DRAFT
ENVIRONMENTAL ASSESSMENT

FOR AN

OCEAN ERA OFFSHORE AQUACULTURE FARM

OFF ‘EWA BEACH, O‘AHU, HAWAI‘I

PREPARED BY:

Ocean Era, Inc.
: 73-4460 Queen Ka`ahumanu Highway, #123, Kailua-Kona, HI 96740

June 6th, 2023

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LIST OF ACRONYMS AND ABBREVIATIONS

ACOE	- Army Corps of Engineers
CDUA	- Conservation District Use Application
CDUP	- Conservation District Use Permit
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 Hawai‘i Department of Agriculture
DOH	- State of Hawai‘i Department of Health
EA	- Environmental Assessment
EPA	- Environmental Protection Authority
ER	- Environmental Review
FAD	- Fish Aggregating Device
FONSI	- Finding of No Significant Impact
HIHWNMS	- Hawaiian Islands Humpback Whale National Marine Sanctuary
HRS	- Hawai‘i Revised Statutes
MAS	- Multiple-anchor swivel
MHI	- Main Hawaiian Islands
NM	- Nautical Miles
NPDES	- National Pollutant Discharge Elimination System
NELHA	- Natural Energy Laboratory of Hawai‘i Authority
NMFS	- National Marine Fisheries Service, a division of NOAA
NOAA	- National Oceanographic and Atmospheric Administration
NWHI	- Northwest Hawaiian Islands
OHA	- Office of Hawaiian Affairs
OSWM	- Office of Solid Waste Management, a division of DOH
OTEC	- Ocean Thermal Energy Conversion

EXECUTIVE SUMMARY

Ocean Era is applying for the requisite permits for an offshore farm in Pacific waters approximately 1.5 miles south of ʻEwa Beach, Oʻahu, Hawai`i. The AOI (area of interest) is located midway between the Old Municipal Airport, south of Barbers Point to the west, and the Honolulu International Airport to the east. An offshore fish farm that produced moi operated within the same area from 1999 – 2013. During that period, there were no major impacts reported from the operation. The 2009 EA for an expansion of the moi farm enjoyed broad community support.

The intent is to establish and operate an aquaculture facility for producing native food fish, such as nenue (*Kyphosus vaigiensis*, also known as chubs, or rudderfish); moi (*Polydactylus sexifilis*, or Pacific threadfin); kahala (*Seriola rivoliana*, or Hawaiian Kanpachi); and possibly mahimahi (*Coryphaena hippurus*, or dolphinfish). Additionally, we propose to integrate the production of native limu (seaweeds). The limu species proposed include ogo (*Gracilaria sp.*), limu lepe o hina (*Halymenia sp.*) and sea grapes (*Caulerpa* spp).

The Ocean Era offshore farm will serve as a commercially viable model for environmentally and socially responsible aquaculture, with minimal reliance on forage fish fisheries (such as anchovies and sardines), and minimal impact to the surrounding environment. The project's design incorporates an innovative approach to farming that combines fish and seaweed, which will promote nutrient cycling and enhance water quality. This approach will also increase biodiversity by providing habitat for a range of marine species. The farm will provide healthful, locally-grown seafood from native species, thereby increasing food self-sufficiency for the islands. The project will also increase employment opportunities for the local community. The primary target market for the fish and limu will be consumers on Oʻahu.

This Draft Environmental Assessment (DEA) assesses the present environment and current human activities in the proposed farm area. It reviews alternative actions, and recommends the project proceed because of the relatively minor impacts of the project, and the economic and environmental benefits to be gained. The DEA is consistent with the requirements under Title 12, Conservation and Resources; Chapter 190D, Ocean and Submerged Lands Leasing, Hawaiʻi Revised Statutes (HRS), as amended, and other relevant laws.

This DEA assesses the potential impacts of the offshore farm and describes means for reducing or mitigating negative potential impacts, as well as reinforcing positive impacts that the project can offer to surrounding communities and ecosystems. Given the depth of water, the bare sand substrate in the area, the high rate of water exchange through the area, and the distance to any nearby reef areas, the Ocean Era offshore farm will result in *de minimus* impacts on water quality and insignificant impacts to benthic ecosystems.

The CDUP and a 20-year lease is requested for the proposed farm site. The site is a 260 acre polygon whose southern boundary follows the 90 meter (50 fathom / 300 ft) contour line. At the widest it is 850 meters north to south and 1260 meters east to west. On the western side it is bounded by a military restricted area. The farm will consist of up to 12 net-pens that each have a volume of 7,600m^3. The pens will be moored in a grid system, very similar to the two other offshore farms that have previously been deployed in Hawai`i. The mooring system will consist of anchors, lines and buoys configured to create a 2 X 6 grid cell system. One pen is held within

each grid cell by eight bridle lines. The grid cells and pens will cover an area of 480 m x 160 m, or roughly 19 acres in the center of the proposed site. The pens are circular, and can be operated from the surface, or can be submerged. The entirety of the anchoring and mooring system will take up an estimated 140 acres, virtually all of which is submerged. There will be roughly 50 meters between each pen. The spaciousness of the grid, the water depth and currents, and conscientious operations will minimize impacts to the water column and benthos. For similar responsibly-engineered systems elsewhere (Kona, Puerto Rico, Panama), these factors have resulted in zero measurable impact to water quality within a distance of just 30m of the cage wall -- i.e., a level of nutrients measurably identical to the nutrients generated by wild biomass and other base conditions in the open ocean.

After fish production is established, and there is a clear understanding of water current dynamics on the farm, lines for limu production will be integrated into or alongside the net-pen array.

Ocean Era anticipates that once the farm is fully built out, the operation will yield up to 2,400 metric tons of fish per year. The primary target market for these fish and limu will be Oʻahu, through established seafood distribution channels. The principals in Ocean Era have previous experience introducing new species into the market, such as the Kona Kampachi.

The issuance of the permit for a commercial offshore farm will have little impact on public activities in the area. The depth of water is well beyond the limits of normal recreational diving. The project will be located in the area used by boats that are trolling for ono, which typically ranges in a "lane" between the 25-fathom to 60–fathom depth lines (50 m [150 ft] – 120 m [365 ft]). This "lane" is also fished for mahimahi during spring and fall seasons. However, the array is expected to enhance the fishery for these species, and not be detrimental. Reef fishing and ʻōpelu koʻa are found well inshore of the proposed site, along the edge of the reef, in waters up to 120 feet deep (40m). Fishing grounds for ʻōpelu at night are usually deeper than 40 fathoms (80m).

The ʻEwa Limu Management Area is located in the waters off ʻEwa Beach on the south shore of Oʻahu, and extends from the western edge of the gunnery range to Muʻumuʻu Place, from the shoreline 150 feet seaward. To exercise native Hawaiian gathering rights and traditional cultural practices as authorized by law, hand-picking up to one pound of all types of limu combined per person per day from 6:00 am to 6:00 pm during the months of July, November, and December is allowed by permit only (HRS 188-22.8). The distance from shore (approximately 1.5 miles) of the proposed farm site is well beyond the limits of the ʻEwa Limu Management Area.

Ocean Era is requesting a lease, but will not be seeking exclusive use of the offshore farm site. The public will be permitted to traverse around the entire farm site area, within safe operating distances from the farm infrastructure. The project requests limitations on activities within the lease area (no anchoring, swimming, SCUBA diving or snorkeling), for safety of the public and employees, and site security. Vessels can transit the site. Fishing would be allowed in the outer lease area, encompassing the anchors and moorings, but the project requests that fishing not occur in the central 19 acre grid, and the immediate area of the net pens, for worker safety and liability reasons. The project also requests that boats do not tie off on any buoys, lines or other farm structures.

Table 1 summarizes the salient issues for offshore culture of native Hawaiian fish and *limu* in Hawaiʻi, based on public comments from Ocean Era's virtual meetings with various community

organizations. The determination for each issue, and relevant page in this document, is also presented in this listing of preliminary consultation concerns.

Table 1: Issues for Offshore Culture of Native Fish and Limu in Hawaiʻi

ISSUE OR CONCERN RAISED BY PUBLIC	ANALYSIS, DETERMINATION, MONITORING AND MITIGATION	PAGE NO.
Deterioration of water quality downcurrent of project	Minor impacts on water quality and the substrate beneath the farm are anticipated. The water quality and sediment will be monitored regularly to inform the operators of any changes. Additionally, the limu will absorb dissolved nutrients from the fish pens.	33, 46, 55
Attraction of reef fish and pelagic fishes (including sharks) to the production system	It is not anticipated that reef fish would abandon their typical reef habitats to take up residence on the structure, as they are highly unlikely to leave the reef and move over open water. Monitoring at other farms in the state shows very few reef fish around each anchor block. Sharks may be attracted to the structures, but the number of sharks in the overall area will not increase.	38, 51, 56
Components of the production system may become detached from the mooring, potentially impacting benthic EFH	Ocean Era has amended the original plan (a single point mooring system) to a more traditional, and well-tested grid system, that will consist of approximately 20 anchors. These cage systems are reliably operated all over the world, as well as here in Hawai`i.	16, 51, 56
Sea turtles and marine mammals may be disturbed by array or entangled in mooring lines	Taut line moorings will reduce the risk of entanglement to *de minimus*. The fish pens, macroalgae lines and moorings will not present a material obstruction to sea turtle and marine mammal movements.	34, 49, 55
The production array would likely act as a FAD, and community fishermen may be excluded from the area	Most of the farm area will be accessible to fisherman, except for inside the (approximately) 19 acre central grid of the net-pen array.	30, 40, 52, 56
Array conflicts with other recreational uses of the area	Local commercial and recreational fisher people and fishing charter boat operators were consulted in determining the final proposed siting location. There are minimal existing recreational uses of the area. The public will be permitted to traverse around the outer farm site area, with some restrictions on public activities for safety and security reasons.	30, 40, 52, 56
Activities would inhibit or restrict Kona crab (*Ranina ranina*) and nabeta (*Iniistius pavo*) fishing	The applicant is not seeking exclusivity of the outer project area. Most of the farm area will be accessible to fisherman, except for inside the central grid of the net-pen array. An increase in abundance of marine life is expected around the array	33, 40, 51, 53

This DEA anticipates a finding of no significant impact (FONSI). Findings to support this determination are based on established "Significance Criteria" (Chapter 200, HAR), and are:

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

No. The offshore area contains no resources that would be significantly affected. The only potential cultural impact considered is the possibility of changing behavior of ʻōpelu around any traditional koʻa. Previous offshore aquaculture operations – such as in Kona - have proven popular with ʻōpelu fishers.

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

No. There is little existing recreational, or subsistence use of the proposed permit area, and minimal proposed curtailment of those uses. There are net positive effects anticipated based on the experience of other similar projects elsewhere (Kona, Puerto Rico, Panama).

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

No. The Ocean Era offshore farm proposes to grow human food, to increase food self-sufficiency in the State. The project is compliant with 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. 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 Ocean Era offshore farm will provide economic benefits from increased employment in the science and commercial aquaculture sectors. The project will contribute to greater food self-sufficiency in Hawaiʻi, improving both the commercial performance and the sustainability footprint of the state's aquaculture sector. Additionally, the company intends to develop science, training, and development partnerships with education and professional training institutions, that will help support participation, benefits, and economic opportunities for nearby communities, and more generally across the state

(5) Substantially affects public health.

No. The Ocean Era offshore farm will have no negative impacts on public health. Some public health benefits may be accrued through increased consumption of locally-grown fish and limu.

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

No. Substantial secondary impacts would not be anticipated.

(7) Involves a substantial degradation of environmental quality.

No. There will be no degradation of environmental quality associated with the project. Only species native to Hawaiʻi will be cultured. There is little impact foreseen to water quality and negligible impact likely to benthic fauna and flora.

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

No. Implementation of the proposed Ocean Era offshore farm will not cause any significant cumulative effects and does not involve any commitment for larger actions. The farm is described in its entirety in the document.

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

No. The proposed Ocean Era offshore farm will not cause any substantial detriment to a rare, threatened, or endangered species or its habitat. Humpback whales, false killer whales, sea turtles and monk seals may all transit through the farm area, but the net pen array will not represent a significant barrier to movement of marine mammals, and there is negligible risk of entanglement in the taut-line array and mooring system.

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

No. Impacts on water quality are anticipated to be negligible, where any resultant nutrients from fish feces or feed wastes would be dispersed, due to depth and currents, and rapidly assimilated. Nutrient levels are expected to be measurably identical with the profile of the surrounding ocean, within a very short distance from the net pen wall. The growth of *limu* will also take up carbon and nutrients from the surrounding environment, and help mitigate and absorb GHG-driven acidification of ocean water. No air pollutants are anticipated to be generated from the net pen array. The operation will be serviced by two to three small- to medium-sized vessels each day. The sounds generated from vessels, fish feeding and net cleaning equipment will be confined to a few hours during the day. Considering the larger military and shipping vessel traffic in the area, we expect the increased sound to be negligible.

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

No. The Ocean Era offshore farm site is in waters that are approximately 60m (200 ft) deep, with strong currents and coarse sand substrate. There are no impacts anticipated on nearby environmentally sensitive areas.

(12) Substantially affects scenic view planes or vistas.

No. The Ocean Era offshore farm would be moored at a distance of approximately 1.5 nautical miles south of ʻEwa Beach and approximately 2.3 nautical miles southwest of Iroquois Point.

The project will use a submergible circular net pen design. These will be raised to the surface for feeding and maintenance, but will offer a low vertical profile. Surface marker buoys will be deployed and lit in accordance with U.S. Coast Guard specifications, but these will not be a significant impact on the view plane, given the existing land use of the residential and commercial operations at the Old Municipal Airport south of Barbers Point to the west, and the Honolulu International Airport to the east. The only visible surface elements will be the marker buoys and the feed barge. All other elements will be submerged in their normal operating configuration.

(13) Requires substantial energy consumption.

No. There will be insubstantial amounts of energy used to power the boats and equipment for the Ocean Era offshore farm. Ocean Era will favor renewable energy solutions wherever practical for deployment and operations.

1 IDENTIFICATION OF APPLICANT

Applicant: Ocean Era, Inc.
73-4460 Queen Ka'ahumanu Highway, #123 Kailua-Kona, HI 96740

2 IDENTIFICATION OF APPROVING AGENCY

Hawai`i Dept. of Land and Natural Resources- Conservation District Use Permit (CDUP) [1]

[1] From HAR Title 13 Subtitle 1 Chapter 5 https://dlnr.hawaii.gov/occl/files/2013/08/13-5-2013.pdf

3 IDENTIFICATION OF AGENCIES, CITIZEN GROUPS AND INDIVIDUALS CONSULTED

FORMAL MEETINGS:

	Date	Notes :
`Ewa Beach Neighborhood Board	1/15/2021 (Zoom)	Project introduction
`Ewa Beach Neighborhood Board	2/11/2021 (Zoom)	PPT overview
Western Pacific Fishery Management Council - Fishing Industry Advisory Committee Meet	6/10/2021 (Zoom)	See Note * 1
Federal and State Scoping meeting convened on zoom	11/13/2020	See Note * 2
Public Information Meeting convened by zoom	2/18/2021	See Note * 3

* 1 = Report available at https://www.wpcouncil.org/event/fishing-industry-advisory-committee-virtual-3/, or see attached WPRFMC Mtg Report.pdf
* 2 = List of invitees attached.
* 3 = See attached list of comments and questions.

OTHER INDIVIDUALS / ORGANIZATIONS CONTACTED:

Individual	Entity / Affiliation (at that time)	Scoping document (email)	Presentation pdf (email)	Follow-up conversations/ emails
James Chang	Senator Schatz's Office	11/13/2020	11/13/2020	
Jen Burks	Sen. Hirono's Office	12/15/2020	12/15/2020	
Ben Chao / Anthony Ching	Cong. Case's Office	12/15/2020	12/15/2020	1/11/2021
Chair Sean Quinlan	House Committee on Economic Development	12/15/2020	12/15/2020	
Vice-Chair Daniel Holt	House Committee on Economic Development	12/15/2020	12/15/2020	
Chair Scot Matayoshi	House Committee on Labor & Government Operations	12/15/2020	12/15/2020	
Chair David Tarnas	House Committee on Water, Land and Hawaiian Affairs	12/15/2020	12/15/2020	
Rep. Matt Lopresti	State Representative, District 41 (`Ewa)	12/15/2020	12/15/2020	
Vice Chair Clarence Nishihara	Senate Committee on Water Land and Agricultu	12/15/2020	12/15/2020	
Chair Mike Gabbard	Senate Committee on Agriculture and Environment (21st District)	12/15/2020	12/15/2020	
Senator Kurt Fevella	State Senate 20th District (`Ewa)	12/14/2020	12/14/2020	1/11/2021
Chair Glenn Wakai	Senate Committee on Energy, Eco Dev and Tourism (15th District)	12/15/2020	12/15/2020	
Kamakana Ferreira	Office of Hawaiian Affairs	3/6/2021	3/6/2021	
Kai Markell	Office of Hawaiian Affairs, Community Engagement			1/12/2021
Jack Kittinger, Dane Klinger	Conservation International		1/12/2021	
Matt Ramsey, Garrett Goto, Ulu Ching	Conservation International (Hawaii)		1/12/2021	2/4/2021
Chad Wiggins	The Nature Conservancy		1/12/2021	
George Leonard	Ocean Conservancy		1/12/2021	
Monica Goldberg	Environmental Defense Fund		1/12/2021	
Joshua Frost	Contact for Sierra Club O`ahu		1/12/2021	
Hunter Heaivilin	Sierra Club representative	1/26/2021	1/26/2021	
Joshua DeMello	WPRFMC	6/8/2021	6/8/2021	
Clay Tam	Pacific Island Fisheries Group			1/30/2023
Wally Ito	Kua'āina Ulu 'Auamo			2/4/21, 2/15/2021
Kevin Chang	Kua'āina Ulu 'Auamo			2/15/2021
Malia Heimuli	Kua'āina Ulu 'Auamo			2/4/21, 2/15/2021
Prof. Karen Umemoto	UH Manoa (Urban Planning)	12/12/2020	12/12/2020	
Prof. Alyssa MacDonald	Leeward Community College, Marine Option Program Coordinator		2/19/2021	2/12/2021
Rhiannon (Rae) Chandler-'Iao	State Waterkeepers	1/26/2021	1/26/2021	2/5/2021
Anne Brasher	Waterkeepers Oahu	1/26/2021	1/26/2021	2/5/2021
Pauline Sato	Malama Learning Center		1/26/2021	
Amanda Milllin	Malama Puuloa	1/27/2021	1/26/2021	
Phil Fernandez	Hawaii Fishermen Alliance for Conservation and Tradition	2/4/2021	2/4/2021	2/4/2021
Mark Ladao	Star Advertizer		7/23/2021	7/23/2021
Lisa Enanoria	Project Manager, Haseko		2/14/2021	2/14/2021
Kevin Rathbun	Affiliated with Kapiolani Chamber Of Commerce		2/19/2021	2/19/2021
Barron Miho	Seafood distributor		6/10/2021	6/10/2021

Ocean Era Federal and State Agency Scoping Meeting 11.13.20 - Invitees				
Last Name	**First Name**	**Agency**	**Division**	**Title**
Akina	Liz	Department of Agriculture (HDOA)	Aquaculture Development Program	Economic Development Specialist
Low	Todd	Department of Agriculture (HDOA)	Aquaculture Development Program	Manager
Maeda	Isaac	Department of Agriculture (HDOA)	Animal Industries	State Veterinarian
Yamasaki	Lei	Department of Agriculture (HDOA)	AI - Livestock Disease Control	Aquatic Animal Veterinarian
Nihipali	Justine	DBEDT	Planning Program	Manager
Hongo	Codey	Department of Health (DOH)	Clean Water Branch	Engineer
Lum	Darryl	Department of Health (DOH)	Clean Water Branch	Engineer
Migita	Reef	Department of Health (DOH)	Clean Water Branch	Engineer
Poentis	Kris	Department of Health (DOH)	Clean Water Branch	Engineer
Cain	Michael	DLNR	Office of Conservation and Coastal Lands	Planner
Lemmo	Sam	DLNR	Office of Conservation and Coastal Lands	Administrator
Neilson	Brian	DLNR	Division of Aquatic Resources	Administrator
Liu	Arnold	Department of Transportation (DOT)	Harbors	Engineer
Shen	Celia	Department of Transportation (DOT)	Harbors	Planner
Tuiolosega	Herman	Department of Transportation (DOT)	Airport	Planner
Watase	Dean	Department of Transportation (DOT)	Harbors	Planner
Chow	Malia	NOAA	National Marine Fisheries Service Pacific Islands Regional Office (PIRO) Habitat Conservation	Supervisory Natural Resource Management Specialist
Davis	Gerry	NOAA	National Marine Fisheries Service Pacific Islands Regional Office (PIRO) Habitat Conservation	ARA Habitat Conservation Division
Dean	Ron	NOAA	National Marine Fisheries Service Pacific Islands Regional Office (PIRO) Protected Resources	Supervisory Biologist
Garrett	Ann	NOAA	National Marine Fisheries Service Pacific Islands Regional Office (PIRO) Protected Resources	ARA Protected Resources
Hawn	Lesley	NOAA	National Marine Fisheries Service Pacific Islands Regional Office (PIRO) Protected Resources	Endangered Species Biologist
Pangelinan	Arlene	NOAA	National Marine Fisheries Service Pacific Islands Regional Office (PIRO) Habitat Conservation	Supervisory Fish Biologist
Schofield	David	NOAA	National Marine Fisheries Service Pacific Islands Regional Office (PIRO) Marine Mammal Branch	Response Coordinator
Spence	Tori	NOAA	National Marine Fisheries Service Pacific Islands Regional Office (PIRO) Sustainable Fisheries	Aquaculture Coordinator
Walters	Jeff	NOAA	National Marine Fisheries Service Pacific Islands Regional Office (PIRO) Marine Mammal Branch	Supervisor
Fox	Kai	University of Hawaii	Seagrant	Aquaculture Extension Specialist
Kauahi	Cherie	University of Hawaii	Seagrant	Aquaculture Extension Specialist
Seale	Andre	University of Hawaii	CTAHR	Assistant Professor, Aquaculture
Williams	Albert	US Army Corps of Engineers	Guam and Hawaii Regulatory Office	Project Manager
Polhemus	Dan	US Fish and Wildlife Service	Pacific Islands Office	Ecosystem Conservation Program Coordinator
DeMello	Joshua	WESPAC		Fisheries Analyst

A full detailing of Public Comments and Responses from the public informational meeting is provided in Section 12, Appendix.

4 GENERAL DESCRIPTION OF THE ACTION'S TECHNICAL, ECONOMIC, SOCIAL AND ENVIRONMENTAL CHARACTERISTICS

4.1 *TECHNICAL CHARACTERISTICS*

Beginning in 2020, Ocean Era initiated farm planning and began the public outreach process. At that time, we first proposed using a net-pen system that is different than what is described here. Initially, we described having two (2) separate production systems each made up of five (5) circular fish pens followed by a limu production unit. These would all be attached to a single-point mooring, and would follow the currents and turn in a watch circle. After extensive evaluation and input received during public outreach, we have decided not to use such a system. Rather we propose to use a more traditional net-pen and mooring system, and integrate the limu lines near the net pens after fish production has been established. Although both systems offer effective and reliable technical solutions, the traditionally mooring grid system has a longer track record that further mitigates risks and may be more adaptable to local conditions.

When fully operational, the Ocean Era offshore farm will consist of twelve (12) net pens. Each pen will be 27 meters in diameter and 13 meters deep, with a volume of 7,600m^3. After several of the pens are installed and fish operations are underway, we will work with net pen designers and engineers to integrate limu production lines into the system. The pens are submersible. At a maximum harvest density of 25 kg/m^3, approximately 200 tons of fish would be produced and harvested from each of the net pen units on a rotational basis. This estimated production equates to a harvest of around 5 million fish per year, while employing 25 - 30 professional, technical, and sales staff of various levels of expertise, for a total gross salary and wages estimate of approximately $2 million annually.

The goal is to increase local food production, and diversify Hawai`i's ocean economy by rearing native fish, along with a variety of native limu (seaweeds). The primary target species of fish are nenue (*Kyphosus vaigiensis*, also known as chubs, or rudderfish), moi (*Polydactylus sexifilis*, or Pacific threadfin), and Kanpachi (*Seriola rivoliana*, aka Kāhala). *Coryphaena hippurus* (mahimahi or dolphin fish) are also included in the requested permit, in case there is a need or opportunity to diversify species in the future. The limu species proposed include ogo (*Gracilaria*), limu lepe o hina (*Halymenia hawaiiana*). limu pālahalaha (*Ulva lactuca* or *U. fasciata*) and sea grapes (*Caulerpa* spp) (McDermid et al. 2019).

4.1.1 Location and Extent of the Proposed Farm Site

Ocean Era (OE) is proposing to establish an offshore farm in the Pacific waters approximately 1.5 miles (2.2 kilometers) south of 'Ewa Beach, O'ahu, Hawai`i. The farm will be roughly midway between the Old Municipal Airport south of Barbers Point to the west, and the Honolulu International Airport to the east. The proposed site encompasses 280 acres (1 km^2 or 0.38 square miles) (Figure 1). Throughout this document this location is also called the "Area of Interest" or AOI. The location of the site is based on the favorable characteristics of the area, explained in detail below. The site was previously used for an offshore moi farm, with generally broad community acceptance. Additionally, restricted areas to the east and west, as well as an artificial reef to the southwest helped to dictate the preferred location. The size of the site is based on the space needed for the anchor and mooring system. The extent of the anchor and mooring system is

determined by water depth, bathymetric features, and the number of pens. Publicly available bathymetric data has been used here to estimate water depth, and the extent of the mooring system (see Figure 1). If OE is granted the necessary permits, we will conduct a more detailed bathymetric and environmental survey of the site, prior to deployment. The survey will result in high-resolution bathymetric data so that engineers can create the detailed, finalized system design. The survey will also allow us to visualize the area before installation of infrastructure, and to locate the four ballast weights that remain from the previous farm installation (BLNR 2014). Once the survey report is complete and net pen design is finalized, all information will be submitted to OCCL and the USACE prior to any construction.

Table 2: Coordinates of the proposed farm site

	Longitude (W)	Latitude (N)
Northwest corner	158° 0' 44.74"	21° 17' 30.22"
Northeast corner	158° 0' 1.02"	21° 17' 16.40"
Southeast corner	157° 59' 56.99"	21° 16' 49.63"
Southeast border	158° 0' 11.37"	21° 16' 51.93"
South border center	158° 0' 21.41"	21° 16' 54.52"
Southwest border	158° 0' 37.79"	21° 17' 1.58"
Southwest corner	158° 0' 43.97"	21° 17' 3.74"

Ocean Era does not seek exclusivity over this entire area. The applicant only asks for exclusivity over the central acreage (19 acres) occupied by the net pens. We ask for people to avoid that area (as identified by marker buoys on the central grid corners), so as to protect the public, our employees and property. Once the net pen design is finalized, we will submit final plans to OCCL and the USACE and initiate construction. The date for initiating construction and deployment of the net pen and mooring array is anticipated to be approximately January, 2025.

Alternative locations for the farm site were considered in preliminary siting analysis. The reasons these alternatives were not chosen are discussed in **Section 6.0 Alternatives**.

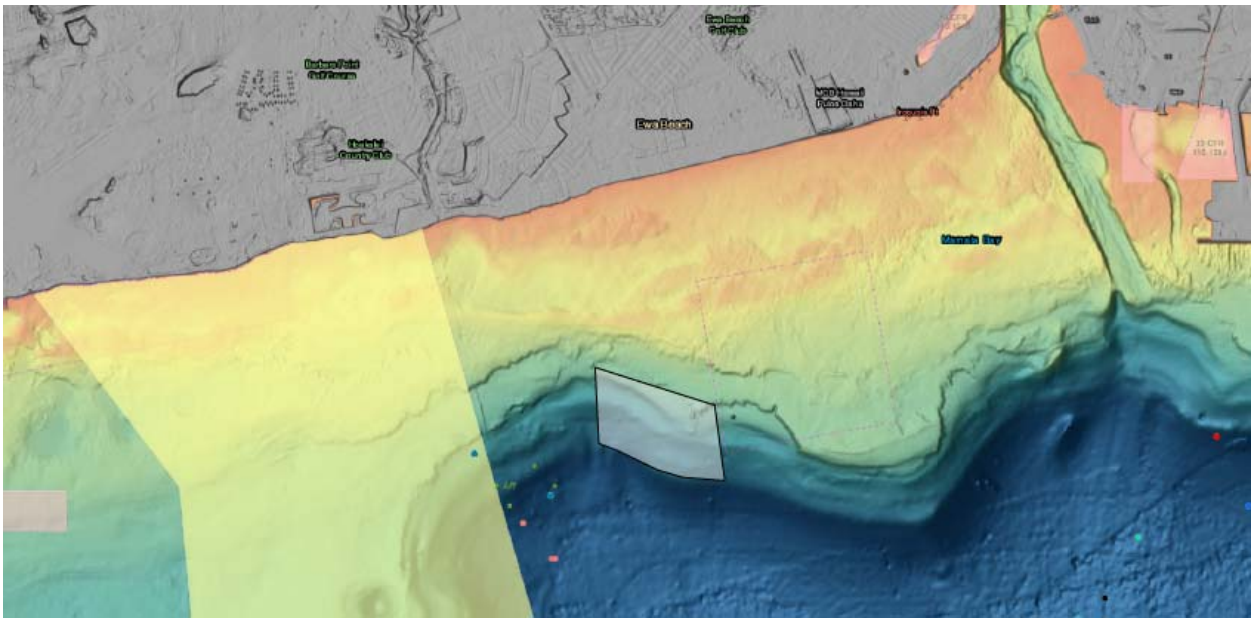

Figure 1: Image of proposed permit area (light grey polygon) off 'Ewa Beach, O'ahu. Public access for transit or fishing will not be restricted through the outer area (except for the 19 acres occupied by the central cage grid), although anchoring, swimming, snorkeling or SCUBA will be restricted, to protect public welfare, employees and farm property.

4.1.2 Aquaculture system design

The farm will consist of up to 12 net-pens that each have a maximum volume of 7,600m^3. The pens will be moored in a grid system, very similar to the two other offshore farms that have been deployed previously in Hawai`i. The mooring system will be made up of anchors, lines and buoys configured to create a 2 X 6 grid cell system. One pen is held within each grid cell by eight bridle lines. The grid cells and pens will occupy roughly 19 acres in the center of the proposed site. The pens are circular and can be operated from the surface or they can be submerged. The entirety of the anchoring and mooring system will take up an estimated 140 acres, virtually all of which is submerged. There will be a distance of around 50 meters between pens.

Detailed descriptions of the anchor and mooring system will be required for the Department of the Army Section 10 Permit. The design will be finalized based on the characteristics of the bathymetry and sediment in the anchor area.

The site will be marked and lighted following guidance and approval by the US Coast Guard.

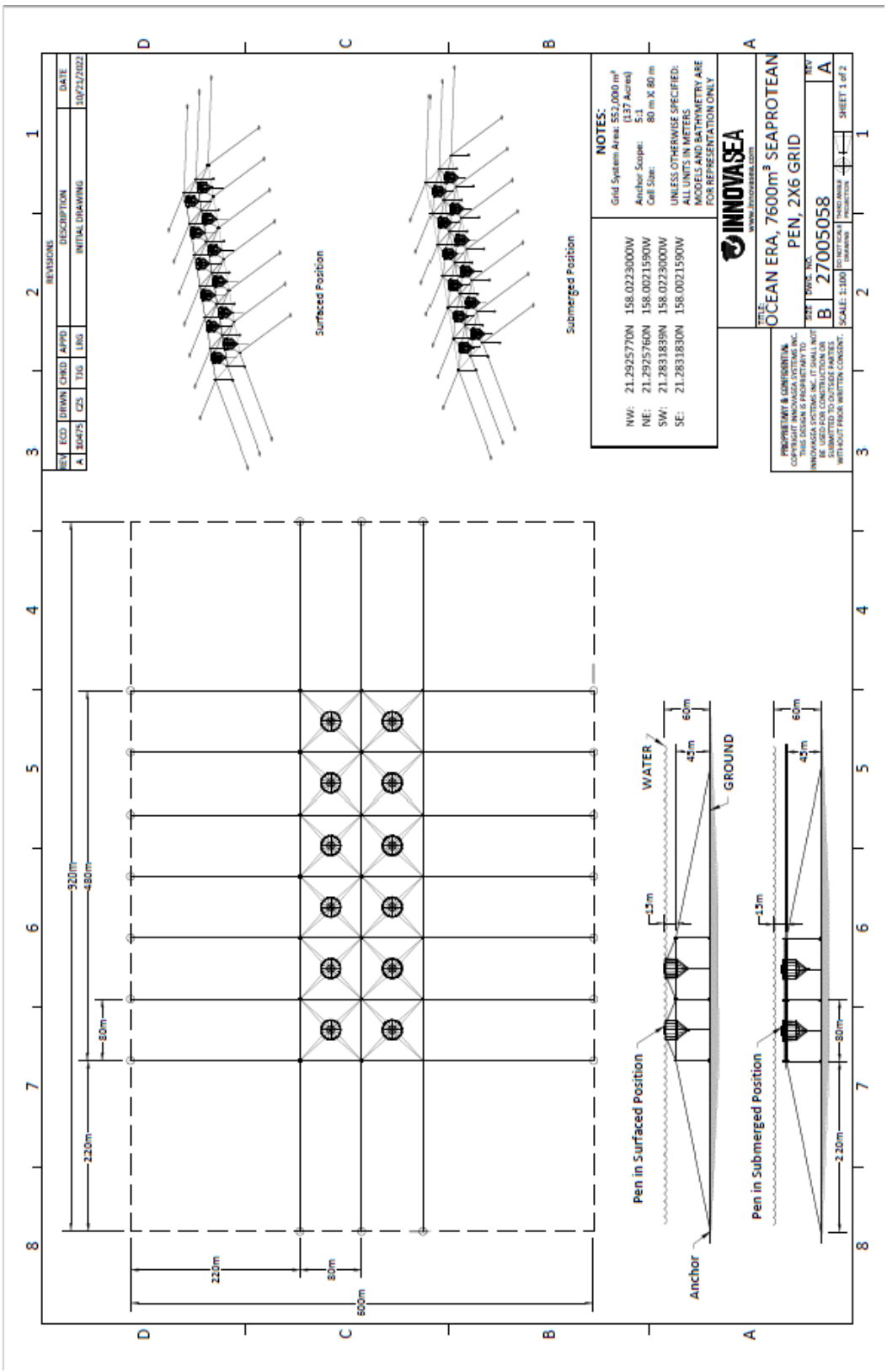

Figure 2: Concept view of the net pen and macroalgae culture array

4.1.3 Culture Operations

The Ocean Era offshore farm will be serviced by tender vessels which additionally will serve as the platform to support the farm. These vessels will likely run out of Kalaeloa Harbor, and will move the farm staff, supplies, and harvested product back and forth between the harbor and the site. Heavy work, such as deployment of the net pen arrays and mooring anchors, will be contracted out to commercial marine construction companies.

Fish Species

Nenue (*Kyphosus vaigiensis,* rudderfish or sea chubs, aka *enenue* in Hawaiian. *See Figure 3*) are highly regarded as a food fish in Hawai`i and other Pacific Islands. *Nenue* are found in abundant schools around Hawai‘i; 2-3-kilogram fish are common, while state records exceed 4.5 kg. Stocks of nenue have declined over the course of the last century or more, as modern technologies have increased fishing pressure on all reef fish stocks. One of the traditional preparations for *nenue* was *poke* – a staple of native Hawaiian food, originally consisting of raw reef fish, sea salt, *limu* (seaweed), and kukui nuts.

Figure 3: Two species of wild-caught nenue, used as broodstock (breeders)

Nenue have a number of advantages as a candidate for aquaculture. As an herbivorous fish, nenue can thrive in the wild eating limu. Cultured nenue can be raised on carbohydrate-based diets, and do not require diets heavy in protein or lipids. Ocean Era has developed methods to raise nenue in the hatchery, and so stocking a farm would require taking no fish from the wild, except for the broodstock (breeders). Because of the strong local demand for reef fish, the ‘Ewa Beach operation will primarily target the local Hawaiian market. Access to the major local market is the primary reason for locating the operation off O‘ahu.

According to NOAA Fisheries Landings data (https://www.noaa.fisheries/foss) the total reported commercial harvest for all rudderfishes in the State of Hawai‘i in 2019 was 22,290 pounds, at a market value of $45,840 (ex-vessel value paid to the fisherman at time of first sale). The market price has increased slightly from 2016 ($1.88/pound) and 2019 ($2.06/pound). Although the species is a prime target for reef fishing by rod and line, or spearfishing, there were no reported recreational landings of rudderfishes between 2015 and 2019.

NOAA Fisheries did not report any commercial import, export, or aquaculture-produced rudderfish products between 2015 and 2019.

Moi (*Polydactylus sexifilis*: Figure 4, Pacific threadfin or six-finger threadfin) is known as the "fish of kings", and only Hawaiian royalty, historically, were allowed to eat this fish. Moi experience a sex reversal (male to female) at approximately 10 inches in length. Moi is a state regulated species by the Department of Land and Natural Resources, Division of Aquatic Resources. It has a closed season from June through August, and at all other times has a daily bag limit of 15 per person, and a minimum size of 11 inches.

Moi were previously cultured on the 'Ewa Beach offshore farm site by Cates International, Inc. (CII) and Hukilau Foods, in submerged SeaStation net pens, from 1999 up until 2013. The fingerlings were produced from the hatchery at Oceanic Institute, using local broodstock, with technology that was developed in Hawai`i for this species. The fish were grown to roughly 1 lb in size, and then sold into the local O'ahu restaurants and retail markets. The Ocean Era operation will integrate moi production into the offshore operation, alongside the nenue, in separate net pens.

Figure 4: Moi were previously cultured on the 'Ewa Beach offshore site.

According to NOAA Fisheries Landings data (https://www.noaa.fisheries/foss) the total reported commercial harvest for all threadfins in the State of Hawai'i in 2019 was 868 pounds, at a market value of $7,054 (ex-vessel value paid to the fisherman at time of first sale). The market price has remained relatively stable between 2016 ($8.05/pound) and 2019 ($8.13/pound). The recreational landings of Moi were reported to be 4,034 lbs, 853 lbs, and 13,181 lbs for 2019, 2016, and 2015, respectively.

NOAA Fisheries did not report any commercial import, export, or aquaculture-produced threadfin products between 2015 and 2019.

Kanpachi (*Seriola rivoliana*, or Kāhala) have been cultured at the offshore farm site in Kona, by Blue Ocean Mariculture, since 2005. Culture of kanpachi at the proposed farm site in `Ewa would allow for greater volumes to be available for the local O`ahu market.

Additional species
To allow for flexibility in the future, Ocean Era also requests that mahimahi (*Coryphaena hippurus,* or dolphin fish) be included in the list of species allowed to be cultured at the site. The company has no immediate plans for commercial culture of these fish, but wish to include them to allow for flexibility.

Fish Production Plan
Ocean Era intends to initially partner with The Oceanic Institute (OI) for production of moi and nenue fingerlings to stock the offshore site. OI has an existing commercial-scale marine fish hatchery that was previously used for producing the moi fingerlings for the Cates/Hukilau operation. Broodstock will be collected from local Oahu waters. Blue Ocean Mariculture may also partner with Ocean Era to provide kanpachi fingerlings.

Moi and nenue fingerlings from the OI hatchery, around 20 g in size, will be transported by truck to a harbor close to the offshore site (likely Kalaeloa), and then transferred to a vessel for movement offshore. At the offshore site, they will be stocked into a small-mesh nursery net, inside a larger grow-out net pen. Once the fish reach sufficient size (around 100 g), they will be released into the larger net pen.

Fish will initially be fed up to 5 times per day, decreasing to 2 or 3 times per day as the fish grow larger. Ocean Era anticipates feeding the fish with pelleted feeds appropriate for their nutritional needs. The pelleted feeds for nenue will be similar in composition to a catfish or tilapia diet – moderate levels of protein, low in lipids, but high in carbohydrates. Nenue may be fed some combination of pelleted feeds and fresh or dried limu. In feed trials in Kona, the nenue have performed exceptionally well on a diet that was comprised primarily of dried freshwater plants. Moi will be fed a standard Marine Grower diet.

The fish biomass density in the net pens is projected to be around 25 kg per cubic meter at harvest weight. Once the fish reach a harvestable size (1 – 2 lbs for nenue and moi; 4 – 5 lbs for kanpachi), they will be seined and pumped out of the net pen into an ice slurry on the harvest vessel, and then taken to market. The daily activities on the farm site will primarily consist of feeding, maintenance, cleaning the net pens, and harvesting the fish. Ongoing environmental monitoring will include collection of water samples, weighing the fish and limu to measure their growth, and monitoring and recording of large marine fauna around the net pens.

Ocean Era anticipates initially scaling up production over the first several years to around 1,000 tons of fish annually, of all species, combined. As the environmental monitoring validates the expectation of minimal ecosystem impacts, the operation will expand to all twelve net pens, producing around 2,400 tons of whole fish per year. The primary target market for these fish will

be O`ahu, through established seafood distribution channels. The principals in Ocean Era have previous experience introducing new species into the market, such as the Kona Kampachi™.

Limu production Plan

Limu (macroalgae) lines will be positioned in the grid system to take advantage of the nutrients released by the fish. The species of limu to be cultured, and the volumes to be produced, are still to be determined. Ocean Era is still at the planning stage for the Kona offshore limu array, and is still developing culture techniques for the targeted species in land-based tanks at their facilities at the Natural Energy Laboratory of Hawai`i Authority.

Only native Hawaiian species will be cultured at the ‘Ewa Beach site.

Figure 5: *Gracilaria* sp. (Ogo). Ocean Era is conducting land-based trials in Kona with *Gracilaria, Caulerpa lentilifera* and *Halymenia hawaiiana*, which may prove suitable for culture on lines down-current of the net pens.

4.2 *ECONOMIC CHARACTERISTICS OF THE ACTION*

4.2.1 Economic Impacts of Farm Operations

The Ocean Era offshore farm will likely have direct impact on the local economy through employment, secondary support industries, and product availability. There will be employment of approximately 25 to 30 professional, technical, and sales staff, and some increased employment for supportive industries. The farm will support other local businesses for materials necessary to build and maintain the operations. There are two additional companies with offices at NELHA on Hawai`i which are working on different aspects of offshore aquaculture (Blue Ocean Mariculture and Forever Oceans), employing approximately 80 people all together.

The Fish Aggregation Device (FAD) effects of aquaculture arrays far offshore have been shown in Kona to contribute to catches by the local charter boat industry, and local subsistence and artisanal fishers. However, the actual FAD effects of the prior Cates/Hukilau array were reportedly minimal. This might be because of the broader shelf off O`ahu (compared to Kona), which keeps pelagic fish species (tuna, marlin, etc.) further offshore. Some increase in other fish species abundance and catches (e.g. akule, `opelu) might be anticipated at the `Ewa site.

4.2.2 Impacts on the Market

Significant commercial activity is anticipated from the sale of fish and algae grown on the Ocean Era offshore farm. When the farm is fully built out (5 to 7 years), approximately 200 tons of either nenue, moi, or kanpachi would be produced and harvested from each of the net pen units..

4.3 *SOCIAL CHARACTERISTICS OF THE ACTION*

Global fisheries are under growing pressure. At the same time, the planet's burgeoning population, greater affluence and growing consumer health awareness, are all driving increased seafood consumption. The United Nations estimates that an additional 47 million metric tons (tonnes) of fish will be needed by 2050. Offshore aquaculture offers a business and sustainability solution to address this challenge (Gentry, et al., 2017), while also relieving further pressure on wild fish stocks, which are already heavily exploited, or in some cases over-exploited.

In addition to aquaculture's role in protecting viable and sustainable fish stocks and life in the oceans, expert groups such as the United Nations High Level Panel on Climate Change and the Oceans, are also advocating for a greater shift towards more marine-based food production systems. This shift could help to reduce the impacts of terrestrial agriculture on fresh water resources, land-use, and greenhouse gas emissions. The potential global benefits are amplified for low food-chain herbivorous fish such as nenue, because of the additional ecosystem services and reduced greenhouse gas emissions from culturing fish with herbivorous diets. Reducing the volume of fresh, air-freighted seafood to Hawai`i, such as opakapaka from Indonesia, would also result in a lower carbon-footprint for locally-consumed seafood. Increased seafood availability is also critically important for U.S. food security. The U.S. already imports over 90% of the seafood that we consume, and around half of that is farmed. However, we have almost no control over the animal welfare or food safety standards, or the environmental impacts of aquaculture in other countries.

As an island state, Hawai`i has a special connection with the oceans, and her bounty. Hawai`i has the highest seafood consumption rate in the country, at almost 37 pounds per person (Geslani, et al., und.). Yet 63% of seafood sold commercially in Hawai`i is imported from overseas (ibid). The multitude of cultural connections with seafood, and the location in the center of the Pacific, have provided past opportunities for Hawai`i to be a pioneer in the development of innovative aquaculture, including offshore operations. Aquaculture has been posited as a potentially attractive driver for a more diversified economy, to reduce the islands' reliance on tourism and the military. Already, aquaculture production of marine shrimp, bivalves and fish in Hawai`i directly supports over 350 jobs.

Offshore culture of native moi, nenue, kanpachi and *limu* would increase the diversity of the economic base on O'ahu. This offers the capacity to strengthen the maritime support industries in coastal areas, such as dock facilities and boat maintenance, marine supplies and engineering, and seafood wholesalers. This could have broad social and economic implications in 'Ewa Beach and Honolulu, particularly in times of economic hardship, such as the recent COVID19 pandemic.

Principals in Ocean Era have extensive experience in developing and executing plans for offshore farming projects (Sims, 2012, 2014; Sims and Key, 2012). Ocean Era recently received a National Pollutant Discharge Elimination (NPDES) permit for a net pen demonstration project – the Velella

Epsilon, supported by the National SeaGrant program - for deployment offshore of Sarasota, Florida. The company's experience includes the essential components of integrating offshore fish farm operations with the complexities of marine fish hatchery production, and introduction of new fish species to the U.S. market.

Ocean Era also recognizes the need for supporting efforts to revitalize traditional Hawaiian loko i'a (fishponds) and limu use (Abbott, 1978; 1996, and 1999; Abbott and Huisman, 2004). The company has provided nenue fingerlings for experimental grow-out in a number of ponds in Kona and O`ahu, and looks forward to continuing to work more closely with groups looking to re-establish limu on Hawaiian reefs and loko i'a.

4.3.1 Public Use of Offshore Ocean Space

As discussed in Section 3.4 (Site Selection) the proposed area is used for transit to or from fishing areas. Our farm will not restrict this transit, and we do not seek or require exclusive use of the entire concession area. The exclusion of the public over the 19 acres occupied by the central grid present no special navigational challenges to other water users. For public safety, Ocean Era will work with local boating associations to communicate the conditions of the lease to ocean users. We are proposing that the farm area be designated as no anchoring, no swimming, snorkeling or SCUBA diving, and slow low-wake speed by boats.

Ocean Era trusts that O'ahu's fisher people and divers will respect the net pen array, and that pilfering or vandalism will not become a problem. If such problems do arise, Ocean Era may, at some later stage, request reconsideration of the level of exclusivity

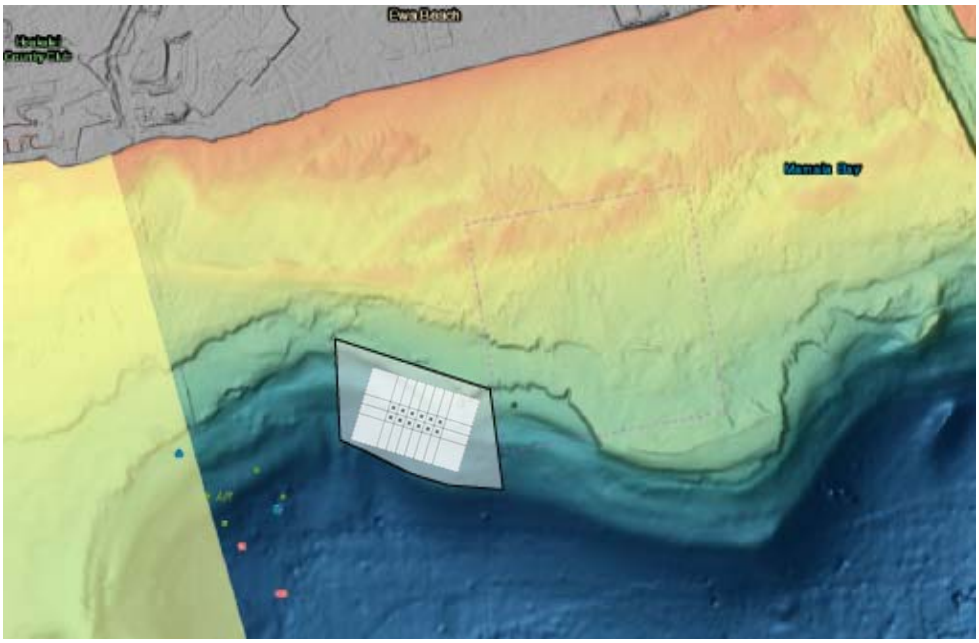

Figure 6: Image of proposed net pen and limu culture arrays overlayed on map of farm area. Ocean Era will not seek exclusive use of the ocean space, only exclusive use of the area inside of the net-pens and the limu line system.

The normal movement of boats within the proposed area will not be adversely affected by the presence of the offshore farm. Surface vessels could traverse freely through this area, so long as a slower speed was maintained as a safety precaution. Trolling and bottom-fishing could also be permitted under normal conditions in the area around the growing platform, although on the understanding that the mooring lines are present in this area, and that any fish that might be hooked may become entangled in these lines. Similarly, no anchoring of boats could be permitted within the entire site, because of the risk of entanglement of anchors in the mooring array. Free-diving, SCUBA diving, and swimming activities will need to be restricted around the mooring lines and the net pens due to public safety, security and liability concerns.

4.3.2 Research, Training and Extension Opportunities

The Ocean Era offshore farm will promote aquaculture research and development, will increase the profile of O‘ahu as a site for innovative ocean aquaculture, and will potentially open up opportunities for training and extension work, to broaden the benefits from these developments. Ocean Era has a demonstrated capacity for research, training, and extension of innovative aquaculture enterprises. By increasing the level of offshore aquaculture expertise among Hawai‘i’s workers, this farm will support the future growth of this industry in the State. It will also enable Hawai‘i to leverage a greater role in the expanding Pacific aquaculture industry.

4.4 *ENVIRONMENTAL CHARACTERISTICS OF THE ACTION AND ITS SURROUNDINGS*

4.4.1 Climate (weather & wind)

The weather conditions at the farm site are strongly influenced by the trade winds. These east and northeasterly winds occur 76% of the time. The average wind speed ranges from 4.0 - 5.6 meters per second (9 – 12 miles per hour). Northeasterly winds tend to blow harder than those coming directly from the east. Kona winds, (i.e. from the south) occur 15% of the time (Garza et al., 2012). The wind data is similar to that described in the prior EA (Juvik, et al., 1989, in Aquaculture Planning & Advocacy, 2009). The Ko’olau and Waianae mountain ranges provide some degree of shelter, reducing the intensity of winds and storm systems originating from the North and East of the site.

4.4.2 Waves and currents

Waves in the Area Of Interest (AOI) are frequently generated by the trade winds and come from the east and northeast, with an average significant wave height (SWH = the average wave height from trough to crest of the highest third of the waves) between 0.75 and 1 meter (2.5 – 3.0 feet), and a wave period of 7.5 - 9 seconds (Office of Coastal Management). Waves coming from the south may periodically affect the site, but previous operators in the area reported that prevailing patterns and seasonal swells did not negatively impact operations (Aquaculture Planning & Advocacy, 2009).

The oceanic currents in the vicinity of the Hawaiian Islands are believed to be driven mostly on the velocity and direction of the wind (Jia, et al, 2011). Currents in the AOI are variable. Data presented in the 2009 FEA, as well as data from NOAA’s Office of Coastal Management, indicate that the current speed in the AOI can range from 0.05 – 1.0 meters per second (0.1 – 2 knots).

Typical current speed appears to be 0.1 – 0.25 meters per second (0.2 – 0.5 knots). The strongest and most consistent flow, throughout the year, is from east to west. Tidal changes can influence the direction and velocity, as indicated by a study conducted for the previous farm operators in September – October 2002 (ibid). During the semi-diurnal tidal changes, twice per day, the velocity diminishes, and in some areas reverses in a circular motion.

4.4.3 Water Quality

The proposed farm site is in waters classified as "Class A Open Coastal" (Hawai'i Department of Health Amendment and Compilation of HAR 54-11 Hawai'i Administrative Rules). Open Coastal Marine Waters are defined as waters bounded by the shoreline to the 183 m (600 feet) depth contour. Based on data from public sources (https://coast.noaa.gov/digitalcoast/tools/ort.html) and the water quality monitoring reports from previous farm operations (Cates, 2000; Aquaculture Planning & Advocacy, 2009), the water column is generally mixed with no distinguishable thermocline or pycnocline during the year. Surface waters are relatively low in nutrients, which is typical of tropical waters that are not regularly influenced by upwelling.

The farm operation will result in effluent water flowing from the fish pens, which will contain increased levels of particulate organic matter and dissolved nutrients. These will generally be a function of the biological loading of each net pen (the number and size of the fish). The proposed farm will generally adhere to a maximum density in the net pens of around 25 kg/cubic meter, which is within the generally accepted industry standard.

Fish in net pens may also impact effluent water quality by uptake of dissolved oxygen (DO). However, the proposed farm operation is highly incentivized to manage fish stocking densities and feeding rates to ensure that DO levels in the net pens do not ever approach a level that could negatively impact the fish growth rate and health. There is therefore equally incentivized assurance that DO levels in the effluent water will not reach levels that could negatively impact the surrounding environment. Furthermore, the profile of the open ocean site (particularly currents) results in a very high degree of water mixing: mitigating risks of dissolved oxygen depletion, and almost immediately re-mixing with non-effluent highly-oxygenated water before any impacts to marine habitat.

4.4.4 The seafloor

The sea floor at the farm site has a gently sloping, sandy bottom. The water depths over the full extent of the Preferred site and Alternative 2 range from roughly 40 to 80 meters. To the southwest of the Preferred site (the AOI), water depth drops quickly to 200 meters. Publicly available environmental data indicates a sandy sea floor at the AOI, with areas of gravel and rock to the west and south. Studies of the substrate in the area confirm sandy sediment, with oxygenated upper layers (positive ORP values; Lee, et al., 2006).

Studies of the infaunal polychaete community are often used as indicators of nutrient enrichment. Lee, et al., (ibid), found nutrient enrichment indicators occurred directly underneath the net pens during the prior moi farm operation at this site, but the "influences were localized to areas immediately surrounding the fish enclosure" (ibid, p. 184). Similarly, the substrate beneath the Kona offshore net pen operation is only impacted in the immediate area directly shaded by the net

pens[2]. Studies of the benthic substrate around the cobia offshore net pen operation in Panama concluded that the nutrient impacts were "relatively benign" (Welch, et al., 2019, p.14), with natural seasonal cycling of organic matter outweighing the effects of the net pens themselves.

The project proposes to culture various species of limu (macroalgae) on lines, strings or bags. Only macroalgae native to the Hawaiian Islands will be cultured. These limu may contribute to increased dispersal of gametes or sporophytes onto surrounding areas. As wild limu stocks on the reef are heavily impacted by fishing pressure, such recruitment enhancement might be considered beneficial. The project proponents have reached out to work with local limu practitioners to identify areas of potential collaboration, and to monitor such impacts going forward.

4.4.5 BIOTA

Relevant biota can be divided into three types: terrestrial biota; marine biota; and rare, threatened, or endangered species.

Terrestrial Biota

The proposed fish farm will not significantly impact any terrestrial biota, such as bird populations. The nearest Audubon Important Bird Area is located in Pearl Harbor, over 4 miles to the northeast. It is home to three endangered species: the Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian Coot (*Fulica alai*), and Hawaiian Common Moorhen (*Gallinula chloropus sanvicensis*). These are wetland associated birds and are highly unlikely to ever occur in the project area.

Marine Biota

The proposed project area is located in the sunlit, well-mixed epipelagic zone, and borders on deeper oceanic waters. The epipelagic portion of the deep ocean ecosystem (0 - 656 ft) is home to a variety of primary and secondary producers (bacteria, phytoplankton, and zooplankton), forage species, and pelagic fishes (WPFMC 2009a).

Macroalgae –

Shoreward of the proposed site there is a regulated limu fishing area, consisting of tidepools that transition into fringing rock and coral reef. Offshore in deeper waters, where the proposed farm site is located, the bottom is primarily unconsolidated sediment (sand), which supports little or no macroalgal growth.

Fishes –

The fish which were most abundant around the net pens previously, as reported by the prior farm operators, include broomtail file fish (*Aluterus scriptus*), mackerel scad (*Decapterus macarellus*), false albacore tuna (*Euthynnus alletterates*), butterfly fish (*Chaetodon* spp.) and surgeon fish (*Acanthurus* spp.). In Kona, fish aggregating around the net pens included mackerel scad ('opelu; *Decapterus macarellus*) and giant trevally (ulua; *Caranx ignobilis*).

Sharks –

[2] https://www.bofish.com/stewardship/monitoring/ - see "Benthic Surveys"

Sharks may occur in coastal waters throughout the Hawaiian Islands, and are found in waters around the project location. Sandbar sharks (*Carcharhinus plumbeus*) were previously reported as frequently occurring in the area around the moi farm net pens in the same location (Aquaculture Planning & Advocacy, 2009). It was unclear if the net pen increased the abundance of sandbar sharks by attracting them to the area, or if it simply provided an aggregation point for sharks that were already present in the AOI, but were more visible because of the frequent diving activity.

The Blue Ocean Mariculture fish farm, operating off the Kona coast, also reports frequent encounters with sandbar sharks, as well as occasional visits by blacktip sharks (*Carcharhinus limbatus*)[3]. Tiger sharks (*Galeocerdo cuvier*) also appear in the area around the net pens in Kona, but their presence around offshore farms in Hawai‘i over the past 20 years has been rare, and generally transitory (ibid; Blue Ocean Mariculture, 2014).

There are an additional nine species of pelagic sharks commonly found in the open ocean environment around Hawai‘i (WPFMC 2009b), but these are unlikely to occur around to the proposed net pens, or if so, then only for short durations.

Sea turtles-
Several species of sea turtles occur in Hawaiian waters and may be present in the action area. ESA-listed threatened green turtles (*Chelonia mydas*) and endangered hawksbill turtles (*Eretmochelys imbricata*) occur in nearshore waters throughout the archipelago. Loggerhead turtles (*Caretta caretta*) may also occur in the area. The North Pacific population of loggerhead turtles is considered a distinct population segment (DPS). NOAA Fisheries designated this DPS as endangered under the ESA (76 FR 58868, September 22, 2011).

There have been no reports of sea turtles being attracted to offshore net pens, or otherwise impacted by offshore operations. Taut mooring lines and taut, semi-rigid mesh material avoid risk of turtle entanglement. No impacts on sea turtles are therefore expected from the proposed activities.

Seabirds-
There are numerous protected seabird species that live in the Hawaiian Islands. The previous operators of the moi farm at the same site stated that “Federally protected bird species do not frequent the area or forage in the vicinity” (Aquaculture Planning & Advocacy, 2009). While it is possible that some seabirds may periodically land on the proposed feed barge, it is unlikely that the operation will cause any negative impact. The net pens will usually be submerged around 10 meters below the surface of the water, and as such the fish inside the pens won’t be an attractant or source of food.

Marine Mammals-
Several species of marine mammals can be periodically found in the AOI. This includes bottlenose dolphins (*Tursiops truncatus*), spinner dolphins (*Stenella longirostris*), humpback whales (*Megaptera novaeangliae*), false killer whales (*Pseudorca crassidens*) and Hawaiian monk seals (*Neomonachus schauinslandi*). The prior moi farm operation at this site reported no notable interactions with marine mammals. The offshore farm site in Kona, however, has reported

[3] https://www.bofish.com/wp-content/uploads/2020/10/Wildlife_2020.pdf

periodic, protracted presence of individual bottlenose dolphins and monk seals. These animals can engage in provisioning, either from fish aggregating to the waters around the net pens, or due to the occasional "leakage" escapee (which occurs as divers enter or exit submerged net pens through zippered access ports). As the proposed net pens will provide diver access from the surface, they will not need to have underwater zippered access ports, and there is therefore no such "leakage" expected from the proposed operation off `Ewa Beach.

Corals –
At last reporting, NOAA Fisheries listed 15 coral species as threatened or endangered under the ESA. While no corals are expected to be in the AOI, deepwater corals have been sighted to the southwest of the action area[4].

No impact has been identified on the coral reef that lies directly inshore of the fish farm operation off Keahole Point, in Kona. Indeed, prolific coral growth has previously been observed on the mooring lines and submerged buoys within close proximity of the kampachi net pens (Figure 6; Sims, 2012), evidencing that the net pen structures and operations present no negative impact to corals.

Figure 7: A submerged mooring buoy on the offshore farm site in Kona, that is covered in cauliflower coral (*Pocillopora meandrina*). This buoy was located about 25 m away from a submerged net pen containing around 75,000 fish.

[4] Information on the location of deepwater coral and artificial reefs comes from https://marinecadastre.gov/oceanreports, Accessed May 10, 2021

4.4.6 RECREATION

Operators of the previously permitted fish farm stated in their 2009 FEA:

> *"Ocean sports such as canoeing and kayaking, have rarely been observed in the vicinity of the sea cages and jet skiing has never been observed. Distance from shore and water depth act as a deterrent to these uses… Curious recreational snorkelers and SCUBA divers in boats have occasionally (a few times a year) approached the area when work boats were on site, but have not lingered when personnel explained what was going on …"* (Aquaculture Planning & Advocacy, 2009)

The 2009 FEA further stated that commercial ʻōpelu fishermen occasionally fished near the site, and it was felt to be a mutually beneficial relationship (ibid). Ocean Era concurs with the statement from the 2009 FEA that "these relationships can be mutually beneficial and even help with security on the site." (ibid, p 23).

Ocean Era is not seeking to exclude fishing vessels in the project site, and accepts that the area will remain open to the passage of recreational users and the fishing community within safe modes of operation and distances from the net pens.

The Coast Guard consultation process will determine the requirements for marking and lighting of the area, as an aid to navigation.

4.4.7 NOISE AND AIR QUALITY

The project will be located in an area with ambient noise from wind and waves, as well as periodic noise from motors on boats, and commercial or military aircraft.

Air quality varies, depending on the amount of vog in the air, a result of emissions from Kilauea Volcano on Hawai`i Island. Usually the air is clear, dry, and cooler in the mornings.

4.4.8 AESTHETICS AND VIEWSCAPE

The visual profile of the project will consist of a feed barge, work boats, buoys, and regular visits (several times per week) of a harvest vessel. The feed barge and buoys will be permanently moored. The work boats will be on site daily, but from the shore it will be difficult to distinguish from normal boat traffic. The proposed farm activities will likely be similar to that which occurred on the site when the prior moi farm was operating.

The net pen structures that will be added to the viewplane are minimal, consisting of the floatation mechanisms of the cage, that are less than around 3 ft above the water line. As cages will be submerged most of the time, they will not usually add any structure to the view plane.

4.4.9 CULTURAL RESOURCES AND PRACTICES

Water depth and distance from shore limit the potential for culturally based recreational uses, such as outrigger canoeing.

Koʻa ʻōpelu (ʻholes' or schooling places for mackerel scad – *Decapterus macarellus*) were the most likely cultural resource that would have been, or could be impacted by farm operations. The location of these koʻa are typically considered to be part of the traditional marine lore, and are considered inappropriate for publication, or for sharing outside of the families or community groups who have traditionally fished these koʻa. An important aspect of the koʻa ʻōpelu tradition is the maintenance of these koʻa by feeding of the school. To keep fish attracted to a koʻa, fishers will regularly drop bags of palu - grated vegetable matter - to the school (daily, or every second day). The knowledge of the names and locations of the koʻa is considered of historical significance and is a tradition that the kupuna would like to see preserved and passed on to future generations.

ʻŌpelu aggregations usually occur in water around 120 ft deep, close to reef drop-offs. During the initial and subsequent environmental assessments undertaken by the previous farming operations, interviews with knowledgeable native Hawaiian fishers and cultural practitioners familiar with the location confirmed that there were no traditional fishing grounds or resources at the project location.

4.4.10 LAND USE AND ENVIRONMENTAL COMPATIBILITY

Current Usage

The immediate AOI does not appear to have any regular usage, since the removal of the previous farm installation in 2014. The applicant has requested assistance from NMFS Sustainable Fisheries personnel in identifying any current use of that area or the nearby artificial reef.

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 will be based out of nearby harbor facilities – likely at Kalaeloa. All work and equipment will be based at suitable onloading and offloading areas of the harbor. The Ocean Era work vessels will be powered by commercially available inboard and outboard motors. Fuel supplies will be purchased as needed from the commercial fuel docks at nearby marinas.

Submerged Lands Issues and the Public Trust

The proposed 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.

The ocean leasing law was amended during the 1999 State legislative session. This legislation attracted many comments 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

O‘ahu required a “user friendly” permit/lease regime, to test the feasibility and impacts of such leases.

Interest in ocean aquaculture is increasing among the conservation community, policymakers and private aquaculture entrepreneurs. However, the general public has limited experience with the issues, impacts and benefits from ocean farming in the offshore environment. This is especially true in the State of Hawai`i, where the community is strongly supportive of 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.

The proposed site was originally permitted as an offshore moi culture demonstration project, in collaboration with the University of Hawai`i and the National SeaGrant Program. The site was subsequently permitted for commercial culture of moi by Cates International (later Hukilau Foods), in 2000 (Cates International, 2000). A subsequent request for expansion, to double the capacity of the operation, was supported by an Environmental Assessment in 2009. This EA received generally positive support from the local fishing and boating community (Aquaculture Planning & Advocacy, 2009).

In 2004, the offshore culture of kampachi (*Seriola rivoliana*, or kahala) was permitted for a site a half-mile from the coastline, one mile north of Keāhole Point in Kona (Kona Blue Water Farms, 2003). This operation produced over 500 tons of kampachi in 2008. The site permits and assets were subsequently acquired by Blue Ocean Mariculture (BOM), in 2009. BOM compiled an EA in 2014, for expansion of the operation from a capacity of 500 tons/year to 1,000 tons/year (Blue Ocean Mariculture, 2014). Again, this request met with generally positive support from the local fishing and boating community, with no opposition whatsoever at the public hearing for Draft EA review.

The Ocean Era offshore farm presents another opportunity to demonstrate the potential benefits that offshore aquaculture could offer, and to also carefully monitor and assess any other potential impacts, which can be used to further guide state policy.

Public Perceptions of Ocean Use

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.

5 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The proposed farm site, also referred to as the area of interest or AOI, is located in an open ocean area, offshore from ‘Ewa Beach, O‘ahu. The site center is approximately 1.5 miles south of ‘Ewa Beach, Oahu. The depth in the AOI ranges from 40m [130 feet] to 90m [295 feet] deep, with a

sandy substrate. The Mamala Bay region hosts multiple industrial uses. Significant features include the entrance to Pearl Harbor (approximately two miles to the east), and Barbers Point and Campbell Industrial Park (approximately six miles to the west). Additionally, there are two domestic wastewater outfalls in Mamala Bay: the Sand Island Outfall (four miles to the east) and the Honouliuli Outfall (one and a half miles to the west). The oil tanker unloading facility lies further west, off Barbers Point[5].

Based on the work conducted in this review, the environmental effects associated with the Ocean Era offshore farm should be negligible and benign. Limu activities will contribute positive environmental benefits, due to its absorption of nutrients and CO_2, and potential for reef re-seeding benefits. Seafood production from farming also has potential to reduce pressure on less scalable forms of seafood supply, as demand for seafood products continues to grow.

The physical and biological attributes of the existing environment of the proposed site are described in detail above (Section 4.4 Environmental characteristic). 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 surf and strong trade winds; and the adjacent shoreline. The existing uses of the area are negligible, because of its depth, the paucity of fish, and the barren benthos.

The affected environment will include the water column in the immediate areas of the net pen array, and the sediment beneath the pens, and to a measured distance in the direction of the prevailing currents. It is estimated that effects to both the water column and benthos will be minimal, because of the deep water and strong current. Only minor effects on water quality and the substrate beneath the site are anticipated in the immediate area of the farm, and these should be very quickly dissipated to immeasurable levels within an extremely short distance from the net pens. This expectation is based on water quality monitoring around the prior moi farm operation, the offshore farm operating in Kona, and the extensive studies of a commercial cobia farm offshore in Panama (Welch, et al., 2019). Given the strong long-shore currents, the deep water, and sand substrate, farm nutrient impacts on water quality are anticipated to be *de minimus*.

The proposed farm sites lies west of the western boundary of the Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS) of Moanalua Bay on the southeastern tip of O'ahu. Estimated humpback whale surface densities are low in this area. Information from National Marine Fisheries Service, and experience from other fish farming areas, indicate that the farm and its operations will not interfere with the movement of the humpback whales. Some concerns have been expressed with the potential for entanglement of whales in the mooring lines of the fish farm net pens. However, records from other locations show that most entanglement 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) (Price et al., 2016). With heavy

[5] The information about the environment provided herein is derived from multiple sources. A primary source of information are the reports and a Final Environmental Assessment (Aquaculture Planning & Advocacy, 2009) from the moi farming operations in the AOI. Additional information was obtained from peer-reviewed literature that was germane to either the specific location or the region, and publicly available environmental data sourced from Marine Cadaster. (https://marinecadastre.gov/)

mooring gear, and taut lines, the potential for entanglement is considered negligible (Wursig and Gailey, 2002).

Although other Federally listed species are known to occur in the area, the Ocean Era offshore farm does not present any potential detrimental impact on these animals. Leatherback and Green Sea Turtles and Monk Seals may occasionally move through these deep-water areas. The proposed farm site lies within Insular False Killer Whale designated habitat, which covers most State waters. The ‘Ewa Beach offshore area is not known as a daytime resting location for Hawaiian Spinner Dolphins. As with humpback whales, however, the heavy diameter / minimal bend / heavy loading mooring system will prevent animals from becoming entangled.

The Ocean Era offshore farm will not impede movement or otherwise disturb the spinner dolphins that typically spend their days resting and socializing in the bays on the western coast of O‘ahu. After resting, the pods then follow an erratic zig-zag pattern in their return to their deep-water feeding grounds. At night, the spinner dolphins are typically found hunting in deeper waters further off O‘ahu shores. The proposed site does not impact any area of concentrated spinner dolphin activity. As such, the potential for the Ocean Era offshore farm to disrupt the normal resting pattern or movement of the dolphins is considered negligible.

5.1 *WATER QUALITY*

The proposed farm site lies in waters classified as “Class A Open Coastal” (Hawai‘i Department of Health Amendment and Compilation of HAR 54-11 Hawai‘i Administrative Rules). Open Coastal Marine Waters are defined as waters bounded by the shoreline to 183 m (600 feet) depth contour. Based on data from public sources (https://coast.noaa.gov/digitalcoast/tools/ort.html) and the water quality monitoring reports from previous farm operations (Cates, 2000; Aquaculture Planning & Advocacy, 2009), the water column is generally mixed with no distinguishable thermocline or pycnocline during the year. Surface waters are relatively low in nutrients, which is typical of tropical waters that are not regularly influenced by upwelling.

5.2 *THE SEAFLOOR*

The sea floor at the farm site has a gently sloping, sandy bottom. The water depth ranges from roughly 40 to 90 meters. To the south and west of the site, water depth drops quickly to 200 meters. Publicly available environmental data indicates a sandy sea floor at the AOI, with areas of gravel and rock to the west and south. Studies of the substrate in the area confirm sandy sediment, with oxygenated upper layers (positive ORP values)(Lee et al., 2006).

5.3 *NOISE AND AIR QUALITY*

The project will be located in an area with ambient noise from wind and waves, as well as periodic noise from motors on boats, and commercial or military aircraft.

Air quality varies, depending on the amount of vog in the air, a result of emissions from Kilauea Volcano on Hawai`i Island. Usually the air is clear, dry, and cooler in the mornings. The action is not expected to have any negative effect on air quality.

5.4 *BIOTA*

5.4.1 Terrestrial Biota

The nearest Audubon Important Bird Area is located in Pearl Harbor, over 4 miles to the northeast. It is home to three endangered species the Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian Coot (*Fulica alai*), and Hawaiian Common Moorhen (*Gallinula chloropus sanvicensis*). These are wetland associated birds, and are highly unlikely to ever occur in the project area.

5.4.2 Sea turtles

Several species of sea turtles occur in Hawaiian waters and may be present in the action area. ESA-listed threatened green turtles (*Chelonia mydas*) and endangered hawksbill turtles (*Eretmochelys imbricata*) occur in nearshore waters throughout the archipelago. NOAA Fisheries and the U.S. Fish and Wildlife Service (USFWS) are proposing to reclassify green sea turtles into 11 distinct population segments (DPSs) under the ESA (80 FR 15271). The proposed Hawaiian DPS would remain listed as threatened.

Loggerhead turtles (*Caretta caretta*) may also occur in the area. The North Pacific population of loggerhead turtles is considered a distinct population segment (DPS). In 2011, NOAA Fisheries designated this DPS as endangered under the ESA (76 FR 58868, September 22, 2011).

Commercial fishing vessels operating beyond 50 NM from Hawai‘i have also caught other sea turtle species, including the endangered leatherback turtle (*Dermochelys coriacea*) and the threatened olive ridley turtle (*Lepidochelys olivacea*) (WPFMC 2009a).

A thorough review of the life history, status and trends, threats, and conservation efforts for sea turtles is available in section 5 of the September 19, 2014 Biological Opinion on the Hawai‘i-based shallow-set longline fishery (NMFS, 2014). Information about Pacific sea turtles' range, abundance, status, and threats is in the recovery plans for each species, available from the NOAA Fisheries website:

- Olive ridley: https://www.fisheries.noaa.gov/species/olive-ridley-turtle
- Leatherback: https://www.fisheries.noaa.gov/species/leatherback-turtle
- Loggerhead: https://www.fisheries.noaa.gov/species/loggerhead-turtle
- Hawksbill: https://www.fisheries.noaa.gov/species/hawksbill-turtle
- Green turtle: https://www.fisheries.noaa.gov/species/green-turtle
- East Pacific green turtle: https://www.fpir.noaa.gov/PRD/prd_green_sea_turtle.html

The taut line moorings and semi-rigid net pen mesh proposed here does not pose a risk to turtle entanglement.

5.4.3 Seabirds

There are numerous protected seabird species that live in the Hawaiian Islands. The previous operators of the moi farm at the same site stated that "Federally protected bird species do not frequent the area or forage in the vicinity" (Aquaculture Planning & Advocacy, 2009).

Seabirds that may occur in the proposed action area include these ESA-listed species:

- Hawaiian petrel (*Pterodroma sanwichensis*)
- Newell's shearwater (*Puffinus newelli*)
- Short-tailed albatross (*Phoebastria albatrus*)

The Hawaiian petrel and Newell's shearwater have breeding colonies in the Main Hawaiian Islands (USFWS 1983). The ESA-listed short-tailed albatross does not appear to frequent the vicinity of the proposed action site. A few short-tailed albatrosses visit Midway Atoll every year in the Northwestern Hawaiian Islands (USFWS, 2008).

The applicant did not observe any ESA-listed seabirds during operation of two other offshore fish farming projects on Hawai`i Island. Some seabirds (usually Brown boobies, *Sula leucogaster*) have landed on net pens and tender vessels at aquaculture operations off both Keāhole Point (the commercial kampachi farm site currently operated by Blue Ocean Mariculture) and Keauhou (a single demonstration net pen, previously operated by Forever Oceans).

The Migratory Bird Treaty Act makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird, except under the terms of a valid permit. The list of migratory bird species protected by the Act is provided in 50 CFR 10.13, and includes most seabirds. Other migratory seabirds occurring in the project area include black-footed and Laysan albatrosses (*Phoebastria nigripes* and *P. immutabilis*); Christmas, flesh-footed, wedge-tailed, and sooty shearwaters (*Puffinus nativitatis, P. carneipes, P. pacificus, and P. griseus*); and masked, brown, and redfooted boobies (*Sula dactylatra, S. leucogaster, S. sula*). Additional information on seabird populations, distribution, life history, and status is available from the USFWS at http://www.fws.gov/birds/index.php and at http://ecos.fws.gov/tess_public/pub/SpeciesReport.do?groups=B&listingType=L&mapstatus=1

5.4.4 Marine Mammals

Several species of marine mammals can be periodically found in the AOI. These include pinnipeds (seals) and cetaceans (whales and dolphins). The following describes the occurrence and status of marine mammals that may occur in the action area.

Hawaiian Monk Seal

The Hawaiian monk seal (*Neomonachus schauinslandi*) is the only pinniped indigenous to Hawai'i. This seal is listed as Endangered under the ESA. Monk seals occur throughout the Northwestern Hawaiian Islands (NWHI), with subpopulations at French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway Atoll, Kure Atoll, Necker Island, and Nihoa Island. They also occur throughout the main Hawaiian Islands (MHI) (NMFS, 2014). According to NOAA Fisheries (2007), monk seals have declined in the NWHI since monitoring began in 1995. Since 1981, the number of monk seals in the MHI has increased. The best estimate of the current total Hawaiian monk seal population is 1,400 seals – about 1,100 in the Northwestern Hawaiian Islands (NWHI from Nihoa to Kure Atoll), and about 300 in the main Hawaiian Islands (MHI from Ni'ihau to Hawai'i). The population in the NWHI has been declining annually due to

low juvenile survival (NMFS, 2014). Monk seal numbers in other parts of their range appear to be increasing, but population growth rate estimates are uncertain at this time (NOAA Fisheries 2014a). The species is depleted, and well below its optimum sustainable population, and is a strategic stock under the MMPA (ibid). Around the MHI, threats include disturbance, fishery interactions (hooking and entanglement in fishing gear or marine debris); human interactions (including feeding and other harassment); diseases (leptospirosis and toxoplasmosis), and intentional killing.

On August 21, 2015, NOAA Fisheries published a final rule for monk seal critical habitat (80 FR 50925). The predominant portion of this critical habitat occurs in the nearshore waters where the applicant would transit for deploying, retrieving, operating, and maintaining the project, as per all other marine traffic in the area. Hawaiian Monk Seal critical habitat in the marine environment extends from the 200 meter depth contour line (relative to mean lower low water), including the seafloor and all subsurface waters and marine habitat within 10 meters of the seafloor, through the water's edge into the terrestrial environment where the inland boundary extends 5 meters. The proposed farm will be within this area, and is located offshore of an area designated as having essential features for Hawaiian monk seals, specifically Kalaeloa/ Barbers Point Harbor through to Iroquois Point[6]

MHI Insular False Killer Whale (IFKW)

The Main Hawaiian Islands (MHI) insular false killer whale (IFKW; *Pseudorca crassidens*) distinct population segment (DPS) is listed as an endangered species under the ESA (77 FR 70915, Nov. 28, 2012). The MHI insular false killer whale DPS occurs in the proposed action area. Because NOAA Fisheries listed the MHI insular FKW DPS as endangered under the ESA, it is also a depleted stock under the MMPA. According to the latest MHI IFKW stock assessment report, the minimum population estimate is 92 animals, and the population appears to be declining (NMFS, 2018).

[6] https://www.federalregister.gov/documents/2015/08/21/2015-20617/endangered-and-threatened-species-final-rulemaking-to-revise-critical-habitat-for-hawaiian-monk

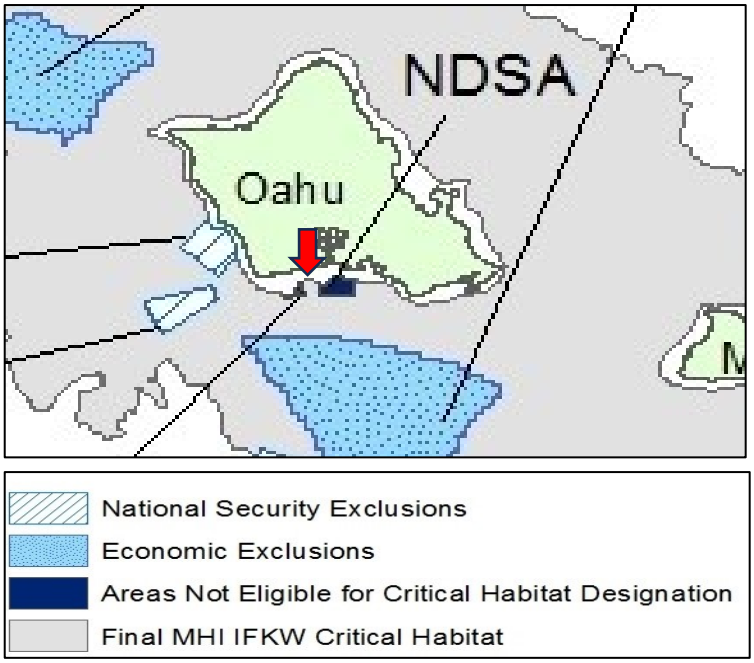

Figure 8: Area surrounding O‘ahu delineating insular false killer whale (MHI IFKW; *Pseudorca crassidens*) critical habitat and exclusion areas. Approximate project location indicated by red arrow.

On July 24, 2018, NOAA Fisheries published a final rule to designate critical habitat for the main Hawaiian Islands IFKW distinct population segment (DPS) by designating waters from the 45-meter depth contour to the 3,200-meter depth contour around the main Hawaiian Islands from Ni‘ihau to Hawai‘i[7]. The AOI for this project is within an area designated as critical habitat for MHI IFKW. However, the proposed site lies directly between two areas considered “not eligible for critical habitat designation” due to national security or military related activities[8].

Humpback Whale

NOAA Fisheries has listed humpback whales as endangered under the ESA and depleted under the MMPA. Both mating and calving humpback whales may be present in or around the area from November through March during the calving and breeding season. Humpback whales wintering in Hawai‘i belong to the Central North Pacific (CNP) stock. The minimum population estimate for the CNP humpback whale stock is 10,103 animals and is growing seven percent annually (NMFS, 2017; https://www.fisheries.noaa.gov/species/ humpback-whale). NOAA Fisheries has started a status review to determine if the DPS should be delisted (79 FR 36281, June 26, 2015). If this DPS is delisted, the protections of the MMPA and the Hawaiian Islands Humpback Whale National Marine Sanctuary would continue to apply. Federal regulations prohibit persons on or in the water from approaching the whales within 100 yards (90 m), within the sanctuary and throughout waters

[7] https://www.fisheries.noaa.gov/action/final-rule-designate-critical-habitat-main-hawaiian-islands-insular-false-killer-whale

[8] https://media.fisheries.noaa.gov/dam-migration/ifkw_ch_map_final.pdf

of the Hawaiian Islands. Baird, et al. (2015) found that the most biologically important areas for humpback whales are outside of the proposed action area.

Other Marine Mammals in the Proposed Action Area

Listed below are marine mammals that are not ESA-listed, but which may occur in the AOI:

- Blainville's beaked whale *(Mesoplodon densirostris*)
- Bottlenose dolphin or common bottlenose dolphin (*Tursiops truncatus)*
- Bryde's whale (*Balaenoptera edeni*)
- Cuvier's beaked whale (*Ziphius cavirostris*)
- Dwarf sperm whale (*Kogia sima*)
- False killer whale (*Pseudorca crassidens*) Hawai'i pelagic population
- Fraser's dolphin (*Lagenodelphis hosei*)
- Killer whale (*Orcinus orca*)
- Longman's beaked whale (*Indopacetus pacificus*)
- Melon-headed whale (*Peponocephala electra*)
- Minke whale (*Balaenoptera acutorostrata)*
- Northern elephant seal (*Mirounga angustirostris*)
- Pantropical spotted dolphin (*Stenella attenuata*)
- Pygmy killer whale (*Feresa attenuata*)
- Pygmy sperm whale (*Kogia breviceps*)
- Risso's dolphin *(Grampus griseus*)
- Rough-toothed dolphin or Steno's dolphin (*Steno bredanensis*)
- Short-finned pilot whale (*Globicephala macrorhynchus*)
- Spinner dolphin (*Stenella longirostris*)
- Spotted dolphin (*S. attenuata*)
- Striped dolphin (*S. coeruleoalba*)

While northern elephant seals (*Mirounga angustirostris*) are occasionally sighted in Hawai'i, these are very rare occurrences. Detailed information on these species' geographic ranges, abundance, bycatch estimates, and status is in the most recent marine mammal stock assessment reports (SARs), which are available online at: https://www.fisheries.noaa.gov/whales and https://www.fisheries.noaa.gov/dolphins-porpoises.

5.4.5 Corals

At last reporting, NOAA Fisheries listed 15 coral species as threatened or endangered under the ESA. While no corals are expected to be in the AOI , deepwater corals may occur on or near an artificial reef that lies in an area approximately 800 meters to the southwest of the site center. These and other corals in the area will not be affected by this project, due to the low footprint of the system, the massively dilutive effects of ocean currents, and the fact that coral encrustation on offshore net pens and grid lines elsewhere in Hawai`i evidences that the farm infrastructure and operations are highly compatible with healthy coral.

5.4.6 Fishes

Shoreward of the proposed site there is a regulated limu fishing area, consisting of tidepools that transition into fringing rock and coral reef. Further offshore in deeper waters, where the proposed farm site is located, the bottom is primarily unconsolidated sediment (sand), which generally supports lower diversity and abundance of resident fish populations, and little or no macroalgae.

Fish diversity and abundance at the AOI is best described by the reported observations of the previous farm operators at the site (Aquaculture Planning & Advocacy, 2009), together with surveys by State and Federal agencies throughout the MHI, and results of baited camera surveys (Asher et al., 2017). Fish that are common in the depth profiles and sand bottom such as at the AOI include: *Pristipomoides filamentosus, Caranx* spp., *Aprion virescens*, *Seriola rivoliana, Seriola dumerili, Decapterus macarellus, Naso hexacanthus, Parupeneus chrysopleuron* and *Oxycheilinus bimaculatus*. Several of these are important commercial fish, part of the Deep Seven group of species. The fish which were most abundant around the net pens previously, as reported by the prior farm operators, include broomtail file fish (*Aluterus scriptus*), mackerel scad (*Decapterus macarellus*), false albacore tuna (*Euthynnus alletterates*), butterfly fish (*Chaetodon* spp.) and surgeon fish (*Acanthurus* spp.).

The Preferred Site has predominantly sandy bottom. An artificial reef complex is located roughly 800 meters (0.5 miles) west of the proposed farm site. This reef complex presumably supports a normal reef fish assemblage, such as "…surgeonfishes (Acanthuridae), triggerfishes (Balistidae), jacks (Carangidae), parrotfishes (Scaridae), soldierfishes/squirrelfishes (Holocentridae), wrasses (Labridae), octopus (*Octopus cyanea, O. ornatus*), and goatfishes (Mullidae)"("Fishery Ecosystem Plan for the Hawaii Archipelago," 2009)

Essential Fish Habitat

The Magnuson-Stevens Act defines essential fish habitat (EFH) as "those waters and substrates necessary for fish spawning, breeding, feeding and growth to maturity." Additionally, the Magnuson-Stevens Act defines Habitat Areas of Particular Concern (HAPC) as "areas within EFH that are ecologically important, sensitive to disturbance, or rare." Thus, HAPCs often require more protection from activities that may adversely affect EFH.

The Western Pacific Fishery Management Council (WPFMC) has designated EFH around the Hawaiian Islands to include the marine water column extending from the surface to a depth of 1,000 meters (m) from the shoreline to the outer limit of the Exclusive Economic Zone (200 nautical miles), and the seafloor to a depth of 700 m. As such, the water column and bottom of the proposed aquaculture site off 'Ewa Beach is designated as EFH, and thus supports various life stages for the management unit species (MUS) identified under the WPFMC Pelagic and Hawai`i Archipelago Fishery Ecosystem Plans. The MUS and life stages found in these waters include: eggs, larvae, juveniles, and adults of Pelagic, Crustacean, and Bottomfish MUS. Specific types of habitat considered as EFH for these MUS include coral reefs, patch reefs, hard substrates, artificial substrates, seagrass beds, soft substrates, mangroves, lagoons, estuaries, surge zones, deep-slope terraces, and pelagic/open ocean. The proposed aquaculture sites off 'Ewa Beach do not coincide with any 'Habitat Areas of Particular Concern' (HAPC) as designated by the WPFMC

Table 3: Details of the EFH that intersects with the proposed farm site

Fishery Management Plan (FEP)	Management Unit Species (MUS)	Stock or Stock Complex	Life Stage(s)	Essential Fish Habitat (EFH) Designation
Pelagic	All pelagic fisheries	Tropical and temperate	Egg/larval	The water column down to a depth of 200 m (100 fm) from the shoreline to the outer limit of the EEZ
			Juvenile/adult	The water column down to a depth of 1,000 m (500 fm)
Hawai'i Archipelago	Crustaceans	Kona crab	Egg/larval	The water column from the shoreline to the outer limit of the EEZ down to a depth of 150 m (75 fm)
			Juvenile/adult	All of the bottom habitat from the shoreline to a depth of 100 m (50 fm)
		Deepwater shrimp	Egg/larval	The water column and associated outer reef slopes between 550 and 700 m
			Juvenile/adult	The outer reef slopes at depths between 300-700 m
	Bottomfish	Shallow stocks: *Aprion virescens*	Egg	Pelagic zone of the water column in depths from the surface to 240 m, extending from the official US baseline to a line on which each point is 50 miles from the baseline
			Post-hatch pelagic	Pelagic zone of the water column in depths from the surface to 240 m, extending from the official US baseline to the EEZ boundary
			Post-settlement	Benthic or benthopelagic zones, including all bottom habitats, in depths from the surface to 240 m bounded by the official US baseline and 240 m isobath
			Sub-adult/adult	Benthopelagic zone, including all bottom habitats, in depths from the surface to 240 m bounded by the official US baseline and 240 m

Sharks

Sharks may occur in coastal waters throughout the Hawaiian Islands, and are found in waters around the project location. Sandbar sharks (*Carcharhinus plumbeus*) were previously reported as frequently occurring in the area around the moi farm net pens in the same location (Aquaculture Planning & Advocacy, 2009). It was unclear if the net pen increased the abundance of sandbar sharks by attracting them to the area, or if it simply provided an aggregation point for sharks that were already present in the AOI, but were more visible because of more frequent diving observations.

The farm operating off the Kona coast, also reports frequent encounters with sandbar sharks, as well as occasional visits by blacktip sharks (*Carcharhinus limbatus*)[9]. Tiger sharks (*Galeocerdo cuvier*) also appear in the area around the net pens in Kona, but their presence around offshore farms in Hawai'i over the past 20 years has been rare, and generally transitory (ibid; Blue Ocean Mariculture, 2014).

There are an additional nine species of pelagic sharks commonly found in the open ocean environment around Hawai'i (WPFMC, 2009b). None of these species have previously been reported from around commercial offshore net pen operations, and are only expected to occur around the proposed operation infrequently.

[9] https://www.bofish.com/wp-content/uploads/2020/10/Wildlife_2020.pdf

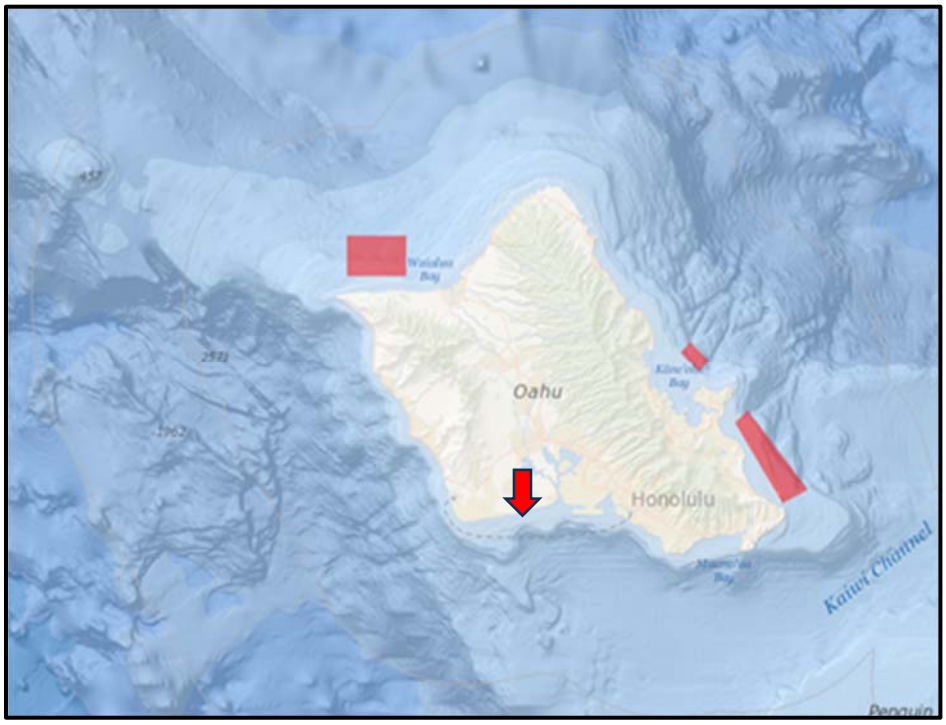

Figure 9: Map showing Habitat Areas of Particular Concern around O‘ahu. Screenshot taken from NOAA Fisheries’ EFH Mapping Tool. Approximate project location indicated by red arrow.

5.5 *RECREATION*

Operators of the previously permitted fish farm stated in their 2009 FEA:

> *“Ocean sports such as canoeing and kayaking, have rarely been observed in the vicinity of the sea cages and jet skiing has never been observed. Distance from shore and water depth act as a deterrent to these uses… Curious recreational snorkelers and SCUBA divers in boats have occasionally (a few times a year) approached the area when work boats were on site, but have not lingered when personnel explained what was going ….”*
> *(Aquaculture Planning & Advocacy, 2009)*

The FEA further stated that commercial opelu fishermen occasionally fished near the site, and it was felt to be a mutually beneficial relationship. Ocean Era agrees wholeheartedly with this. The previous offshore fish farming activities that Ocean Era personnel have been involved with (on Hawai`i Island) did not exclude others from using the space for fishing, provided caution and respect for personnel, infrastructure and the farmed fish was practiced. Ocean Era agrees with the statement from the 2009 FEA that “these relationships can be mutually beneficial and even help with security on the site” (ibid).

The Coast Guard consultation process will determine the marking of the area and potential for passage of boat traffic within the AOI.

5.6 *AESTHETICS AND VIEWSCAPE*

Viewscape is important to coastal property owners, as well as all manner of ocean users. The AOI is located about 1.5 miles from shore, and is in the same viewplane as the fuel offloading moorings and the entrance to Pearl Harbor. The site is offshore and southeast of the Old Municipal Airport south of Barbers Point, and is located between two areas of restricted access, to the east and to the west.

5.7 *CULTURAL RESOURCES AND PRACTICES*

Water depth and distance from shore limit most culturally based recreational uses, such as outrigger canoeing.

The primary cultural practice undertaken in the area of the previous moi farm project was ʻōpelu fishing.

Koʻa ʻōpelu (ʻholes' or schooling places for mackerel scad – *Decapterus macarellus*) are the cultural resource that could be impacted by farm operations. The location of these koʻa are typically considered to be part of the traditional marine lore, and are considered inappropriate for publication, or for sharing outside of the families or community groups who have traditionally fished this koʻa. An important aspect of the koʻa ʻōpelu tradition is the maintenance of these koʻa by feeding of the school. To keep fish attracted to a koʻa, fishers will regularly drop bags of palu - grated vegetable matter - to the school (daily, or every second day). The knowledge of the names and locations of the koʻa is considered of historical significance, and is a tradition that the kupuna would like to see preserved and passed on to future generations.

ʻŌpelu aggregations usually occur in water around 120 ft deep, close to reef drop-offs. The initial and subsequent environmental assessments undertaken by the previous moi farming operations included reference to interviews with knowledgeable native Hawaiian fishers and cultural practitioners familiar with the location (Cates International, 2000; Aquaculture Planning & Advocacy, 2009). These confirmed that there are no traditional koʻa ʻōpelu or other traditional fishing grounds or resources at the project location.

5.8 *LAND USE AND ENVIRONMENTAL COMPATIBILITY*

Current Usage

The immediate AOI does not appear to have any regular usage, since the removal of the previous farm installation in 2014, other than occasional use by vessels transiting to or from fishing grounds. The applicant has requested assistance from NMFS Sustainable Fisheries personnel in identifying any current use of that area or the nearby artificial reef.

Submerged Lands Issues and the Public Trust

The proposed demonstration site constitutes part of the ceded lands trust, since all submerged lands are ceded lands.

Public Perceptions of Ocean Use

The public perceptions of ocean access and ownership in Hawai‘i 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 ahupua‘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.

6 IDENTIFICATION OF IMPACTS AND ALTERNATIVES CONSIDERED

6.1.1 Site selection and the ‘Preferred Site’

Three areas were initially considered when planning for the siting of this farm operation. The preferred site is close to the center of the former Hukilau Foods farm site. It is located 1.5 miles offshore of ’Ewa Beach. Permitting this site will be considered the “Preferred Site” (Figures 7 and 8). This site was selected for its suitability, based on the following primary criteria:

1. The site is a deep-water area that will present less exposure to storm or wave damage, where water depth and currents provide for effective mitigation of potential impacts on water quality and benthos, and help ensure optimal fish health and well-being.

2. There is little or no public use of this area. The site lies beyond the limits of normal recreational SCUBA-diving (around 120 feet). While it is within the normal depths for offshore trolling for ono (wahoo, *Acanthocybium solandri*), the array is expected to enhance ono catches, rather than negatively impact them.

3. The site is afforded some measure of protection from strong trade winds. The proximity to shore could also allow for a shore-based control and security facility, which may reduce the need for vessels on site, reducing fuel use and GHG emissions from vessels transiting back and forth to the site.

4. There is ready access from Kalaeloa, or from Honolulu Harbor, both of which provide support facilities such as loading docks, slips, ramps, and fueling.

5. The site is offshore and southeast of the Old Municipal Airport south of Barbers Point.

A second location (Alternative 1 in Fig. 7) that was considered is located 0.5 miles further offshore of the Preferred Site. This site, 2 miles offshore of `Ewa Beach, is in waters roughly 160 meters (525 feet) deep. Such depth requires a large scope for mooring lines, and a greater spread of the anchors, and would therefore necessitate a very large area to be permitted. This would then create wider user restrictions that would encumber other marine uses. Further, the size of the mooring system would add additional costs that might preclude the project's economic viability. 'Alternative 1' site was therefore not considered further.

A third location (Alternative 2 in Fig. 7) that was considered is west of 'Ewa Beach, closer to Kalaeloa. This site was suggested during the initial scoping discussions, when Ocean Era representatives met with the 'Ewa Beach neighborhood board. Early consultation with the US Army Corp of Engineers Honolulu District, indicated that this site is in a restricted area. Therefore, it was not considered further.

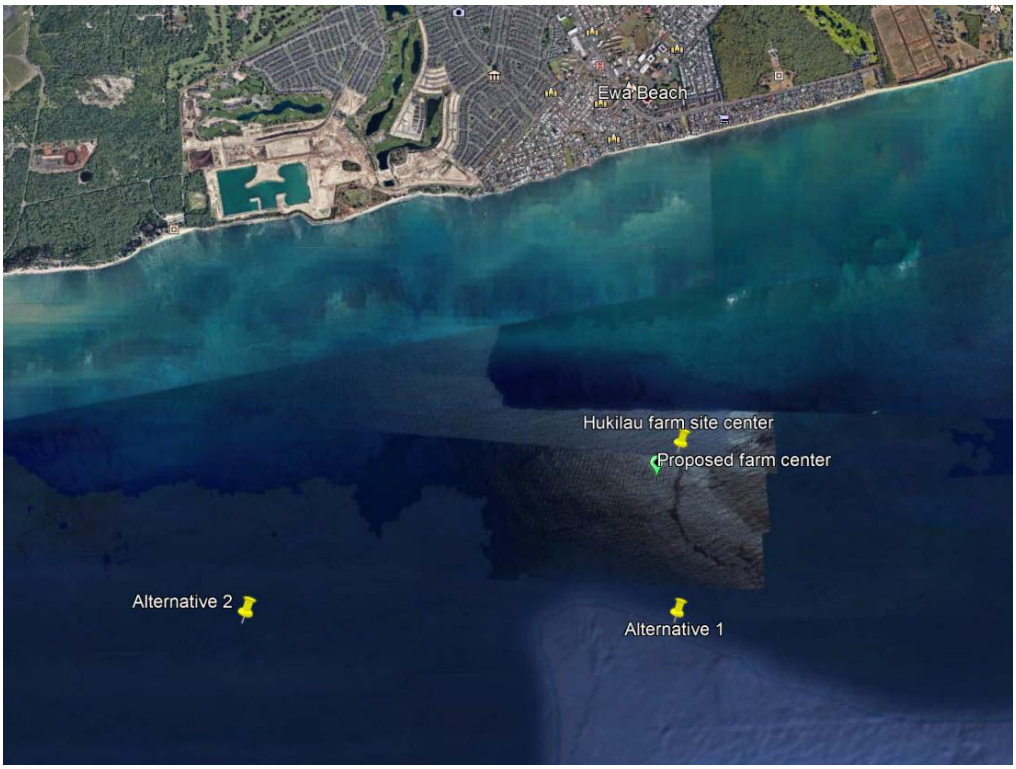

Figure 10: The Preferred Farm Site ("Proposed Farm Center") and Alternative Site Locations

Table 4: Center coordinates of the preferred farm site and the three alternatives evaluated

	Latitude:	Longitude:
Preferred Site	21°17'08.94" N	158° 00'29.54"W
Hukilau farm site center	21° 17' 15.97" N	158°00'23.88 W
Alternative 1 (directly south)	21° 16'53.41" N	158° 00' 10.88" W
Alternative 2 (to the west)	21° 16' 32.26" N	158° 00' 24.77" W

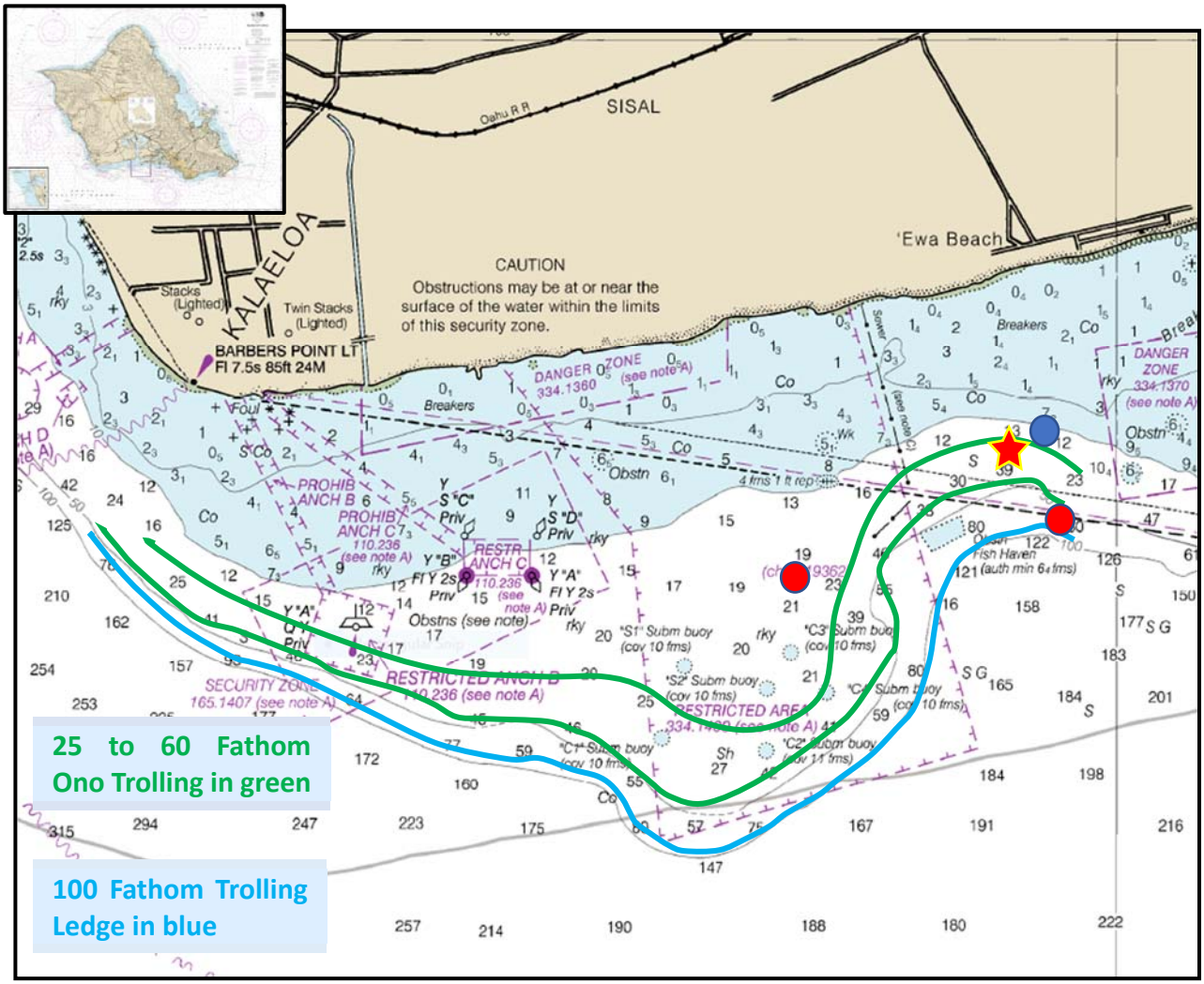

Figure 11: Nautical chart showing approximate locations of the two Alternative Sites (red circles). The Preferred Site is shown as a red star. The prior moi farm site center is shown as a blue circle. Isobaths for fishing are shown in green and blue.

6.1.2 No Action Alternative

Under the no-action alternative the DLNR would not issue the CDUP for the proposed offshore fish farm. The option of No Action is not recommended, given the economic and sustainability benefits that could accrue from development of offshore fish and macroalgae farming in Hawai`i. To take no action would be demonstrating a lack of responsibility for self-sufficiency and sustainability in food fish resources for Hawai`i.

Additionally, if the option of No Action is taken, this would hinder the development of sustainable offshore aquaculture in Hawai`i, and probably discourage further research or development efforts in this area. The only alternatives, then, would be to continue to increase reliance on imported seafood, and/or development of land-based marine fish and macroalgal culture. Increasing seafood imports limits employment and development opportunities for the community, and runs counter to

efforts to increase food security in the islands. Land-based activities are land-intensive, and very energy-intensive, limiting both their production potential, and creating less optimal environmental footprints at scale. Furthermore, the very high capital requirements for land-based aquaculture restricts production to high-priced products, which limits availability and affordability to customers, and in many cases negates the viability and competitiveness of the underlying investment case. To confine future marine aquaculture in Hawai`i to shore-based activities would also limit the public and private investments into future research that could improve Hawai`i's leadership and competitiveness as a global driver of responsible, sustainable, and successful marine aquaculture

6.2 *SHORT-TERM IMPACTS DURING CONSTRUCTION*

Short term impacts during construction will be caused by anchor placement and the increased activity associated with assembling the array. The array grid system will be moored to the seafloor in waters approximately 70 meters deep by a series of anchors. The anchor chains will also contact the seafloor during the deployment. Precise anchor placement will be based on visual and / or acoustic imaging to ensure that only barren unconsolidated sediment is physically disturbed. There will be very short-lived and highly localized increases in turbidity due to anchor placement. Due to the critical nature of this work, the deployment will not be undertaken when wind, wave or current conditions are marginal. Additionally, the farm will be sited in an area that is resilient to slight increases in nutrients and suspended solids. As such, there will be little opportunity for disturbed sediment to drift into areas that might be negatively impacted.

Protected Species

Ocean Era will ensure that any and all operators or contractors involved follow safe operating procedures to ensure that no marine mammals or sea turtles are adversely affected during construction or deployment. The company welcomes input from State and Federal Agencies to develop construction and operation-specific procedures. Specific measures that will be taken in the presence of protected species are included below in **Section 7- *Mitigation***.

Spills

Any activity on boats presents some risk, however small, of pollution from spills of fuel, oil, or hydraulic fluids from the boats used in deploying the anchors and grid, the net pens, and the macroalgal arrays. Standard precautions (best management practices) and Coast Guard regulations for working on the ocean will be adhered to during the towing and deployment operations. Operation of vessels by professional crews in accordance with legal requirements mitigates risks of pollution from these sources.

6.3 *CLIMATE CHANGE AND SEA LEVEL RISE*

Hawai`i is vulnerable to impacts of climate change such as rising ocean temperatures and sea level rise. By demonstrating and developing the benchmarks of responsible and sustainable marine aquaculture, the proposed project can contribute positively and importantly towards conditions for reducing the drivers of climate change (land clearance and increasing consumption of terrestrial proteins) and increasing climate change adaptiveness, globally, and at scale.

Preferred Alternative - Issuance of the requisite permits. The issuance of the requisite permits, and deployment and operation of the proposed farm operation will likely result in negligible

emissions of Green House Gases (GHGs) resulting from operation of support vessels. The cages and other structures could be vulnerable to disturbance during increasing frequency and intensity of storm events due to climate change. However, abundant safety measures will already be incorporated into the mooring and net pen design, minimizing the potential for damage to the environment from any such storm events.

The Preferred Alternative is also in line with the needed transitions to less impactful food production systems, from a climate change perspective, and one that is less susceptible to changing climate patterns and freshwater limitations. One of the five major recommendations of a recent United Nations High Level Panel on the Oceans and Climate Change[10] was that humanity must begin to transition to source more foods from the ocean. Marine-sourced foods require no land area conversion, or fresh water. Methane is the primary greenhouse gas emission from terrestrial sources of animal protein production (ruminants: primarily beef, but also pork and lamb), yet marine fish culture in the ocean produces virtually no methane. Further, macroalgae (limu) culture removes nutrients and CO_2 from ocean surface waters, countering eutrophication and ocean acidification, and – at some larger scale – offering potential for carbon sequestration or decarbonization of food systems. If this operation moves forward, then it could represent a significant step further in moving Hawai`i closer to fulfilling the recommendations of the UN HLP, and towards a lower environmental footprint for local food production.

No Action Alternative - The No Action alternative would result in no beneficial effect on the climate because an aquaculture facility would not be built without a CDUP. No Action would also mean that there would accrue no positive environmental benefits from marine-sourced, locally produced foods.

6.4 *LONG TERM IMPACTS*

Concerns related to the environment regarding aquaculture operations include water quality (waste, pharmaceutical applications), genetic impacts to wild fish from cultured fish escapes (e.g., loss of fitness to wild populations if wild and cultured fish interbreed), spread of disease from cultured fish to wild fish, entanglement of protected species in aquaculture gear, sustainability and safety of feed ingredients, risk of loss of equipment and damage to the marine environment during severe storm events (e.g., tropical storms, hurricanes), privatization of a public resource (State waters) for profit, loss of ocean space where aquaculture operations are sited, and socio-economic impacts on commercial or recreational fisheries. These concerns are all significantly reduced or eliminated by adherence to US and Hawaii state regulations around culture practices; application of modern best management practices; use of only native species, and location of farm sites offshore, in deeper water with greater currents, over bare sediment substrate.

Generally, open ocean aquaculture may have effects on water and sediment quality, and the plant and animal communities living in the water column, and those in close association with, on, or in the sediments. The two major factors which determine the negative effects of open ocean aquaculture on the surrounding natural environment are farm management practices, and farm siting. Sound farm operating practices reduce waste loading by employing efficient feeding methods and efficiently digested feeds. Good management practices can also limit escapes, prevent

[10] https://www.oceanpanel.org/climate

pathogen proliferation. Farm siting minimizes water column and benthic impacts by avoiding sensitive biological communities and optimizing current flow through the culture system. Optimal siting can also reduce potential marine resource use conflicts.

6.4.1 Water quality

The water quality around offshore aquaculture operations is mainly affected by the release of dissolved and particulate inorganic and organic nutrients. Water column effects around offshore aquaculture operations can include a decrease in dissolved oxygen, and increases in biological oxygen demand, increased nutrient concentrations (P, total C, and organic and inorganic N), increased turbidity and potential for ammonia toxicity. Changes in water quality parameters are greatest within the fish culture structures and diminish rapidly with increasing distance from the net pens. Recent studies have documented only limited water column impacts due to rapid dispersal (Holmer, 2010; Price and Morris, 2013).

The prior moi farm operation reported no significant impact on water quality (Aquaculture Planning & Advocacy, 2009). Similarly, there have been no measurable impacts on water quality around the Kona-based offshore kanpachi farm operation (Sims, 2012; and Blue Ocean Mariculture water quality reports[11]). Further, an offshore fish farm operation in Panama, consisting of around 30 net pens stocked with cobia (*Rachycentron canadum*) had no significant impact on water quality, and usually no measurable impact whatsoever (Welch, et al., 2019). Culture of limu also offers potential ecosystem services, such as improving water quality, by absorbing excess nutrients and CO2, and increasing primary productivity and biodiversity.

Preferred Alternative - Issuance of the requisite permits. The proposed alternative, issuance of the CDUP and other permits, will lead to effluent from the fish farm being released into the ocean. However, because the farm will be operated in a manner that minimizes effluent loading (managed feeding, monitored stocking densities, and regular pen cleaning), and because the site is in an area with almost constant current, any increase in nutrient levels or turbidity is expected to be negligible, extremely localized, and temporary.

Ocean Era will perform regular monitoring of the water column and the seafloor around the farm, as per Federal and State regulations and reporting requirements.

No Action Alternative - The No Action alternative would result in no change to the quality of the water column because an aquaculture facility would not be built.

6.4.2 The sea floor

The two most significant sources of impacts to sediment quality from offshore aquaculture operations are solids deposition and nutrient enrichments of seafloor sediments from uneaten feed, biofouling and fish feces. Numerous studies have shown that organic enrichment of the seabed is the most widely encountered environmental effect of culturing fish in net pens (Karakassis et al., 2000; Karakassis et al., 2002; Price & Morris, 2013). The spatial patterns of organic enrichment from offshore aquaculture operations varies with physical conditions at the sites, and farm

[11] https://www.bofish.com/stewardship/monitoring/ - see "Water Quality Reports"

specifics, and has been detected at distances from meters to several hundred meters from the perimeter of the cage array (*ibid)*. Studies of offshore aquaculture operations in the Mediterranean (with relatively shallow waters, and less active currents) showed that the severe effects of organic inputs from fish farming on benthic macrofauna are limited to up to 25 m from the edge of the cages (Lampadariou, et al., 2005) although the influence of carbon and nitrogen from farm effluents in the sea floor can be detected in a wide area about 1000 m from the cages (Sara, et al., 2004). The impacts on the seabed beneath the cages were found to range from very significant to relatively negligible, depending on sediment type and the local water currents.

In offshore sites that are more representative of the AOI, such as Kona and Panama, benthic impacts are greatly reduced, and are usually undetectable 30 or more from the edge of the net pen (Welch, et al., 2019).

There may be an increase in the amount of marine benthic fauna on the mooring lines and net pens. Fouling on mooring lines would probably include macroalgae, bivalves (several species of mussels and oysters (*Pteria* and *Pinctada* spp), corals (*Pocillopora* and *Porites*), sea urchins (*Echinothrix calamaris*), nudibranchs (*Stylocheilus longicauda*) and sponges. These would all settle out of the plankton, and there would be no measurable impacts on adjacent communities. The presence of these organisms would primarily be a function of the presence of the artificial substrates, rather than any other perturbation to the environment.

Fish pens will be cleaned periodically and some of this fouling will fall to the bottom. Regular cleaning to minimize biofouling buildup, and monitoring sediment chemistry, composition and infauna communities will be key in preventing degradation to the environment.

The anchor chains may move with any significant change in current direction, and the chain will impact the substrate for a narrow radius around the anchor, where it contacts with the bottom. However, as this substrate is all unconsolidated sand, the expectation is that there will be no significant impact from this action.

The project proposes to culture various species of limu (macroalgae) on lines, strings or bags. Only macroalgae native to the Hawaiian Islands will be cultured. These limu may contribute to increased dispersal of gametes or sporophytes onto surrounding areas. As limu stocks on the reef are heavily impacted by fishing pressure, such recruitment enhancement might be considered beneficial. The project proponents have reached out to work with local limu practitioners to identify areas of potential collaboration, and to monitor such impacts going forward.

Preferred Alternative **-** Issuance of the requisite permits. Issuance of the requisite permits will have minimal impacts to sediment quality in the vicinity of the proposed facility. The siting analysis conducted during the site selection process chose an area with sufficient depth and current flow parameters that will result in broad dispersion of solid wastes. Additionally, Ocean Era will regularly monitor the sediment condition during operations. If adverse effects are seen, then culture operations can be adjusted.

Ocean Era will perform regular monitoring of the water column and the seafloor around the farm, in accordance with Federal and State permit requirements.

No Action Alternative **-** The No Action alternative would result in no effect on sediment quality around the site, because an aquaculture facility would not be built.

6.4.3 Noise and air quality

Boat engines, fish feeding systems, and cage cleaning apparatus will increase noise levels in the area of the farm site. In the context of the wide range of sea, land and air uses in the area, however, these impacts are not expected to be significant. The support vessels would result in minimal emissions, and these emissions would not exceed the general level of vessel air emissions that occur in the area on a regular basis. These emissions would not individually or cumulatively result in any measurable degradation of air quality. Winds at sea are expected to disperse the small amount of emissions quickly.

6.4.4 Terrestrial Biota

The proposed fish farm will not significantly impact any terrestrial biota, such as terrestrial bird populations. There are no terrestrial flora or marine macroflora in the proposed offshore farm area.

6.4.5 Sea Turtles and Marine Mammals

The Hawaiian Monk Seal (*Neomonachus schauinslandi*), the Humpback whale (*Megaptera novaeangliae*), the Main Hawaiian Island Insular False Killer Whales (*Pseudorca crassidens)*, Green Sea turtles (*Chelonia mydas*) and Hawksbill sea turtles (*Eretmochelys imbricata*) are endangered or threatened species that could occur in the project area.

There are several types of potential impacts to sea turtles, monk seals, and other marine mammals from the proposed action's gear and operations.

These include:

- Entanglement in gear including mooring lines, bridles, and netting;
- Collisions with vessels including propellers;
- Impacts of fishing by others around the array;
- Impacts to critical habitat; and
- Impacts to behaviors, including habituation.

Each of these potential impacts will be mitigated according to the following conditions or actions:

Cetacean entanglement in passive fishing gear is a well-documented problem (Price et al., 2016). However, there is evidence that noise and lighting help reduce the likelihood of entanglements (Carretta & Barlow, 2011). Cetaceans tend to actively echolocate in the presence of floating and submerged objects, avoiding direct contact with them. With the activity and sounds (wave action, feeders, etc.) coming from the culture array, it is likely that cetaceans, especially odontocetes, would be aware of the presence of the array and avoid becoming entangled.

In 2017 a Hawaiian monk seal apparently swam inside an open, empty submerged net pen at the offshore fish farm site in Kona, and evidently drowned after not relocating the opening to escape.

The company (Blue Ocean Mariculture) has subsequently worked with NOAA PIRO to investigate the cause, and implement new operating procedures to prevent recurrence. It has never been repeated follow adaption of the new procedures, such as not allowing any entry to submerged net pens. These risks and procedures for prevention are discussed in greater detail in Section 7.3: Sea Turtles and Marine Mammals. Ocean Era will also work with State and Federal Agencies to ensure that infrastructure will not endanger protected species.

The proposed net pens in the array will be designed to be raised to the surface for servicing by divers, who will be able to enter and exit the net pens through access ports above water. This therefore virtually eliminates the potential for provisioning of marine mammals from the occasional "leakage" of fish escape from inside the net pens (such as can occur when divers enter or exit submerged net pens through zippered access ports below the water surface). The proposed operations therefore expect to exert significantly less attractive impact on marine mammals.

Mooring infrastructure – As mooring lines will be under constant tension and free of loops, this avoids the risk of entangling cetaceans, monk seals, or sea turtles. The mooring lines are modelled to remain taut, even as the currents shift, because of the negative buoyancy of the chain and upper rope.

The mooring system at the proposed project site is similar to that used for by Blue Ocean Mariculture, in Kona. Ocean aquaculture facilities located in State waters, moored offshore of O'ahu and the Island of Hawai'i, have not had issue with any animal becoming entangled in mooring lines (Aquaculture Planning & Advocacy, 2009; Kona Blue Water Farms, 2008; Sims, 2012).

Collisions with Support Vessels **-** Ship strikes also have potential to kill or injure cetaceans including false killer whales. False killer whales in waters surrounding Hawai'i ride the bow or stern wake of vessels, and may come into proximity with propellers (Baird, 2002). A propeller strike from a small support vessel may cause disfigurement of the dorsal fin or other parts of the body without killing the whales; however, a strike could also seriously injure or kill smaller protected species (e.g. dolphins, monk seals, sea turtles) (Wells et al., 2008). No documented ship-strike related injuries or deaths of false killer whales or humpback whales exist for Hawaiian waters. However, Baird (2009) reported a fresh head wound on one MHI insular DPS false killer whale photographed off Oahu in September 2009 that may have been caused by a propeller strike. Monk seals have also been seen with presumptive propeller wounds. There have also been reports of sea turtles killed or injured by propellers in waters around the State. Safe and professional boat operations mitigate the risk of collisions with sea life. All Ocean Era boat work will be performed by trained, appropriately certified and competent operators.

Preferred Alternative **-** Issuance of the requisite permits. The proposed action alternative, issuance of the CDUP and other permits, will likely have no impact on sea turtles, and no significant impacts to the marine mammals expected to occur in the vicinity of the proposed facility.

No Action Alternative - The No Action alternative would result in no effect on sea turtles and marine mammals occurring in the area, because, without a CDUP or other permits, the facility would not be constructed.

6.4.6 Sea Birds

Potential impacts to seabirds from the offshore fish farm could be related to the physical structure, presence of fish, and associated activities that would attract migratory seabirds. While it is possible that some seabirds may periodically land on the proposed feed barge, it is unlikely that the operation will cause any negative impact. Aquafeeds stored on the feed barges will be in covered and sealed conditions and not accessible to birds The net pens will usually be submerged around 10 meters below the surface of the water, and as such the fish inside the pens won't be an attractant or source of food to the birds.

There were no negative ESA-listed seabird interactions reported from the prior moi farm at this proposed site (Aquaculture Planning & Advocacy, 2009). No seabirds of any species have been seen by farm staff to be diving on the pens at either the prior moi farm operation in the AOI (ibid), or on the Kona offshore farm location (Sims, 2012). No other adverse impacts on seabirds have been reported from these operations.

Preferred Alternative - Issuance of the requisite permits. The proposed action alternative, issuance of the CDUP and other permits, will likely have only very minimal and inconsequential impacts to the seabirds expected to occur in the vicinity of the proposed facility.

No Action Alternative - The No Action alternative would result in no effect on seabirds and other migratory birds occurring in the area, because, without the permits, the facility would not be constructed.

6.4.7 Corals

Discharge of concentrated particulate waste or dissolved nutrients has the potential to damage coral via sedimentation or stimulating macroalgal overgrowth of corals. As the proposed activity anticipates minimal impacts on water quality, it is not expected to result in any detriment to corals in the surrounding area. Further, evidence from the Kona offshore fish farm indicates that neither the profuse corals on adjacent reef (0.5 miles inshore), nor the corals that settle on mooring lines or buoys, are detrimentally impacted by the operation.

Preferred Alternative - Issuance of the requisite permits. The proposed site will be located over unconsolidated sediments, limiting any potential physical and biological impacts to coral or other live bottoms. Positioning away from potential coral habitat will mitigate physical benthic impacts from the anchor and mooring lines.

No Action Alternative - The No Action alternative would result in no impact on live bottom habitat and associated biological communities around the proposed site because an aquaculture facility would not be built.

6.4.8 Fishes and essential fish habitat -

The farm infrastructure will likely aggregate a mix of reef species, as well as some pelagic fish, as some fish are naturally attracted to objects floating at the surface (Fish Aggregation Devices, or

FADs). This has been documented in the AOI by previous farm operators at the site (Aquaculture Planning & Advocacy, 2009), and also at the offshore farm site in Kona (Sims, 2012). Fish may also be attracted to the site due to the fouling on the structures. Schools of mackerel scad (ʻōpelu: *Decapterus macarellus*) may also be occasionally attracted to the area, but are not anticipated to take up permanent residence. A small population of the following species may be present after the farm is in operation: Opakapaka (*Pristipomoides filamentous),* Ulua *(Caranx sp).,* Uku (*Aprion virescens*), Kāhala (*Seriola rivoliana* and *S. dumerili),* ʻōpelu (*Decapterus macarellus),* Kala *(Naso hexacanthus),* Yellow striped goatfish (*Parupeneus chrysopleuro*), butterfly fish (*Chaetodon* spp.) and surgeon fish (*Acanthurus* spp.). etc. Several of these are important commercial fish, part of the Deep Seven group of species. Fish observed by previous farm operators at this site include broomtail file fish (*Aluterus scriptus*) and mackerel scad (*Decapterus macarellus*). The ʻōpelu will congregate in the vicinity of the cages, and this in turn would attract pelagic predators, such as false albacore tuna (*Euthynnus alletteratus*).

The array would not serve as a "fish sink" to pull fish away from neighboring reefs. Most reef fishes are site resident, with varying home ranges (Howard, et al., 2013). It would not be anticipated that they would abandon their typical reef habitats, to cross open water, and take up residence on such structures (Meyer and Holland, 2005). Meyer, et al., (2010) documented natural boundaries that are typically situated along major habitat breaks (e.g., large sand channels between reefs) in reef ecosystems, and serve as natural barriers to reef fish movements.

Essential Fish Habitat for pelagic, bottomfish, and crustacean management unit species exists within the area of the proposed farm site.

Ocean Era is not seeking exclusivity from fishing vessels in the project site, and accepts that the area will remain open to the passage of recreational users and fisherpeople within safe modes of operation and distances from the surface vessels.

Sharks

Sharks often investigate floating objects in their environment, and fish congregating around the array would present a potential food source. This effect would likely be similar to any other FAD in Hawai`i. Tension on the array's lines (i.e., mooring) would preclude sharks from entangling themselves.

Sand Bar Sharks (*Carcharhinus plumbeus*), have become part of the fauna around both the Hukilau Foods fish cages (previously occupied in the area of interest), as well as at Blue Ocean Mariculture in Kona (OCCL, 2009, 2014). Experience also shows that the numbers of sharks vary greatly over the year, with no particular pattern of attraction or avoidance. These observations are supported by scientific studies of shark movements conducted in several locations around the islands.

Preferred Alternative **-** Issuance of the requisite permits. The preferred site was selected to minimize potential impacts with fishing areas and artificial reefs. Best management practices (e.g. daily removal of any dead fish) will minimize attraction to sharks. Therefore, the issuance of a permit is unlikely to have significant impacts to fish or their habitat.

No Action Alternative **-** The No Action alternative would result in no effect on water column or benthic fish communities around the site, because the facility would not be constructed without the CDUP and other permits.

6.4.9 Recreation

Ocean Era does not anticipate the proposed offshore farm having negative impacts to the local fishing community and ocean users. The farm structure would likely act as a FAD, attracting baitfish and pelagic fishes like any other floating object in the open ocean. Ocean Era is not requesting exclusive use of the entire permitted area, and is only requesting that people not swim, snorkel, SCUBA dive or anchor near the net-pen array.

Based on previous experience, Ocean Era expects some community fishers (both recreational and commercial) will fish in the vicinity of the farm structure. Gear entanglements or collisions with the farm array or mooring lines can be avoided by boat operators remaining a safe distance from the structure and any marker buoys. The USCG would note the array's position, as appropriate, through a USCG Notice to Mariners (and issuance of a Private Aid to Navigation). The surface buoys would be illuminated at night to prevent collisions.

Preferred Alternative **-** Issuance of the requisite permits. Issuance of permits would not significantly impact the opportunities for recreation in the area, because Ocean Era is not requesting exclusive use of the area. The only restrictions on recreation that are requested (no swimming, snorkeling, SCUBA diving or anchoring) are not currently practiced in the area.

No Action Alternative **-** The no action alternative would result in the facility not being constructed, so there will be no change to recreational opportunities in the area.

6.4.10 Aesthetics and viewscape

Viewscape is important to coastal property owners, as well as other ocean users. The visual profile of the project will primarily include a feed barge, work boats, a harvest vessel and buoys. The cages will be submerged most of the time, so they will not add structure to the view plane. Farm activities will likely be similar to those when the site was previously operated as a commercial moi farm, from 1999 to 2013. The work boats that will be on site daily will be difficult to distinguish from normal boat traffic.

Preferred Alternative **-** Issuance of the requisite permits. Issuance of permit could lead to the minor and insignificant changes to the view plane as stated above. However, because of the distance form shore, and the low-profile of the net-pen array, a significant change is not expected.

No Action Alternative **-** The no action alternative will result in no changes to the current view plane because a farm will not be built without the CDUP and other permits.

6.4.11 Cultural Practices and Traditional Resources

Ko`a `ōpelu ('holes' or schooling places for mackerel scad – *Decapterus macarellus*) were the most likely cultural resource that could be impacted by farm operations. During the initial and

subsequent environmental assessments undertaken by the previous farming operations, interviews with knowledgeable native Hawaiian fishers and cultural practitioners familiar with the location confirm there are no traditional fishing grounds or resources at the project location (Aquaculture Planning & Advocacy, 2009).

Preferred Alternative **-** Issuance of the requisite permits. Issuance of a permit, and subsequent construction of the fish farm will not have impacts on traditional cultural practices or access to resources. No ko`a `ōpelu are in the area, and the community will still have access to the area being permitted.

No Action Alternative **-** The no action alternative will cause no effects to cultural practices or traditional resources, because without the CDUP and other permits, the farm will not be built.

6.4.12 Cumulative Impacts

Cumulative impacts to water quality and sediment may include discharges of dissolved and particulate inorganic and organic nutrients into the water column, and discharges of total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. There are other sources of organic and inorganic discharges within five miles of the site, such as a municipal wastewater treatment facility. There are other commercial and recreational activities that occur in the area that might also cause mortality to fish or marine mammals through collision or entanglement.

There are no other potential cumulative impacts, as issuance of this CDUP and other permits does not confer any obligation to issue additional permits for other similar activities.

7 PROPOSED MITIGATION MEASURES

The following sections list mitigation measures to the specific impacts listed above, as well as general mitigation measures that equate to best management practices.

7.1 *WATER QUALITY*

The project requires a National Pollutant Discharge Elimination System (NPDES) permit, issued through the Hawai‘i Department of Health, Clean Water Branch. Issuance of this permit will be dependent upon an in-depth modelling study, to ensure that water chemistry is not significantly negatively affected by the operation. Additionally, the NPDES will require a series of Best Management Practices. Examples of BMP’s for offshore fish farming to mitigate degradation of water quality include:

1. Fish must be fed with a diet that is nutritionally optimal, to avoid excessive nutrient excretion.
2. Feedings must be observed visually (if net pens at surface) or by divers or cameras (if submerged) to minimize potential for feed wastage
3. Any dead fish must be collected daily, ocean conditions permitting
4. Biofouling on pens must be kept to a minimum, so that cleaning events result in minimal increases in turbidity or solids deposition to the substrate.
5. All processing operations will take place at a land-based facility. No fish processing water will be discharged from the offshore facility.

6. Discharges into the water column of chemicals and other fluids dissimilar from seawater must be prevented.

7.2 *SEA FLOOR AND CORALS*

1. Net pens will be sited in areas of moderate current, minimizing the risk of settleable solids accumulating on the sea floor.
2. Net pens will be sited over bare sandy substrate, away from sensitive seafloor habitats, such as corals or seagrass, or other hard bottom.
3. Cage cleaning will occur regularly, minimizing the amount of biofouling that will fall to the seafloor.
4. Feedings will be observed to minimize potential for feed wastage (as per 7.1)
5. Pre-deployment reconnaissance (e.g., drop cameras) will be undertaken to ensure that all anchors/moorings are set on sandy bottom, devoid of corals and seagrass. Anchor/mooring siting will take into consideration damage that could occur from chains as the structures move due to changes in current direction.

7.3 *SEA TURTLES AND MARINE MAMMALS*

Mitigation measures to avoid impacts to marine mammals and sea turtles are designed to minimize potential for vessel strike, and to prevent entanglement.

1. Vessel operators shall alter course to remain at least 100 yards from whales, and at least 50 yards from other marine mammals and sea turtles.
2. Vessel operators shall reduce vessel speed to 10 knots or less when piloting vessels in the proximity of marine mammals, and to 5 knots or less when piloting vessels in areas of known or suspected turtle activity.
3. If approached by a marine mammal or turtle, the vessel operator shall put the engine in neutral and allow the animal to pass.
4. Vessel operators shall not encircle or trap marine mammals or sea turtles between multiple vessels or between vessels and the shore.
5. Farm operators will remove fish mortalities on a daily basis, sea conditions permitting (as per 7.1).
6. If a net pen is not fully constructed, or if there is a pen that has a hole any larger than the standard net mesh, the pen will be kept at the surface, to allow any trapped animal access to air, and such damage will be immediately repaired, sea conditions permitting.
7. The net pens and anchor systems will be designed to keep mesh and lines taught, to minimize risks of entanglement.
8. Farm operators will not interact with marine mammals or sea turtles
9. A protected species management plan will be developed with input from State and Federal agencies.

7.4 *FISH (INCLUDING SHARKS)*

1. Prevent escapes of farmed fish into the environment by use of net-pens designed for above-water access only.
2. Minimize feed loss (which could act as attractant) by observing feeding (as per 7.1)
3. Develop a shark management plan with DLNR DAR, to specify steps to be taken in the event that sharks begin interacting with the cages or divers.

7.5 *RECREATION*

Impacts to recreational use of the area are expected to be minimal. The community can transit the entirety of the site, except (for safety reasons) in the immediate 19 acre area around the net pens and the central grid.

7.6 *GENERAL*

1. Require a long-term maintenance plan for gear, instrumentation, and equipment to prevent failures that could lead to adverse effects to Essential Fish Habitat (e.g., vessel groundings).
2. Create a storm and tsunami emergency contingency plan.

7.7 *IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES*

The proposed action does not involve an irreversible and irretrievable commitment of marine resources or State finances. A long-term lease will be requested. The lease term will be finite, and revocable for cause. Additionally, the lease will likely require the lessee to post a bond so that in the event of bankruptcy, funds will be available for the State to remove structures and return the environment to its former condition.

The open ocean environment around the main Hawaiian Islands has demonstrated an enormous capacity to rapidly assimilate and recycle excess nutrients from fish farming. Consistent, strong currents mix and disperse fish waste products into a naturally low nutrient environment. Any changes that may occur to the sediment due to farm operations will likely revert to pre-farm conditions within a relatively short amount of time if the farm is removed.

A decision to issue the associated permits would not automatically result in the approval of future projects. Future permit applications, if any, would be subject to independent environmental evaluation, coordination with others, and compliance with all applicable laws, including NEPA.

8 ANTICIPATED DETERMINATION

Chapter 200, HAR, establishes “Significance Criteria” to be used as a basis for identifying whether significant environmental impacts will occur. The operations are not anticipated to have any significant effects in the context of Chapter 343 HRS and HAR 11-200-12. Therefore, when an EA is prepared, a finding of no significant impact (FONSI) is anticipated. A summary of findings supporting this proposed determination follows (Table 2-1). These criteria are addressed in more detail below.

Table 5: Significance Criteria, Findings, and Anticipated Determination for Each Criterion

Significance Criteria	Does Project meet Criterion for risk of significant impacts?
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, viewsheds, or vistas	No
13. Requires substantial energy consumption	No

9 FINDINGS AND REASONS SUPPORTING THE ANTICIPATED DETERMINATION

1. Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.

No. There are no natural or cultural resources that would be lost or destroyed by the farm's installation and operation.

2. Curtails the range of beneficial uses of the environment.

No. There is little existing recreational, or subsistence use of the proposed permit area, and minimal restrictions of the public's movement or activities in the proposed farm area.

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

No. The farm proposes to grow human food with minimal impact on the ocean environment. The project is another example that is compliant with 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. The proposed project is consistent with the environmental policies established under Chapter 344 HRS. In addition, the project's potential to increase local food production is consistent with Hawai`i Green Growth's Aloha+ Challenge[12].

4. Substantially affects the economic or social welfare of the community or state.

No. The Ocean Era farm will provide economic benefits from increased employment in the science and commercial aquaculture sectors, generate inwards investment and tax revenues, and will provide fresh, sustainable, and locally-grown seafood to consumers in the State.

5. Substantially affects public health

No. The Ocean Era farm will have no negative influence on public health, and may actually benefit public health by encouraging increased consumption of seafood.

6. Involves substantial secondary impacts such as population changes or effects on public facilities.

No. Substantial secondary impacts would not be anticipated.

7. Involves a substantial degradation of environmental quality.

No. Environmental quality will not be degraded. The offshore farm will be operated using management practices that minimize the potential for negative effects, while generating significant net positive effects for oceans and climate. Further, there will be an environmental monitoring program designed to alert farm operators and regulatory agencies of any changes in the environment due to farm operations.

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

[12] https://aloha-challenge.hawaiigreengrowth.org/

No. Implementation of the proposed offshore farm will not cause any significant cumulative effects, and does not involve any commitment for larger actions. The farm is described in its entirety in the document.

9. Substantially affects a rare, threatened, or endangered species or its habitat.
No. The proposed offshore farm will not cause any substantial detriment to any rare, threatened, or endangered species or its habitat. Humpback whales and monk seals may all transit through the farm area, but the net pen array will not represent a significant barrier to movement of marine mammals, and there is negligible risk of entanglement in the mooring system. The farm's taut-line design avoids risk of entanglement, as evidenced by performance of similar systems elsewhere in Hawaii, and globally. The farm will not impede movement or otherwise disturb spinner dolphins.

10. Detrimentally affects air or water quality or ambient noise levels.
No. Impacts on water quality are anticipated to be negligible, where any resultant nutrients from fish feces or feed wastes would be broadly dispersed due to the currents and depth of the water. The limu co-culture in the net pen array will absorb some of the nutrients released by the fish, and contribute generally to nutrient cycling and increased productivity. No air pollutants or noise emissions are anticipated to be generated from the net pen array.

11. Affects or is likely to suffer damage by being located in an environmentally sensitive area.
No. The offshore farm site is in waters that are approximately 70 meters (230 feet) deep, with strong currents and coarse sand substrate.

12. Substantially affects scenic view planes or vistas.
No. The offshore farm would be moored at a distance of approximately 1.5 nautical miles south of `Ewa Beach and approximately 2.6 nautical miles southwest of Iroquois Point. The culture system will have a limited profile on the water surface; the only visible surface elements will be the float rings, marker buoys and the feed barge. All other elements will be submerged. Surface marker buoys will be deployed and lit in accordance with U.S. Coast Guard specifications; these will not be a significant impact on the view plane, given the existing land use of the residential and commercial operations at the Old Municipal Airport south of Barbers Point to the west, and the Honolulu International Airport to the east.

13. Requires substantial energy consumption.
No. There will be insubstantial amounts of energy used to power the boats and equipment for the offshore aquaculture farm. Renewable energies will be used wherever practical for deployment and operations on the farm.

10 LIST OF REQUIRED STATE, FEDERAL AND COUNTY PERMITS

Table 6: State and Federal Permits required for Ocean Era's Offshore Aquaculture Farm

Required State Permit	**State Permitting Agency**
Conservation District Use Permit (CDUP)	Hawai`i Department of Land and Natural Resources, Office of Conservation and Coastal Lands
National Pollutant Discharge Elimination System Permit (NPDES)	Hawai`i Department of Health Clean Water Branch
Hawai`i Coastal Zone Management Consistency Determination	State of Hawai`i Office of Planning
Aquaculture License	Hawai`i Department of Land and Natural Resources, Department of Aquatic Resources
Required Federal Permits	**Federal Permitting Agency**
Department of the Army Permit (Section 10)	US Army Corps of Engineers Honolulu District
Private Aids to Navigation Buoy	US Coast Guard

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12 APPENDIX- PUBLIC COMMENTS AND FORMAL RESPONSES

Ocean Era has made a Preliminary Environmental Review available on its website since March, 2021[13], with an open invitation for comments or suggestions on the proposal. None have, as yet, been received.

The following page lists comments and questions from the public informational meeting, Feb 18th, 2021.

[13] http://ocean-era.com/ewa-beach-offshore-aquaculture-proposal

EWA BEACH OFFSHORE AQUACULTURE FARM PROPOSAL:

PUBLIC INFORMATIONAL MEETING, Feb 18, 2021, 7.00 - 8.30 pm

Convened on zoom - Maximum number of participants = 51

Questions and responses:

Name	Comment / question	Response
Forrest McFall:	Did OE consider reshwater aquaponics?	Yes, but we see pressing need for increasing seafood production, as there is more market demand.
Forrest McFall:	How will OE address issues with shipping safety?	The site will be lit at night according to USCG requirements, and listed as a "PATON" or private aid to navigation.
Michael Cain:	What is OE's expected timing for submission of the application?	OE is still at the stage of community outreach. We expect to not file the application for at least another year.
Alexander Gaos:	I appreciate the approach, and the alternatives described.	Thank you.
Sandy Ward:	OE should pay attention to ancestral wisdom.	OE is respectful of culture and traditions, but also seeks to apply innovative technologies to achieve environmental goals.
Sandy Ward:	What will you do to monitor waste and disease?	The EPA and State permits will require regular water quality and seafloor monitoring around the farm site, and reporting of any disease outbreaks.
Walter Ritte:	Will the farm grow gorilla ogo or other invasive species?	OE will only culture native species at the offshore site.
Adrian Barnes:	How will OE guarantee net pen survivability at the site?	All offshore structures will be designed and installed by experienced engineers and specialists. All net pens will be submersible.
Randy Cates:	I have applied for the permit that Cates International originally held at the site, but this was blocked by DOT-Airports	OE is reaching out to all cognizant State and Federal agencies. DOT had not objected to the site location.
Randy Cates:	Has OE discussed this with US Navy Pearl Harbor, and Haseko?	OE has been in contact with Haseko and US Navy.
Mark Tagal:	What will be the source of fingerlings?	Oceanic Institute will initially provide the moi and nenue fingerlings. Eventually the operation may need its own hatchery, closer to the site.
Mark Tagal:	Is there any evidence that nenue will do well offshore?	No evidence to date, but we are hoping to run some trials in Blue Ocean Mariculture's net pens in Kona.
Mike Plowman:	Generally in favor, but is OE concerned about security issues?	OE will use on-site monitoring by video and other means to track site security.
Pahonu Coleman:	OE should conduct broader community outreach.	OE would be happy to do so. Please follow up with suggestions for who else we might reach out to, to provide information.
Jim Wyban:	Great to see economic development of aquaculture.	Thank you.
Randy Cates:	The original moi farm had no issues with theft; local fishermen supported the farm, and assisted with site monitoring.	OE hopes to have the same close working relationship with the fishing community that was also enjoyed at the Kona farm site.
Randy Cates:	The original moi farm harvested up to 15,000 lbs/wk, and all of that stayed in Hawaii. What are OE's plans?	The operation will primarily target the local market, as that is where moi and nenue and limu are already known, and demand is strong. But the farm may also ship product to the mainland.

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