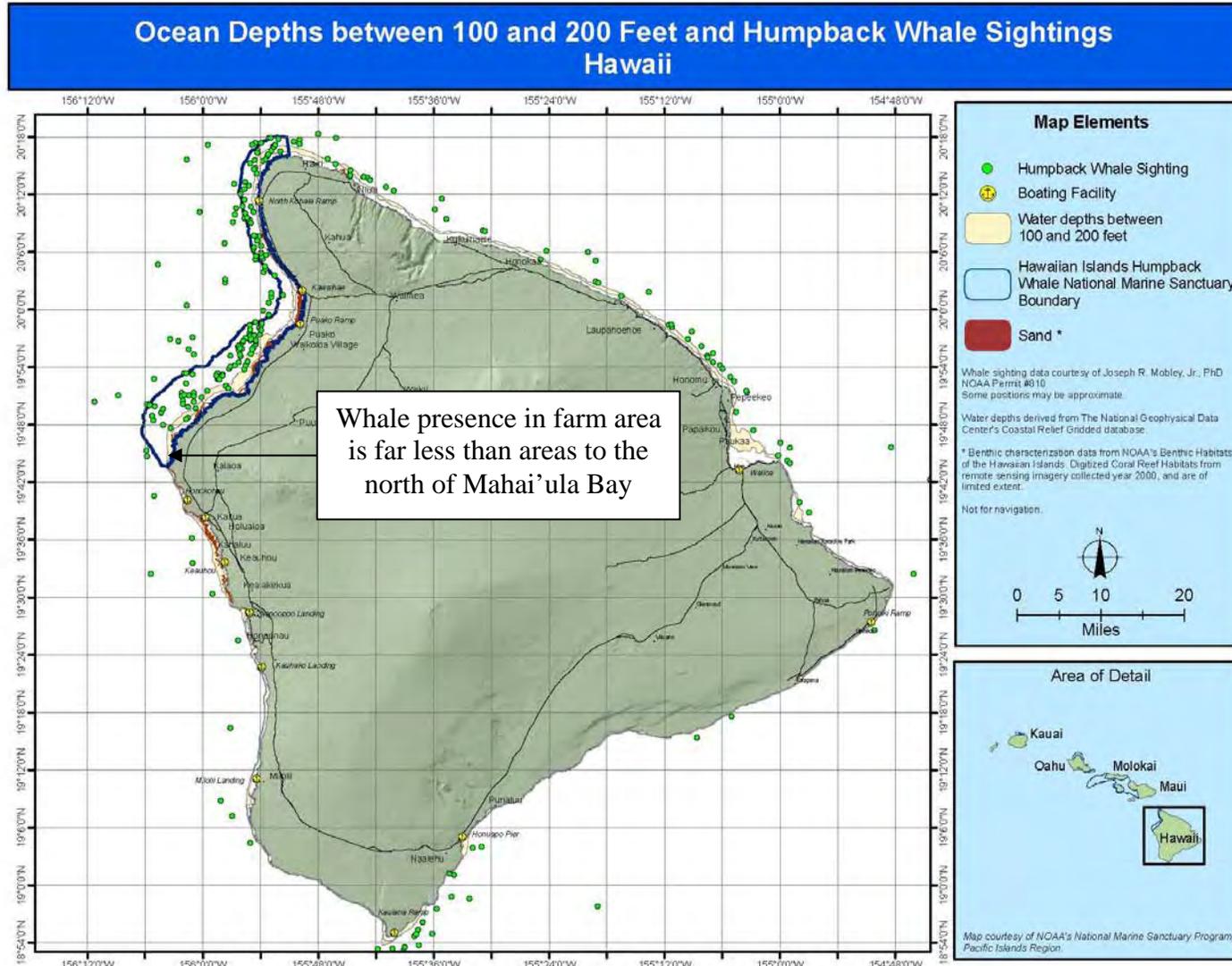
The earlier 2007 Final EA provided a comprehensive analysis of available records on entanglement by whales (NMFS Stock Assessments), a review of interactions between marine mammals and Hawaii's fisheries (Nitta and Henderson, 1993), and details of marine mammal strandings compiled by NMFS Pacific Area Office (NMFS-PAO). These all support the assessment in the original project EA (2003 Final EA) that entanglement problems for whales are all due to slack-line fishing gear or extensive, loose-mesh fishing nets. Amongst all these observations, there is no record from any U.S. aquaculture operation of entanglement of humpback whales, or other marine mammals, in the taut moorings or net panels of fish net pens.

#### *Mitigation measures*

Given the above minimal risk of any displacement or entanglement by marine mammals in the farm structures, the single greatest mitigation measure is to further reduce the entanglement risk by working with net pen engineers in design and deployment of the net pens and the moorings. Mattila and Walters (pers. comm.) suggested for the original project that the number of mooring lines in the net pen design should be kept to a minimum. This aspiration needs to also be balanced with the need to ensure that the net pens are adequately moored, with appropriate sharing of the load around the rim. Most of the mooring load on the PolarCirkel net pens is borne by the triple-ring, thick-wall HDPE pipe that forms the main structure of the rim. Kona Blue is also working with engineers to adapt rigid steel weight-rings to the PolarCirkel net pens. This would allow the bridle lines to remain at the bottom of the net pen, away from the surface, and for fewer bridle lines to be used. Kona Blue has applied to NMFS for assistance with testing these mooring designs on our site.

In addition, if these proposed changes are implemented, the overall number of net pens will be reduced from eight to a maximum of five. On the farm at present there are a total of eighty eight (88) bridle lines mooring the eight Sea Stations to the grid, and a total of 12 ballast weight lines suspended below the net pens. If all five proposed net pens were to be deployed as surface net

Figure 5 : Typical Humpback whale sighting patterns around the Big Island of Hawaii



pens, using the bridling and mooring systems proposed, then each net pen would use eight bridle lines, for a total of forty (40) bridle lines overall. There would be no vertical ballast moorings below each net pen. Overall, then, these net pen modifications result in more than a 50% reduction in net pen bridle lines, and possible elimination of all of the ballast mooring lines.

Other mitigation measures were considered unworkable and inappropriate. The installation of weak links, such as is used in some lobster and gillnet fisheries, has been previously examined, and found to be unworkable, because of the increased risk of loss of the net pens. The use of acoustic deterrence devices is probably unnecessary and inappropriate for applications within the humpback whale Sanctuary.

### *Marine Mammal Monitoring Plan*

Kona Blue will continue to support the Marine Mammal Monitoring Plan (MMMP) for assessing the degree of interaction between the project and marine mammals. The MMMP is based on adherence by all Kona Blue staff to reporting requirements, and to support of Sanctuary staff in monitoring of whale abundance patterns around the farm site. The MMMP describes Federal recommendations or instructions in the unlikely event of any entanglement, and also details ongoing reporting requirements for any close interaction with humpback whales, or any physical interaction between the farm array and other marine mammals. The initial response is to immediately call the NOAA Marine Mammal Stranding Hotline (1 888 256 9840). Kona Blue has previously indicated to HIHWNMS officials that the company would be eager to have staff trained in appropriate first-response measures, but this has not been pursued up to this point because of concerns about liability, or establishment of appropriate certification standards for such training. Kona Blue recognizes the complexity of these issues, with Sanctuary protocols and ESA considerations, but still affirms our willingness to assist Sanctuary or NMFS staff in any such manner that is deemed appropriate.

The company will extend the existing monitoring program to cover the amended net pen array that is proposed here. The assistance of HIHWNMS staff or NMFS experts will be obtained to modify the program, as necessary, to ensure the maximum practical amount of usable information is collected. Mattila and Walters (pers. comm.) indicated that detailed measures of abundance or spatial distribution were not needed, but that basic records of interactions would suffice (e.g., close approach of a whale, such as within 50 m, or whales rubbing against mooring lines or running into the net pens). Kona Blue is also seeking funding from the Federal government, through the NMFS Saltonstall-Kennedy program, to help support a UH-Hilo researcher to develop a more robust third-party on-site monitoring program, to allow better evaluation of the effects of farm activities – particularly the net pens and mesh material - on bottlenose dolphins and other marine mammal behaviors.

### 7.2.3 Recreation

The survey results indicate negligible use of the farm area prior to Kona Blue initiating activities. There has been no significant increase in use of the area, beyond increased trolling activity by fishing boats, around the farm perimeter.

The greatest impacts of the proposed net pen modifications on existing recreational use of the area will be the visual impact upon divers and boaters of the buoys or surface net pen rims, as they pass to or from the preferred dive sites at Kona Coast State Park, to the north. However, the Sea Station net pens that are presently in use are regularly raised to the surface, where they occupy a prominent position. The base of the Sea Stations is each around 80 ft in diameter, and the top of the net pen pyramid can be 25 ft high, when fully-raised, out of the water. Up to four or sometimes five net pens can be raised at any one time, to aid in the drying of the Dyneema mesh, to reduce the biofouling of the net pens, or to allow divers to work inside the net pens. Sea Station net pens can sometimes be raised for 8 or 10 hours per day, to maximize the drying effects of the sun. The presence of the surface net pens proposed here will therefore not measurably increase this visual impact. There will be no more than five surface net pens overall. The two PolarCikel Production Net Pens proposed here would each be of around 30 m (100 ft) diameter, and will extend no more than 3 ft above the water's surface. Sea Station production net pens will be of similar diameter, but as with the existing Sea Stations they will extend some 30 ft or more above the water surface when fully raised. The Nursery and Research Net Pens may be of varying dimensions (as the form of these net pens is, as yet, undetermined), but as the total volume allowable will be no more than 7,000 cubic meters, no one Nursery or Research Net Pen could be of greater overall size than either of the Production Net Pens.

Kona Blue also only seeks the same restrictions for the new net pen array that apply to the existing lease area: exclusive control over the fish inside the net pens, and no anchoring, SCUBA-diving, spear-fishing or swimming within the lease area. These modest limits are considered the minimum needed to protect the company's investment, to limit our liability (and retain our ability to obtain insurance coverage), and to assure public safety.

As with the existing farm site, the passage of boats through the modified net pen array will not be noticeably impeded. No anchoring will be permitted within the lease area, as the anchors could become entangled in the net pen mooring lines. Fishing by the public from unanchored boats (trolling, or line-fishing from drifting boats) will still be permitted, but with the continuing caveat that any fishing lines that become entangled in the net pen mooring lines must be left in place, and cannot be retrieved by divers. We will request that fishermen not troll through the center of the farm site, because of the potential for fishing lines to entangle divers, or for lures to hook into mooring lines or nets. We will also continue to request that boats transiting the immediate net pen area observe a slow 'no-wake' boat-speed, to maximize safety for divers.

Unguided recreational SCUBA diving or unauthorized commercial SCUBA dive tours will not be permitted anywhere within the lease area, because of liability, safety and security concerns. However, as discussed above, the company intends to examine the potential public demand and legal liability issues involved with conducting guided tours for paying customers, as an eco-tour operation. These eco-tours could help to increase public awareness of Kona Blue's activities, and open ocean aquaculture in general, as well as help promote the Kona Kampachi® brand and provide an additional revenue stream to the company. These guided tours would be at the sole discretion and authority of the company, as the lessee, and the company would assume all liabilities for public safety for participants on these eco-tours.

The loss of access to recreational activities within this relatively small area of ocean space is not considered significant. Kona Blue's ongoing observations affirm that there is virtually no fishing or other recreational use of the lease area, beyond trolling, which is probably enhanced by the farm's presence. Any surface obstructions within the lease will be clearly marked with navigation lights, as per U.S. Coast Guard requirements, and will not present any significant impedance to vessel movements along the coast.

#### 7.2.4 Noise and air quality

The fish farm modifications will not contribute measurably to ambient noise levels. Boat engines and other equipment used by the farm will generate some minor noise during farm operation, but this already occurs with existing activities. These noises and air quality impacts will be insignificant compared with the noise from the nearby Kona International Airport. Likewise, the exhaust from the small boat engines and pressure washers will have an insignificant effect on air quality.

Submarine noise has been reported from the existing farm site by some recreational divers at depth along the Makako Bay drop-off. The source of this noise is not clear: it was reported to have occurred at dusk, but there are rarely any such noise-making activities at the farm at this time. This may possibly be reference to the use of the underwater net cleaning machines that are used periodically, to clean the bottom half of the net pens. It is anticipated that the new surface net pens will allow cleaning more readily by workers standing on the net pen rim. New Sea Station net pens should also allow more frequent air-drying and inverting of the net pens. Cleaning will therefore probably happen more frequently, but will not be for the extended time periods (sometimes days to clean a single net pen) required for the existing submersible net pens.

#### 7.2.5 Aesthetics

Community value judgments and perceptions of how the oceans should be used will largely govern the impact of the project on the community's aesthetic enjoyment of the area. In community meetings, Kona Blue generally continues to enjoy very strong support for the broad goals of the project. There is wide recognition of the severely depleted status of bottomfish species in Hawaii. The awareness of the global fisheries crisis has recently been amplified by several scientific studies, such as that of Worm, et al (2006), which projected a collapse of world fish stocks by 2048, unless significant remedial changes were made to fisheries and marine ecosystem management.

The visual impact of the expanded project will be minor, compared with the existing operation, and the adjoining properties of Kona International Airport and the aquaculture operations at NELHA. The major visual impact from the farm operation will be from any surface pens and the existing feed barge; this represents no major additional impact. Because of the greater efficiency of tending to larger pens, the modified array should probably require some significantly reduced level of support activities. There may still be some additional presence of work and dive boats, and harvest boats, on some days. However, the impacts of these structures and activities will not

be significant, given the distance from the nearest residences, more than 3 miles away (i.e., at the beginning of the Palisades subdivision), and the existing operations.

The general consensus of support for the proposed fish farm project is best reflected in the few objections voiced to the earlier expansion plans that were presented to the community. There is wide recognition that the project fits in well with the overall ambience of innovative aquaculture at NELHA, and the need for Kona to develop alternative industries beyond tourism. Fisherfolk and other mariners recognize the validity of the criteria that Kona Blue has used to select this site (c.f. deeper or shallower sites), and have not expressed a strong preference for the project to be located elsewhere.

The company therefore believes that the amended project proposed here will continue to be viewed as a positive development for the area, and will be considered an aesthetic asset – something which continues to embellish the Big Island's reputation as a center for innovative, environmentally-friendly industry, and its overall ambience of sustainable marine initiatives.

#### 7.2.6 Cultural practices and traditional resources

The modifications proposed here will not have any differential impact on the customary and traditional uses of opelu ko'a, nor will they affect the distribution of opelu in any manner that would be appreciably different from the existing operations.

Access to, or practice of any other customary activities will not be significantly constrained by the changes to the farm array or operations. The exclusive control over the waters (and the fish) inside the net pens is consistent with traditional and cultural practices that identified fish traps or lobster traps – and the animals therein – as the private property of the trap owner. The same principles apply here.

#### 7.2.7 Land use and environmental compatibility

##### a. Current usage

The area is already leased to Kona Blue for offshore farming purposes. The proposed modification to the net pen type and operations of the farm within the Unualoha offshore ocean space is not incompatible with the other industrial uses of the area: Kona International Airport and NELHA area aquaculture and energy production.

##### b. Submerged lands issues and the public trust

The amended ocean leasing law directly addresses the issue of distribution of lease payments, as it relates to the State's obligations to the Office of Hawaiian Affairs (OHA). Kona Blue already provides payments to the State's Aquaculture Development Fund, of which 20% is payable to OHA, in compliance with the law regarding all ceded lands. These broader issues have been addressed in more detail in previous assessments, such as the original 2003 Final EA, and the

2007 Final EA. This application involves no alteration to the existing lease, and so does not impinge in any additional way on submerged lands or public trust.

#### 7.2.8 Cumulative impacts

The proposed modification to the net pen array and maintenance or reduction in fish biomass will reduce the likelihood of any cumulative impacts. As water quality impacts are not measurable from the existing operation, and benthic impacts are only perceptible in the immediate area of the net pens, there is no suggestion that this current or reduced production capacity will have any cumulative impact on the overall ocean ecosystem in the area.

Approval of this modification to this one fish farm will not obligate DNLN to issue subsequent leases or further modifications to either this or subsequent applicants. This lease is only the second such lease in the State, since passage of the revised open ocean leasing legislation in 1999. The failure of several proposals to complete the CDUA process bears witness to the strength of this operating legislation, and to the effectiveness of the public review process in vetting applicants.

#### 7.2.9 Irreversible and irretrievable commitment of resources

The proposed amendments to the project require no further commitment of submerged lands or the water column, and only an insignificant commitment of surface waters, which are already impinged upon when the existing Sea Station net pens are raised to the surface. These modifications are neither irreversible nor irretrievable, and in no other way differ from the existing farm array.

All impacts on the benthos or water quality will be temporary, and reversible. In areas of soft sediments and strong currents, such as are found in the proposed lease area, the habitat could be expected to recover very rapidly from any perturbation that might occur.

#### 7.2.10 Summary of operating constraints

Operating constraints discussed in the above sections are summarized in Table 3, below.

TABLE 3 : SUMMARY OF OPERATING CONSTRAINTS

TOPIC	ISSUE OR IMPACT	OPERATING CONSTRAINT OR MITIGATING CIRCUMSTANCE
Water quality	Current levels of excretion by the present number of fish have resulted in no measureable impact on nutrient levels in the waters in the immediate area downcurrent from the net pens. Fish numbers and farm biomass, will be unchanged, or fewer.	Regular water quality monitoring program already established at the Unualoha site includes monitoring of ammonia, turbidity, and a range of other water quality parameters. Ongoing monitoring to be conducted according to EPA, State Dept of Health and DLNR requirements.
	Solids from uneaten food, fish feces or fouling on the net pen or moorings may increase levels of organic suspended solids in immediate area below the net pens.	Existing or reduced levels of fish biomass will result in same or less feed. Larger net pens allow more prudent farm management strategies to minimize levels of uneaten food. Improved efficiency and frequency of net pen cleaning should reduce biofouling biomass, and reduce any potential impacts on substrate.
	Periodic bath treatments of dilute hydrogen peroxide solution may impact fish health, product quality or the marine environment.	Hydrogen peroxide is benign, and quickly breaks down to form water and oxygen. Evidence from existing operation suggests no negative impacts. Ongoing monitoring of effluent water from baths will be conducted according to requirements EPA and State Dept of Health. Improved management of new, larger net pens should allow less frequent treatments.
Terrestrial Flora / Fauna	N/A.	None. No significant bird use of the area.
Marine Biota	Potential to inhibit movements of threatened green sea turtles or endangered hawksbill turtles.	None. Taut line moorings and rigid mesh will eliminate risk of entanglement. Fewer net pens present fewer obstructions to movements.
Rare, threatened or endangered species	Potential to disrupt endangered humpback whales in the Hawaiian Islands Humpback Whale National Marine Sanctuary.	None. Taut line moorings and rigid mesh will virtually eliminate risk of entanglement. Fewer net pens present fewer obstructions to movements. Laws protecting threatened species will be followed.
	Potential to disturb endangered Hawaiian Monk Seals.	None. Taut line moorings and rigid mesh will virtually eliminate risk of entanglement. Laws protecting threatened species will be followed.

Recreation	Net pens on the surface (raised Sea Stations or surface PolarCirkels) may preclude fishermen or other boaters from anchoring within the lease area.	Existing restraints within current lease area are minimal. Existing area presently offers no tangible assets or resources; currently unused by the public except for occasional transit, and trolling. Usual deep water fishing methods do not require anchors.
	Lease will preclude unguided or unauthorized SCUBA diving, snorkeling or swimming within the expanded lease area.	This is an existing restraint within current lease area. Lease area is presently unused by the public, except for occasional transit. Guided eco-tours may increase public access and awareness of open ocean fish farming benefits.
Noise and Air Quality	Noise and air emissions during construction or operation of the farm will be minimal.	None.
	Net cleaners may be audible underwater from nearby sites.	Pressure net cleaners may be used more frequently for cleaning the surface net pens, but will be used for shorter periods of time.
Aesthetics	Visual impact of surface net pens or larger Sea Stations (when raised to the surface) on the view plane from land or water.	Visual impacts already occur frequently as submersible net pens are already regularly raised to the surface. View plane impacts will be insignificant, compared with the nearby Natural Energy Laboratory and Kona International Airport.
Cultural Practices and Traditional Resources	Limited activity (no anchoring, SCUBA-diving, or swimming) within expanded lease area.	Existing restraint within current lease area. Negligible traditional resources or cultural practices in expanded lease area.
	Potential impact on traditional 'opelu ko'a.	No significant potential to draw fish away from ko'as. 'Opelu are often found around the farm, but still appear to maintain patterns of movement throughout the area.
Land Use Compatibility and Environmental Justice	Community or cultural groups or individuals may object to ceded lands being used for private projects.	There is no change requested to the existing lease boundaries or terms.
	Community or cultural groups or individuals expressed strong interest in seeing some of the benefits from the farm lease rental directed towards appropriate activities in Kona.	Lease rentals are paid to Special Land and Development Fund for planning research and development of the aquaculture industry. There is potential for directing some proportion of funds to reef restocking or other marine educational or training activities in Kona.
	There is a constitutional requirement for legislative oversight of any disposition of the public lands trust.	The amended 190 D HRS addresses this issue by requiring an annual report to the legislature by the implementing agency (Aquaculture Development Program, in DOA).

Cumulative	Implementation of amendments to farm array may present cumulative impacts.	Net pen modification will not change potential for cumulative impacts. Existing farm has no measurable impact on water quality. Benthic impacts limited to those directly beneath the net pens. There are no other considerable cumulative impact mechanisms.
------------	--	---

## REFERENCES

- Celikkol, B., 1999. Biological assessment of the University of New Hampshire open ocean aquaculture demonstration project finfish component. Prepared for U.S. Army Corps of Engineers, New England Division, Concord, MA. 60 p., plus appendices.
- Kemper, C.M. and S.E. Gibbs, 2001. Dolphin interactions with tuna feedlots at Port Lincoln, South Australia and recommendations for minimizing entanglements. *J. Cetacean Res. Manage.* 3(3):283-292.
- Marten, K., and S. Psarakos, 1999. Long-term site fidelity and possible long-term associations of wild Spinner Dolphins (*Stenella longirostris*) seen off Oahu, Hawaii. *Mar. Mammal Sci.*, 15(4): 1329 – 36.
- Nitta, E.T., and J.R. Henderson, 1993. A review of interactions between Hawaii's Fisheries and Protected Species. *Mar. Fish. Rev.*, 55 (2): 83 – 92.
- Norris, K.S. and T.P. Dohl, 1980. Behavior of the Hawaiian spinner dolphin, *Stenella longirostris*. *Fish. Bull.*, 77(4), 821-849.
- Norris, K.S. Wursig, R.S. Wells, M. Wursig, S. Brownlee, C. Johnson and J. Solow, 1994. The behavior of the Hawaiian Spinner Dolphin, *Stenella longirostris*. NMFS/SFC Administrative Report LJ-85-O6C.
- Ostman, J.S.O., 1994. Social organization and social behavior of Hawai'ian Spinner Dolphins, (*Stenella longirostris*). Ph.D. dissertation. U.C. Santa Cruz. 114 pp.
- Ostrowski, A.C., J. Bailey-Brock, and P.S. Leung, 2001. Hawaii Offshore Aquaculture Research Project (HOARP) – Phase II. Final Report to Sea Grant College Program. Award No. NA86RG0041. Oceanic Institute, Waimanalo. 79 p.
- Silber, G.K., K.A. Waples and P.A. Nelson, 1994. Response of free-ranging harbour porpoises to potential gillnet modifications. *Rep. Int. Whal. Comm'n (Special Issue)* 15: 579 – 584
- Wursig, B., and G.A. Gailey, 2002. Marine mammals and aquaculture: conflicts and potential resolutions. Pp 45 – 59 *in* Responsible Marine Aquaculture. R.R. Stickney and J.P. McVey (eds). CAB International.
-