

**STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
Office of Conservation and Coastal Lands  
Honolulu, Hawaii**

CDUA: HA-3495

Acceptance Date: January 30, 2009  
180 Exp. Date: October 27, 2009

October 23, 2009

**Board of Land and  
Natural Resources  
State of Hawaii  
Honolulu, Hawaii**

**REGARDING:** Conservation District Use Application (CDUA) HA-3495  
Hawaii Oceanic Technology, Inc. Proposed Open Ocean Fish Farm and  
Request for Marine Waters Lease

**STATUTORY** Hawaii Ocean and Submerged Lands Leasing Act

**AUTHORITY:** Chapters 171 and 183C, Hawaii Revised Statutes (HRS)

**APPLICANT:** Hawaii Oceanic Technology, 425 South Street, Suite 2902, Honolulu,  
Hawaii, 96813

**LANDOWNER:** State of Hawaii, Department of Land and Natural Resources (DLNR)

**TMK:** State Marine Waters

**LOCATION:** 2.6 Nautical Miles/3 Miles Due West of Malae Point, North Kohala,  
Island of Hawaii

**DEPTH:** Approximately 1,320 Feet

**AREA OF USE:** 247 Acres

**EXCLUSIVE USE:** 8.86 Acres

**SUBZONE:** Resource

**DESCRIPTION OF AREA AND CURRENT USE:**

The applicant, Hawaii Oceanic Technology, Inc. (HOT), proposes to establish a 247-acre (one square kilometer) open ocean aquaculture farm in Class A waters, 2.6 nautical miles/3 miles offshore located due west of Malae Point, North Kohala, Island of Hawaii. The project would

occur in state waters at about the 1,300-foot depth. The applicant would also like a lease, pursuant to Chapter 171, HRS (Exhibits 1, 2 & 3).

## ENVIRONMENTAL SETTING

### *Seafloor, Geology, Topography, Benthic Review:*

Current knowledge of the seafloor at this depth in the West Hawaii area is limited to existing surveys and mapping. HOT refers to the National Seafloor Mapping and Benthic Habitat Studies Project, Hawaii Undersea Research Laboratory (HURL) Submersible Pisces Dive Report, and State Office of Planning GIS database (2007) data to describe the sea floor and benthic habitat. The National Seafloor Mapping and Benthic Habitat Studies project identifies and references depths of 1,312 feet (400 meters) to 5,000 feet (~1524 meters) off the area between Keahole Point and Malae Point. This study indicates that the seafloor and topography consists of either of the following bottom types: low angle sediment with occasional basalt outcrops, basalt flow features with sandy channels and corals, vertical carbonate walls, carbonate blocks, manganese coated carbonate blocks, sandy bottom, basalt and carbonate rubble, basalt outcrops and flow features, barren low angle silt and/or clay bottom.

According to HOT, the HURL reports describe the Northern West Hawaii Coast as rock (basalt), and although the site-specific seafloor geology classification of the subject site is not known at this time, the closest data point may indicate that the subject site may contain similar geology (rocky basalt bottom).

HOT notes the oceanspheres will be located approximately 2.6 nautical miles/3 miles from the seaward edge of the nearest reef.

**[Note: It should be noted that the applicant did not conduct a recent site-specific benthic survey, although an analysis of the benthic environment below the proposed farm site based on older data is attached to this report as Exhibit 7. The applicants have made an argument that a site survey was not necessary because the project would not impact the seafloor due to the ocean depth (1,300 feet), mineralization/consumption of nutrients, dilution, and lack of benthic fauna at these depths.]**

### *Ocean Current:*

The ocean off the Kohala coast is sheltered from the prevailing northeasterly trade winds by Mauna Loa and Mauna Kea; providing calm waters year round. Trade winds are prevalent in winter, and blow from the north or northeast. The project site experiences tremendous levels of flushing from the steady current.

According to HOT, currents approximately three (3) miles offshore west Hawaii average 0.4 knots, with maximum speeds of 1.5 knots in the vicinity of the project site. Long term current monitoring (based on observations ship drift, satellite tracked buoys, current measurements) indicates the average current speed is less than ten (10) centimeters per second (0.2 knots).

Ocean currents in the region of the project site were analyzed by HOT. The project site has weak mean flows and is subject to frequent strong transient motions associated with eddies. The project site is in a region exposed to strong positive wind stressed curl, which drives upwelling

and the development of cyclonic mesoscale eddies. The eddies retain their coherence for much shorter times than the anticyclonic eddies that form further to the south in the lee of Hawaii (they are more dispersive). Strong vertical shears are usually found in the eddies, causing strong vertical mixing. The vertical mixing, combined with the horizontal dispersion associated with the mesoscale and submesoscale eddies, suggest the project site is ideal to minimize accumulation of by-waste products. Should an accumulation of by-waste occur it will disperse within a few days, or it will be consumed by phytoplankton and zooplankton.

*Water Quality Model and Water Quality Data:*

Studies indicate that near the surface, the water column is mixed by wind and has uniform properties (i.e. temperature, salinity, and nutrient concentrations). The depth of the turbulent layer varies from approximately 400 feet (122 meters) in winter to less than 100 feet (30 meters) in summer. Below the surface mixed layer (SML), there is a sharp decrease in temperature from 77° Fahrenheit (25° Celsius) at the surface to 41° Fahrenheit (5° Celsius) at 2,297 feet (700 meters) depth (thermocline). HOT states the properties of the water above and below the thermocline prevent mixing between them. Thus, dissolved nutrients and much of the particulate matter generated in the SML will not migrate to the water below; causing little impact on water quality of deeper water.

A zone of mixing model (ZOM) incorporated total nitrogen, ammonia nitrogen, nitrate + nitrite, total phosphorous, turbidity, and total suspended solids. The Water Quality model study indicated ambient levels of water quality would be achieved by the edge of the ZOM. The water quality model and water quality data (gathered from the surface, depth of 50 meters, depth of 150 meters at the center of the project site, 1 mile upcurrent from the site) concluded there will be little impact to water quality.

*Terrestrial Flora & Fauna:*

HOT notes there is no terrestrial flora located in the project site. No terrestrial fauna (seabirds) will be significantly impacted. The area is not considered important for birdlife. The oceanspheres subsurface placement would eliminate potential impacts.

*Marine Macroflora:*

The applicant notes there is no marine macroflora located in the project site. Algae may be found on the oceanspheres (i.e. netting, accessories) and will increase from organic loading within the platform. Marine benthic fauna (bivalves - mussels, oysters, corals, sea urchins, nudibranchs, sponges) is expected to grow on the oceanspheres.

*Fish:*

Fisherman, historical document research, marine resource management studies, boater interviews provided information regarding fish data. West Hawaii Aquarium Project, and Coral Reef Assessment and Monitoring Program surveys provided data regarding reef fish (coral reef, algae, and invertebrates) in the general *and near-shore area* of Keahole Point. The few marine plants or animals found consisted of pelagic, planktonic algae, or free-swimming open water fishes.

*Marine Mammals:*

The applicant notes sharks (inshore - big nose shark, blacktip shark, blacktip reef shark, glapagos shark, grey reef shark, sandbar shark, scalloped hammerhead shark, smooth hammerhead shark, tiger shark, whitetip reef shark, and offshore - blue shark, common thresher shark, cookiecutter shark, megamouth shark, oceanic whitetip shark, shortfin mako shark, silky shark, whale shark, white shark) may be attracted to the oceanspheres due to excess fish food, fish visibility, and morts (dead fish). Sharks may also be attracted to the oceanspheres which may act as Food Aggravating Devices (FADs) but they may not reside there permanently. Sharks may be attracted to dolphins at the oceansphere causing predation on dolphins.

The project site is not located in the Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS). However, whales may transit the project site. The project site is located at the 1,320 foot/220 fathom contour line. The sanctuary boundary runs along the 100-fathom line from Keahole Point to Upolu Point to the north.

As noted, spinner dolphins, spotted dolphins, and bottlenose dolphin sightings may occur at the project site. The project site may also attract Hawaiian monk seal, green sea turtles, rare hawksbill turtle, leatherback turtle, loggerhead turtle, pygmy whales, dwarf sperm whales, killer whales, false killer whales, pygmy killer whales, pilto whales, melon-headed whales, rough-toothed dolphins, and false killer whales.

*Recreation:*

The project site is not targeted as a fishery. Trolling boats for mahimahi/ono may transit the area while on route to other fishing areas to southwest. Bottom fishing boats were seen approximately one (1) mile away from the project site (September until April). Opelu fishing boats were seen approximately 2 1/2 miles (near shore/130-150 feet deep water) from the project site.

SCUBA operators, snorkeling operators, sailing operators, recreational and commercial fisherman, and private individuals were contacted during the recreational use survey (August 2007 and September 2007). Results concluded 18 % operate along Kohala Coast (Kawaihae Harbor and Hawi). Recreation use of offshore Malae Point is diminished during winter.

Boat observations were made (*August 2007 to September 2007*) while stationed: 1) in the project site; 2) within three (3) miles of the project site, and 3) three (3) miles outside of the project site. Observations indicated Malae Point had a maximum of one (1) vessel inside the project site per day; and twelve (12) vessels at one time within three (3) miles of the project site. A NOAA whale watcher/USCG marine biologist was on board to watch for marine mammal activity and marine biota.

Observers were also situated at Malae Point (200 foot elevation), during seven summer days (*between August 2007 and October 2008*), with light ocean swells and trade winds. During 40 hours of observation, two (2) vessels entered the project site for less than 30 minutes, and twelve (12) vessels traveled within three (3) miles of the project site.

*Land Use:*

The dominant use of the shoreline area around Malae Point has been associated with ranching, recreational, and subsistence use by paniolo families from Kahua Ranch (started in 1928). Currently, the shoreline is used for camping, fishing, recreation, gathering, subsistence, and cultural purposes. HOT notes Malae Point is not a public area and permission is required from Kahua Ranch to access the area.

HOT met with the following coastal landowners and fisherman regarding the coastline and land uses: Monty Richards (Kahua Ranch), Pono von Holt (Ponoholo Ranch), Hoopai ohana (Kahua and Ponoholo Ranch), Kaike o Ka aina (lessee of adjacent ahupuaa parcel), "Lala" Laau (opelu fishermen), Robert Cambra (opelu fishermen), and Kwanji Fukuyama (troller/bottom fish fisherman). HOT met with the West Hawaii Fishery Council, Kawaihae Local Resource Council, and the Kona Kohala Chamber of Commerce Committee on Environment and Natural Resources. Results indicate the proposed project will not have any impact on aesthetics or land use(s) in the area because: 1) the oceanspheres will submerged a majority of the time; 2) the oceanspheres are 2.6 nautical miles/3 miles from shore; 3) boats and oceanspheres are similar to ocean use(s); and 4) the agricultural activity of aquaculture is consistent with coastal land use of ranching.

*Historical, Traditional & Cultural Sites:*

There are no historic sites, areas of traditional importance or traditional cultural places in the project site. A search of document research and oral history interviews have not provided any oral tradition, legend, or cultural activity associated with the project site. There are no resources (prehistoric, historic cultural) that are listed on the National Register of Historic Places (NRHP). The site is not used for trolling, net fishing, opelu fishing, bottom fishing, or other cultural practice. Consultations occurred with coastal landowners, general public, and kupuna involved in fisheries in the area.

**DESCRIPTION OF THE PROPOSED USE:**

HOT's objective is to create an environmentally responsible, economically sustainable project to produce seafood and reduce the pressure on wild fish stocks in the future. Short term goals are to: 1) be environmentally responsible; 2) be economically viable - returns; and 3) attract investors. HOT's long term goals are to license and sell the oceansphere technology. HOT is a technology company that is utilizing tuna as the goal to construct oceanspheres to attract additional investors.

According to HOT, the proposed project was chosen 2.6 nautical miles/3 miles offshore because of the depth of the water, currents, microscopic life and regulatory standards.

The proposed project would be three dimensional (depth, volume, length). The project would be located in state waters at approximately the 1,320-foot depth. The fish cages would not be moored to the ocean bottom but would navigate to maintain their location using a modified Ocean Thermal Energy Conversion (OTEC) engine. The cages would occupy the water column from about the 20-meter to 75-meter depth.

HOT would use the location's depth to grow pelagic fish (yellowfin and bigeye tuna). According to HOT, the site is attractive because: 1) there are existing regulatory standards (i.e. permits from USACOE, DOA, DLNR, etc. are in place; and 2) there is no mechanism to lease federal waters, thus there is no mechanism for ocean lease for property rights. HOT notes the lack of these two factors would probably not attract Hawaii investors.

HOT intends to use the submerged waters and lands that are necessary to operate the proposed project. HOT is asking for exclusive use of 8.65 acres (376,990.8 square feet) of the 247-acre/1 square kilometer project site/lease area. This figure was calculated by computing a 100-foot/32 meter radius footprint from each of the twelve oceanspheres buoys. HOT notes for safety all fisherman and boaters be kept 100 feet from each of the twelve oceansphere's buoy. Fisherman will be allowed to fish around the oceanspheres but not directly above or below them. No swimming or SCUBA diving would be allowed in the 247 acre ocean project site/lease area

#### *Location*

The project site consists of a 247-acre area that is square shaped located 2.6 nautical miles/3 miles due west of Malae Point, North Kohala, Island of Hawaii. The Distance between the proposed site's four corners is approximately 3,200 feet. The four corners of the project area are: 20°05'53.72" N 155°55'55.68" W; 20°05'53.72" N 155°55'24.36" W; 20°05'26.04" N 155°55'24.36" W; and 20°05'26.04" N 155°55'55.68" W. The center point of the area is located at 20°05'40.00" N 155°55'40.00" W. The depth at the center of the site is approximately 1,320 feet deep.

#### *Oceanspheres*

Twelve (12) oceanspheres (referred to as "platforms" in the EIS) will be evenly distributed within the 247 acre project site. Each oceansphere is 165 feet (54 meters) in height and 165 feet (54 meters) in diameter. The center of the oceanspheres will be held at a depth of 180 feet depth (53 meters) below the water surface. The tops of the Oceanspheres will be held 65 feet (21 meters) below the sea surface (**Exhibit 4**).

Oceanspheres will be constructed of an anodized aluminum frame/High Density Poly-Ethylene (HDPE), and covered in taut, anti-fouling netting (Kikkonet mesh netting, polyethylene Dyneema fiber). Entry into the oceansphere is via zippered openings. The oceanspheres have less than a 30% surface area footprint (solid surface), 70 % of the current will pass through the oceansphere. The oceanspheres are self-contained, spherical, and contain no mooring lines. Internal cage volume is estimated to be ~40,000 cubic meters to 82,406 cubic meters.

Each oceansphere includes: 1) a surface buoy (includes power generator, automated feed dispenser, GPS receiver, telemetry, radio controlled telemetry, antenna, warning light, Automated Identification System (AIS); 2) a buoy mooring (feeding tube, electric cable); and 3) hydro acoustic sensors, transducers, feed dispenser port, tunnel thrusters.

Oceanspheres will be capable of submerging to preprogrammed depths and staying in position via the: 1) *OTEC* propulsion system or biofuel engine; 2) Dynamic Positioning System (DPS) comprised of a Satellite Global Positioning System (GPS)/Inertial Navigation System (INS) and 24/7 land-based radio telemetry control; and 3) shielded electric tunnel thrusters.

Buoys and navigational lights (visible up to two (2) miles) will mark the oceanspheres. The feeder buoy and accessory antennas will be the only visible portions breaking the surface.

The oceanspheres will employ low rpm high torque thrusters that will produce low frequency noise at less than 70 db at 1m (*m=mile*). Originally, the applicant notes in the FEIS the figure was 100 db at 1m. The surface buoys and power generators will not generate noise levels: 1) over 50 dba during the daytime (7AM to 10PM) and 45 dba at night (10 PM to 7 AM) outside the project site; or 2) result in maximum instantaneous noise levels that exceed 70 dba during the daytime and 65 dba at night. Oceanspheres will never exceed 160 dB re 1 mPa at 1 m.

### *Species Selection*

The applicant intends to culture yellow fin (*Thunnus albacares*) tuna and bigeye tuna (*Thunnus obesus*), known as Ahi (**Exhibit 5**).

### *Operation Plan*

Each oceansphere is modular. The self-contained central stem, buckyball spherical hexagon, and pentagon panels will be brought to the project site via boat and assembled by divers in the ocean.

Twelve (12) oceanspheres would be deployed over a period of four (4) years; HOT expects to be fully operational by 2013:

- Year 2010 = one (1) oceansphere - total 1 oceansphere;
- Year 2011 = two (2) oceanspheres - total three (3) oceanspheres;
- Year 2012 = four (4) oceanspheres - total seven (7) oceanspheres;
- Year 2013 = five (5) oceanspheres - total twelve (12) oceanspheres.

### *Species Cultivation*

HOT proposes to stock the twelve oceanspheres with either yellowfin tuna (*Thunnus albacores*) or bigeye tuna (*Thunnus obesus*). Fingerlings for both species will be grown from eggs collected from two (2) to six (6) captured broodstock. Females can produce up to 3,000,000 million eggs under the "right conditions." HOT should be able to use the broodstock to produce enough eggs to stock the entire production. HOT notes less than 1/2 of 1% fingerlings will survive. A second way eggs may be harvested from tuna is called "stripping at sea" or "larval rearing." Fisherman or a biologist (accompanying fisherman) would harvest eggs and sperm from tuna for HOT, where they would be transferred to a laboratory to grow fingerlings.

Fingerlings will be grown at the PARC center or future NELHA tuna hatchery in Kailua-Kona. HOT notes the PARC center in Hilo has a permit for research and development to take 85 tuna to use as broodstock.

### *Stocking Density*

Stocking density will be less than 1 fish per 4 cubic meters. The applicant expects that 20,000 100 pound tuna will be stocked per cage. When all twelve oceanspheres are deployed the average total biomass for the farm will be 2,016 tons of ahi with an average tuna size of 32 pounds after 6 months of growth. Each oceansphere will be stocked annually; stocking will be staggered every two months. Once fingerlings reach twelve inches (12) five (5) pounds they will be transferred

via boat to the oceanspheres. Fingerlings will be contained in the oceanspheres with internal netting. The grow-out of fingerlings may take 4 to 6 months and are identified in this stage as the "right size" when the fingerlings will be able to eat pelletized food (size may vary depending on when tuna are weaned).

*Fish Feeding:*

Feed will be replenished every two (2) weeks. Automated feed canisters will be located in the surface buoy. Feed will be dispersed down the oceansphere via a feeding tube built into the stem of the oceansphere.

*Fish Food:*

To grow a 100-pound tuna approximately 200 pounds of dry feed is required. One thousand (1,000) tons (900 metric tons) of feed stock per month will be required when fully operational by 2013. HOT will purchase dry feed from a supplier and store it at Kawaihae Harbor. HOT will specify the content of feed and quality standards, but the feed source will be determined by the supplier. A fish feed vendor has not been selected thus the specific components of fish meal, and fish oil is unknown. There are no plans to use GMO soy. HOT plans to follow the National Organic Standards Board for organic aquaculture. Local farmers will be retained in the future to supply fish based feed stock with a byproduct of bio-diesel production. Feed will be inspected by the Hawaii Department of Agriculture (DOA) before being fed to tuna. Fish pathologists from HIMB will also inspect feed for the presence of pathogens (if required).

*Cage Production:*

Single oceansphere production is estimated at 1,000 tons of ahi per year. Total annual production capacity for the open ocean aquaculture farm is estimated to be 6,000 tons (5,443 metric tons) per year of either Yellowfin tuna or bigeye tuna. HOT notes bigeye tuna is a more desirable product - it fetches \$14.00 per pound versus \$8.00 to \$9.00 per pound of yellowfin tuna at the market. This is based on a schedule of harvesting six (6) oceanspheres per year. Annual production schedule is expected at 1,000 tons of ahi by 2011, 3,000 tons of ahi by 2012, and 6,000 tons of ahi by 2013.

*Harvesting:*

Fingerlings are expected to reach harvest size within one (1) year. Harvesting will occur when the tuna are 100 pounds. Prior to harvesting the oceanspheres may be sent into deeper and colder water (328 feet/100 meters for yellowfin tuna and 656 feet/200 meters for bigeye tuna) to maintain sufficient dissolved oxygen levels to increase fat content. Tuna will be harvested at sea, placed on ice, shipped to Hilo or Kawaihae Commercial Harbor, and shipped to existing fish processing/packaging vendors. Tuna will be sold to US mainland (California) and Japan markets, and local Hawaii markets.

*Fish Health:*

University of Hawaii, Hawaii Institute of Marine Biology (HIMB) fish pathologists will monitor the tuna's health and diagnose morts (dead fish). If disease is present guidance will be sought from HIMB fish pathologists or the DOA, Aquaculture Development Program (ADP), Disease Management Program. Diseased Tuna will be removed from the oceansphere.

*Work Hours & Office Operations:*

Work hours will be 6 AM to 6 PM daily, with 24/7 on-call monitoring of oceanspheres. Two boats will be used to travel to the oceanspheres Monday through Friday. HOT is proposing locating its operations (office operations, communications station, maintenance duties, equipment, three (35 foot) boats, and 22 jobs (1 site manager, 3 oceansphere operators, 1 operations coordinator, 5 seaman, 3 biologist, 4 divers, 5 laborers) at Kawaihae Harbor. Kawaihae Harbor is a man made port (constructed between 1960-1970) and is located along the leeward coast of the island.

*Oceansphere Maintenance:*

Scuba divers will be deployed *daily* to observe, record, video feedings, and monitor tuna behavior and health. Unmanned water robots (Seabotix) will be used to remove the morts. Morts are estimated to be 1 % per stocked cage. HOT notes the project site is 3 miles from land and less protected from storms and dangerous sea conditions. During this time morts could increase, and the length of time morts remain in the oceansphere may increase which may attract sharks. HOT notes DAR will be consulted if the removal of sharks becomes necessary.

Fouling growth on the oceanspheres is scheduled to be cleaned *as needed*. Growth will be air dried above the water for 4 hours in sunlight, allowed to fall into the water, will be eaten by fish in the area or decompose as it falls through the water column. Marine benthic fauna (bivalves - mussels, oysters, corals, sea urchins, nudibranchs, sponges) would be scraped off the oceansphere (and may fall) to the bottom to become part of the general benthic processes of detritivores and decomposers in the soft substrate of the deep sea.

Maintenance and repair of the buoy or oceansphere will be scheduled once a month. Periodic repairs will take place on site. The oceanspheres will be disassembled annually at the project site, and transported via boat to Kawaihae Harbor.

*Possible Oceansphere Failure:*

The oceanspheres will be monitored 24 hours a day. Malfunctioning oceanspheres will: 1) remain at depth; 2) deploy a deep sea anchor; and 3) send a distress signal via radio telemetry system. The oceanspheres are positively buoyant so they will surface. If the propulsion system (engine) fails the backup system (*consisting of the batteries located in the buoy*) will radio and dispatch, via satellite, the oceansphere's velocity, speed and direction to the shore based control station (*Kawaihae Harbor or Kahua Ranch*). Each oceansphere will have broadcast radio identification tags. If difficulties (*oceansphere malfunctions, poaching*) arise the US Coast Guard (USCG) will be notified. A salvage crew would be dispatched from Kawaihae Harbor or Honokohau Harbor to retrieve the oceansphere(s). With a total systems failure, it is estimated through current data study with a one (1) knot current that the oceansphere will move less than one (1) mile per hour in a northwest direction (passing south of Oahu).

*Collision:*

The Monitoring Plan will include a record of interactions between marine wildlife (i.e. whales) and oceanspheres. HOT will adhere to federal recommendations regarding collision (ship strikes). The NOAA fisheries (marine mammal stranding hotline) will be called if needed.

*Emergencies:*

All workboats will have an Electronic Position Indicating Radio Beacon (EPIRB) and/or a Very High Frequency (VHF) radio on board. The USCG, Division of Boating and Ocean Recreation (DOBOR), and/or Division of Conservation and Resources Enforcement (DOCARE) will be notified if casualties (capsizing, groundings, falls overboard, falls on board, injuries on vessels), diving injuries, shark incidents, and/or nautical emergencies occur.

*Waste Management:*

The applicant encourages local vendors (local cattle feed, nutraceutical industries) to use fish byproducts/offal; the waste products are a rich source of protein and omega 3 oils.

**POTENTIAL IMPACTS AS REPORTED BY THE PROJECT APPLICANT:**

HOT's FEIS notes there are no unresolved issues that have not been addressed through: 1) the project design; 2) operational protocols; 3) best management practices (BMP); and 4) mitigation.

HOT discusses the relationship between local short-term use of the environment and long-term productivity. According to HOT, short-term damage to the environment relating to the proposed project would be limited. No significant impacts were identified that could not be mitigated to a less than significant level. Long-term productivity of the environment will not be lessened by the proposed project. Ongoing environmental monitoring will be done to ensure protection of the environment. The long term productivity of the open ocean aquaculture industry would be enhanced by the proposed project, which would meet the high market demand of fish, by providing a sustainable source of high quality, pure, clean tuna through open ocean aquaculture. The proposed project is designed to meet these production goals, enhance the quality of life and welfare of its staff, and the quality of the natural environment.

HOT discusses the irreversible and irretrievable commitments of resources. HRS 343 requires an analysis of the extent to which the proposed project's primary and secondary effects would commit nonrenewable resources to uses that would be irretrievable to future generations. Implementing the proposed project would require committing both renewable and nonrenewable energy and material resources (vehicles fuel, boat fuel, water increase, power increase, resources necessary to maintain and operate facilities for staff, increase in local resources required to support the staff and their families) for open ocean aquaculture operations

However, HOT notes there will be no irreversible or irretrievable commitment of natural resources to this project. Staff recommends that any lease for this type of project require any lessee vacating an ocean lease to remove all equipment and to restore the site to its original condition. The lessee should also be required to purchase comprehensive insurance for recovery and removal of any lost or damaged farm materials, and for any other damage that might be inflicted by the farm.

### **PROJECT ALTERNATIVES:**

HOT considered three (3) alternatives: 1) Alternative # 1 - located 2.6 nautical miles/3 miles offshore Malae Point, North Kohala (preferred alternative); 2) Alternative Site # 2 - located 2.6 nautical miles/3 miles offshore Keahole Point, North Kona Coast; and 3) No Action Alternative.

Malae Point was selected as the preferred due to the following reasons: 1) continued research; 2) stakeholder meetings; 3) user surveys (limited use of public/low chance of finding vessel in proposed area); 4) public outreach comments; 5) infrastructure considerations; and 6) proximity to Kawaihae Harbor. The Keahole Point site (Alternative Site 2) was not pursued for several reasons: 1) greater distance work vessels would need to travel to Keahole Point from Kawaihae Harbor; 2) greater fuel costs; 3) greater wear and tear on boat vessels; and 4) potential for user conflicts due to the higher number of vessels using the area. The No Action Alternative was not chosen, as it would not enable HOT to achieve their sustainable aquaculture production.

### **PUBLIC NOTICES AND INPUT:**

Notice of the application was published in the West Hawaii Today and Honolulu Star Bulletin newspapers on February 13th, 20th, and 27th, 2009, which invited the public to comment on the proposed project by April 9, 2009. Also, pursuant to Chapter 183C, HRS, and Chapter 13-5, Hawaii Administrative Rules (HAR), a Notice of Public Hearing was published in the Hawaii Tribune Herald on March 14, 2009, in the Honolulu Star Bulletin on March 14, 2009, and in the West Hawaii Today on March 24, 2009.

A Public Hearing was held at 6 PM on April 14, 2009 at the Hamakua Macadamia Nut Company, 61-3251 Maluokalani Street, Kawaihae, Island of Hawaii.

Approximately 18 individuals attended the public hearing. Of those in attendance 16 were in support, and 2 had questions regarding the proposed project. Major issues discussed during the public hearing included job opportunities for Hawaii residents, engine technology, tuna spawning, research and training opportunities, fish feed content, feeding fish genetically

modified soy - how will affect tuna and will tuna be considered organic, affect wild organisms in the ocean from algae to larger species, difference in taste of genetically modified tuna versus wild caught tuna, impact to wild fish stock, potential for disease, operation plan to remove mortalities, reintroduction of tuna into open ocean, use of antibiotics, and fish escapes. Staff notes HOT has addressed these concerns in the response comment letters (see below) and in the FEIS.

### **SUMMARY OF WRITTEN COMMENTS:**

The Office of Conservation and Coastal Lands (OCCL) requested comments from the following agencies regarding the proposed project: Department of Land and Natural Resources (DLNR) – Division of Aquatic Resources (DAR), Division of Forestry and Wildlife (DOFAW), Division of Conservation and Resource Enforcement (DOCARE), Historic Preservation Division (HPD), Division of Boating and Ocean Recreation (DOBAR), Engineering Division, Division of State Parks (DSP), and Hawaii District Land Office (HDLO); Department of Health (DOH) - Environmental Planning Office, Aquaculture Development Program, Department of Agriculture (DOA), Department of Accounting and General Services (DAGS), Department of Business, Economic Development and Tourism (DBEDT) - Energy, Resources & Technology Division, Office of Planning (OP), Department of Defense (DOD), Department of Hawaiian Home Lands (DHHL), Department of Transportation (DOT), University of Hawaii (UH) - Environmental Center, Water Resources Research Center, and Office of Environmental Quality Control (OEQC); Office of Hawaiian Affairs (OHA); U.S. Fish and Wildlife Service (USFWS) - Pacific Islands Regional Office, National Oceanic and Atmospheric Administration (NOAA) - National Marine Fisheries Service, U.S. Army Corps of Engineers (USACOE) - Environmental Management Office, U.S. Coast Guard (USCG), Hawaii County- Council Members Yoshimoto & Hoffman, Fire Department, Department of Planning, Department of Parks and Recreation, Police Department, Department of Public Works, Department of Environmental Management, Department of Research and Development, Board of Water Supply (BWS), Sierra Club, National Resources Defense Council (NRDC), and Earthjustice, In addition, the Honolulu Advertiser, Honolulu Star Bulletin, Hawaii Tribune Herald, West Hawaii Today, Garden Island Newspaper, Maui News, Molokai Dispatch, and Senator Akaka, Senator Inouye, Senator Green, Representative Nakashima, Congresswoman Hirono, Congressman Abercrombie were notified of the proposed project. The following libraries received copies of the proposed project: Kailua-Kona State Library, Hilo State Library, Bond State Library, Thelma-Parker State Library, Naalehu State Library, Kahului State Library, Molokai State Library, Lanai State Library, Kauai State Library, Kaimuki State Library, Kaneohe State Library, Pearl City State Library, and Hawaii State Library.

Staff notes HOT responded to these written comment letters in a satisfactory manner. Substantive Federal, State and Public comments are summarized.

Division of Conservation and Resources Enforcement  
Division of State Parks  
Division of Forestry and Wildlife  
Hawaii District Land Office  
Hawaii County Department of Public Works

Hawaii County Police Department  
Hawaii County Fire Department  
Department of Hawaiian Homelands  
No comment.

Historic Preservation Division

We have no record of historic properties in this location.

Engineering Division

The National Flood Insurance Program does not regulate activities under water.

Hawaii County Planning Department (May 13, 2009 late comment letter)

The proposed marine lease is located in 2.6 nautical miles/3miles off Malae Point and is not within the counties jurisdiction. The proposed CDUA contains conflicting information (existing infrastructure versus new infrastructure) regarding the land base located within Kawaihae Harbor. Special Management Area (SMA) approval is required from our office for construction, pursuant to Planning Commission Rules of Practice and Procedure, Section 9-8.

*Applicant Response:* HOT notes in the FEIS if no building at Kawaihae Commercial Harbor (zoning is MG-1a) is available for lease, we will need to lease undeveloped land at the harbor, and construct an office and storage areas; new construction will require SMA approval and building permits from the planning department.

Hawaii County Department of Environmental Management

Submission of a Solid Waste Management Plan will be required for the project.

*Applicant response:* HOT will comply with all County of Hawaii requirements for waste management; a solid waste management plan will be prepared and submitted.

Hawaii County Department of Research and Development

The DEIS acknowledges open ocean aquaculture is a relatively new technology and the scale of operation is quite substantial; the department recommends that an independent entity conduct the water quality monitoring to ensure compliance with the required National Pollution Discharge Elimination System (NPDES) Permit. Tuna are usually grown out in surface cages, rather than submerged cages, and the proposed cage technology is yet to be proven. If it is determined later a surface cage system will be used, a new environmental review should be required. The DEIS is not completely clear whether harvested fish will be processed by the applicant or by third parties. There was a lack of detail regarding the processing plant(s), its inputs (labor, power, freshwater, etc.), its effluents, and by-products. The operation may produce over 2,000 tons of offal per year. There is substantial opportunity for the material to be furthered processed into fishmeal or fertilizer.

*Applicant Response:* HOT is willing to contract with an independent third party laboratory to conduct water quality monitoring to assure compliance. Components of our technology have been proven in other industries: 1) oil industry - oil drilling platforms are unmanned and kept in geo-static position using similar techniques; and 2) U.S. Navy - variety of unmanned underwater

vehicles and buoy observation stations using similar telemetry systems to keep their buoys on station. Catch and fatten tuna operations have high stocking densities and may encourage disease and escapes. It is highly unlikely we will shift our technology focus in that direction. However, a new environmental review will be undertaken if HOT proposes to change to a catch and fatten system. We intend to contract with a HACCP approved fish processing facility in Kona. Waste stream, consisting primarily of guts and gills, represents about 20% of the total body weight or 1,200 tons per year. We have asked the fish processing company to work with other local businesses to reuse this valuable by-product for cattle feed, bio-diesel (if such facilities are built by then), or possibly processed into nutraceuticals (including Omega 3 and 6 fatty acids) which can be used to supplement our own fish feed. No waste will be introduced into Big Island landfills. We have a letter of intent from a local cattleman's association as well as verbal requests from ranchers in North Kohala for by-products.

Department of Accounting and General Services

The proposed project will not impact any DAGS projects or existing facilities.

Department of Business, Economic Development & Tourism/Office of Planning

A Department of the Army Permit (DOA) permit and a Coastal Zone Management (CZM) Program, federal consistency review will be required. OP asks that the Final EA provide a discussion on how the proposed activities and actions are consistent with CZM objectives and policies. Commercial and sport fisherman should also be asked to comment on the project.

*Applicant Response:* The Army Corps of Engineers will determine if a federal permit is required as the oceanspheres are geostatically positioned vessels, and will not be tethered to the ocean floor. The FEIS discusses how the proposed activities and actions are consistent with CZM objectives and policies. HOT has consulted fishermen, fishing organizations, attended the West Hawaii Fishery Council meetings, and Kawaihae Local Resource Council meetings. We will continue to meet with commercial and sport fishing organizations.

Department of Health/Clean Water Branch

DOH notes: 1) read the DOH website standard comments; 2) any project and its potential impacts must meet the antidegradation policy (pursuant to HAR, Section 11-54-1.1), designated uses (pursuant to HAR, Section 11-54-3, c), water quality criteria (pursuant to HAR, Section 11-54-4 through 11-54-8, 3) if impaired state waters are listed in the Clean Water Act section 303(d) list of impaired water bodies in Chapter IV; 4) types of wastewater discharge not covered by an NPDES general permit may require a NPDES individual permit; 5) regarding PARC, if there are discharges of process wastewater associated with hatchery activities to State waters an NPDES individual permit maybe required; and 6) discharges related to the project construction or operation activities must comply with Water Quality Standards (regardless of whether NPDES permit coverage and Section 401 Water Quality Certifications are required).

*Applicant Response:* The operations will not cause degradation to the surrounding water quality. The project meets the antidegradation policy, designated uses, and water quality criteria. The FEIS discusses the effluent model, and the resulting water quality parameters are compliant with water quality standards for Class A marine waters. There are no impaired water bodies that will be affected by the proposed project. HOT notes DOH, CWB requires a revised NPDES Permit

and Zone of Mixing (ZOM) permit (pursuant to Federal Clean Water Act, Section 402, HAR 11-55). A NPDES permit application will be submitted to CWB. As part of the NPDES the required WLA implementation and monitoring plan will be prepared. If required, we will prepare and submit an NPDES individual permit. The project will consult CWB to determine if a separate NPDES is required for PARC. We understand all discharges from project construction and operations must comply with Water Quality Standards.

#### Department of Transportation

Kawaihae Commercial Harbor berths and operational areas are congested. Project requirements should be addressed in the Harbors Division Hawaii Island Commercial Harbors 2035 Master Plan. Please consult with DOT Harbors Division, Planning Section regarding the use of the state harbors.

*Applicant Response:* HOT has contacted and met with DOT staff (Ian Birnie - now retired District Administrator for Commercial Harbors); HOT will continue to work with staff on the progress of the project. HOT attended the meeting on May 20, 2009 for the 2035 Master Plan and presented the proposed project's requirements.

#### Office of Hawaiian Affairs

According to OHA: 1) there is agreement that local stocks of fish have been heavily impacted; 2) new approaches towards ocean resources must be advanced; 3) offers initial support for the project in theory; 4) looks forward to the project's presentation and analysis of it; 5) to consider the potential effect upon wildlife and aquatic life (protected species) of the surrounding area; 6) the monitoring plan and management plan (marine mammals, sea turtles, sharks) should be presented in the CDUA and the environmental review otherwise potential adverse effects and their associated mitigations cannot be assessed; 7) to elaborate on why there are few conceivable ways for the proposed action to negatively impact rare, threatened, endangered, or protected species (whales, dolphins, monk seals, turtles) so OHA and the state can perform their constitutional and legislative duties; 8) when developing the shark management plan, the measures to keep the sharks away from working divers must be culturally appropriate; 9) to consider setting a percentage of the harvest to the sell to local markets; 10) to consider replenishing local stocks of tuna with mature, breeding fish; and 11) we see the proposal's potential.

*Applicant Response:* HOT notes public access is important; fisherman will be allowed to fish within the lease area so long as they adhere to the 100-foot safety zone. The EIS disclosed this fact and HOT will pursue a policy of full disclosure to the public. The EIS and CDUA include initial monitoring and management plans for marine mammals, sea turtles and sharks; the management plan was expanded in the FEIS. A comprehensive management plan (adhering to DAR and federal agencies) will be established and implemented upon approval. The FEIS expanded on impacts on protected species. Shark safety will be part of the BMPs. HOT will provide 10% (or one fifth to the annual consumption rate of high quality tuna in Hawaii) of our annual harvest to the Hawaii market. HOT is sensitive to not having a negative impact on the local fishing industry. Hawaii imports 80% of the seafood we consume. Current NOAA and DLNR guidelines indicate we cannot release aquaculture fish to the wild. Should these guidelines change HOT will work closely with DLNR/DAR to replenish yellowfin and bigeye tuna local stocks.

Department of Agriculture/Aquaculture Development Program

HOT proposes a forward thinking project and has the potential to significantly impact Hawaii's economy. HOT's EIS fulfilled what was requested by various state and federal representatives at the two scoping meetings. HOT's community outreach program is very impressive. ADP strongly supports the project.

*Applicant Response:* HOT is grateful for the advice and support provided by staff. Thank you for agreeing the DEIS has fulfilled state and federal agencies requests that participated in the scoping meetings. Mr. Tarnas has done an impressive job of supporting our community outreach efforts and communicating well with our stakeholders. We look forward to working with the ADP, we consider ADP to be a valuable resource for helping grow the Hawaii aquaculture industry.

Department of Defense/Office of the Director of Civil Defense

The potential natural hazards have been acknowledged and that appropriate mitigation measures have been considered in preparing for any future incident.

John J. Patterson

I support HOT's DEIS, CDUA, permit issuance, and request for ocean lease which will allow them to commence operations. As an investor I hope the enterprise will one day become a profitable entity. There are a number of reasons that influenced my decision to invest in this particular venture. There is a significant decline in the seafood protein available from our oceans. There is significant increase in the demand for affordable seafood protein worldwide. HOT can begin to help this imbalance in a sustainable and environmentally neutral manner. The operation will benefit Hawaii citizens, provide steady employment, and employ suppliers.

*Applicant Response:* HOT appreciates your investment in the company and your continued support of the business; one day it will become the profitable enterprise we all envision. Thank you for acknowledging the driving factors influencing your investment (decline in seafood protein from our oceans, the significant increase in world demand, need to address imbalance through economically sustainable and environmentally responsible fish farming). We agree that the project will benefit the citizens of Hawaii in many ways (employment, contracting with existing businesses, generation of state tax revenues through successful revenue generation).

David Bangert Pd.d/John Wiltshire PH.d

Hawaii needs a sustainable and environmentally respectful way to use our vast ocean as a resource, to contribute to the overall state economy, while being culturally appropriate. The project addresses the need to meet worldwide growth in demand for seafood protein without harming the environment. Hawaii's ocean lease law was established to enable companies (HOT) to conduct business. Give the law a chance to work, help this company succeed. Fish farming is a good business to support in Hawaii; we need the jobs the business will create. The proposed project is the right kind of use in these conservation lands in the ocean; I encourage DLNR to accept the CDUA for HOT. The DEIS is comprehensive and complete. DLNR is correct in its FONSI. We are surrounded by the ocean; it is only used for commercial and sport fishing, transportation, and tourism. It is time to farm the ocean like we farm the land. HOT uses the

ocean instead of Hawaii's scarce land resources to produce food in an environmentally friendly way. HOT will help strengthen Hawaii's bio-security by producing a food source locally; not depend on imports to satisfy local demand. The project will have a safe source of fresh seafood grown under strict US laws. Hawaii's seafood exports have suffered from the rising cost of fuel and dwindling amount of tuna caught in Hawaiian waters. Commercial fisheries are experiencing serious decline, including tuna fisheries. Hawaii imports 70 percent of its food; it is about time that we become more self-sufficient. The proposed project offers a way to produce high quality tuna without putting more fishing pressure on the wild stocks of fish. HOT will use wild ahi as broodstock grown to market size. I am proud to support this social enterprise with funding. I support the plan; the company is using ocean thermal energy conversion to reduce the cost of putting food on the table. The technology that HOT proposes is exciting. Hawaii can become a leader in open ocean fish farming. Hawaii's maritime industry has slowed down and the proposed project will boost business. HOT proposes to locate its operations far from shore to allow the project to avoid potential conflicts with fisherman, boaters, recreation.

*Applicant Response:* As a member of our board of advisors, you have intimate knowledge of our planned operation. Your comments are meaningful regarding HOT's plans to provide a sustainable and environmentally respectful way to use our vast ocean as a resource that contributes to the economy of Hawaii is meaningful. It is encouraging as a scientist and ocean engineer you favor our technical approach while understanding the economic and social pressures forcing companies to find innovative ways to farm the ocean. Hawaii produces world class professionals (marine scientists, ocean engineers) to give us the opportunity to employ the best and the brightest minds to meet the challenges ahead. HOT agrees Hawaii's ocean lease law gives the state a unique opportunity to develop a business: 1) that can provide a local source of food; and 2) that can develop technology for offshore open ocean fish farming that can be used throughout the world. We appreciate your support and look forward to your continued role as a company advisor.

William N Jardine

I have been an active participant in most every ocean activity along the Kohala coast. I am an active sport fisherman; I own the Kakalina. As an offshore fisherman I am aware of the decline we have seen in ahi numbers and size. Large harvesters of these roaming fish populations gradually decimate these wild populations. Anything we can do to take pressure off these wild populations will be helpful in maintaining the health of the pacific fishery. Having a reliable supply of market size fish will create an efficient stream of useful product to the restaurants and hotels as well. Under today's conditions there is so much waste having to deal with fish that is either too small or far too big. I have a BA from Cornell and maintained an active interest in: 1) Big Islands agricultural struggles; and 2) the pristine ocean environment. Mankind has to do what mankind has to do to feed itself. Push comes to shove, a democratic society will always vote for its own immediate self interest. When it comes to food there is no question society will do what it has to do to create and maintain a high-quality food supply. It is a good thing for the public to support the proposed project. We should be doing all we can do to support early efforts. The farming venture has gone to rigorous lengths to satisfy every conceivable concern leaving little in the way of responsible protest. The area selected is replete with a current swept seafloor, holding comparatively few resident populations, and seems to be a high quality location for farming enterprise. I like the fact the operation is Hawaii-based; it may peak children's interest

growing up. I like the advanced technology; I have confidence that once underway it will improve by leaps and as all technology does. I hope you will consider this written testimony in your deliberations. Folks like me are not inclined to write letters and stir things up, while those members of our society opposed to new developments are far more inclined to broadcast their views and promote the fallacy that they represent the common man.

*Applicant Response:* As a sport fisherman, I am glad that you understand the severe decline of ahi (number, size) and the impending decimation of ahi. HOT agrees ahi farming is one way to take pressure off the fishery, and improve its health. We appreciate you see the future potential of the project; it will help meet the growing demand for seafood. Hawaii is the best place in the United States for the project; Hawaii is the only state with a legal regulatory infrastructure (high environmental standards) for a high quality fish farming operation. We look forward to employing local students (aquaculture, etc.), and training them in the technology and aquaculture techniques so Hawaii can continue to be the world leader in open ocean aquaculture. HOT can show the world it can be an economically sustainable and environmentally responsible ways to farm the ocean.

Herbert Richards

I served as a manager of Kahua Ranch; the ranch owns the land of Kiiokalani ahupuaa and the coastal lands at Puaiki. HOT proposed use (aquaculture) of the ocean areas off Malae Point is consistent with the area's CD designation, and its surrounding land use (ranching). Because almost 3 miles offshore the visual impacts won't be a problem for anyone on shore. It'll look like a few more boats in the area. The proposed project advances goals set for aquaculture development that are part of the state's plan for agriculture in Hawaii. Aquaculture is why the ocean leasing law was passed by the legislature. HOT's project is the next step in food security for Hawaii to produce its own seafood; it is safe, environmentally friendly, and not reliant on wild fish harvesting to meet the market demand for fish. HOT will provide needed jobs (local area) which are important during these tough economic times.

Natural Investments LLC/Michael Kramer

I represent clients who are investors. I am in favor of approval because: 1) the facility will be far offshore it will not pose negative environmental impact(s) (increase nitrogen, negatively impact reefs, attract sharks), that can be found in shore tethered aquaculture farms; 2) HOT is a deep sea water cage offshore that will not impact the shoreline; 3) the use of renewable energy; 4) no impact on the ocean's availability of wild ahi; 5) cultivation of mercury free ahi; and 6) it is the right kind of use of these conservation lands in the ocean. Fish supplies are dwindling, we need this resource to provide high quality of fish. We need to provide HOT with a lease to allow it to operate. HOT addresses the need to meet worldwide growth in demand for seafood protein without harming the environment. I encourage DLNR to accept the CDUA. The DEIS is comprehensive and complete; DLNR is correct in its FONSI.

Charles Wilson/Linda Wilson

I support HOT; I am a small business owner and Big Island resident. Business are struggling on the Big Island due to Wall Street collapse and drop in tourism. HOT project will stimulate the local economy; especially for mariners like myself. The project is: 1) good for the world's population food demand; 2) good for the local economy; and 3) environmentally sound. There

will be a significant growth in jobs and taxes paid to the State of Hawaii. I believe the production of food source is a big reason for the project. Our harvest is the ocean in Hawaii that is sustainable and equally important will increase future fish stocks. Now is not the time to sit on the project and study it to death. It is time for action. HOT provides vast opportunity (food, jobs) and is supported by scientific studies and ongoing research.

*Applicant Response:* HOT's project will create jobs, marine service contract(s), and generate tax revenues. You understand the need to develop environmentally sound ways to meet the world's increasing demand for fish protein. Our objective is to create an environmentally responsible, economically sustainable way to produce seafood, and reduce the pressure on wild fish stocks into the future. Hawaii has the only regulatory infrastructure designed to allow HOT to obtain permits and ocean lease in Hawaiian waters. HOT is built on years of research. The experience of two other open ocean fish farm operations have demonstrated HOT will have no significant negative impacts on the environment.

Virendra Nath - UH angels

I am an investor of HOT. I realize the first mover advantage is crucial to business success. In 25 years, fish (ahi) farming will be done in many places in the world and will be no different than agriculture or chicken raising. The world lives close to coastlines and depends on fish proteins to survive. The increase in world population, and increase in health standards around the world would place an unsustainable burden on fisheries (worldwide). HOT current business plan is sustainable on its own as a producer of high quality ahi tuna. This is a perfect plan and opportunity for Hawaii. Hawaii has the chance to become the next Silicon Valley of large marine aquaculture. Hawaii will become the center for research and development, and the source of capitol and entrepreneurship. HOT can also become a central player in the export of marine technology; 1) farms will need help setting up, equipment, and technical support. I can foresee when HOT: 1) products and technology are licensed to parts of the world, creating a great entrepreneurial, and technical/scientific jobs in the Hawaii; 2) as a branding possibility that the that the best ahi come from Hawaii. A cursory review of the application and request for license would show the plan has no negative impacts (land, ocean) and is sustainable on its own merits. Some will reflexively oppose the license request; that is their right. Fisherman or fishing communities livelihood will not be affected. The farm will be far offshore. Marine aquaculture has been well tested, is sustainable, and will create a better product. The request for a license meets the required laws on the book. Please approve the DEIS so that the company can get on with the business of producing ahi, and building its technology to export to other growers around the world.

*Applicant Response:* We appreciate your support of HOT, and your understanding of why HOT is important. Your investment in HOT helps to provide capital that will allow us to achieve the vision that Hawaii is the "Silicon Valley of Aquaculture." HOT appreciates your understanding about the technology, how it has been well tested (other marine applications), and is ready to be applied to aquaculture. We have grasped the trademark, "King Ahi" (as a branding opportunity) which will stand for a product of superior quality much like "Kona Coffee." HOT looks forward to demonstrating our approach to open ocean aquaculture will: 1) have no significant negative impacts; 2) provide employment; 3) utilize contract services; and 4) increase tax revenues from sustainable company revenues.

PARC Aquaculture Education Specialist/Adam Daw and UH Hilo Tropical Conservation and Environmental Science Masters Program/Sierra Tobiason

I would like to continue working on HOT's project and live on the Big Island. Please consider the economic consequences involved to Big Island residents in refusing HOT lease. The project will help Hawaii in many aspects: 1) produce own food locally; 2) minimizing reliance on foreign imports and wild tuna stocks; 3) expand the local and state economy (add jobs, revenue); and 4) serve as a current and future model for sustainable and environmentally friendly aquaculture.

*Applicant Response:* HOT is devoted to creating quality jobs in Hawaii for students in ocean science/environment. We are concerned about the need to diversify the economy in Hawaii; especially as it pertains to supplying the state with sustainable sources of quality seafood protein. This is a global problem, and where Hawaii has a competitive strategic advantage due to our vast ocean surroundings and technical expertise, especially in aquaculture.

David Kopra

As a Merchant Marine, diver, fisherman, kayaker, and coastal user, the water off of Malae Point is ideal for an open ocean aquaculture project. The project site will not hinder the safe passage of fishing vessels or charter vessels; there is adequate sea room to transit the site. The site will become an attraction and point of interest; drawing attention as the most technologically advanced aquaculture project - it will stimulate the local charter company. I encourage more industry development within the harbor. This will help upkeep the financially strained Harbor's Division. The commercial capacity of the harbor is not realized, and the addition of more vessels utilizing the harbor will not hinder current operations. If the project advances we could: 1) create immediate maritime industry jobs; 2) training for open ocean aquaculture professionals; 3) expose Hawaii students to aquaculture industry; 4) develop and train community individuals; and 5) help find youth jobs in the maritime industry. The world is plagued with hunger, land resources are dwindling, natural fish stocks in danger. The fisherman of the world can become farmers. Technology and techniques developed in the course of the project can benefit Hawaii and world. The world will start to farm the ocean again; let Hawaii lead the way. The DEIS is thorough, inclusive, satisfies questions about the project's impacts, outlines proper monitoring system critical to the operation, and is accurate in its analysis of coastal area.

*Applicant Response:* Your study of the DEIS demonstrates you have an understanding why the project is important to Hawaii, its youth, and the way it can meet the world's insatiable demand for seafood protein. HOT appreciates your: 1) experience/understanding as a maritime industry professional; 2) how HOT will have a positive effect on Kawaihae Harbor; 3) understanding of the proposed lease site; and 4) long term commitment to the community. Your support for the project will go a long way to helping HOT get the permits and leases. Through Hawaii's ocean lease law and environmental permitting process, our project can have a competitive edge in fulfilling the vision that Hawaii is the "Silicon Valley of Aquaculture."

Gregg Hirata

Hawaii ocean resources are used for commercial and sport fishing, transportation and tourism. We should be able to utilize the ocean for farming as it is done in an environmentally friendly way. The proposal will: 1) reduce fishing pressure on wild stock; 2) positively contribute to the economy in Hawaii by providing jobs; and 3) help Hawaii become more sustainable.

*Applicant Response:* HOT agrees the declining supply of wild stock will increase due to insatiable consumer demand. This form of agriculture can be done in an environmentally friendly way, and will positively contribute to the economy (provide direct and indirect jobs). Economic sustainability is our primary goal; we are convinced the size of our operation is key to achieving this goal.

Aquaculture Planning Advocacy LLC/John Corbin

Hawaii aquaculture companies lead the nation in commercialization of large scale offshore farming thanks to government supportive policies (State, Legislature) to expand and diversify Hawaii economy. Use of state waters is consistent with these efforts. The severe economy underscores the strong need to nurture aquaculture, which contributes to the resistance of recession and food security. A commercial-scale demonstration of the integration of these various systems (new combination of existing technology and new technology) would "open the door" to making the deep ocean environment more productive for society, and further Hawaii's leadership in aquaculture. There are environmental advantages of fish cage culture such as: 1) addressing concerns over transit via vessels; 2) mixing and assimilation of fish waste products; 3) minimizing concerns regarding wild stock impacts; and 4) safeguards with cage malfunctions. HOT has the potential to: 1) be economically beneficial to Hawaii; 2) create jobs; 3) revenues; 4) produce seafood locally and mainland markets; and 5) produce technological innovation.

*Applicant Response:* HOT agrees the State and Legislature have historically encouraged such projects. HOT agrees a successful demonstration of the innovative technology proposed will further Hawaii's leadership role, and "open the door" to making the deep ocean environment a more practical and productive marine farming location. HOT has: 1) endeavored to design a system and operating plan to address concerns regarding commercial and recreational vessels; 2) mixing and assimilation of fish waste; 3) creation of a "closed loop process" of securing tuna from hatchery to plate to minimize impacts on wild stocks; and 4) addressed malfunctioning consequence with a variety of backup plans and safeguards. HOT anticipates: 1) significant job creation (direct hires, contractors); and 2) taxable revenues (export of quality product). HOT has been careful to understand and address the cultural concerns of the community.

Department of Land and Natural Resources, Division of Aquatic Resources - late comment letter April 9, 2000

There are many aspects, which seemingly typify what an ideal offshore aquaculture venture, would be: un-tethered cages, autonomous feeding, energy production and propulsion systems, and the stocking of cages with cultured fish from locally captured wild brood stock. There are many technical challenges inherent in this project, and to the best of my knowledge there is nothing similar to it anywhere else in the world. In essence, as a production facility, there are a multitude of untried and untested aspects of this project. That being the case it would seem to be most prudent for the applicant to initially pursue this project as a proof of concept. I do

understand from the application that it is proposed to have the number of cages phased in over several years. I would recommend that the CDUA permit explicitly limit (e.g. 2 cages) the number of cages deployed. Furthermore, it would seem rational to have the cages on site for a period of at least 6 months without any animal or feed to test the effectiveness and reliability of the navigational, propulsion and communication systems as well as cage structural integrity. This trial period will also present an ideal opportunity to test the applicant's emergency response plan.

*Applicant Response:* HOT has reviewed a range of hardware that has been tried and tested (US NAVY, offshore oil drilling industry). All aspects of the systems structural design are available commercially off the shelf. HOT's goal is to adapt the technologies to fish production. We plan on conduct several tests of our methodology for the hatchery process and the oceansphere before tuna stock introduction. The technology path will include a phase where we will complete the lifecycle of the tuna from "hatchery to plate," using available grow-out technology (land tanks at PACRC or NELHA). After successful testing, a full-scale oceansphere will be constructed which will allow HOT to implement improvements in the technology and lessons learned. The full-scale oceansphere is planned to be the long-range workhorse for the project moving forward. HOT has engaged Science Application International to do an independent evaluation, report on optimal technologies to be considered, before the full-scale oceansphere is fully designed and implemented for sea trials. All system components will be thoroughly evaluated on the basis of marine capability, duration of operation, capex and overall long-term functionality.

DAR - late comment letter August 12, 2009

DAR notes HOT states food and nutrients would not reach the bottom due to the depth of 1,300 feet. DAR questions this statement without the relevant studies. If the surface did generate enough nutrients, waste, and/or feed to reach the bottom what will be the impacts? What are the bottom resources? 1,300 feet is the prime depth for *Corallium spp.* - if the substrate is hard there will likely be a reasonable chance of high diversity of deep-water fauna. This should be taken into consideration. Given the bottom slope of that region, how far away is the 100-meter contour? This should be considered as well. Keahole Point may not be indicative of the benthic structure at Malae Point. So, an assumption about the abundance of *Corallium spp.* based on Keahole surveys needs to be revisited. *Corallium spp.* typically have patchy distributions; visual surveys at the proposed site would be better than using a proxy.

*Applicant Response:* The objective of choosing the proposed ocean lease site in very deep water and directly in open ocean currents, the so-called "oligotrophic environment," allows for full mineralization of nutrients thereby preventing any effluent or feed from reaching the ocean floor. The perimeter of the proposed site is 2 miles from the 100-meter (50 fathom) bathymetry contour. The ZOM, current and eddy structure, and input (feed/effluent) of the proposed ocean lease site determine whether effluent will reach the seafloor. The Current Report, dilution model and associated impacts to the environment are considered in the EIS and CDUA. The dilution model notes that Water Quality Standards are met by the project - no effluent or feed will make it to the bottom; there will be no significant impacts to any benthic flora or fauna that may or may not be living beneath the ocean lease site. Precautions will be utilized (video monitoring, studying feeding events) to avoid excess feed. Tuna effluent is a semi-solid; it is easily diluted and mineralized. The dilution model, which is based on a ZOM to a depth of 492 feet, ensures water quality standards for open ocean waters will be conserved and full nutrient mineralization

will occur. The HURL report and Dr. Griggs research identified: 1) benthic flora and fauna on the slopes of the Island of Hawaii; and 2) likelihood of finding coral beds. A complete census of all known deep-water coral beds was conducted in 2000 and 2001 - dives focused on surveying off of Keahole Point known coral beds. In 2000, researchers surveyed 16,000 square kilometers of seafloor off Keahole Point (depth 1,181/360 meters to 1,591 feet/485 meters). In 2001, the team returned to the same area and surveyed 24,500 square kilometers of seafloor in 1,246 to 1,483 feet (380 to 452 meters) of water (Griggs 2002). No benthic macrofauna was observed below these depths and only a few bottomfish were seen during the dives. Two sets of two additional dives each were conducted at the Keahole Point bed in October 2004; focus was on paleoclimatology and macroinvertebrate-associated species. As with the 2000-2001 dives, deep sea corals occurred in sparse numbers and were confined to a specific depth. At depths below about 3937 feet/1200 meters the bottom consists mainly of sandy silty carbonate muds with occasional basaltic boulders. To summarize, the Pisces V observers found sparse numbers of benthic organisms at 400 meters and none below 800 meters.

**DAR Response to Applicant Response:** It is hard to comment on the water dilution and influence from the cages onto the benthic fauna. The applicant should address all sources of influence including scrapped material from the cage similar to the feed and feces models referenced. It is assumed the cages will need substantial cleaning from epiphytic growth that may reach the bottom below or down current of the cages.

**Staff Note:** The Pisces Report and research by Dr. Griggs focused on an area surrounding Keahole Point, which is located approximately 20 miles away from Malae Point.

#### NOAA/USFW

The USFW asked HOT to provide: 1) a full acoustic impact analysis of the engine's operations and proposed project's installation and operations of aquaculture project on marine mammals; 2) information on marking devices attachment (to the pens) to assess the likelihood of entanglement; 3) address concern regarding marine mammals hooking their teeth into netting, getting entangled, injured, or drowned; 4) increase likelihood of increased predation on bottlenose dolphins and sharks; 5) that the oceanspheres could act as a FAD and change (bottlenose) dolphins feeding behavior; 6) affect of the proposed project on cetacean species (spotted dolphins, short-finned pilot whales, pygmy whales and false killer whales); 7) explain how data from KBWF marine mammal monitoring program can be used to infer similar impacts would occur at the project site; and 8) how the project could result in alteration of certain marine mammals feeding behavior.

#### *Applicant Response:*

- 1) The oceansphere will employ low rpm high torque thrusters which will produce low frequency noise at less than 90 dB at 1 m. The Maintenance and Installation operations of the oceanspheres will use standard work boats with sound output levels of below 95 dB at 1 m in the frequency range of 20-500 Hz. oceansphere operations will not exceed the 160 dB re 1 mPa at 1 m. The work boats are in the small to medium class range and will not be operated at full speed during installation operations. This is also true of harvesting operations. The oceanspheres are not high speed vehicles and as a result will employ low rpm high torque thrusters which will not produce excessive noise levels. The oceansphere

will be constructed on the dock and towed out to the project site and deployed. It is anticipated that the construction of the oceansphere will not result in any increase in ambient noise other over the sound of a normal tug boat.

- 2) The surface buoy will be connected to the Oceansphere by standard roping used in open mooring systems and approved by the USCG. A single mooring is necessary to connect the Oceansphere to the surface buoy as described in the DEIS. Radio communication must be conducted in the atmosphere so a surface expression is required. There will also be power and data cables to connect the buoy and the Oceansphere will be held taut due to the prevailing current, the buoyancy of the buoy and the propulsion system in the Oceansphere. Because of this, the possibility of entanglement is extremely unlikely.
- 3) Hardened Dyneema® or Kikkonet rigid plastic net pen mesh will be used and represents no marine mammal entanglement threat.
- 4) The BMP goal is to avoid predator interactions. HOT will avoid contact with pelagic predators (i.e. sharks) by denying them a food source. The oceanspheres will be utilize by cage design, netting materials, video monitoring, wildlife monitoring and a reporting system to meet DAR/DLNR protocol. Use of the Dyneema® or Kikkonet rigid plastic net pen mesh should reduce the attractant nature of the farm, and reduce/eliminate breaches in the mesh.
- 5) HOT notes the following have been observed in the vicinity of KBWF: bottlenose dolphins, spotted dolphins, and rough-toothed dolphins. HOT summarizes KBWF impacts, mitigation measures, monitoring, reports, data collection, migration patterns, and interactions. KBWF notes bottlenose dolphins were attracted to KBWF by: 1) net pens acting as FAD, 2) occasional escape of fish when the net pens are opened; 3) divers interactions. As noted above, the oceanspheres design and materials, and operations procedures will deny dolphins speci a food source, and they will lose interest. The oceansphere will likely act as a FAD and would attract fish (ono and mahi mahi), and sharks, dolphins. However, the effects as a FAD are unknown as the time. Future HOT operations will include monitoring. Fish escapes (which may provide a food source) from the oceanspheres will be avoided by: 1) surfacing the cages during harvest and maintenance operations; and 2) oceansphere design divers will enter or exit directly into the Oceansphere. Oceanspheres will utilize Dyneema® or Kikkonet rigid plastic mesh to reduce the attractant nature of the farm, and reduce/eliminate mesh breaches.
- 6) Cetacean species (spotted dolphins, short-finned pilot whales, pygmy whales and false killer whales) were discussed in the DEIS. The proposed site is one mile from the HIHWNMS. There are no mooring lines, no flat walls, funnels, or bottlenecks in the oceansphere design; surface is taut mesh and is strutted to maintain tension on the net material; thus there are no entanglement risks. The oceanspheres present a hard rounded surface to animals which would deflect them in one direction or another; versus a flat wall or funnel which halt progress. To visually orienting marine mammals, the mesh would appear to present an almost solid surface. Whales will be able to move around the platforms due to water depth. As noted above, the oceanspheres design and materials, and

operations procedures will deny the cetacean species a food source, and they will lose interest.

- 7) HOT has learned from this KBWF experience and specifically designed the technology to solve the two main operational factors that attract dolphins, as previously described in #5 above.
- 8) The design of the Oceansphere is specifically to incorporate lessons learned from the KBWF experience with dolphins and the issue of provisioning these animals. By preventing escapes and reducing diver time outside the Oceansphere, the attractant nature of the Oceanspheres to dolphins will be substantially less. HOT will work closely with NOAA National Marine Fisheries Services Pacific Islands Regional Office, as well as DAR to update BMPs and monitoring and feeding protocols. Problems which arise will be evaluated and the regulatory agency responsible will be informed and consulted on the best way to change protocol to accommodate the effected species. The Oceansphere will be raised during maintenance operations and divers will enter from the surface, thus avoiding subsurface escape, which is identified to occur at the KBWF aquaculture site.

#### Form Letter 350+ Comments

I have significant concerns about HOT's DEIS for the proposed project off the Kohala Coast. The proposed lease site is three times the size of any existing ocean fish farming operation in Hawaii, and aims to produce 48 more times more fish than another local farm it claims to be similar to. HOT's DEIS fails to sufficiently address the effects of the proposed fish farm on: 1) wild fish populations; 2) conflicts with marine mammals; 3) endangered species and fisherman; 4) concerns about fish feed; 5) impacts on cultural resources; 6) impacts from self-powered cages and how it affects benthic and pelagic organisms; and 7) overall economic impacts on Hawaii and related US Markets to which fish will be exported. Hawaii waters are a public resource. 8) HOT is asking the citizens of Hawaii to lease our land to a private company for profit that could cause substantial harm to public resources. Whatever impacts HOT will have on existing natural resources will be shared by all of us, while profits will be only theirs. 9) It is imperative that HOT addresses the issues before a conservation lease is granted. I urge the DLNR, Tetratch, and OEQC to hold HOT accountable and provide the public with a more informative and thorough EIS.

#### *Applicant Response:*

- 1) There will be less than significant impacts from the project on wild fish. The proposed site is located 2.0 to 2.6 miles to the nearest reef, opelu koa, and ono trolling lanes; distance to the bottom fish grounds is one mile.
- 2) There are no mooring lines attaching these platforms to the seafloor, and given that the first proposed site is in 1,320 feet of water and 3 miles (2.6 nautical miles) from land, and the alternative is in 5,800 feet, and 3 miles from land, whales will easily be able to move around the platforms. Also, refer to relevant section of the DEIS, pages 2-60 to 2-66.
- 3) Fisherman Eddie "Lala" La'au and Robert Cambra, and Kwanji Fukuyama were interviewed for the CIA. There was agreement on: 1) the location of cultural resources

(opelu koa, trolling areas, bottom fishing areas); 2) cultural landscape of the coastal lands; 3) the proposed ocean lease site is deeper than the areas used for bottom fishing and opelu; 4) the area is not specifically targeted for trolling; 5) the oceanspheres may attract opelu but that it would not have a permanent affect on the opelu fishery; 6) the platforms would probably attract mahi and ono and other fish; and 7) fishermen should be able to fish for these fish around the platforms. Some individuals thought it might have a beneficial impact on fishing, especially trolling, and make it easier for people to fish for mahi and ono. HOT notes the issue of exclusivity and resulted HOT's decision to reduce the exclusive zone from what was previously proposed, and allow fishing as close as 100' of each oceansphere's buoy.

- 4) The fish feed initially proposed to be used in the operation is pelleted fish feed that will be produced according to HOT's exact specifications. The company is sensitive to the concern about the sustainability of the harvest of some fish used to produce fish meal and fish oil. HOT will use a feed company that is responsive to our exact specifications and very transparent about their feed ingredients and processing, and will produce our feed to our exacting specifications. At this time, the vendor to supply the fish feed has not been selected. So, the specific components of fish meal, fish oil is currently unknown. HOT has no plans to use GMO soy. When the NOSB finalizes its organic standards, HOT plans to follow its requirements for organic aquaculture. HOT will also seek to identify local alternatives for its fish food and other components such as protein, Omega 3 and Omega 6 fatty acids in order to obtain more of the feed components from local sources. The company has begun discussions with possible suppliers who might eventually have the capability to meet our supply requirements, but has not finalized any contract to source the feed components locally, yet.
- 5) The DEIS includes a CIA that is consistent with the Guidelines for Assessing Cultural Impacts adopted by the Environmental Council, State of Hawaii on November 19, 1997. The CIA presents the results of historical literature and map research, as well as interviews and close consultation with native Hawaiian kupuna with a lifelong and ancestral connection to the ocean in the general area of the proposed site, and the coastal land adjacent to the proposed ocean lease site. The CIA is addressed in detaion in Section 2.11 of the DEIS.
- 6) The EIS Chapter 2.4 on Water Quality states in Section 2.4.2 on Environmental Impacts notes that "Pumping water from a depth of 427 feet (130 meters) to the platform depth of 180 feet (55 meters) will have no effect on nutrient concentrations around the platforms. While the water drawn from 427 feet (130 meters) is just below the SML, the differences in temperature, nutrients, and other water quality parameters between these two water masses is negligible. Because the intake for the cold water pipe is located at 200m depth, and the bottom is at 400m, there would be no impact from the intake on the benthic environment. Because there is no impact on water quality, there is not expected impact on pelagic organisms.
- 7) The project proposes to grow ahi in a sustainable manner, protect the environment, and produce employment. From a sustainability stand point the company would be happy to

provide tuna to the local market to reduce imports so long as it does not have a negative impact on local fishermen. Some ahi produced in the aquaculture operation will be sold in the local market, US domestic market, and Japan because of the higher price the product will obtain. Sales made out of Hawaii will generate revenue, provide taxable export revenues, benefit employees and investors. Domestic sales to US and Hawaii customers will directly contribute to food security for US and Hawaii consumers. The company does not want to hurt local fisherman who also catch high value tuna that is sold locally and exported to Japan and the mainland. Annually, Hawaii consumes 3,000 tons of tuna; 80% is imported. HOT plans to supply 10% of the local market with tuna to educate hotel customers and restaurants about the qualitative characteristics of the clean ranching conditions of its farm raised tuna. If more tuna is desired and it does not affect the livelihood of local fishermen, more can be supplied. It is not the intent of HOT to compete with local fishermen on supply or price of tuna.

- 8) As noted in Section 3.0 of the DEIS, open ocean aquaculture is consistent with state policies. Open ocean aquaculture is allowed by Hawaii law and is highly regulated to meet the strictest environmental standards. HOT is committed to the standard, as shown in the mitigation measures and monitoring programs it will implement. Hawaii has a 200,000 square mile EEZ that can be enjoyed by commercial fisherman, recreational fisherman, and boaters. Our ocean lease request and permit asks for less than one-half square mile (.00025 percent) of the available EEZ to pursue a legally allowed commercial endeavor which will provide jobs, contract revenues, and tax revenues to the state.
- 9) HOT produced a DEIS, which the State found to be in conformance with Chapter 343, HRS, and Chapter 11-200-8, HAR.

#### Petition 46 Signatures

We the undersigned have serious concerns about the DEIS for the ahi aquaculture project. The DEIS inadequately addresses: 1) critical issues of untested, untethered oceansphere fish pen system with thermal energy exchange; fish feed conversion ratios; pollution; diseases; cultural resources, etc. 2) The DEIS also includes major discrepancies such as citing two different amount of optimal production capacity - 12,000 tons of fish produced annually versus 6,000 tons annually. We urge the DLNR not to grant HOT a conservation lease to begin the project until these issues and discrepancies have been addressed in their DEIS. Please stick up for Hawaii's people and for responsible planning.

#### *Applicant Response:*

- 1) The company is taking an innovative approach to solve many of the problems of alternative aquaculture systems. The propulsion system to hold the cages in geostatic position is ecofriendly, and is an example of hybrid renewable energy system. The technology the company intends to employ has been demonstrated, and tested by modern day open ocean oil drilling companies; rigs are unmanned, remotely operated, and able to stay accurately in specific locations in a variety of currents and sea conditions. HOT's design engineering contractor has built and deployed systems for many years.

Our projected feed conversion rations are similar to other aquaculture operations.

The ocean lease site that has been proposed was carefully selected based on a variety of factors related to current, protection from winds and relatively constant calm sea conditions. The design of this project is to minimize any potential for impacts to the benthic environment by allowing the platforms to be located in 1,320 feet of water, 2.6nm offshore North Kohala in an area of high current and pelagic waters. As noted in the UH Environmental Center comment letter on the DEIS, "At the site location many of the issues about water quality, bottom impacts and entanglement would be nonexistent." Also refer to DEIS, Section 2.4 (P. 2-40) on Water Quality.

The size of the Oceansphere allows for a low stocking density, which reduces the potential for disease among the cultured fish.

In the CIA, several fishermen were interviewed for information on fishing patterns in the area. Fisherman Eddie "Lala" La'au and Robert Cambra, and Kwanji Fukuyama were interviewed for the CIA. There was agreement on: 1) the location of cultural resources (opelu koa, trolling areas, bottom fishing areas); 2) cultural landscape of the coastal lands; 3) the proposed ocean lease site is deeper than the areas used for bottom fishing and opelu; 4) the area is not specifically targeted for trolling; 5) the oceanspheres may attract opelu but that it would not have a permanent affect on the opelu fishery; 6) the platforms would probably attract mahi and ono and other fish; and 7) fishermen should be able to fish for these fish around the platforms. Some individuals thought it might have a beneficial impact on fishing, especially trolling, and make it easier for people to fish for mahi and ono. HOT notes the issue of exclusivity and resulted HOT's decision to reduce the exclusive zone from what was previously proposed, and allow fishing as close as 100' of each oceansphere's buoy.

- 2) Applicant notes the typographical error. The projected annual production from the aquaculture operation is 6,000 tons.

#### Maui Tomorrow

The plan is inadequately addressed in the document and raises many concerns regarding environmental, social, and economic issues. Maui Tomorrow notes: 1) conflict of interest are likely regarding the use of fishing grounds for both recreational and commercial fisherman; 2) fish farming will bring the price of fish down which will compete with commercial fishing operations and loss of revenues to recreational and charter boat operations; 3) aquaculture industry has failed to demonstrate ocean fish farming is financially sustainable; 4) environmental issues and impacts regarding fish wastes, excess food, fish escapes, antibiotics, water pollution, harming surrounding habitats, wildlife, soy products; 5) concerns about fish feed; 6) FAD's and shark attractions. Maui Tomorrow asks further research is conducted to address potential impacts and to mitigate potential consequences prior to the project moving forward.

#### *Applicant Response:*

- 1) There will be less than significant impacts from the project on wild fish because of the distance of the proposed site to the nearest reef, opelu ko'a, and ono trolling lane (2.0 to

2.6 nm), and distance to the bottom fish grounds (one mile), and the depth of water (1,320 feet).

Several fishermen were interviewed for information on fishing patterns in the area. The only two opelu fishermen who have used this general coastal ocean area for many decades were interviewed: Eddie "Lala" La'au and Robert Cambra. Both fishermen informed the researcher for the Cultural Impact Assessment that the fishing ko'a for opelu do not exist in the project area. The longtime bottom fishermen, Kwanji Fukuyama and Robert Cambra noted that the bottom fishing area only extends out to a depth of 150-160 fathoms. This is located about one mile from the proposed ocean lease site.

As analyzed in the EIS, section 2.5, there will be less than significant impacts from the project on wild fish because of the distance of the proposed site to the nearest reef, opelu ko'a, and ono trolling lane (2.0 to 2.6 nm), and distance to the bottom fish grounds (one mile), and the depth of water (1,320 feet).

- 2) Data from the aquaculture industry reflect a different economic scenario than the one you describe. The project proposes to grow ahi in a sustainable manner, while protecting the environment, and producing meaningful work for local area residents. Some ahi produced in the aquaculture operation will be sold in the local market. But, the target market for the ahi is the US domestic market, especially the west coast, as well as Japan because of the higher price the product will obtain. These sales made out of Hawaii will generate revenue that will benefit the state in terms of taxable export revenues, the company's employees and investors which are primarily based in Hawaii. Domestic sales to US and Hawaii customers will directly contribute to food security for these US and Hawaii consumers. The company does not want to hurt local fisherman who also catch high value tuna this is sold locally but also exported to Japan and the mainland. Hawaii only consumes 3,000 tons annually of tuna of which 80% is imported. From a sustainability stand point the company would be happy to provide tuna to the local market to reduce imports so long as it does not have a negative impact on local fishermen.
- 3) Hawaii Oceanic Technology has studied the experience of other aquaculture operations, learning about the challenges and solutions they devised. The lessons learned by these other company's informed the technology design of the Oceanspheres as an untethered self-powered submerged open ocean aquaculture platform. As noted in the DLNR Division of Aquatic Resources comment letter on the DEIS, "there are many aspects of this project which seemingly typify what an ideal offshore aquaculture venture would be. The untethered cages, autonomous feeding, energy production and propulsion systems, and the stocking of cages with cultured fish from locally captured wild brood stock. To be sure, there are many technological challenges inherent in this project, and to the best of my knowledge, there is nothing similar to it anywhere else in the world." (See the letter in the appendix to the FEIS). Based on these new designs, Hawaii Oceanic Technology is confident that its business model will be a success.

- 4) The design of this project is to minimize any potential for impacts to the benthic environment by allowing the platforms to be located in 1,320 feet of water, 2.6 nm offshore North Kohala in an area of high currents and pelagic waters. As noted by the UH Environmental Center in their comment letter on the DEIS, "At the site locations many of the issues about water quality, bottom impacts and entanglement would be nonexistent."

The ocean current study in the EIS Appendix B concludes on page 11 stating, "The proposed site has relatively weak long-term average flows, and is frequently subject to strong transient motions associated with eddies. The proposed site is in a region that is exposed to strong positive wind stress curl, which drives upwelling and the development of cyclonic mesoscale eddies. These eddies retain their coherence for much shorter times than the anticyclonic eddies that form further to the south in the lee of Hawaii (Calil et al., 2008). Thus they tend to be more dispersive than the average of both cyclonic and anticyclonic motions studied by Lumpkin (1998)." (Lukas 2008, p. 11).

"Strong vertical shears are usually found in these eddies, causing strong vertical mixing (Eden and Greatbatch, 2008). This vertical mixing combined with the horizontal dispersion associated with the mesoscale and submesoscale eddies, suggests that the proposed site is in an ideal region to minimize accumulation of by-waste products from open-ocean aquaculture." (Lukas 2008, p. 11). "Should an accumulation of by-waste occur, it will very likely be dispersed within a few days (Table 1), as the strong cross-flow concentration curvature increases dispersion. An accumulation of by-waste will also likely be reduced through neglected sinks (e.g., consumed by phytoplankton and zooplankton)." (Lukas 2008, p. 11).

- 5) The fish feed initially proposed to be used in the operation is pelleted fish feed that will be produced according to our exact specifications. The company is sensitive to the concern about the sustainability of the harvest of some fish used to produce fish meal and fish oil. Because of this, the company will use a feed company which is responsive to our exact specifications and very transparent about their feed ingredients and processing. At this time, the vendor to supply the fish feed has not been selected. So, the specific components of fish meal, fish oil is currently unknown. The company has no plans to use GMO soy. The company plans to produce the highest quality ahi, suitable for sashimi. When the NOSB finalizes its organic standards, Hawaii Oceanic Technology plans to follow its requirements for organic aquaculture. Hawaii Oceanic Technology will also seek to identify local alternatives for its fish food and other components such as protein, Omega 3 and Omega 6 fatty acids in order to obtain more of the feed components from local sources. The company has begun discussions with possible suppliers who might eventually have the capability to meet our supply requirements, but has not finalized any contract to source the feed components locally, yet.
- 6) Our Best Management Practices goal is to avoid predator interactions. Sharks and other pelagic predators will be attracted to the activities associated with off shore cage culture. We will avoid contact with these pelagic predators by denying them a food source by the

use of impenetrable cages and netting materials, video monitoring of feedings, and a wildlife monitoring and reporting system to meet DAR/DLNR protocol.

Kona Blue has recorded only rare instances of tiger sharks around its existing farm; probably related to seasonal migrations. For the first eight months of operation, only one fleeting shark sighting occurred: a small tiger shark. There are generally brief influxes of tiger sharks (mano: Galeocerdo cuvier) to the area in the months of September and October of each year. Most of the animals at this time appeared individually, or in pairs, with a range of sizes from 8ft to 15ft in length, and appear to not take up residence on the farm site. This is further confirmed by data from the DAR shark transponder receiver station on the farm site: tiger sharks only very infrequently pass by the site, and rarely do they show any interest in the operation. From July, 2006 to May, 2007, there were a total of eight (8) records of tagged tiger sharks in the Kona Blue farm area. None of these sharks took up residence. One animal passed by the farm site three times in two months, another animal was recorded twice in two months, and three other animals had single records.

Use of the hardened Dyneema® or Kikkonet rigid plastic net pen mesh should further reduce attractant nature of the farm, and reduce or eliminate breaches in the mesh.

#### Joseph Carvalho

I am in full agreement a new food source is a necessity due to increase in world population. The target for food production seems to be for the upper classes of Japan and California. Recently the community's North Kohala community plan was adopted by the Hawaii County Council, and signed by Mayor Kim. I do not recall any public meeting to apprise the community regarding the project. I have the following questions: 1) what fishing impacts are there for local trollers; 2) what happens to the waste; 3) how fast can the globes recover from drifting; and 3) what is the impact for the shoreline fishery. If your project is approved as it appears community meetings in North and South Kohala regarding the project is essential.

#### *Applicant Response:*

- 1) Some ahi produced in the aquaculture operation will be sold in the local market, US domestic market, and Japan because of the higher price the product will obtain. Sales made out of Hawaii will generate revenue; provide taxable export revenues, benefit employees and investors. Domestic sales to Hawaii 7 mainland customers will directly contribute to food security for Hawaii and mainland consumers. The company does not want to hurt local fisherman who also catch high value tuna that is sold locally and exported to Japan and the mainland. Annually, Hawaii consumes 3,000 tons of tuna; 80% is imported. Initially the company plans to market its farmed ahi in Hawaii primarily for branding and brand awareness purposes.
- 2) In the DEIS Section 2.4 (p. 2-40) on Water Quality it states that, "Stocking the platforms with fish will result in some increase in nutrients and particulate matter in the water column from the fishes' metabolic wastes, feces, and any excess feed. The prevailing currents in the ROI (See appendix Current Study Report), constant mixing of the SML,

placement of the platforms at 180 feet (55 meters depth), 3 mile (2.6 nautical mile) distance from coral reefs and depth of the water at the site all indicate that there will be negligible impacts on water quality in the immediate vicinity of the platforms.”

The design of this project is to solve any potential for impacts to the benthic environment by allowing the platforms to be located in 1,320 feet of water, 2.6 nm offshore North Kohala in an area of high currents and pelagic waters. As noted by the UH Environmental Center in their comment letter on the DEIS, “At the site locations many of the issues about water quality, bottom impacts and entanglement would be nonexistent.” (Please see UH Environmental Center letter in the appendix to the FEIS).

As described on p. 2-42 of the DEIS, Section 2.4 on Water Quality, given the distance from land and depth of water, the strict standards for water quality for oceanic waters, the high volume of water moving through the site quickly diluting excess nutrients, and the high variability of natural concentrations of nutrients due to cyclonic eddies as described in the Current Study in the DEIS, the proposed project is expected to have a less than significant impact on water quality in the surrounding ocean.

The ocean current study in the EIS Appendix B concludes on page 11 stating, “The proposed site has relatively weak long-term average flows, and is frequently subject to strong transient motions associated with eddies. The proposed site is in a region that is exposed to strong positive wind stress curl, which drives upwelling and the development of cyclonic mesoscale eddies. These eddies retain their coherence for much shorter times than the anticyclonic eddies that form further to the south in the lee of Hawaii (Calil et al., 2008). Thus they tend to be more dispersive than the average of both cyclonic and anticyclonic motions studied by Lumpkin (1998).” (Lukas 2008, p. 11).

“Strong vertical shears are usually found in these eddies, causing strong vertical mixing (Eden and Greatbatch, 2008). This vertical mixing combined with the horizontal dispersion associated with the mesoscale and submesoscale eddies, suggests that the proposed site is in an ideal region to minimize accumulation of by-waste products from open-ocean aquaculture.” (Lukas 2008, p. 11).

“Should an accumulation of by-waste occur, it will very likely be dispersed within a few days (Table 1), as the strong cross-flow concentration curvature increases dispersion. An accumulation of by-waste will also likely be reduced through neglected sinks (e.g., consumed by phytoplankton and zooplankton).”(Lukas 2008, p. 11).

3) See Response to #1 above.

Hawaii Farmers Union (HFU)/Eden Peart

HFU has many concerns regarding: 1) sustainable working waterfronts - access and conservation harvest practices are essential to fishery dependant coastal communities and active working waterfronts; and 2) marine aquaculture - the development of industrial-scale offshore finfish aquaculture is detrimental to the family fishers and local economies of historic fishing communities. HFU notes the project should not be allowed to proceed: 1) unless and until there

is national legislation in place that ensures it; 2) HOT has not established that this type of aquaculture will contribute to Hawaii's food security; 3) HFU looks forward to working with lawmakers to develop policy and legislation (initiatives will utilize the exemplary models of precontact Hawaiians regarding traditional agriculture and aquaculture; and 4) look at the big picture rather than court "venture capitalists." HOT's DEIS is inadequate; the proposal should not be considered without educational outreach and public hearings.

*Applicant Response:*

**Environmental Sustainability**

We understand your concerns about the past experiences of some forms of open ocean aquaculture, such as some of the past salmon farming off the Pacific Northwest coast. The design of this project learns from the lessons of these other operations. The unique design enables the Oceanspheres to be located in very deep water without any anchors. The design of this project is to minimize any potential for impacts to the benthic environment by allowing the platforms to be located in 1,320 feet of water, 2.6 nm offshore North Kohala in an area of high currents and pelagic waters, which provides the water circulation necessary to keep a healthy environment for the production facility and surrounding marine environment.

As described in the DEIS Section 2.4 (p. 2-40) on Water Quality, "Stocking the platforms with fish will result in some increase in nutrients and particulate matter in the water column from the fishes' metabolic wastes, feces, and any excess feed. The prevailing currents in the ROI (See appendix Current Study Report), constant mixing of the SML, placement of the platforms at 180 feet (55 meters depth), 3 mile (2.6 nautical mile) distance from coral reefs and depth of the water at the site all indicate that there will be negligible impacts on water quality in the immediate vicinity of the platforms

Regarding any potential impact on fisheries, as analyzed in the EIS, section 2.5, there will be less than significant impacts from the project on wild fish because of the distance of the proposed site to the nearest reef, opelu ko'a, and ono trolling lane (2.0 to 2.6 nm), and distance to the bottom fish grounds (one mile), and the depth of water (1,320 feet).

As described in Sec. 5.1 of the Cultural Impact Assessment, several fishermen were interviewed for information on fishing patterns in the area. The only two opelu fishermen who have used this general coastal ocean area for many decades were interviewed: Eddie "Lala" La'au and Robert Cambra. Both fishermen informed the researcher for the Cultural Impact Assessment that the fishing ko'a for opelu do not exist in the project area. The longtime bottom fishermen, Kwanji Fukuyama and Robert Cambra noted that the bottom fishing area only extends out to a depth of 150-160 fathoms. This is located about one mile from the proposed ocean lease site.

**Economic Sustainability**

Hawaii Oceanic Technology has studied the experience of other aquaculture operations, learning about the challenges and solutions they devised. The lessons learned by these other company's informed the technology design of the Oceanspheres as an untethered self-powered submerged open ocean aquaculture platform. As noted in the DLNR Division of Aquatic Resources comment letter on the DEIS, "there are many aspects of this project which seemingly typify what

an ideal offshore aquaculture venture would be. The untethered cages, autonomous feeding, energy production and propulsion systems, and the stocking of cages with cultured fish from locally captured wild brood stock. To be sure, there are many technological challenges inherent in this project, and to the best of my knowledge, there is nothing similar to it anywhere else in the world.” (see the letter in the appendix to the FEIS). Based on these new designs, Hawaii Oceanic Technology is confident that its business model will be a success.

### **Food Security**

The project proposes to grow ahi in a sustainable manner, while protecting the environment, and producing meaningful work for local area residents. Some ahi produced in the aquaculture operation will be sold in the local market. But, the target market for the ahi is the US domestic market, especially the west coast, as well as Japan because of the higher price the product will obtain. These sales made out of Hawaii will generate revenue that will benefit the state in terms of taxable export revenues, the company’s employees and investors which are primarily based in Hawaii. Domestic sales to US and Hawaii customers will directly contribute to food security for these US and Hawaii consumers. The company does not want to hurt local fisherman who also catch high value tuna this is sold locally but also exported to Japan and the mainland. Hawaii only consumes 3,000 tons annually of tuna of which 80% is imported. From a sustainability stand point the company would be happy to provide tuna to the local market to reduce imports so long as it does not have a negative impact on local fishermen.

### Food and Water Watch (FWW)

FWW requests DLNR not move forward with the proposed project. The DEIS is full of contradictions and provides inadequate details regarding the proposed project, thus potential impacts are unclear to FWW. HOT proposed project should not proceed until extensive science has confirmed it will not harm the ecosystem or communities. Concerns regarding the DEIS include: 1) new technology (project's engine); 2) size; 3) fish feed; 4) marine mammals/animals; 5) cumulative impacts; 6) disruption to fisherman; 7) economic impacts; 8) disregard to cultural resources and traditions; and 9) mitigation measures. FWW urges the DLNR to adopt a precautionary approach to open ocean aquaculture, to reject the DEIS, and not to move forward with HOT's proposed project.

### *Applicant Response:*

- 1) The EIS Chapter 2.4 on Water Quality states in Section 2.4.2 on Environmental Impacts notes that “Pumping water from a depth of 427 feet (130 meters) to the platform depth of 180 feet (55 meters) will have no effect on nutrient concentrations around the platforms. While the water drawn from 427 feet (130 meters) is just below the SML, the differences in temperature, nutrients, and other water quality parameters between these two water masses is negligible. A deepwater pipe is no longer part of the design. Therefore, the following concerns do not apply: 1) will the cold water inlet pull in aquatic animals/organisms; 2) water suction; and 3) how much water will be pumped up over a specific time frame. Because the physical water quality parameters of the deep water are little different from the surface water, there would be no expectation that the currents would be affected at all.

- 2) Production at full build out may vary between 6,000 tons per year and 12,000 tons depending upon the final system design. Production capacity is a variable that will be adjusted according to engineering and economic decisions that are not yet finalized.

The study noted the project site has relatively weak long-term average flows, and is frequently subject to strong transient motions associated with eddies. The proposed site is in a region that is exposed to strong positive wind stress curl, which drives upwelling and the development of cyclonic mesoscale eddies. These eddies retain their coherence for much shorter times than the anticyclonic eddies that form further to the south in the lee of Hawaii (Calil et al., 2008). Thus they tend to be more dispersive than the average of both cyclonic and anticyclonic motions studied by Lumpkin (1998)." (Lukas 2008, p. 11). "Strong vertical shears are usually found in these eddies, causing strong vertical mixing (Eden and Greatbatch, 2008). This vertical mixing combined with the horizontal dispersion associated with the mesoscale and submesoscale eddies, suggests that the proposed site is in an ideal region to minimize accumulation of by-waste products from open-ocean aquaculture" (Lukas 2008, p. 11). The prevailing currents in the ROI (See appendix Current Study Report), constant mixing of the SML, placement of the platforms at 180 feet (55 meters depth), 3 mile (2.6 nautical mail) distance from coral reefs and depth of the water at the site all indicate that there will be negligible impacts on water quality in the immediate vicinity of the platforms. Please review the article which reports on a study led by UK University of Exeter let international team that describes how alkaline in fish feces counters the effect of CO2 in shallower waters. In other words, fish poop may be good for the oceans; web site. <http://www.sciencedaily.com/releases/2009/01/090115164607.htm>.

- 3) The fish feed proposed to be used in the operation is pelleted fish feed that will be produced according to HOT's exact specifications. The company is sensitive to the concern about the sustainability of the harvest of some fish used to produce fish meal and fish oil. HOT will use a feed company which is responsive to our exact specifications and very transparent about their feed ingredients and processing, and will produce our feed to our exacting specifications. At this time, the vendor to supply the fish feed has not been selected. So, the specific components of fish meal, fish oil is currently unknown. HOT has no plans to use GMO soy. HOT will also seek to identify local alternatives for its fish food and other components such as protein, Omega 3 and Omega 6 fatty acids in order to obtain more of the feed components from local sources.
- 4) While it is true that some outcomes are known, there are still outcomes that are unknown. To get the latest information on marine mammal interactions with open ocean aquaculture, additional consultation was carried out with KBWF managers. This additional language was added to the EIS, Chapter 2.5. Also refer to the NOAA NMFS comments above.

HOT notes the following have been observed in the vicinity of KBWF: bottlenose dolphins, spotted dolphins, and rough-toothed dolphins. HOT summarizes KBWF impacts, mitigation measures, monitoring, reports, data collection, migration patterns, and interactions. KBWF notes bottlenose dolphins were attracted to KBWF by: 1) net

pens acting as FAD, 2) occasional escape of fish when the net pens are opened; 3) divers interactions. As noted above, the oceanspheres design and materials, and operations procedures will deny dolphins a food source, and they will lose interest.

Sharks may be attracted to the oceanspheres due to excess fish food, visibility of fish inside the oceansphere, fish scent and increase of fish outside the platform. An increase on predation on dolphins or other marine mammals may occur. However, HOT notes: 1) there is no quantifiable evidence showing an effect or no effect; 2) it is not known if sharks may be aggregated to the oceanspheres; 3) sharks drawn to the platform will be drawn away from adjacent areas thereby reducing the apparent density of sharks (which may result in less risk to the public). The DEIS did not note sharks would be killed but discussed alternatives such as: 1) the "Shark Safety Plan" involve divers with nonlethal "shark pokers" to deter shark interactions; 2) suspending all in-water work if sharks are present; 3) notifying the relevant personnel (offshore manager, assistant manager, VP Operations, President); and 4) consulting with DAR to determine any baiting, hooking and/or tagging would be done to discourage sharks. HOT is sensitive to the cultural significance of sharks. The EIS and CIA state that to Hawaiians sharks are considered a sacred animal, an aumakua or guardian spirit, and is considered a member of their ohana.

Cetacean species (spotted dolphins, short-finned pilot whales, pygmy whales and false killer whales) were discussed in the DEIS. The proposed site is one mile from the HIHWNMS. There are no mooring lines, no flat walls, funnels, or bottlenecks in the oceansphere design; surface is taut mesh and is strutted to maintain tension on the net material; thus there are no entanglement risks. The oceanspheres present a hard rounded surface to animals which would deflect them in one direction or another; versus a flat wall or funnel which halt progress. To visually orienting marine mammals, the mesh would appear to present an almost solid surface. Whales will be able to move around the platforms due to water depth. As noted above, the oceanspheres design and materials, and operations procedures will deny the cetacean species a food source, and they will lose interest.

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- 5) The EIS Chapter 2.1.4 on Cumulative Impacts Analysis does disclose that KBWF is already operating in Kona. However, the water quality model and current study results discussed above in #2, indicate that the water quality impacts would not be significant outside the zone of mixing. The KBWF site is far enough away from the proposed HOT site that there would be no combined impact to water quality in the marine environment. HOT farming operations have been designed from the very beginning to serve as a model for environmentally responsible open ocean aquaculture. We plan to identify and establish best practices that can be adopted by other companies operating in Hawaiian waters.
- 6) The Cultural Impact Assessment (CIA) author is a planner with expertise in coastal and marine resources, social and natural sciences, and has local experience in ethnographic studies, oral histories, and historical research, and is knowledgeable about historic and current fishing practices in the Hawaiian Islands.

The search for lineal heirs of the land and ocean was done by consulting Native Hawaiian kupuna in the area, searching historical documents, records of the Royal Patents and Land Court Awards, Hawaii County Planning Department title records, the Hawaiian language newspapers (Hawaiian Nupepa Collection at Bishop Museum), Bond Memorial library resources, and UH Manoa, Department of Urban and Regional Planning (DURP) North Kohala Coastal Cultural Resource and Heritage Landscape Study (2005).

Hawaii Oceanic Technology consulted with Native Hawaiian groups and individuals who are directly related to the specific region of the project (Ho`opai ohana, Ka'ike o Ka'aina). William Akau (kupuna, lifelong water man) advised HOT to consult with Monty Richards (Kahua Ranch). Kahua Ranch leases thousands of acres of coastal land adjacent to the proposed ocean lease site for over eighty years. Because of this history with the land, William Akau suggested that Monty Richards and Pono von Holt could be considered the konohiki of the area. Cultural activities at the project site and the surrounding ocean area are primarily related to fishing. Though the proposed project site is not targeted for fishing, fishermen may transit the project site to offshore fishing areas primarily located to the south and southwest. The area could be transited by those who are voyaging in a Hawaiian sailing canoe. For this project, a cultural practitioner in the ocean would include the native Hawaiian fishermen, and non-Hawaiian cultural practitioners, cultural practitioners would include those who spend time camping, hiking, visiting cultural sites, fishing, gathering and praying on the shoreline. A cultural practitioner on the adjacent coastal land is a native Hawaiian who have used these coastal lands for generations.

Fisherman Eddie "Lala" La'au and Robert Cambra, and Kwanji Fukuyama were interviewed for the CIA. There was agreement on: 1) the location of cultural resources (opelu koa, trolling areas, bottom fishing areas); 2) cultural landscape of the coastal lands; 3) the proposed ocean lease site is deeper than the areas used for bottom fishing and opelu; 4) the area is not specifically targeted for trolling; 5) the oceanspheres may attract opelu but that it would not have a permanent affect on the opelu fishery; 6) the platforms would probably attract mahi and ono and other fish; and 7) fishermen should be

able to fish for these fish around the platforms. Some individuals thought it might have a beneficial impact on fishing, especially trolling, and make it easier for people to fish for mahi and ono. HOT notes the issue of exclusivity and resulted HOT's decision to reduce the exclusive zone from what was previously proposed, and allow fishing as close as 100' of each oceansphere's buoy.

There are no konohiki rights in the project area No registered fisheries in the office of the Territorial Surveyor were located off Kiiokalani ahupuaa, or other ahupuaa in the Puu Ulaula region of North Kohala. So, there are no legal konohiki rights or registered fisheries in the project area.

The CIA also asked coastal users and shore-based fisherman to assess the impact of the proposed (projects) action, alternatives, and mitigation measures on cultural resources, practices and beliefs. The noted: 1) the site was far offshore in deep water that is not used for any cultural activity; 2) the distance from shore resulted in the proposed project having no impact on the view shed from the coastal trails and camps; 3) boats regularly traverse the ocean closer to shore; and 4) work boats and Oceanspheres will have no impact on the cultural resources, practices, and beliefs of the coastal lands.

- 7) Standard socioeconomic analytical tools were used to determine impacts. Factors considered in determining whether an alternative would have a significant impact on socioeconomics include the extent or degree to which its implementation would result in the following a: 1) change the unemployment rate for Hawaii County; 2) change total income; 3) change business volume; 4) change the demand on housing; 5) change school enrollment; 6) result in disproportionate impacts on minority and low-income population; and 6) result in risks on the health and safety of children. Malae Point and Keahole Point (Alternative 2) would have beneficial effects on the local economy, with increases in employment, income, and business sales volume from the proposed project. Environmental Justice will be positively impacted by the availability of jobs at all educational levels. In addition to full time employees the company also expects to contract for a variety of services that will provide additional employment. Investors strongly believe the business will provide needed economic development for the state's economy. In addition, maritime industry individuals, fishing industry, and aquaculture industry testified the proposed project would provide much needed employment in the maritime industry.

- 8) Refer to responses above.

**Food Water Watch - (late comment August 27, 2009)**

The DLNR and HOT did not meet the requirements for CDUA's as stated in Section 190D-11, HRS. Do not to approve HOT's CDUA for the following reasons: 1) insufficient public notice; 2) Public Trust Doctrine and Precautionary Principle; 3) HOT's project may have a significant adverse effect upon fishing; 4) effect(s) upon wildlife, aquatic life, environment of the surrounding area. The BLNR should use the precautionary principle in examining the considerations stipulated for CDUA's in Section 190D-11, HRS. The BLNR will find that

according to environmental, social, and economic considerations, HOT's project is not in the public interest, and that HOT may not even be able to carry out all aspects of the plan.

UH Manoa Environmental Center (late comment letter April 14, 2009)

Our review was conducted with the assistance of Environmental Center and Department of Molecular Bioscience and Bioengineering/Aquaculture Specialist. The DEIS contains little information regarding the operations economics, and projected revenue. The market price of tuna varies with the type of fish, physical condition, and demand. HOT must have some ideas about the range of revenue they will receive for their product. This goes to the feasibility of the project and would be an important piece of information for decision makers to know before permitting the project. Other concerns include: 1) significant beneficial and adverse effects; 2) purpose and need; 3) description of the proposed action; 4) feeding; 5) oceansphere maintenance; 6) tuna health inspections; 7) terminology; 8) summary of potential impacts of proposed action, alternative number 2, and no action alternative; 9) waste management; 10) resource overview; 11) dolphins and other large odontocetes; 12) Kawaihae Harbor marine traffic; 13) air quality; 14) economy, employment, and income; and 15) conformance with the Hawaii State Plan.

*Applicant Response:*

- 1) A specific business plan discussion is not requested in the DEIS regarding project revenue. HOT has some idea about the range of revenue for our product. We would not propose such a project unless our business case was able to demonstrate economic feasibility and sustainability. Much of this discussion is contained in our Business Plan which has served as the basis for raising the private equity investment required to launch our operation in 2006, and continue to operate the business until it achieves positive cash flow. HOT financial projections take into a consideration a variety of factors that have demonstrated to the founders and the company's investors that the operation of the business can be profitable. Some of the advantages the company expects to have are the ability to harvest its product on demand for designated distributors in key markets, provide a consistent quality of product at a negotiated price that provides acceptable Earnings before Income Tax, Depreciation and Amortization (EBITDA). Under the worst case scenario each oceansphere will generate a sufficient gross margin for this company to be a success. Sales made out of Hawaii will generate revenue that will benefit the state in terms of taxable export revenues, the company's employees, and investors which are primarily based in Hawaii. Domestic sales to US and Hawaii customers will directly contribute to food security for these US and Hawaii consumers.
- 2) HOT will clarify the wording you reference (in the DEIS) to read: "It has been reported that populations of large predatory fish in Hawaiian waters and the global ocean, including tuna, have been reduced by up to 90% ~~of~~ from pre-industrial levels..." Dr. Boris Worm in publications, lectures and interviews is one of many scientists that have predicted the imminent collapse of several fisheries. He stated in a recent interview published in April 2009, that "Our research established that the large proportion of these creatures... like tuna, billfish, shark – even large cod, halibut and species like that – have declined by up to 90% in many areas and that really showed me how profound our impact had been – not just in some areas, but really all of them." Despite the anecdotal nature of some of the information (fisherman) we have relied upon, it is clear that population

growth, demand for seafood protein and the impact of pelagic species at the high end of the troposphere are under severe stress; alternatives such as open ocean aquaculture need to be developed in order to reduce the stress on these fisheries.

- 3) It is not and never has been the “fallback” position of this project to stock Oceanspheres with juveniles. PARC (UH Hilo) has obtained the necessary permits to capture tuna for broodstock purposes. Whether PARC (UH Hilo) captures juveniles or mature ahi for this purpose is not part of the DEIS.

PARC (UH Hilo) will be supplying fry from captive Yellowfin and bigeye broodstock. PARC intends to follow protocol established by Achatines Laboratory (Panama) for Yellowfin tuna, which has been replicated for ~12 years. PACRC has all of the facilities and capacity necessary to undertake the steps necessary for commercial output of fingerlings necessary for the success of the project. There have been recent successes in hatchery outputs for Yellowfin tuna, the reports emphasize they are for research and experimental purposes. Commercial output is still a long way away. Technological advances in hatchery outputs of bluefin tuna (Kinki University) still have to be transferred to the Hilo facility.

The propulsion system to hold the cages in geostatic position is ecofriendly, and is an example of hybrid renewable energy system. The technology the company intends to employ has been demonstrated, and tested by modern day open ocean oil drilling companies; rigs are unmanned, remotely operated, and able to stay accurately in specific locations in a variety of currents and sea conditions. HOT's design engineering contractor has built and deployed systems for many years.

- 4) HOT plans to work closely with a variety of sources, including the ADP Disease Management Program for disease diagnostics.

The company will also seek to identify local alternatives for its feed which may include algae protein and Omega 3 and 6 fatty acids. Research indicates there are several projects by companies (Cellana, Hawaii BioEnergy) which propose to use algae to produce biofuels. Algae can be formulated so that the Omega 3 and 6 fatty acids can be retained by the algae protein. HOT can reduce pressures on low value fish used in fish protein and develop a locally produced food source for our project. If these projects go out of business HOT does not anticipate this would have a negative impact on our business; commercial fish feed is available from companies that can formulate the feed to HOT's specifications. The 101% total is due to rounding error. HOT would like to source food components locally to reduce shipping and storage costs. Reference to Kawaihae was included as it pertains to where feed will come into the island and how much space it will require.

- 5) A low stocking density afforded by the oceansphere is anticipated to reduce the incidence of mortality and disease transfer.

- 6) Fish health will be monitored remotely via video and mortalities will be removed daily and sent to the Hawaii Institute of Marine Biology (HIMB) for necropsy. As stated, if disease is found, the tuna will be treated as appropriate based on the advice of HIMB pathologists.
- 7) We have corrected typographical errors in the FEIS.
- 8) We do not think the impact is negative.
- 9) Existing processing facilities in Kona and Hilo have expressed a desire to work with HOT. We expect the processing companies will also increase capacity as demand increases. Presently the company only plans to gut and gill tuna to market demands.
- 10) The fact that the lease area is larger than either of the two cited facilities and the depth of the water, plus constant currents as well as the biological likelihood that effluents will never reach the bottom are factors in making this determination. This is also combined with the ZOM model which relies on the much greater volume of water in the area than the other two sites.
- 11) HOT notes the following have been observed in the vicinity of KBWF: bottlenose dolphins, spotted dolphins, and rough-toothed dolphins. HOT summarizes KBWF impacts, mitigation measures, monitoring, reports, data collection, migration patterns, and interactions. KBWF notes bottlenose dolphins were attracted to KBWF by: 1) net pens acting as FAD, 2) occasional escape of fish when the net pens are opened; 3) divers interactions. As noted above, the oceanspheres design and materials, and operations procedures will deny dolphins speci a food source, and they will lose interest.
- 12) HOT is participating in discussions as the plan is being developed; it cannot be cited as a basis for more detail to answer your questions.
- 13) Thank you for pointing out that aquaculture burns less fossil fuels and saves on the amount of carbon dioxide release to the atmosphere. This should be included as a potential beneficial impact.
- 14) The company will only introduce supplies of its brand of ahi into the local market as appropriate to assist with branding its product. If more ahi is desired and if it does not affect the livelihood of local fishermen, more can be supplied, but it is not the intent of the company to compete with local fishermen on supply or price of ahi.
- 15) Applicant notes this.

Kanaka Council Kale Gumapac

The Kanaka Council provided 63 questions related to cultural, customary, traditional, and religious rights. The complete letter and response is provided in the FEIS. A summary of the applicant's response grouped by topic is below:

*Applicant Response:*

**Cultural Impact Assessment**

The Cultural Impact Assessment (CIA) author is a planner with expertise in coastal and marine resources, social and natural sciences, and has local experience in ethnographic studies, oral histories, and historical research, and is knowledgeable about historic and current fishing practices in the Hawaiian Islands.

The search for lineal heirs of the land and ocean was done by consulting Native Hawaiian kupuna in the area, searching historical documents, records of the Royal Patents and Land Court Awards, Hawaii County Planning Department title records, the Hawaiian language newspapers (Hawaiian Nupepa Collection at Bishop Museum), Bond Memorial library resources, and UH Manoa, Department of Urban and Regional Planning (DURP) North Kohala Coastal Cultural Resource and Heritage Landscape Study (2005).

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The CIA also asked coastal users and shore-based fisherman to assess the impact of the proposed (projects) action, alternatives, and mitigation measures on cultural resources, practices and beliefs. The noted: 1) the site was far offshore in deep water that is not used for any cultural activity; 2) the distance from shore resulted in the proposed project having no impact on the view shed from the coastal trails and camps; 3) boats regularly traverse the ocean closer to shore; and 4) work boats and Oceanspheres will have no impact on the cultural resources, practices, and beliefs of the coastal lands.

### **Laws of the Kumulipo**

The Kumulipo is a very important cultural resource, and references to these Hawaiian creation stories is included in the CIA. But Chapter 343, HRS or the OEQC EIS guidelines require the EIS document to consider the laws of Kumulipo.

### **Fishing Koa**

The two opelu fishermen were interviewed and noted the fishing koa for opelu does not exist in the project site.

### **Poe Kanaka**

The CIA interviewed individual Native Hawaiians who are currently cultural practitioners who have personal knowledge of the coastal land (camping, fishing, cultural practices) and water use: William Akau, Lala La'au, Kimo Bernard, Leinaala Hoopai, Michael Hanohano.

### **Native Resources Prior Western Contact**

There are no historic sites recorded in the proposed ocean lease site.

### **Kanaka Maoli**

HOT supports the rights of Native Hawaiians. However, there was no evidence, anecdotal or historical, or any religious practices at the project site so no additional steps will be taken. The section regarding Environmental Justice (FEIS Section 2.9 Socioeconomic Conditions) notes that beneficial impacts are expected on minority and low-income populations as a result of the proposed project; new jobs will become available at all educational levels, and local contractors will benefit from the new business. Native Hawaiians are expected to benefit in this manner.

### **Habitat and Nesting Area**

No habitat or nesting area will be destroyed.

### **Creation of Ecosystem**

It is likely fouling growth of marine benthic fauna (bivalves - several species of mussels and oysters [*Pteria and Pinctada spp*]), corals (*Pocillopora* and *Porites*), sea urchins (*Echinothrix calamaris*), nudibranchs (*Stylocheilus longicauda*), and sponges) will occur. No measurable impacts are expected on the adjacent communities. The presence of these organisms would primarily be a function of the presence of the artificial substrates, rather than a perturbation of the environment.

### **Koa Forest**

The DEIS focus is on the proposed project and adjacent coastal lands. It is outside the scope of the EIS to evaluate how many islands have koa forests and what should be done to protect them.

### **Aquatic Laws**

State ocean resources laws can be found Chapter 187A, HRS, Aquatic Resources. State laws to protect ocean water quality can be found in Chapter 342D, HRS, Water Pollution, and Section 11-54, HAR, Water Quality Standards.

### **Sustainability**

HOT is committed to sustainable economic development. A straightforward definition provided by the American Heritage Dictionary (Houghton Mifflin Co. 2009), for the word, “sustainability” is the noun form of the word “sustainable,” which means, “capable of being continued with minimal long-term effect on the environment.” The project proposes to grow ahi in a sustainable manner, while protecting the environment, assuring economic capacity to operate and provide meaningful work for local area residents.

### **Royal Patent, Clear Title Established, Private Ownership & Kingdom of Hawaii**

There is no Royal Patent for the project area. Title to the ocean land is with the State of Hawaii. This proposed project proposes to lease the ocean for aquaculture per Chapter 190D, HRS, Ocean and Submerged Lands Leasing.

### **Impact to the Wild Fish Population**

These fish would be the first generation offspring from wild ahi caught in Hawaiian waters. There would be no effect on wild fish populations from any escaped fish since there is no genetic difference between the wild ahi and the ahi cultivated in the Oceanspheres.

### **Fish Meal**

The main difference between catch and fatten operations is that the food conversion ratio of 12 or 15 to one is based on feeding the tuna wet food, rather than nutritionally balanced dry food pellets. HOT projected feed conversion ratios are similar to other aquaculture operations. Other aquaculture operations have achieved the ratio of two pounds of feed to one pound of growth or less based on a pelletized nutritionally balanced diet. This is not uncommon in the aquaculture industry. We have not identified the best diet yet. The fish feed will be pelleted fish feed that will be specially designed and produced according to exacting standards prescribed by the company. The company is sensitive to the concern about the sustainability of the harvest of some fish used to produce fish meal and fish oil. The company will specify the exact requirements for its feed to the supplier. The specific components of fish meal, and fish oil is currently unknown. The company has no plans to use GMO soy. The company will also seek to identify local alternatives for its feed which may include algae protein and Omega 3 and 6 fatty acids. Research indicates there are several projects by companies (Cellana, Hawaii BioEnergy) which propose to use algae to produce biofuels. Algae can be formulated so that the Omega 3 and 6 fatty acids can be retained by the algae protein. HOT can reduce pressures on low value fish used in fish protein and develop a locally produced food source for our project. If these projects go out of business HOT does not anticipate this would have a negative impact on our business; commercial fish feed is available from companies that can formulate the feed to HOT's specifications. The 101%

total is due to rounding error. HOT would like to source food components locally to reduce shipping and storage costs. Reference to Kawaihae was included as it pertains to where feed will come into the island and how much space it will require.

### **County Responsibility**

Chapter 205A, HRS, delegates authority to the counties regarding over the SMA of coastal land. Inasmuch as the coastal land-based activities may affect near shore waters, SMA permit conditions may include measures to reduce polluted runoff from the land into the ocean, as well as water quality monitoring programs.

### **Pollution**

There are projected to be less than significant impacts on water quality from the proposed project. Stocking the platforms with fish will result in some increase in nutrients and particulate matter in the water column from the fishes' metabolic wastes, feces, and any excess feed. The prevailing currents in the ROI, constant mixing of the SML, placement of platforms at 180 feet (55 meters) depth, 3-mile (2.6 nautical mile) distance from coral reefs and depth of the water at the site all indicate that there will be negligible impacts on water quality in the immediate vicinity of the platforms. If there is an accumulation of by-waste it will be dispersed within a few days, as the strong cross-flow concentration curvature increases dispersion. An accumulation of by-waste will be reduced through neglected sinks (i.e. consumed by phytoplankton and zooplankton).

### **Emergency**

In most events workboats will be able to restore the Oceansphere. HOT will contract with a salvage company that can provide 24/7 emergency response if the oceanspheres become inoperable. An ocean sail (sea anchor) will be deployed to slow its movement away from the designated station. Onboard monitors will send a signal to the monitoring station that a problem has occurred and the salvage crew will be deployed. The USCG will be immediately notified. The oceansphere will most likely move less than one mile per hour in a northwest trajectory and pass hundreds of miles south of Oahu.

### **Hazard/Tsunami**

A tsunami would affect harbors and near shore environments not in the deep ocean.

### **Reserved Fish for Hawaiian Use**

Fish produced by HOT will be owned by HOT, and sold on a wholesale basis to any potential buyer including those of Hawaiian descent. HOT is willing to accommodate fish requests on a case by case basis.

### **Lease site**

The proposed project site is located approximately 2.6 nautical miles offshore Malae Point in North Kohala. The site consists of one square kilometer and is centered at 20°05' 40.090" N 155°55' 40.00" W. The ocean lease site was carefully selected based on a variety of factors (currents, winds, calm sea conditions).

### **Violations**

HOT is not aware of any pending violations.

### **Previous Owner & Other Fish Farm Projects**

HOT is proposing this project; there is no “previous owner” and “proposed owner.” The ahi aquaculture project is the first project proposed by HOT.

### **Government Funding**

HOT has not received any government funding.

### **Past Issues and Problems**

There is no history of issues or problems.

### **NRCS and Hilo Soil and Water**

The NRCS and Hilo Soil and Water are not involved in the proposed project.

### **Tax Obligations**

The company is not aware of any tax obligations.

### **Information Disclosure**

The company will follow all legal requirements to disclose information to the government and public.

### **Public Hearing**

A public hearing was held on April 14, 2009 in Kawaihae, Kohala, Big Island.

### **Environmental Impact Statement (EIS)**

There was only one Draft EIS submitted to DLNR (published by OEQC on February 23, 2009). The state found the DEIS to be in conformance with Chapter 343, HRS, and Chapter 11-200, HAR. A finding of no significant impact to the environment (FONSI) was anticipated for the proposed project (January 30, 2009 acceptance letter). The public comment period for the DEIS ended on April 9, 2009. The DEIS document is 342 pages, not 2000+ pages long and no parts were missing from the DEIS (posted on the OEQC website). The FEIS was revised to provide additional information, and respond to questions from public and agency comments. DLNR has given all statutorily required notices necessary for public input into this process.

### **Sierra Club (late comment letter April 14, 2009)**

The scope of the proposed project is too large, it involves species not previously farmed in mariculture operations, and involves untested technology (dynamic positioning system and propulsion system). Other concerns include: 1) significant impacts on marine species; 2) untested technology; 3) fish food; 4) overall sustainability; 5) public outreach; 6) insufficient DEIS with regards to proposed project potential adverse impacts in terms of secondary impacts, ocean mammal threats, endangered species, economic impacts, technology, capabilities and limitations, sustainability, and public outreach. Common sense notes the proposed project should be proven on a smaller scale versus the current scale.

*Applicant Response:*

- 1) The CDUA and EIS propose to initiate wildlife monitoring efforts once ocean deployment commences. If any adverse effects are identified project operations will be modified to minimize those effects. Consultation with appropriate federal and state agency officials will guide the protocol for managing and monitoring any interactions between employees and marine mammals. Impacts are expected to be less than significant with monitoring in place. Public involvement regarding the development of the monitoring plans is up to the management agencies. HOT will provide wildlife monitoring program data and water quality monitoring data to the community (if the data does not conflict with proprietary procedures). The Monitoring Program will; 1) have qualified observers monitor spinner dolphin, marine mammal species, sea turtles to ensure no negative impacts; 2) monitoring reports will be distributed to agency personnel and research groups; 3) surveying will be done (daily, weekly) by cleaning and maintenance personnel; 4) on-site project personnel will be apprised the listed species status, by local marine wildlife experts; 5) agency personnel will be contacted and informed of impending work that exceeds daily and routine maintenance; 6) wildlife experts and agency personnel will be contacted in the event of any marine wildlife concerns (collisions, strikes, entanglements) that may occur during the project.

Sharks may be attracted to the oceanspheres due to excess fish food, visibility of fish inside the oceansphere, fish scent and increase of fish outside the platform. An increase on predation on dolphins or other marine mammals may occur. However, HOT notes: 1) there is no quantifiable evidence showing an effect or no effect; 2) it is not known if sharks may be aggregated to the oceanspheres; 3) sharks drawn to the platform will be drawn away from adjacent areas thereby reducing the apparent density of sharks (which may result in less risk to the public). The DEIS did not note sharks would be killed but discussed alternatives such as: 1) the "Shark Safety Plan" involve divers with nonlethal "shark pokers" to deter shark interactions; 2) suspending all in-water work if sharks are present; 3) notifying the relevant personnel (offshore manager, assistant manager, VP Operations, President); and 4) consulting with DAR to determine any baiting, hooking and/or tagging would be done to discourage sharks. HOT is sensitive to the cultural significance of sharks. The EIS and CIA state that to Hawaiians sharks are considered a sacred animal, an aumakua or guardian spirit, and is considered a member of their ohana.

FEIS data on monk seals was obtained from the NMFS, U.S. Pacific Marine Mammal Stock Assessments: Hawaiian Monk Seal chapter, 2008. Humpback whale population data is taken from the 2008 SPLASH Report/Hawaiian Islands Humpback Whale National Marine Sanctuary.

- 2) The expected life time of the Oceansphere caged is 10 years, but with proper maintenance and periodic replacement of subsystems, the lifetime could be 20 years. A monitoring system (cameras, etc.) will measure fish growth and automate feeding. Daily maintenance will assure food is being properly dispensed. The automated feeding system has been demonstrated by the University of New Hampshire for several years and will be adapted to HOT needs.

As noted in Section 2.10 on Emergency Services and Human Health and Safety, (p. 2-98 DEIS), it states that “In case an aquaculture platform becomes inoperative while it is deployed, Hawaii Oceanic Technology is required to contract with a salvage company that can provide 24/7 emergency response. An ocean sail, also known as a sea anchor, will be deployed to slow its movement away from the designated station. Onboard monitors will send a signal to the monitoring station that a problem has occurred and the salvage crew will be deployed. The Coast Guard will be immediately notified. The Oceansphere monitors will dispatch a work boat to the area and the salvage ship will be on call. In most events the work boat will be able to restore the Oceansphere however; a salvage company will be called in the event the work crew can't handle the problem.

As noted in the EIS Section 1.4 Description of the Proposed Action (p. 1-12 DEIS), “Free drifting 'subsurface' floating cages will not likely come ashore as ocean currents diverge at ocean-land margins (Cliff Goudy, MIT professor, as per comm.). Also of note the Oceansphere, is mostly an empty structure with less than a 30% surface area foot print and 70% of the current will pass directly through the mesh. A salvage company will be retained to retrieve the Oceansphere upon failure. By inspecting the average currents in the North Kohala area (see Appendix C) in a total systems failure, in a one knot current, the Oceansphere will most likely move less than one mile per hour, in a North West direction in a trajectory to eventually pass hundreds of miles south of Oahu. However, the Oceansphere will be recovered within a few hours of failure by the 24/7 dispatch marine salvage company, such as the work boat the “Raven” operating out of Honokohau Harbor.”

Unmanned underwater robots such as Seabotix (San Diego) will be used to remove mortalities. Estimated cumulative mortality is expected to be 1%.

- 3) The main difference between catch and fatten operations is that the food conversion ratio of 12 or 15 to one is based on feeding the tuna wet food, rather than nutritionally balanced dry food pellets. HOT projected feed conversion ratios are similar to other aquaculture operations. Other aquaculture operations have achieved the ratio of two pounds of feed to one pound of growth or less based on a pelletized nutritionally balanced diet. This is not uncommon in the aquaculture industry. We have not identified the best diet yet. The fish feed will be pelleted fish feed that will be specially designed and produced according to exacting standards prescribed by the company. The company is sensitive to the concern about the sustainability of the harvest of some fish used to produce fish meal and fish oil. The company will specify the exact requirements for its feed to the supplier. The specific components of fish meal, and fish oil is currently unknown. The company has no plans to use GMO soy. The company will also seek to identify local alternatives for its feed which may include algae protein and Omega 3 and 6 fatty acids. Research indicates there are several projects by companies (Cellana, Hawaii BioEnergy) which propose to use algae to produce biofuels. Algae can be formulated so that the Omega 3 and 6 fatty acids can be retained by the algae protein. HOT can reduce pressures on low value fish used in fish protein and develop a locally produced food source for our project. If these projects go out of business HOT does not anticipate this would have a negative impact on our business; commercial fish feed is available from

companies that can formulate the feed to HOT's specifications. The 101% total is due to rounding error. HOT would like to source food components locally to reduce shipping and storage costs. Reference to Kawaihae was included as it pertains to where feed will come into the island and how much space it will require.

- 4) The project proposes to grow ahi in a sustainable manner, protect the environment, and produce employment. From a sustainability stand point the company would be happy to provide tuna to the local market to reduce imports so long as it does not have a negative impact on local fishermen. The proposed project is a sustainable use of ocean resources for environmentally-friendly food production for local consumption and export that provides stable employment for local residents and is consistent with state plans and policies.

HOT is committed to sustainable economic development. A straightforward definition provided by the American Heritage Dictionary (Houghton Mifflin Co. 2009), for the word, "sustainability" is the noun form of the word "sustainable," which means, "capable of being continued with minimal long-term effect on the environment." The project proposes to grow ahi in a sustainable manner, while protecting the environment, assuring economic capacity to operate and provide meaningful work for local area residents.

The long-range viability of air freight shipments of ahi to Japan and the Mainland were based on the company's financial projections (estimated future shipping costs, estimated future tuna prices). There is no evidence that airlines will stop providing freight services to Japan and the Mainland at any time in the future.

The company is forging partnerships. No finalized contract has been negotiated with any specific partner, such as local farmers or algae-to-diesel production operations; data about quantities and availability are not finalized.

- 5) The DEIS scoping meeting included meetings with the public and relevant government officials:
  - September 5, 2006, HOT met with relevant government agency officials;
  - February 2007, HOT met with DLNR, DOH and DOA;
  - July 16, 2008, HOT met with government agency officials;
  - April 23, 2007 HOT met with West Hawaii Fishery Council; and
  - August 3, 2008 and April 5, 2009 HOT met with Kawaihae Local Resource Council.

*Staff note: DLNR is responsible for placing public notices in the media all such notices were provided in accordance with the law in a timely manner.*

### **STAFF ANALYSIS:**

Article XI, Section 6 of the Hawaii State Constitution, provides that "The State shall have the power to manage and control the marine, seabed and other resources located within the boundaries of the state." This same provision goes on to provide that "[a]ll fisheries in the sea

waters of the State not included in any fish pond, *artificial enclosure*, or state-licensed mariculture operation shall be free to the public." [emphasis added] The proposed project is for the placement of an artificial enclosure in the sea waters of the State. This project is subject to the power of the State to manage and control this activity.

The proposed project is to conduct open ocean aquaculture which is an approved use within the resource subzone of the conservation district that requires a Board permit and a management plan. HAR §13-5-24. The following topics seek to address how the subject application and request for lease of state marine waters comply with Chapters 183C, HRS, Title 13-5, HAR, criteria. If this application is approved, the Board would consider a request for a lease of state waters at a later date pursuant to Chapter 171, HRS.

Following review and acceptance of the subject application for processing, the Department scheduled a public hearing. Public notice of the hearing was provided as specified by Chapter 183C-6(c), HRS.

On January 30, 2009, the Department notified the applicant (in part), that:

1. The proposed use is an identified land use (R-1, AQUACULTURE, D-1) within the Resource subzone of the Conservation District, according to Section 13-5-24, Hawaii Administrative Rules (HAR); please be advised, however, that this finding does not constitute approval of the proposal; and
2. Pursuant to Section 13-5-40 (3), HAR, a public hearing will be required since the proposed use is of a commercial nature.

An Environmental Impact Statement Prep Notice (EISPN) was published in the November 23, 2009 issue of the Environmental Notice. The Draft Environmental Impact Statement (DEIS) was published in the February 23, 2009 issue of the Environmental Notice. The forty-five (45) day public review period ended on April 9, 2009. On July 7, 2009, the Department wrote to HOT and noted the project meets the requirements of Chapter 343, HRS, and Chapter 200 of Title 11, HAR, Environmental Impact Statement Rules. The Final Environmental Impact Statement (FEIS) was published in the July 23, 2009 issue of the Environmental Notice.

When the Department accepted the FEIS, HOT was notified that their remained unresolved issues regarding: 1) the engineering design of the proposed engine, 2) fish feed components, 3) lack of benthic studies in the project area, and 4) lack of shark, marine mammal, and endangered species protection plans. Staff believed that the entitlement process could proceed provided that these issues were adequately addressed at a later time.

Documentation of the project's compliance with the provisions of Chapter 205A, HRS relating to the Special Management Area (SMA) requirements was found to be complete in a letter from the Hawaii County Planning Department dated May 13, 2009.

The following discussion evaluates the merits of the proposed land use by applying the criteria established in Section 13-5-30(c), HAR.

1. *The Proposed Land Use Is Consistent With The Purpose Of The Conservation District:*

The purpose of the Conservation District is to regulate land uses for the purpose of conserving, protecting, and preserving the important natural resources of the state through appropriate management and use to promote their long-term sustainability and the public health, safety and welfare.

Staff believes that the proposed open ocean aquaculture project is consistent with purpose of the conservation district. The project utilizes the state's natural resources, but in a judicious manner. Project impacts have been evaluated and considered. Staff foresees no significant detrimental or irreversible environmental and/or cultural impacts resulting from the implementation of this project under proper regulatory guidelines and conditions. Even if the project were found to have detrimental effects, then the oceanspheres could be removed. The project may, in fact, have beneficial economic, social, and environmental effects for Hawaii.

Although there are several issues that still need to be addressed before this project is implemented, staff believes that its has been planned to ensure minimal impact to natural and cultural resources. If the Board approves the project, staff would ensure that all terms and conditions of the permit were followed such as completion and implementation of a marine mammals and shark protection plan, and completion of a benthic survey.

2. *The Proposed Land Use Is Consistent With The Objectives Of The Resource Subzone:*

The objective of the Resource Subzone is to develop, with proper management, areas to ensure sustained use of the natural resources of those areas.

HOT seeks to develop an open ocean aquaculture farm that is an identified land use in the Resource subzone. Staff notes if HOT's proposed mitigation measures are observed, and the marine mammal and shark protection plan is in conformance with the wishes of the relevant resource managers, and staff's proposed mitigation measure is approved by the BLNR (see Discussion Section below) that the natural resources of the state will be conserved for future generations.

3. *The Proposed Land Use Complies With The Objectives And Guidelines Contained In Chapter 205A, HRS, Entitled "Coastal Zone Management" Where Applicable:*

*Recreational Resources:*

The proposed project would be submerged most of the time. It is located in deep water (+ 1,300 feet) and 2.6 nautical miles/3 miles offshore Malae Point, Big Island. No land based recreational resources would be impacted. Boating will not be affected since the oceanspheres are submerged. Boat traffic is minimal according to surveys. For liability reasons there will be no swimming or SCUBA diving allowed in the 247-acre project site. Fisherman would be allowed to fish around the oceanspheres but not directly above or below them. For safety reasons all fisherman and boaters are asked to keep 100 feet

from the twelve oceansphere's marker buoys. Since HOT would need to use Kawaihae Commercial Boat Harbor for berthing/transiting it is conceivable that there could be an effect on existing recreational uses within and around Kawaihae. However, based on the estimated boating needs of this project, staff believes that the impact on recreation would be negligible.

*Historic Resources:*

No historic resources are known to exist at the subject location.

*Scenic and Open Space Resources:*

Staff does not believe that any scenic or open space resources would be impacted. The oceanspheres would be submerged and are located 2.6 nautical miles/3 miles offshore Malae Point.

*Coastal Hazards:*

The proposed farm would be submerged and located in deep water. Staff does not believe that typical coastal hazards, including severe weather, would cause the farm adverse impacts. The submerged position of the oceansphere makes them invulnerable to severe weather. The oceanspheres will be designed to be positively buoyant should they malfunction.

*Coastal Ecosystems:*

The proposed project has the potential to have detrimental effects on the marine ecosystem located below the project site. Other threats include: 1) potential to harm marine mammals, 2) disease, and 3) fish feed ingredients. Staff notes HOT has given relevant arguments why there will be no detrimental effect on the marine environment. HOT notes that project would not impact the seafloor due to the ocean depth (1,300 feet), because fish feed and fish waste would be mineralized or consumed in the water column, due to dilution, and due to lack of benthic fauna at these depths.

Staff has considered comments provided by the Division of Aquatic Resources (DAR) and by the project applicant in regards to benthic resources. Staff has also considered existing benthic information and data provided by the Cates International and Kona Blue Water fish farms. Based on the experiences of these two existing farms, one of the major effects to the benthic community is the detritus that sinks to the bottom as a result of periodically removing/cleaning the organisms that grow on the cage structures (e.g. algae). These two projects are in water with depths of less than 200 feet (much shallower than HOT). While impacts to the benthic communities have been documented at these sites, the impacts are not thought to be serious and have been contained to regions directly below the farms. Be that as it may, staff believes that HOT should provide some information to characterize the benthic environment below the proposed project, in order to create a baseline. DAR made some recommendations for a benthic survey, which have been incorporated as conditions to this report.

Threats to marine mammals have been addressed through cage design, and operation plans. According to the applicant, a supplier for fish feed has to be found. Feed

components are not available to disclose to the general public at this time. HOT will be transparent about ingredients and the DOA will have to approve feed type. HOT will work with the DOA and HIMB fish pathologists regarding fish disease(s). HOT will work with federal and state officials to establish a protection plan for sharks, marine mammals and endangered species. Ongoing monitoring will occur to determine impacts to marine mammals. A monitoring regime and monitoring data will be available to the general public and resource agencies for review. Staff notes if serious impacts are detected and documented, the lease for the proposed project may be revoked or modified. Lastly, staff notes HOT is willing to contract with a 3rd party to conduct water quality to assure compliance.

*Economic Uses:*

HOT expects to create at least 22 direct jobs and 46 indirect jobs. Various sub-contractors will also be hired (fisherman, boat operators, seafood processing companies, testing laboratories, eventually local farmers, providers of fish food) which will create/sustain jobs on the Big Island. Another positive economic effect of our business for Hawaii is the generation of science and technology revenues that will help balance the state's dependence on tourism and the military while generating jobs, GET revenues and income tax revenues for the state.

4. *The Proposed Land Use Will Not Cause Substantial Adverse Impact to Existing Natural Resources Within the Surrounding Area, Community or Region:*

See discussion above.

5. *The Proposed Land Use, Including Buildings, Structures, And Facilities, Shall Be Compatible With The Locality And Surrounding Areas, And Appropriate To The Physical Conditions And Capabilities Of The Specific Parcel Or Parcels:*

The oceanspheres will be mostly submerged and is appropriate to the marine environment.

6. *The Existing Physical And Environmental Aspects Of The Land, Such As Natural Beauty And Open Space Characteristics, Will Be Preserved Or Improved Upon, Whichever Is Applicable:*

The proposed oceanspheres will be submerged and not impact ocean surface views.

7. *Subdivision of Land Will Not Be Utilized to Increase the Intensity of Land Uses in the Conservation District:*

Subdivision is not proposed.

8. *The Proposed Land Use Will Not Be Materially Detrimental to the Public Health, Safety, and Welfare:*

Staff expects the proposed project will have a positive impact upon the public's health, safety and welfare.

## **DISCUSSION:**

HOT's objective is to create an environmentally responsible, economically sustainable way to produce seafood, and reduce the pressure on wild fish stocks in the future. HOT cites the severe decline of ahi (number, size) and the impending decimation of ahi. HOT notes ahi farming is one way to take pressure off the fishery, improve its health, and will help meet the growing demand for seafood. HOT notes the project will benefit Hawaii in many ways - employment, contracting with existing businesses, generation of state tax revenues through successful revenue generation.

Hawaii's waters and specifically the location 2.6 nautical miles/3 miles was chosen for HOT's proposed project because: 1) it is the only state with a legal regulatory infrastructure (high environmental standards) for a high quality fish farming operation; 2) it's ocean lease law gives the applicant's opportunity to develop a business which can provide a local source of food, and develop technology for offshore open ocean fish farming.

Staff reviewed the FEIS and noted it met the requirements of Chapter 343, Hawaii Revised Statutes (HRS) and Chapter 200, Title 11, HAR, EIS rules. However, staff notes there were four unresolved issues regarding lack of environmental and project disclosure, analysis regarding the engineering design of the proposed engine, fish feed components, and lack of shark, marine mammal and endangered species plan.

### *Environmental and Project Disclosure*

In regards to benthos, HOT gathered information from: 1) the National Seafloor Mapping and Benthic Habitat Studies Project; 2) HURL Report; 3) State Office of Planning GIS Data (2007); and 4) reference to bathymetric charts for the Region of Influence (ROI) which includes the project site.

HOT concluded that based on general knowledge of the deep ocean habitat, and shallow water surveys off Kona, it can be inferred there is a decrease in marine life with increasing depth that supports a limited benthic community and fish faunal assemblage. HOT also concluded the project site is deep and will not affect the coral reef communities, has minimal effects, and no cumulative impacts are anticipated to geology, sediments, and soils. However, HOT noted there is no conclusive benthic studies, or specific data of the sea floor, geology, and/or topography for the project site.

Additional reasons for not doing a survey are that HOT notes surveys regarding marine biota are expensive. The cost to rent a submersible and bring it to Hawaii is \$200,000.00. The cost to use a vessel (i.e. HURL) to launch the submersible is \$22,000.00 per day, and there was a time constraint on the cost of renting the submersible.

HOT notes based on available scientific data and practical argument(s) no negative impacts would occur to the benthic habitat. HOT notes the Zone of Mixing study took into consideration

inputs (fish, food) and outputs (feces, excess food) for the proposed project. The result, according to HOT, was there would be no impact on benthic habitat. In addition, tuna do not excrete solid fecal matter; it is a fluid. Anything escaping would be mineralized and/or dissipated by prevailing currents. Based on the scientific literature, Zone of Mixing analysis, tuna biology, and desire to have no net loss of food there would be no impacts, according to HOT. HOT also noted that PISCES 5 2000-2006 survey conducted dives at similar depths along the coastline and dive results indicate coral beds at 1,200 feet were sparse and/or nonexistent. **[Note: Staff notes that these PISCES dives were approximately 20 miles from the HOT site.]**

In term of the potential for sinking, HOT notes that the oceansphere are designed to be neutral or positively buoyant. The oceanspheres will be kept at depth through ballast, water pumped out, and backup power system will maintain the battery and thrusters. According to HOT, even if the oceanspheres drift there is sufficient time to retrieve them via a salvage crew based at Kawaihae Harbor - seven (7) miles from the proposed site; estimated boat time to the project site is 20 to 30 minutes.

On 9/10/2009, and 9/15/2009 OCCL staff discussed with DAR what would be acceptable benthic data for a project of this type. DAR mentioned the use of side scan sonar imagery (50 meter scans and 5 meter/high resolution scans) could be utilized to determine the bottom's hardness but not what it is composed of. DAR independently analyzed a 50-meter scan for the proposed site. The results indicate the area appears to be a step/slope area is not flat - thus some marine life may exist. DAR further notes HURL's submersible and ROV (remote operating vehicle) can be hired by other entities (i.e. NELHA) for \$35,749.00 per day, plus a transit charge of \$31,000.00 (from Honolulu to neighbor islands). HURL is scheduled for to visit NELHA and Maui for research (before December 2009). DAR notes the following information could be received: 1) water sample; 2) video; 3) current meter; 4) still imagery; 5) bottom samples. DAR notes the information could provide baseline data versus no data at all.

Lastly, DAR notes extensive photographic evidence (images adequately characterize the lease area, and are high quality) could be used to verify the bottom to help serve the purpose of the benthic characterization. DAR notes, in conjunction, some bottom sediment samples would be desirable at a number of locations.

[Staff Note: The applicant submitted an analysis of the benthic habitat at the proposed site of the project conducted by Dr. Richard Grigg. The analysis is based on old data but does include some information about the benthic environment directly below the proposed farm site. Staff has attached this report as **Exhibit 7.**]

#### *Engineering Design Proposed Engine*

Staff notes HOT submitted the design of the Hybrid Solar Ocean Thermal Energy Conversion Power (SOTEC) system (Persistent Oceanic Power/patent application USPTO # 11/849,338) to the department on 9/9/2009.

Oceansphere(s) will use SOTEC power system using a combination of electricity production and storage elements (batteries) to meet its energy demand. The power system will supply energy to all systems that compose the Oceansphere (thrusters, telecommunications, buoy). Sufficient

power will be supplied to maintain the Oceansphere in position against a range of currents speeds (average 0.4 knots - maximum speeds of 1.5 knots) in the vicinity of the ocean lease site. At the core of the system is a Stirling engine that will generate electricity with a piston that is driven by the contraction and expansion of a refrigerant that is sealed within the engine. Solar energy will supply the hot side of the system needed to expand the refrigerant. Surface seawater will supply the cold side of the system needed to contract the refrigerant. Seawater will be pumped through a heat exchanger to cool the enclosed and sealed refrigerant, which is internal to the Stirling engine. Seawater is separate from the refrigerant. As part of the heat exchanger process the temperature of the extracted seawater will increase slightly by 0.25 degrees centigrade. It will then undergo a cooling process before being returned to the ocean surface.

Hybrid SOTEC power generating elements include: solar ocean thermal Stirling engine, backup motor using biodiesel fuel, and central battery storage. Power will be supplied to the electric thrusters, telecommunication, telemetry and monitoring systems. Batteries are the direct source of power for the dynamically positioning thrusters and have a three-day lifetime without charging. Should the engines stop working, battery power will provide ample time for company crews and/or salvage crews to be on site and affect remediation. The Stirling engine, SOTEC system, and biodiesel motor will connect in parallel to the battery bank and will maintain the charge on the batteries to produce continuous power.

Staff notes the OTEC engine has not been constructed and/or tested. Therefore, its potential impacts, whether positive or negative are unknown at this time.

#### *Fish Feed Components*

HOT notes to grow a 100-pound tuna, approximately 200 pounds of dry feed are required. The tuna have to be fed a diet of fish feed with omega 3 and omega 6 fatty acids. HOT will specify the content of feed and quality standards but the feed source will be determined by the supplier. HOT notes the biggest producer of fish food is Purina or Sketting. A fish feed vendor has not been selected and the specific components of fish meal and fish oil is unknown. As tuna have never been raised in aquaculture farms HOT will be looking at fish feed and how it affects the taste of tuna. There are no plans to use GMO soy. HOT would like to meet organic standards, but none have been developed. Feed will be inspected by the DOA and fish pathologists from the Hawaii Institute of Marine Biology (HIMB) before being fed to tuna.

Staff notes the content and/or components of feed, feed source, use of fish oil are of concern. Staff notes with the approval of Cates International, and KBWF aquaculture projects the use of feeds containing supplemental hormones or antibodies is not allowed. Staff notes that supplemental hormones and antibodies will not be permitted under the terms and conditions of the CDUA, if approved. Staff further notes that feed will be inspected by the DOA for approval before feeding, as a term and condition of the CDUA, if approved.

#### *Sharks, Mammals & Endangered Species Plan*

HOT notes there will be one marine mammal plan which discusses the management of sharks, mammals, and endangered species; NOAA and DAR will be consulted for guidelines.

Staff notes these plans will be in place prior implementation of the proposed project, with the advice of DAR and NOAA and will be incorporated as a condition of the CDUA, if approved.

## **CONCLUSION**

HOT notes aquaculture is one export industry in which Hawaii can excel. HOT notes the proposed project's export revenues is expected to be \$120 million per year; the figure is six times more than the current value of all aquaculture output in the state. Staff notes the amount does not contain a monetary value for the oceansphere and OTEC system technology that HOT proposes to develop and sell to others as new technology.

Staff notes the proposed project seems to be more science fiction than reality. However, staff notes without space exploration today's technological advances would not be possible. Staff notes if HOT is able to work out the: 1) design and construction of the oceansphere(s) and SOTEC system; 2) raise fingerlings from eggs received from broodstock; 3) produce a marketable final tuna product (muscle, meat, flavor/texture); 4) perfect fish feed components; and 5) are able to spawn yellowtail tuna or bluefin tuna in captivity, aquaculture operations will be revolutionized.

Staff notes the proposed project will have positive impacts on the field of aquaculture, creation of jobs directly and indirectly, contribute to existing businesses (cattle ranch, processing plants), and promote technological advances, which will revolutionize how aquaculture is produced and aquaculture farms are operated in the future. Aquaculture research and development will benefit from the proposed project.

Staff agrees that Hawaii is too dependent on tourism and the military. Staff agrees the state needs to be less reliant on these two factors and become sustainable in general, whether it is in the form of exports; food, technology, or otherwise. Staff agrees that fisheries are declining and ways need to be found to promote and restock fish (and other species).

DAR also had concerns with the science of the proposed project. DAR noted it would be prudent for the applicant to initially pursue this project as a proof of concept. DAR recommended that the CDUA permit, if approved, should explicitly limit (2 cages) the number of cages deployed. DAR noted it would be rational to have the cages on site for a period of at least 6 months without any animal or feed to test the effectiveness and reliability of the navigational, propulsion and communication systems as well as cage structural integrity. According to DAR, the trial period would also present an ideal opportunity to test the applicant emergency response plan.

DAR also was concerned with nutrients, waste, and/or feed reaching the bottom, and the possible change in the diversity of deep-water fauna. Staff notes without existing or current surveys of the benthic environment located below the proposed project area it will be unclear whether marine life exists and what if anything would be impacted.

Therefore, should the Board decided to approve the CDUA HA-3495, approval should be contingent upon the submittal of still imagery and/or extensive photographic evidence of the proposed project site, which identifies the benthic environment/serves as baseline data.

Staff notes DAR will be forwarded the information and feedback will be sought. If there are possible negative impacts to the environment, HOT will identify and submit additional Best Management Practices (BMPs), mitigation measures, and/or other ways to lessen negative impacts to the environment. Staff notes HOT can provide additional information such as; 1) bottom samples; 2) water sample; and 3) video as baseline data.

Staff will recommend a condition which notes, "the applicant will submit to the Department either still imagery and/or extensive photographic evidence of the proposed lease area within six months from the date of the Board's approval of the CDUA, for the Department's review and approval. DAR will be forwarded the information and feedback will be sought. If there are possible negative impacts to the environment, HOT will at that time identify and submit additional Best Management Practices (BMPs), and/or other ways to lessen negative impacts to the environment."

Staff notes HOT would like to deploy the first oceansphere by 2010 and second by 2011. All oceanspheres would be deployed by 2013. Staff would like the Department to have some discretion on how deployment proceeds. Thus, staff believes that the Board should approve the up to two (2) oceanspheres for initial deployment. If the technology works and HOT's methods are acceptable to the Department, then the permittee should return to the Board in the future to brief the Board on the project's performance. The applicant could then seek additional deployments under this permit and the approved EIS, at the discretion of the Department.

Staff notes HOT has done the relevant studies regarding water quality; no degradation to water quality will occur. The project meets the criteria for antidegradation policy, designated uses, and water quality. The FEIS discusses the effluent model, and the resulting water quality parameters are compliant with water quality standards for Class A marine waters. There are no impaired water bodies that will be affected by the proposed project. HOT notes the appropriate permits from state and federal agencies will be sought.

Staff notes HOT discusses access and that fisherman will be "allowed" to fish within the lease area (247 acres). However, staff notes HOT has only asked for exclusive use of 100 feet (32 meters) radius from each oceanspheres marker buoy - total area of proposed exclusive use is 8.65 acres (376,990.8 square feet).

HOT notes ocean lessees are required to purchase comprehensive insurance for recovery and removal of any lost or damaged farm materials, and for any other damage that might be inflicted by the farm. Staff notes a bond should be posted by HOT for recovery of the oceansphere.

Staff notes HOT submitted a Management Plan, pursuant to Section 13-5-24, HAR, R-1, AQUACULTURE, and is attached as **Exhibit 8**.

**STAFF RECOMMENDATION:**

- A. That the Board of Land and Natural Resources APPROVE the Conservation District Use Application and Management plan by Hawaii Oceanic Technology, Inc. for an open

ocean fish farm located within the given coordinates offshore off Malae Point, Hawaii, subject to the following terms and conditions:

1. The applicant shall comply with all applicable statutes, ordinances, rules, and regulations of the federal, state, and county governments, and applicable parts of Chapter 13-5, Hawaii Administrative Rules;
2. The applicant, its successors and assigns, shall indemnify and hold the State of Hawaii harmless from and against any loss, liability, claim, or demand for property damage, personal injury, and death arising out of any act or omission of the applicant, its successors, assigns, officers, employees, contractors, and agents under this permit or relating to or connected with the granting of this permit;
3. The applicant will submit to the Department either still imagery and/or extensive photographic evidence of the proposed lease area within six months from the date of the Board's approval of the CDUA, for the Department's review and approval. DAR will be forwarded the information and feedback will be sought. If there are possible negative impacts to the environment, HOT will at that time identify and submit additional Best Management Practices (BMPs), and/or other ways to lessen negative impacts to the environment;
4. The applicant shall obtain appropriate authorization from the Department for the use of state lands;
5. The applicant shall comply with all applicable Department of Health administrative rules;
6. Before proceeding with any work authorized by the Department or the Board, the applicant shall submit four copies of the construction plans and specifications to the chairperson or his authorized representative for approval for consistency with the conditions of the permit and the declarations set forth in the permit application. Three of the copies will be returned to the applicant. Plan approval by the chairperson does not constitute approval required from other agencies;
7. Any work or construction to be done shall be initiated within one year of the approval of such use, in accordance with construction plans that have been signed by the chairperson, and, unless otherwise authorized, shall be completed within five years of the approval of such use. The applicant shall notify the department in writing when construction activity is initiated and when it is completed;
8. All representations relative to mitigation set forth in the accepted environmental impact statement for the proposed use are incorporated as conditions of the permit;
9. The applicant understands and agrees that the permit does not convey any vested rights or exclusive privilege;

10. In issuing the permit, the Department and Board have relied on the information and data, which the applicant has provided in connection with the permit application. If, subsequent to the issuance of the permit such information and data prove to be false, incomplete, or inaccurate, this permit may be modified, suspended, or revoked, in whole or in part, and the department may, in addition, institute appropriate legal proceedings;
11. Where any interference, nuisance, or harm may be caused, or hazard established by the use, the applicant shall be required to take measures to minimize or eliminate the interference, nuisance, harm, or hazard;
12. The offshore fish farm shall operate submerged at least 60 feet (20 meters) below the ocean surface, but may be raised for repair, transport or other maintenance, unless otherwise approved by the Department;
13. The use of feeds containing supplemental hormones or antibodies shall not be allowed. Proposed feeds shall be provided to the Department with the pre-approval of the Department of Agriculture, for Departmental review and approval;
14. Yellowfin tuna and bigeye tuna are the only species approved;
15. Signs or other markings of the site shall be regulated by site plan approval;
16. Buoys, signs or other markings shall be provided on the ocean surface to clearly mark the location of the oceanspheres;
17. The applicant shall forward details of all monitoring efforts to the Office of Conservation and Coastal Lands (OCCL), to the Division of Aquatic Resources, Kona Branch, and shall forward water quality results to the Department of Health, two weeks after receipt of the results;
18. The OCCL shall be immediately notified of the failure of the oceansphere system, major fish escapes, disease outbreak, theft or vandalism, or other unusual events;
19. The applicant shall periodically sample ocean-farmed fish, and when necessary, fish in the area of the farm, and examine the sampled fish for parasites or other disease. Unless the Chairperson specifies other methods of sampling and analysis, sampling shall occur not less than once per year;
20. The applicant shall submit all research, data, results or other publications, papers or reports concerning the fish farm and its surrounding environment to the OCCL, and to the Kona Branch of the Division of Aquatic Resources, and shall use objective, third party experts to collect water quality samples and marine mammal data. The applicant shall place copies of all Federal or State-mandated environmental quality reports at local repositories, such as the DLNR, Division of Aquatic Resources Kona Office, so that local residents may review the data. The applicant shall

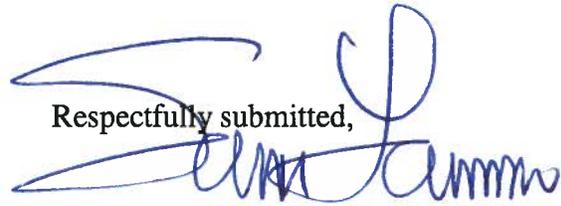
- provide reasonable access to Federal, State and County officials for monitoring and oversight purposes;
21. The applicant need not submit information related to farm operations which is not necessary to evaluate the quality of the environment at the submerged fish farm and surrounding areas;
  22. When submitting information to the Department, copies of all information shall be supplied to both the Office of Conservation and Coastal Lands and Division of Aquatic Resources, Kona Branch Office;
  23. After the deployment of the first two oceanspheres, the applicant shall brief the Board of Land and Natural Resources on the performance of the project. The applicant shall obtain the approval of the Chairperson before deploying additional cages;
  24. The applicant shall monitor the condition of the submerged fish farm on a daily basis;
  25. The applicant shall implement mitigative measures approved by the Chairperson to alleviate environmental or use concerns, when the need is apparent or when required by the Chairperson. Such mitigative measures may include the partial or complete removal of the fish farm facility;
  26. The oceanspheres and accessory structures shall be removed at the conclusion of the use;
  27. Any nets or other debris that foul on the cages or other part of the farm facility shall be disposed of as required by federal, state and city and county regulations and shall not be set free in the marine environment;
  28. The applicant shall work with NOAA and DAR to develop and implement a marine mammal plan in coordination with, and subject to the approval of the Division of Aquatic Resources. The program will ensure to the maximum practicable extent that all close approaches and direct physical interactions of marine protected species with the project's structure(s) are recorded, described and reported to state and federal marine protected species agencies in an effective and timely manner. Direct physical interactions will include, but not be limited to collision, entanglement, grazing, or any other direct physical contact between any part of the structure (cages, mooring lines, buoys, etc.) and any marine protected species (all species of cetaceans and sea turtles.). The protocol will describe conditions and criteria related to adverse impacts on marine protected species that would trigger associated mandatory modification of project activity. The criteria and conditions will include, but not be limited to direct physical contact between marine protected species and any part of the structure. Associated mandatory project activity modifications will

range from increased monitoring to immediate project shut-down and removal of the entire structure, depending on the severity of the impact(s);

29. The Board of Land and Natural Resources may revoke the permit if the Department determines that there is an adverse impact to marine mammals and/or the marine environment;
30. Dead fish shall not be disposed of in the surrounding waters but shall be removed from the site and disposed of at a County approved site;
31. The applicant shall work with the Department to revise the Management Plan to be consistent with any conditions imposed by the Board of Land and Natural Resources herein, and shall further develop a emergency response contingency plan to be part of the Management Plan in anticipation of any oceansphere system failures and/or unanticipated oceansphere movements. The Board of Land and Natural Resources herein delegates to the Chairperson the responsibility to approve amendments to the Management Plan which shall be fully developed and approved by the Chairperson prior to the deployment of the first oceansphere;
32. Regarding the OTEC system engine the following shall apply:
  - a. The activity/use shall not adversely affect a Federally listed threatened or endangered species or a species proposed for such designation, or destroy or adversely modify its designated critical habitat;
  - b. The activity/use shall not substantially disrupt the movement of those species of aquatic life indigenous to the area, including those species, which normally migrate through the area;
  - c. When the Chairperson is notified by the applicant(s) or the public that an individual activity deviates from the scope of the activity/uses, or activities are adversely affecting fish or wildlife resources or their harvest, the Chairperson will direct the applicant(s) to undertake corrective measures to address the condition affecting these resources. The applicant(s) must suspend or modify the activity to the extent necessary to mitigate or eliminate the adverse effect; and
  - d. When the Chairperson is notified by the U.S. Fish and Wildlife Service, the National Marine Fisheries Service or the State Department of Land and Natural Resources that an individual activity/use or activities conducted under the CDUA is adversely affecting fish or wildlife resources or their harvest, the Chairperson will direct the applicant(s) to undertake corrective measures to address the condition affecting these resources. The applicant(s) must suspend or modify the activity to the extent necessary to mitigate or eliminate the adverse effect.

33. Failure to comply with any of these conditions shall render the permit void; and
34. Other terms and conditions as prescribed by the Chairperson.

Respectfully submitted,



Sam Lemmo, Administrator  
Office of Conservation and Coastal Lands

Approved for submittal:

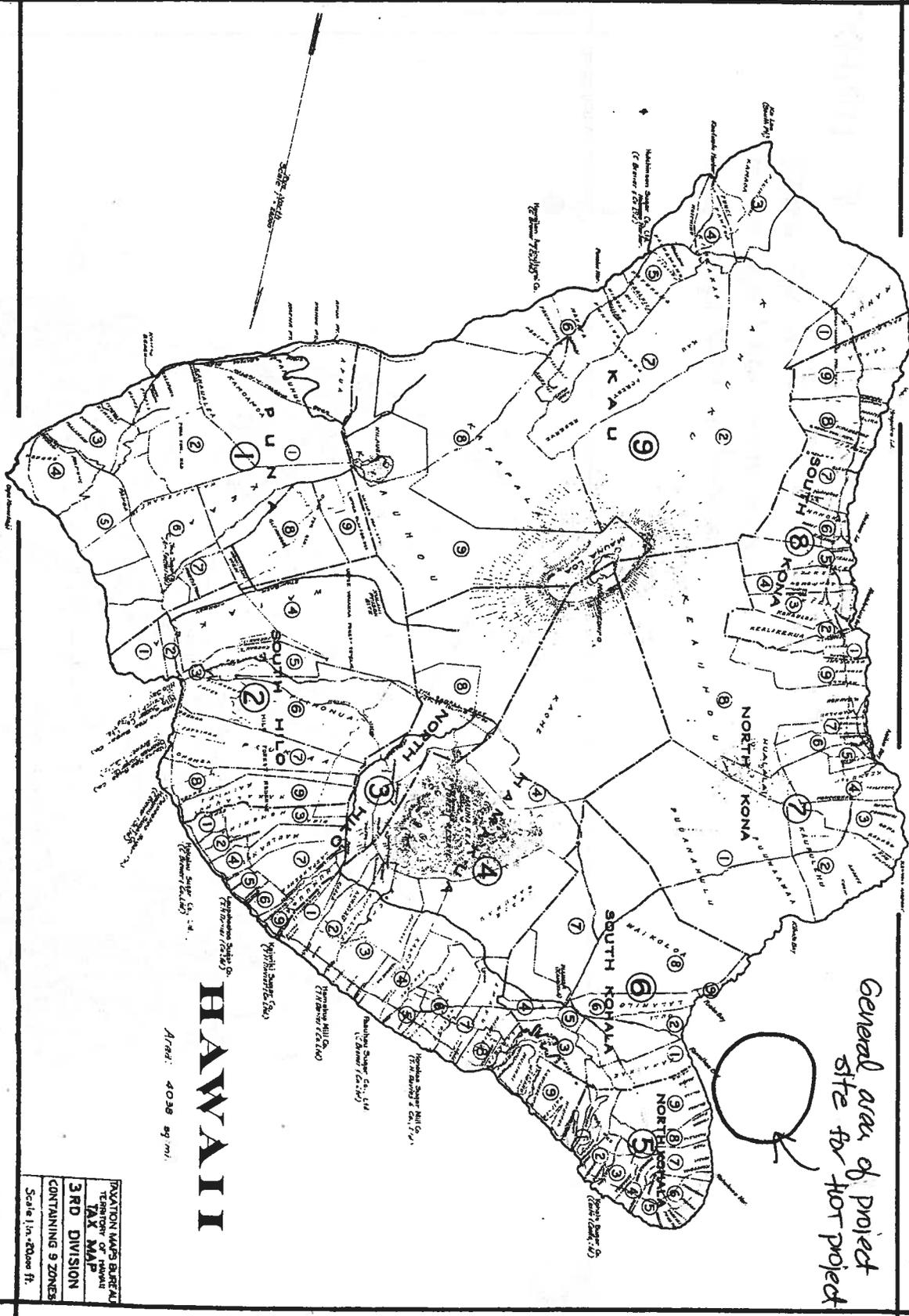


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LAURA H. THIELEN, CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES

Dwg. No. 937  
 By: L.L. [unclear]  
 Source: Territorial Survey, 1907-1910

Appr. by: [unclear]  
 Revised by:  
 Appr. by:



# HAWAII

Area: 4028 sq. mi.

DIVISION MAPS BUREAU  
 TERRITORY OF HAWAII  
 TAX MAP  
 3RD DIVISION  
 CONTAINING 9 ZONES  
 Scale 1 in. = 20000 ft.

General area of project site for HOP project

EXHIBIT I

EXHIBIT I



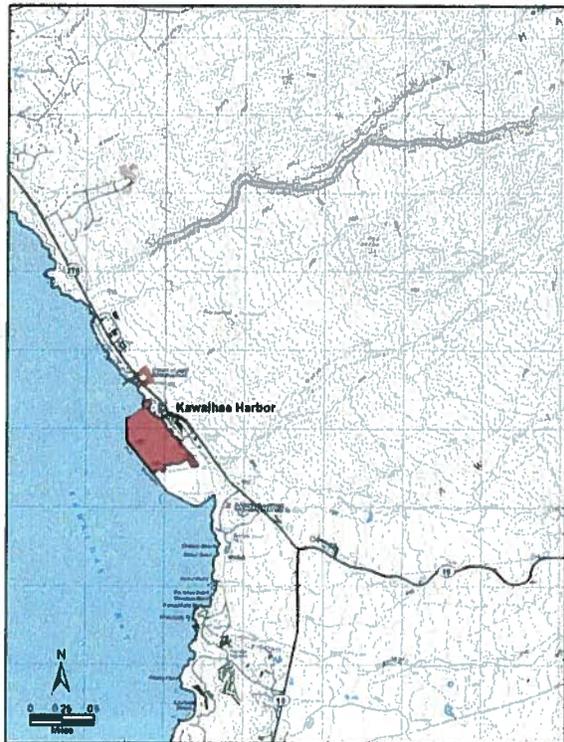
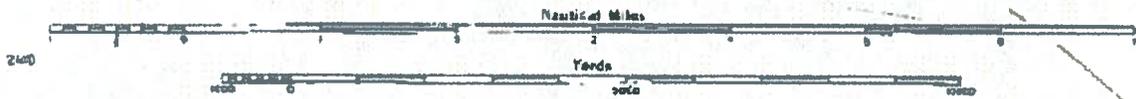
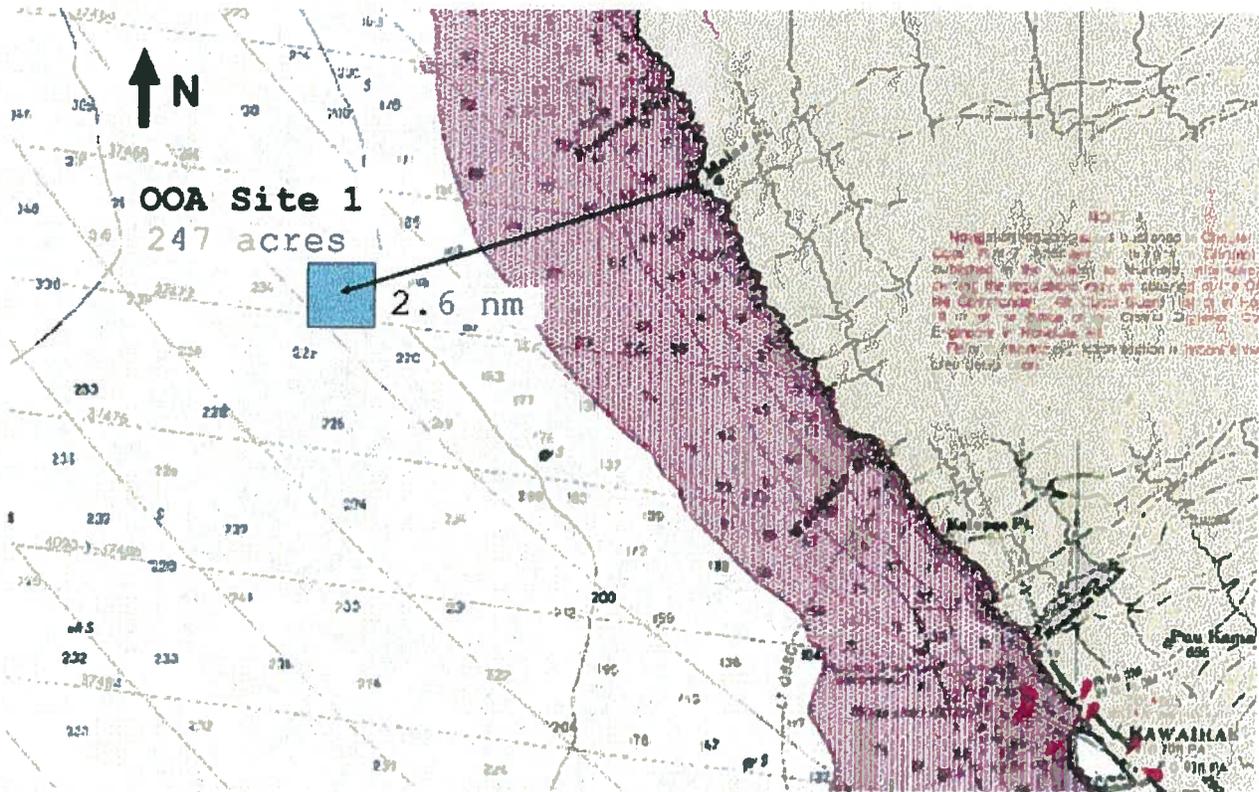
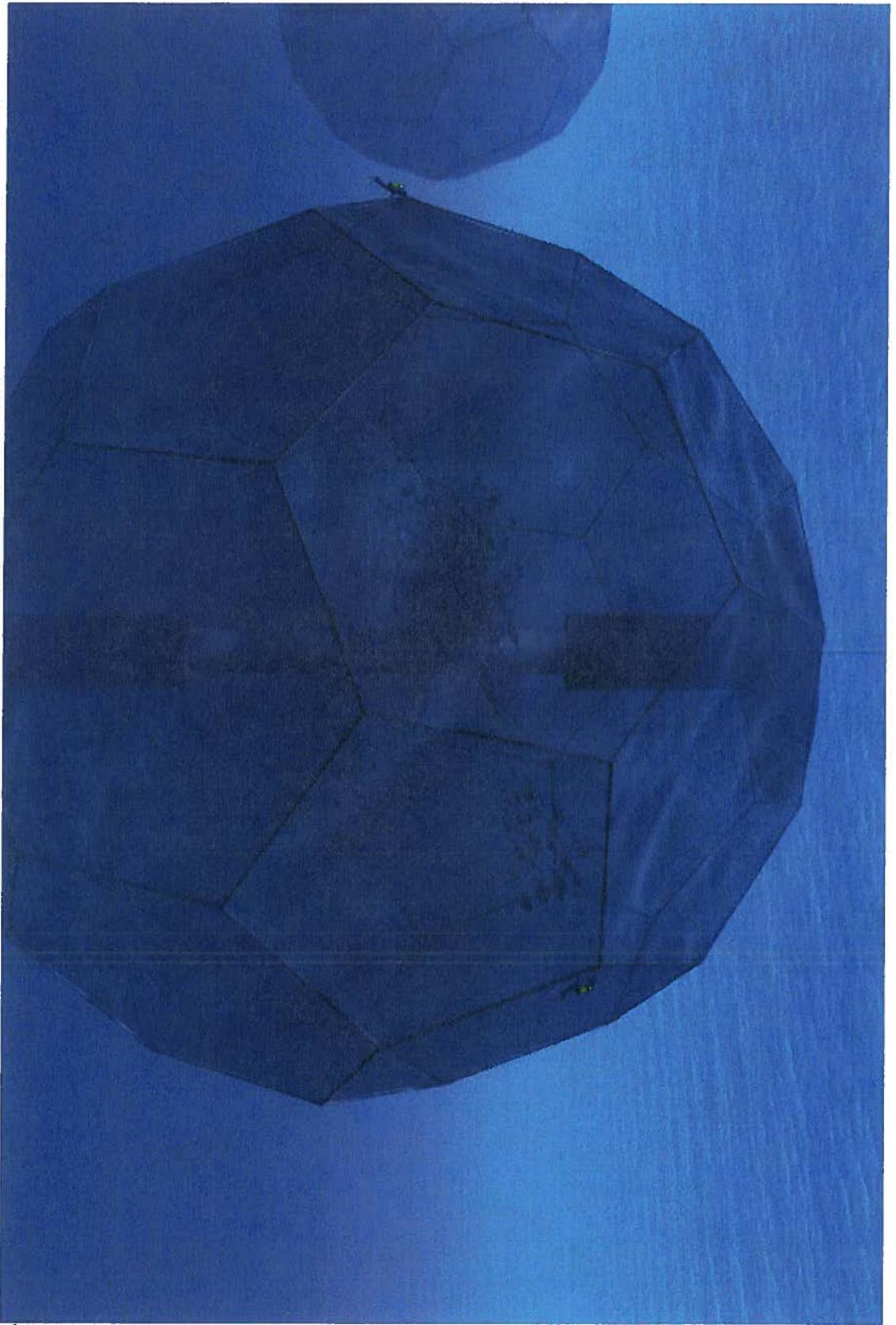


EXHIBIT 3

EXHIBIT 3



PROPOSED OCEANSPHERE

EXHIBIT 4

EXHIBIT 4

Diagram of Oceansphere - not to scale

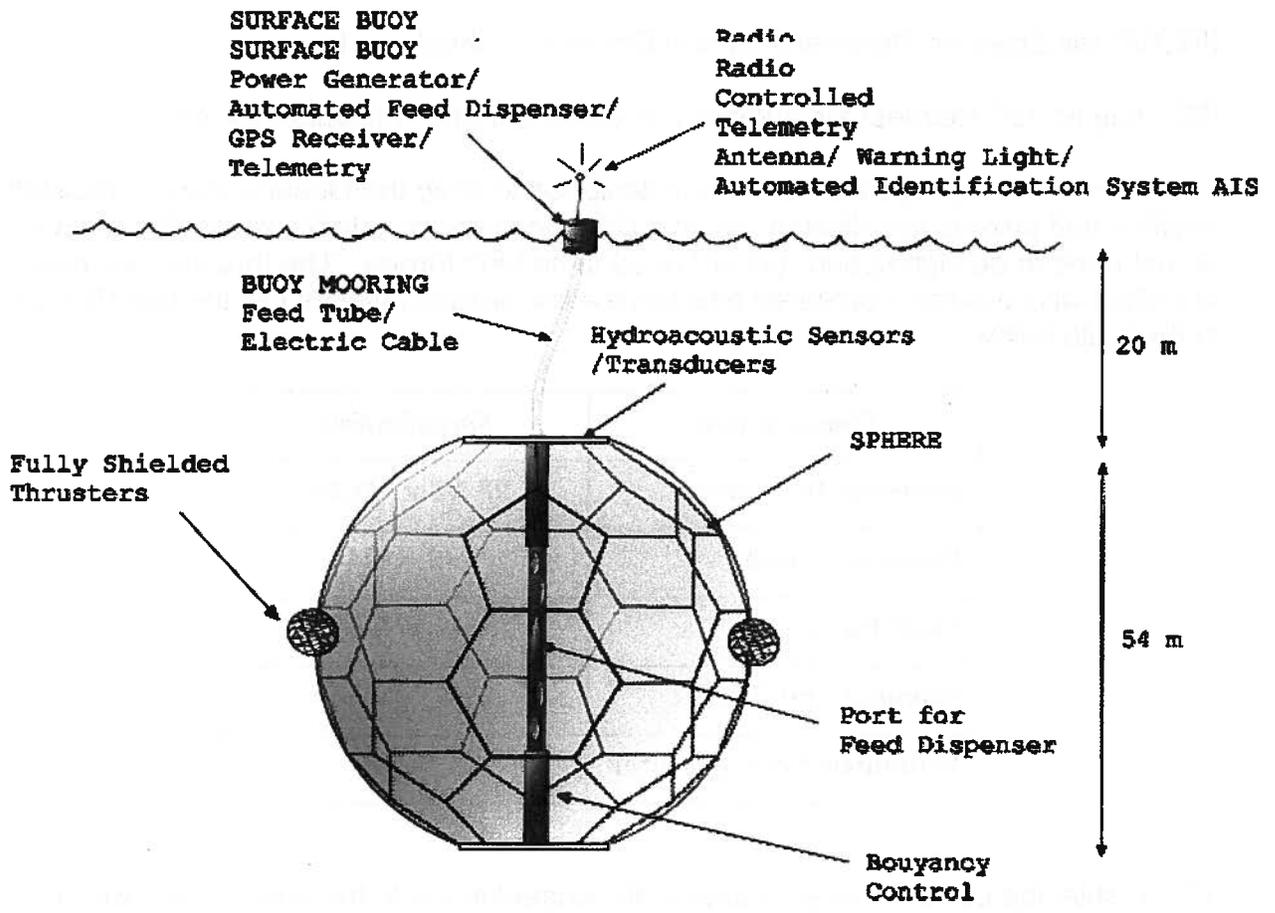


EXHIBIT 4

August 20, 2009

TO: Dawn Hegger, DLNR, OCCL

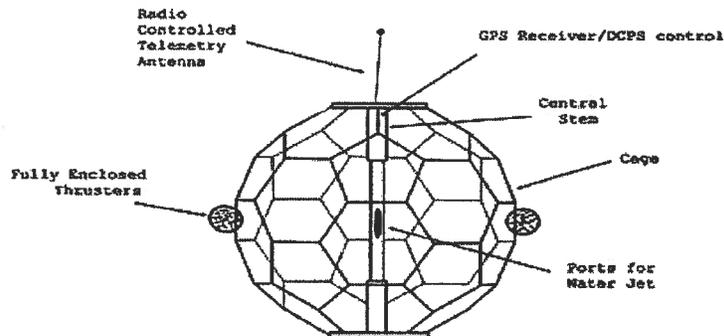
FROM: Bill Spencer, President, Hawaii Oceanic Technology, Inc.

RE: August 19<sup>th</sup> Request for Summary of Oceansphere Propulsion System

The Oceansphere propulsion system is designed to keep the Oceansphere in geostatic position and provide stabilization against changing current. Unlike a boat the thrusters do not need to be high speed, but will need to be high torque. The thrusters we have identified will be electric powered plus have a low decibel level as per the specification in the table below.

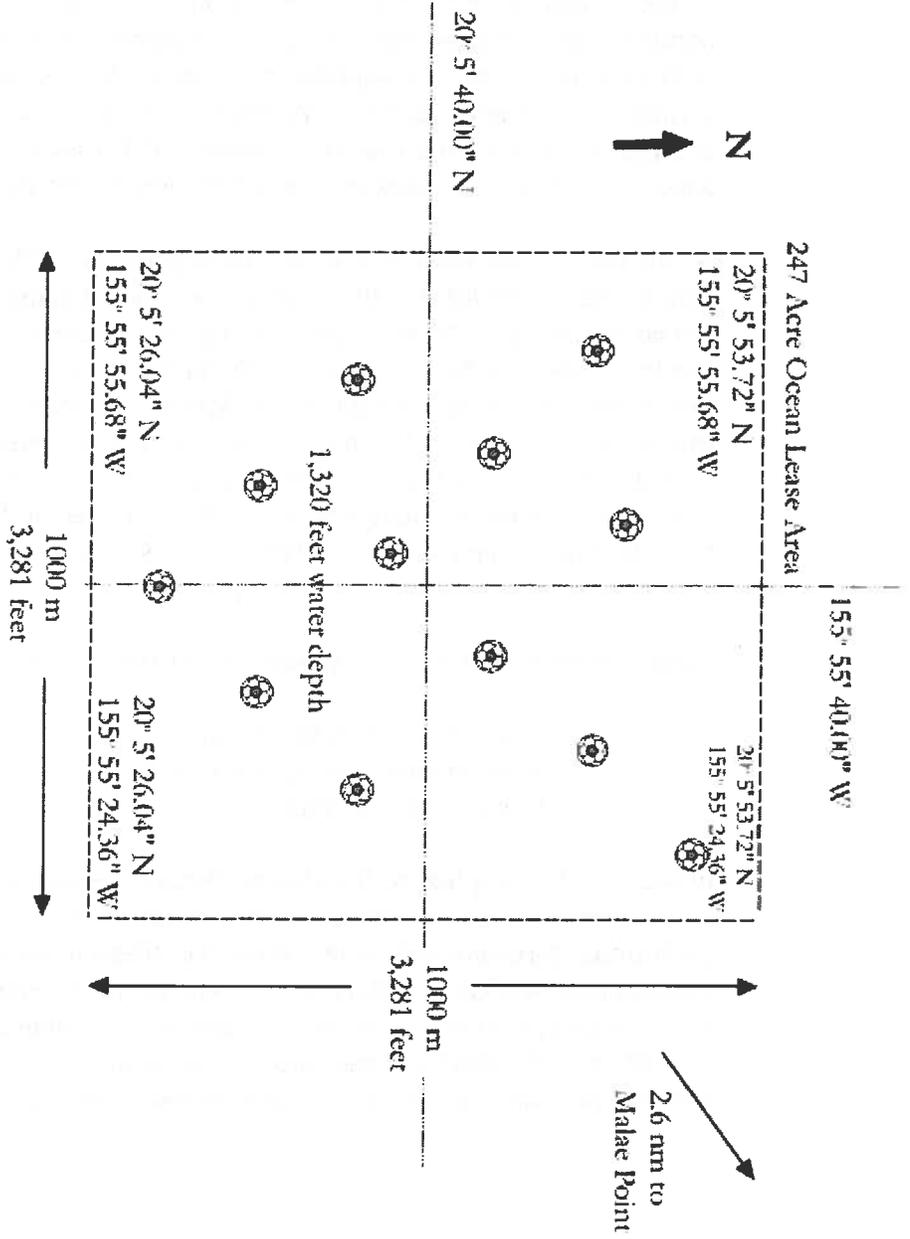
<i>Characteristic</i>	<i>Specifications</i>
<b>Propeller Diameter</b>	<b>98 3/8in (8.2ft)</b>
<b>Propeller Speed</b>	<b>43 RPM</b>
<b>Shaft Power</b>	<b>5.0Kw / 8.4HP</b>
<b>Nominal Max Thrust</b>	<b>4.5KN / 990lbs</b>
<b>Estimated Noise at Motor</b>	<b>70dba</b>

These shielded electric tunnel thrusters are located in the in the sphere wall, will be encased and will be used to maintain the Oceansphere on station. The Persistent Ocean Power (POP) system will provide power for positioning, telemetry, and autonomous operation as per the figure below provided for illustration purposes only. Drawing is not to scale.



EXHIBIT

4



**Figure 1-1. Map of the Proposed Action at Preferred Site 1**  
**The proposed lease site is centered at  $20^{\circ} 05' 40.00''$  N  $155^{\circ} 55' 40.00''$  W, shown here with spacing of twelve Oceanspheres within the ocean lease site to maximize mixing.**

EXHIBIT 4

## **Hybrid Solar Ocean Thermal Energy Conversion Power System**

The Oceansphere will use a hybrid solar ocean thermal energy conversion (SOTEC) power system (referred to as the Persistent Oceanic Power System or POP system - patent application USPTO # 11/849,338) using a combination of electricity production and storage elements (batteries) to meet the energy demand of the Oceanspheres. The power system will supply energy to all systems that compose the Oceansphere including thrusters, telecommunications and buoy. Sufficient power will be supplied to maintain the Oceansphere in position against a range of currents speeds. Measured current meter data shows that currents average 0.4 knots, with maximum speeds of 1.5 knots in the vicinity of the ocean lease site (FEIS, Appendix B, Current Report by Dr. Roger Lukas).

At the core of the system is a Stirling engine that will generate electricity with a piston that is driven by the contraction and expansion of a refrigerant that is sealed within the engine. Solar energy will supply the hot side of the system needed to expand the refrigerant. Surface seawater will supply the cold side of the system needed to contract the refrigerant. Seawater will be pumped through a heat exchanger to cool the enclosed and sealed refrigerant which is internal to the Stirling engine. Seawater is separate from the refrigerant. As part of the heat exchanger process the temperature of the extracted seawater will increase slightly by 0.25 degrees centigrade. It will then undergo a cooling process before being returned to the ocean surface.

Oceansphere hybrid SOTEC power generating elements are as follows:

- Solar ocean thermal Stirling engine
- Backup motor using biodiesel fuel
- Central battery storage

Power will be supplied to the electric thrusters, telecommunication, telemetry and monitoring systems. Batteries are the direct source of power for the dynamically positioning thrusters and have a three day lifetime without charging. Should the engines stop working, battery power will provide ample time for company crews and/or salvage crews to be on site and affect remediation. The Stirling engine SOTEC system and biodiesel motor will connect in parallel to the battery bank and will maintain the charge on the batteries to produce continuous power.

**AHI**



**Yellow Fin (*Thunnus albacares*) Tuna**

<http://www.montereybayaquarium.org/storage/animals/520x260/yellowfin.jpg>



*J Fontes ImagDOP*

**Bigeye Tuna (*Thunnus obesus*)**

[http://www.horta.uac.pt/imagdop/Servicos/Thunnus\\_obesus/Thunnus\\_obesus\\_Jorge\\_Fontes\\_lq.jpg](http://www.horta.uac.pt/imagdop/Servicos/Thunnus_obesus/Thunnus_obesus_Jorge_Fontes_lq.jpg)

EXHIBIT

5

# Hawaii Oceanic Technology, Inc.

425 South St., Ste. 2902, Honolulu, Hawaii 96813 808-225-3579

www.hioceanictech.com

February 10, 2009

Laura H. Thielen, Chairperson  
Board of Land and Natural Resources  
State of Hawaii  
Department of Land and Natural Resources  
Office of Conservation and Coastal Lands  
Post Office Box 621  
Honolulu, Hawaii 96809

RECEIVED  
OFFICE OF CONSERVATION  
AND COASTAL LANDS  
2009 FEB 10 P 12:17  
DEPT OF LAND &  
NATURAL RESOURCES  
STATE OF HAWAII

REF:OCCL:DH CDUA: HA-3495

Dear Ms. Thielen,

Please find attached with this transmittal letter ten copies of our DEIS, CDUA with the Chairperson's signature page, the DLNR acceptance letter and Enclosure 3 as requested. The January 30, 2009 acceptance letter from the Chairperson of the Board of Land and Natural Resources (BLNR), notes that as part of the BLNR evaluation of the Hawaii Oceanic Technology, Inc. application for a lease for marine activities in state marine waters, "we (BLNR) request information related to the two criteria listed in Section 190D-11(e). Specifically: (1) The applicant has the capacity to carry out the entire project; and (2) The proposed project is clearly in the public interest upon consideration of the overall economic, social, and environmental impacts." Hawaii Oceanic Technology, Inc. responds as follows:

**(1) The applicant has the capacity to carry out the entire project**

Hawaii Oceanic Technology, Inc. (HOT) is a "C" corporation formed under Delaware law and operating exclusively in the State of Hawaii. It has been certified by the Hawaii State Department of Taxation as a "qualified high technology business" in the Ocean Science category and eligible for Act 221/215 investment based on the fact that at least 50% of the company's business activity involves research and development and that 75% of the company's projected revenues will be derived from the results of that research and development. The company's legal structure as a "C" corporation allows it

to sell stock to qualified individual and institutional investors. The company has been continually raising money for this project since inception in 2006.

The funding raised to date is sufficient to conduct research and development as well as carry on all of the activities necessary to pursue permits, complete an Environmental Impact Statement, assist UH Hilo with student training and preparation of tuna spawning facilities at their existing facilities at the Pacific Aquaculture and Coastal Resources Center (PACRC) and perform the associated design, engineering and construction planning necessary to build its open ocean aquaculture platform known as the Oceansphere. All investment rounds have been registered with the U.S. Securities and Exchange Commission in accordance with SEC rules and regulations.

In summary, Hawaii Oceanic Technology, Inc. is properly legally structured to raise funds through the sale of stock to qualified individuals and institutional investors. Investors in the company include three professional venture capital firms, Kolohala Venture Fund, mTerra Venture Fund and Fulcrum Fund and 11 individual qualified investors and/or family trusts. All of these professional institutional venture funds have as their objectives investment in green technology, clean technology or socially responsible companies.

Companies such as Hawaii Oceanic Technology, Inc. which seek to develop new technologies to meet the needs of large markets are typically venture backed. Venture capital companies such as those investing in HOT have high standards and requirements that must be met before they invest. Venture capital companies are managed by professional investment managers, experienced entrepreneurs and boards of directors comprised of industry experts and people from among their limited partners. A venture fund is typically a limited partnership. The limited partners pool their money into the fund and that money is then invested over a period of time of usually 2-3 years in a portfolio of companies that meet the stated objectives of the fund. Once a certain amount of money is raised from the limited partners, the fund is closed to additional investors. The fund managers then begin seeking companies to invest in using strict investment criteria. The criteria include but are not limited to: (1) an experienced management team, (2) evidence of breakthrough intellectual property under development, patented inventions and/or inventions undergoing the patent process, (3) a well defined market addressed by the company's intellectual property, (4) the ability to achieve specific progress milestones and or history of achievement, (5) a well-defined business model (how the company will make money once its product/service is fully developed), and (6) a realistic "exit strategy" such as being acquired by a larger company, or a public stock offering that will give the investors a reasonable return on investment.

Venture capital funds rarely if ever invest all of the money they expect to invest in a company all at once, or up front. They typically participate on the company's board of directors, closely monitor progress, oversee and in some cases supplement management teams, and make sure the company stays focused on achieving stated

milestones. Every year after careful review of progress, the investors will decide whether and how much to continue to invest.

As milestones are met and progress is made, the value of the company increases which determines the price per share. Investors with large holdings in a company will typically put in more money proportionate to their ownership share so that they continue to own the same share of the company going forward that they initially started out with. This is why companies go through several rounds of investments known as "series" or "tranches".

For example: If a company raises \$1M in a Series A round with a "pre-money" valuation of \$2M, the post money valuation will be \$3M and the investor who puts in \$1M will own 33% of the company. When the company achieves certain milestones that add value, like obtaining a permit, or receiving a patent, the company may seek to raise additional funding in order to capitalize on those accomplishments. The company will offer a Series B round and the pre-money valuation will increase commensurate with the accomplishments. At this point, for example, the pre-money valuation might be \$10M, so the investor in order to maintain its ownership share would then invest an additional \$5M allowing them to maintain their 33% ownership share of the company.

As the company makes further progress, achieves milestones and continues to grow it may require additional investment, the amount of which would be determined by the increased valuation. Of course, company founders and early investors would all like to see a company achieve growth in revenues and profitability such that additional investment may not be required. In most cases, however, companies will go through several rounds of private financing before revenue can be made and profitability can be achieved.

In the case of HOT, the key milestones affecting valuation and the ability to raise funding sufficient to start generating revenues, are continuing to be met and funding is continuing to be raised. The next significant value creation event for the company will be obtaining its permits and ocean lease. Achieving these milestones will allow the company to begin tuna farming operations and start growing tuna for sale to markets in Japan and the U.S. mainland. By this point, investors will be ready to put in the funding necessary to move forward. They will certainly not abandon the company and walk away from their earlier investment, as it is their goal to achieve a return on their investment. If HOT cannot get a permit and ocean lease in Hawaii, the company would move its operations to a place where permits could be obtained.

To date, HOT has demonstrated beyond any doubt that it meets all of the criteria demanded by institutional investors that make it an attractive investment. Although the company and its investors are keenly aware of the risks they are taking, it is the goal of the management team and the investors to work very hard to mitigate those risks, set achievable milestones and make steady progress that increases the company's valuation thereby justifying additional investment.

HOT's founders and management team have demonstrated to their investors that it has the "legal competence and fitness," or "capacity," to achieve its stated business plan. Since no investor gives a company all the money it needs up front, HOT management has proven it can execute its plan and has raised larger and larger amounts of funding in three investment rounds. Management has demonstrated the ability to execute its business plan, technical capability and prudent fiscal management.

As of 2009, the company is continuing to do all the work necessary to achieve critical value creating milestones. The fact that three professionally managed venture funds have continued to invest in the company further demonstrates the company's worthiness for continued investment if milestones continue to be met. It should be clear from this evidence that the company and its management team have demonstrated the "capacity to carry out the entire project" especially if milestones such as obtaining permits necessary to operate can be achieved.

Hawaii Oceanic Technology, Inc. has demonstrated that it has the "capacity to carry out the entire project." Withholding permits based on an interpretation of 190D-11(e) that a company must have all of the funds in the bank is impractical and discriminatory. Such an interpretation goes against the very spirit of innovation that this country is founded upon. It would discriminate against entrepreneurship; it would be inconsistent with Governor Lingle's stated policy to promote an "innovation economy" for Hawaii; and it would be inconsistent with how venture capital finance works. Such an interpretation would require that only a large company with large amounts of discretionary cash be allowed to undertake an innovative project such as the one HOT proposes. An interpretation of this nature would have prevented companies such as Apple Computer, Intel, Google, eBay, Amazon, Facebook, Motorola and thousands of other venture backed start-ups from ever getting off the ground and forever changing the way we live.

From an analysis of public documents for the other open ocean aquaculture companies in Hawaii, it appears that Cates International and Kona Blue did not necessarily have all the funding they needed to execute their open ocean aquaculture projects when they were granted an ocean lease and CDU permit based on an Environmental Assessment. HOT has exceeded their requirement by preparing an Environmental Impact Statement.

The definition of "capacity" according to Webster is "legal competency or fitness" and "the facility or power to produce, perform or deploy." Hawaii Oceanic Technology, Inc. has met a very high standard set by venture capital investors that meets that definition and demonstrates to its investors that with the cooperation of the state of Hawaii it has the capacity to carry out this project.

**(2) The proposed project is clearly in the public interest upon consideration of the overall economic, social, and environmental impacts.**

**In the Public Interest**

The concept of "public interest" is a term of policy for which there is little consensus as to definition. We will attempt to address this question both in terms of how our business contributes to the general welfare of the people of Hawaii, and by how our business addresses a global problem defined as the world's ocean's inability to sustainably meet global demand for seafood as a source of protein. We assume that it is commonly understood that modern day fishing techniques have changed little since pre-historic days. For the most part, humans behave as hunter gatherers, taking seafood from the oceans with little regard to quotas and virtually no regard to impact. Hunting for wild fish is also deemed a "sport" for some who typically do not require the food they catch to feed their families. Ancient Hawaiians recognized the sacred nature of fish as a food source, and endeavored to adopt fish farming and fishery management practices, in their efforts to sustain this precious resource.

Today the United States imports 85% of all seafood it consumes. More than 40% of those imports are from Asian aquaculture producers, many of whom do not use environmentally sound methods or even those that the U.S. Food and Drug Administration would deem safe procedures. Overall, the US seafood industry is in decline and our dependence on foreign sources of seafood threatens our national security. Specifically, the tuna industry in Hawaii and worldwide is in decline. Stocks of blue fin, big eye and yellowfin are reportedly under such stress that in some regions they may not recover. In today's world rising fuel prices and dwindling supplies of wild fish stocks portend a certain collapse of the fishing industries in many countries, and denial of the world's population access to this important source of healthy food protein.

In Hawaii, the tuna fishery is also under great stress. The tuna fishery in Hawaii is 90% fished out and the few tuna fisherman still in business have to travel as much as 1,500 miles and stay at sea 2-3 weeks in order to catch sufficient tuna to re-coup the fuel and operating expenses they incur. We estimate that long liners have to travel 50 miles for every pound of tuna they catch. Jobs have been lost and livelihoods destroyed. Yet as an island state we are surrounded by billions of square miles of ocean. Hawaii's Exclusive Economic Zone is 200,000 square miles, second only to Alaska's in size. While tourists flock here by the thousands to fish for marlin, swordfish and tuna, the fishing industry is under severe stress. The cost of fresh wild caught tuna can reach more than \$20 per pound at many times during the year putting it out of reach for most citizens. Like the rest of the United States much of our tuna is imported from the Philippines and other developing countries. It has to be treated with "tasteless" carbon monoxide gas, in order to preserve the look of freshness, frozen and shipped thousands of miles.

It is clearly in the public interest to sustainably produce more ocean based seafood before wild fisheries collapse. It is further in the public interest, that methods be

developed to farm fish in the open ocean in an environmentally respectful and economically viable manner. The mission of Hawaii Oceanic Technology, Inc. is to use the latest technology and the most scientific and sound environmental principals to achieve these goals.

### **Environmental Impact**

Presently, due to fishing and shipping methods, the carbon footprint of tuna as a food source actually exceeds that of cattle, which in addition to the transportation contribution to their carbon footprint also contribute millions of tons of ozone depleting methane gas into the atmosphere. In 1985, acclaimed ocean explorer Jacques Cousteau declared that "mankind must learn to farm the sea as we farm the land." Little progress has been made since then. Most of what progress has been made has occurred right here in Hawaii. Hawaii has been declared the "Silicon Valley" of aquaculture by the last Secretary of Commerce.

Thanks to two companies, Cates International (now Hukilau Foods) and Kona Blue Water Farms, Hawaii has the only two closed loop open ocean fish farms in the United States. Hawaii Oceanic Technology, Inc. intends to be the third. Another US company, Snapperfarms, has had to move from Puerto Rico to Central America due to permitting difficulties. In the aquaculture research sector, Hawaii is also home to the Oceanic Institute, one of the world's foremost aquaculture research organizations, contributing to industry's ability to spawn several varieties of fish in captivity as well as creating a disease resistant shrimp brood stock sold throughout Asia.

Hawaii Oceanic Technology, Inc. has demonstrated in its Environmental Impact Statement and Conservation District Use Application the company has demonstrated an approach to open ocean fish farming that, if allowed to proceed, has the potential to revolutionize the aquaculture industry with no significant environmental impact. The overriding design objective of the company is to implement an environmentally respectful and economically viable way to farm seafood in the deep ocean, away from shorelines where there are constant currents, massive amounts of clean water and stable temperatures. These factors will contribute to fish health and eliminate the need to use antibiotics and prevent disease. They will also allow maximum dilution of effluent. Our approach is also designed to minimize the carbon footprint associated with seafood production and eliminate pressure on wild stocks helping them replenish.

Our closed loop strategy takes advantage of the demonstrated ability to spawn tuna in captivity. Using this system, approximately seven tuna will be caught per year in waters off the Island of Hawaii and used as brood stock to produce fingerlings from eggs under contract to the Pacific Aquaculture and Coastal Resources Center in Hilo. This closed-loop aquaculture system avoids the negative impacts of increased fishing pressure from current tuna farming "catch and fatten" methods that take young tuna out of the ocean before they have had a chance to reproduce, further stressing the fishery. In addition, a recent study published in the journal *Science*, January 19, 2009, by researchers led by Rod W. Wilson of the University of Exeter in England shows that marine fish excrete

between 3% and 15% of total carbonate found in the ocean. This has the documented effect of countering the acid created by carbon dioxide absorbed by the ocean. In layman's terms, fish poop is good for the ocean. This may be another potentially beneficial environmental impact of open ocean aquaculture that merits future research.

The company's Oceansphere is a large aquaculture platform that is NOT tethered to the ocean floor. Like modern day ocean survey vessels and oil drilling platforms, it is designed to operate autonomously and stay on station in geo-static position utilizing the latest telecommunication technology and tools, many of which have been tested, proven and are in use by the U.S. oil industry and military services. At the heart of the company's technology is a hybrid Ocean Thermal Energy Conversion (OTEC) power source. Our OTEC system uses the difference in temperatures between the surface and 600 feet below the surface to expand and contract a gas inside an engine that in turn drives an electricity generator. That electricity is then stored in batteries and used to operate the various components of the Oceansphere that keep it on station, allow observation of the Oceanspheres' contents, the quality of the water, the speed of the currents and the detection of intruders, whether man or animal.

There are 21 separate inventions incorporated in the company's patent application that defend these technological advancements. One of the best ocean engineering companies in the world has been contracted with to assist with the design and engineering of this OTEC power plant and related systems. Although OTEC is normally thought of as a way to provide large amounts of power, enough to electrify a city, our hybrid OTEC power plant is small scale and designed to produce just enough power to operate the Oceansphere. One venture capitalist who reviewed our technology suggested that it might be the "killer application" for OTEC, meaning it was one of the best OTEC applications he had ever seen.

Hawaii Oceanic Technology's business plan and environmental impact statement shows how its operation will significantly reduce the carbon footprint associated with the production of seafood, in particular tuna. When fully operational the company expects to produce 6,000 tons of Ahi per year in one half square mile of ocean or one square kilometer. That is .00025% of Hawaii's 200,000 square mile Exclusive Economic Zone. As a comparison, average production data from cattle operations indicate that it would take about sixty times more land area, 21,000 acres, or 30 square miles, to produce an equal quantity of beef from cattle.

By taking advantage of the ability to operate in the deep ocean environment, the company does not require a large physical footprint to be economically viable. The total fuel consumption of work, harvest boats and delivery vehicles required by the company to produce 6,000 tons of tuna is equal to five miles per pound of tuna or 1/10<sup>th</sup> the amount of fuel consumed by Hawaii's long line fishing fleet for the same amount of tuna. The company can also reduce fuel and other costs by the ability to "harvest on demand", and can supply consumers a fresh consistent quality product at a predictable price on a sustainable basis.

In today's \$70 billion aquaculture industry, what you feed farmed fish is a major issue. Indeed, this is one of the largest expenses the company will incur. Presently the company intends to obtain its fish food from sustainable sources it has identified. The food will not be treated with any artificial substances or antibiotics. It will be nutritionally appropriate for the species being raised and will meet the highest possible organic standards. The food will be thoroughly tested before it is accepted and deployed for feeding. Our goal is to produce seafood that meets or exceeds contemplated standards for organically farmed seafood products.

Due to the cost of incoming shipping and a desire to have minimum impact on lower value fish that comprise fish food today, the company is devoting resources to finding economically viable alternatives that do not affect the flavor and texture of the final end product. Furthermore, the company would like to work with local farmers and suppliers of fish food alternatives so as to reduce associated shipping costs and contribute to the local economy. One such alternative is the algae by-product derived from the use of algae to produce biofuels.

Many companies, some of which are backed by large mainland oil companies like Shell Oil, intend to grow algae in Hawaii for biofuels. We are working closely with some of these companies to make arrangements to take what remains after the oils are extracted from the algae and use this by product to supplement or even replace fish protein in fish food. In other cases we may contract with farmers to grow soy beans as a source of protein and nutrients in our fish food. We will also work with researchers at the University of Hawaii that have figured out a way to make fish food from the waste by-product used to make ethanol. Sixty-five percent of all fishmeal based food product is used to feed farm animals. We are sensitive to the fact that as the \$70 billion a year aquaculture industry grows, companies must find viable alternatives.

### **Economic Impact**

Since Governor Ariyoshi began efforts to stimulate the growth of a high technology economic sector in Hawaii in the mid eighties, thousands of companies have been started by entrepreneurs just like the founders of Hawaii Oceanic Technology, Inc. In the last seven years, investors have put more than \$1.2 billion dollars into qualified high tech companies such as ours. These companies have created world changing intellectual property, hired thousands of workers and contractors and put \$1.4 billion back into the Hawaii economy. Innovation is key to Hawaii's economic survival into the future. Hawaii Oceanic Technology, Inc. is intent on building an economically viable solution to one of the biggest problems facing mankind, the growing depletion of seafood by a world hungry for fish. We join two other open ocean aquaculture companies in Hawaii in attempting to achieve this goal and believe that thanks to Hawaii's forward looking ocean lease law, it is one of the only places in the U.S. that can achieve this objective.

Hawaii has depended almost solely on tourism and the military as its economic engine. Since the state is no longer competitive as a producer of land based agricultural

products, its reliance on tourism has resulted in several economic slumps over the last 20 years as factors outside of our control have impacted the number of tourists visiting our islands. Aquaculture is one of the few export industries that Hawaii can excel at.

Our location in the middle of the Pacific and aquaculture expertise gives us a global competitive strategic advantage. The EIS explains in detail how this proposed project is consistent with state economic development policies, agricultural development policies and ocean resources management policies. Specifically, the Hawaii Ocean Resources Management Plan (HORMP) sets the goal to “encourage cutting edge and appropriate ocean science and technology with safeguards for ocean resource protection,” with a strategic action to “plan and develop sustainable commercial aquaculture in coastal areas and ocean waters to diversify and expand Hawaii’s economy and provide locally produced sources of seafood (HORMP, 2006, p. 38).

Unfortunately, due to the lack of land in Hawaii, some types of on shore aquaculture are not economically viable leaving us with the option of moving aquaculture into the open ocean. The inability of near shore tethered open ocean aquaculture systems to expand horizontally has hampered economic scalability and forced one of our two pioneering aquaculture firms to seek expansion outside of Hawaii, thereby denying the state of export revenues and subsequent jobs and tax revenues. Hawaii Oceanic Technology seeks to avoid the potential conflicts found in the near shore environment by using a technological design allowing the operations to be located far from shore in deep waters without anchors.

Hawaii Oceanic Technology, Inc. is devoted to operating in Hawaii. The company believes that the State’s ocean lease law gives it tremendous competitive strategic advantage that can afford economic viability. The company’s technology allows the construction of very large aquaculture platforms, our Oceanspheres. The Oceansphere takes advantage of the ability to operate in very deep water, far from shore. Their large size, 82,500 cubic meters, allows for low stocking densities and high capacity in a small geographic footprint. This makes for predictable economic scalability with no significant environmental impact. The company projects export revenues of approximately \$120 million per year which is six times more than the current value of all aquaculture output in the state.

The company expects to create at least 22 direct jobs and using DBEDT’s economic multiplier, 46 indirect jobs. The company also expects to sub-contract with fisherman, boat operators, seafood processing companies, testing laboratories and eventually local farmers and other providers of fish food which will create or sustain hundreds of other jobs on the Big Island. Another positive economic effect of our business for Hawaii is the generation of science and technology revenues that will help balance the state’s dependence on tourism and the military while generating permanent jobs, GET revenues and income tax revenues for the state.

Once the company’s business model and technologies are proven, it may seek to expand its operation in Hawaii’s Exclusive Economic Zone and license its technology

throughout the world. If allowed, the company will also be able to provide a sustainable source of quality affordably-priced seafood to the people of Hawaii. It will also help protect the natural stocks of tuna of Hawaii and the world, which are on the verge of collapse, and help meet the seafood protein requirements of the world's rapidly growing population.

In summary, Hawaii Oceanic Technology, Inc. founders and investors believe that with the cooperation of the State of Hawaii, the company has the capacity to carry out its business plan, and that this proposed project is clearly in the public interest upon consideration of the overall social, economic and environmental impacts. We look forward to building a successful environmentally-responsible aquaculture company in Hawaii and helping to strengthen and diversify our local economy for the benefit of Hawaii's people.

Sincerely,



Bill Spencer  
Chief Executive Officer

**Attachments:**

DEIS  
CDUA  
DLNR Acceptance Letter  
Chairpersons signature page  
Enclosure 3

# Analysis of the benthic habitat at the proposed site of the Ahi Aquaculture Project off Malae Point, Hawaii and Potential Environmental Impacts

By

Richard W. Grigg  
Emeritus Professor of Oceanography  
University of Hawaii  
Honolulu, Hawaii

## I. Introduction

In this report, the benthic habitat at depths directly below the proposed (preferred) site of the Ahi aquaculture Project off Malae Point, West Hawaii, is described and the potential of environmental impacts are analyzed. Given that an alternative site (OOA-Site 2) is located 4 nautical miles south of a known precious coral bed off Keahole Point, the broader habitat at depths ranging between 1200-1500 feet (~370-450 m) off leeward West Hawaii is also briefly described.

The preferred site is located 2.6 nautical miles off Malae Point at 20 degrees - 5' - 40" North and 155 degrees - 55' - 40" West, at a water depth of 1320 feet (~400 m) (Figure 1). The proposed project plan is to culture hatchery grown fingerlings of yellowfin and big-eye tuna within cages (oceanspheres) submerged at depths between 20 and 80 m that are un-teathered (no anchors) and remain in position by a system of self contained propulsion thrusters. The fingerlings will be grown to 100 pound harvest size using dry fish feed supplied through automated feed dispensers. The zone of mixing around the oceanspheres has been modeled to extend to a depth of 150 m beyond which all generated nutrients and particulate organic material (POM) are expected to dilute to background levels.

## II. The deep water benthic habitat off leeward West Hawaii

Over the past 35 years, approximately 40 dives in deep water submersibles (Star II, Pisces IV and V and Deep-Worker-2000) have been conducted off West Hawaii. Exploratory precious coral surveys and harvesting dives were concentrated at depths between 1200-1500 feet (~370-450 m) (Grigg, 1974-1975).

In 1974-75, four deep dives in the Star II submersible were taken by the author off the Kohala Coast at depths close to the 200 fathom contour which is a known depth zone for precious corals. Remarkably, one of these dives (Dive # 6, 4-25-75) was located directly off Malae Point at depths between 190-210 fathoms (1140-1350 feet, 347-412 m) (Figure 2). Again remarkably, the transect of this dive actually crossed exactly under the preferred site of the aquaculture project (center position). Along this dive transect, about 0.4 nautical miles of bottom habitat were covered, and the bottom was observed to consist uniformly of sand with a few outcrops of rock that were heavily sedimented. No

EXHIBIT 7

octocorals or bottom-fish were observed during this dive. The only invertebrates noted were small undescribed tunicates and these were rare. Weak ripples were observed in the sand and the bottom current was westerly with suspended particulate matter moving at a rate of about 5 cm/sec (0.1 knots). The dive was terminated at a depth of 1350 feet (412 m) because the habitat was judged unsuitable for precious corals, the object of the survey. Precious corals normally require a clean swept substratum and moderate to strong bottom current (0.5-3 knots).

With regard to the other sites explored in 1974-75 off the Kohala Coast, only those north or northwest of Upolu Point and over 12 nautical miles north of the preferred site for the ahi aquaculture project, were characterized by sufficiently strong bottom currents and hard-ground substrata to support precious corals. Pink, bamboo and gold corals were found but at very low and patchy levels of abundance north of the 12 mile point. For example, a recap of a dive located 3.7 miles northwest of Upolu Point at depths of 1210-1240 feet (~370-380 m) was characterized by hard ground substrata throughout the dive and a clean swept bottom, but only 6 small colonies of pink coral (*Corallium secundum*) were observed.

In contrast, to the deep dives off the Kohala Coast described above, a small but moderately dense bed of both red and gold (*C. regale* and *Gerardia* sp.) exists at depths of 1200-1475 feet (365-450 m) (off Keahole Point (US DOC, 1980; Grigg, 2002). Utilizing Deep Worker-2000 submersibles, American Deepwater Engineering harvested 61 kg of *C. regale* and 150 kg of *Gerardia* in 1999 and 2000 from the Keahole Bed. The Keahole precious coral bed is approximately 20 nautical miles southwest of the preferred ahi aquaculture project site.

### III. Potential environmental impacts of the proposed project

As noted in Section II, no precious coral or commercial bottom-fish were observed on the bottom directly below the preferred site of the proposed Ahi Aquaculture Project Site. In fact, the habitat in the general area below the site, was judged to be unsuitable for precious corals because moderate to strong bottom currents were not present and the substrata was observed to be primarily sand or heavily sedimented rocky outcrops. Heavy sedimentation on the bottom is an indicator that weak bottom current is the norm.

Because of the vigorous mixing and dispersion that is expected to characterize the surface and mixed layers (R. Lucas, H.O.T. Ahi Aquaculture Project EIS) at the preferred site, no waste food or fecal matter is expected to reach the bottom below the cages. Even if it did reach the bottom, it would be in the form of POM and it would be eaten by benthic infaunal organisms that most likely occur there in the sand.

Parenthetically, in the case of a much shallower open-water fish culture project operated by Cates International off Ewa Beach, Oahu, no significant impacts on the bottom (benthic habitat) have been encountered there, other than slight enrichment of two species of infaunal polychaetes that have been found to be ephemeral in space and time.

The only known habitats that support precious corals off the leeward West Hawaii coast are at Keahole Point some 20 nautical miles to the southwest of the preferred site and off Upolu Point, over 12 nautical miles to the northwest of the site, therefore the preferred ahi aquaculture project site poses no real or potential threat to these known resources. As noted in the EIS by Hawaii Ocean Technology, the preferred site is also situated at a depth and distance off-shore that is beyond traditional trolling zones and known depths for commercial bottom-fish.

In conclusion, and from the standpoint of precious corals or other known fishery resources, the ahi aquaculture project preferred site poses no apparent or significant potential of negative environmental impact to the underlying benthic habitat. A discussion of other environmental subjects and concerns that are not covered in this report can be found in the main body and appendices of the H.O.T. Ahi Aquaculture Project EIS.

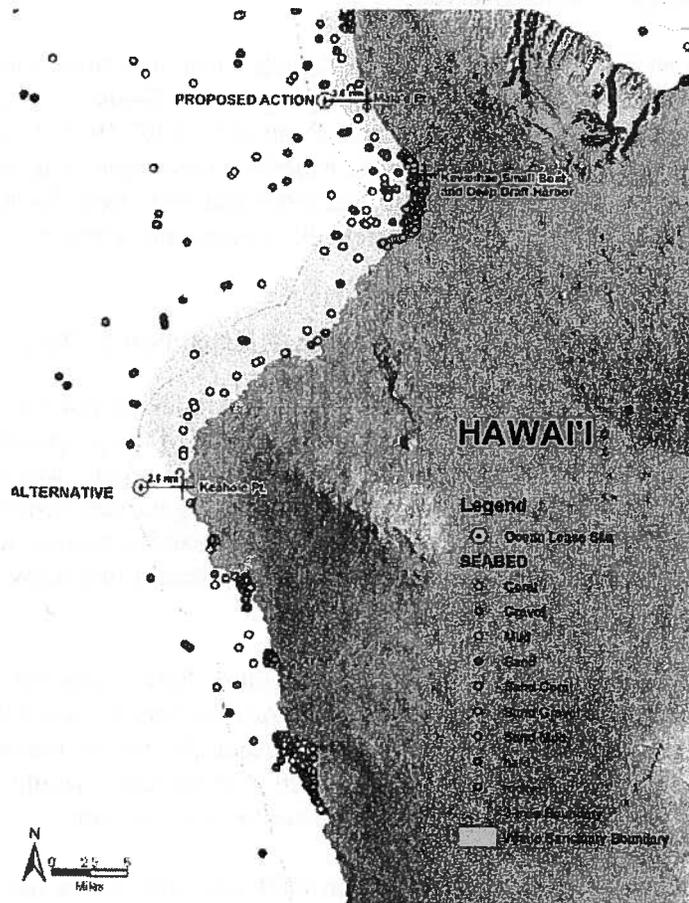


Figure 1. Map of preferred and alternate sites for the ahi-aquaculture project.

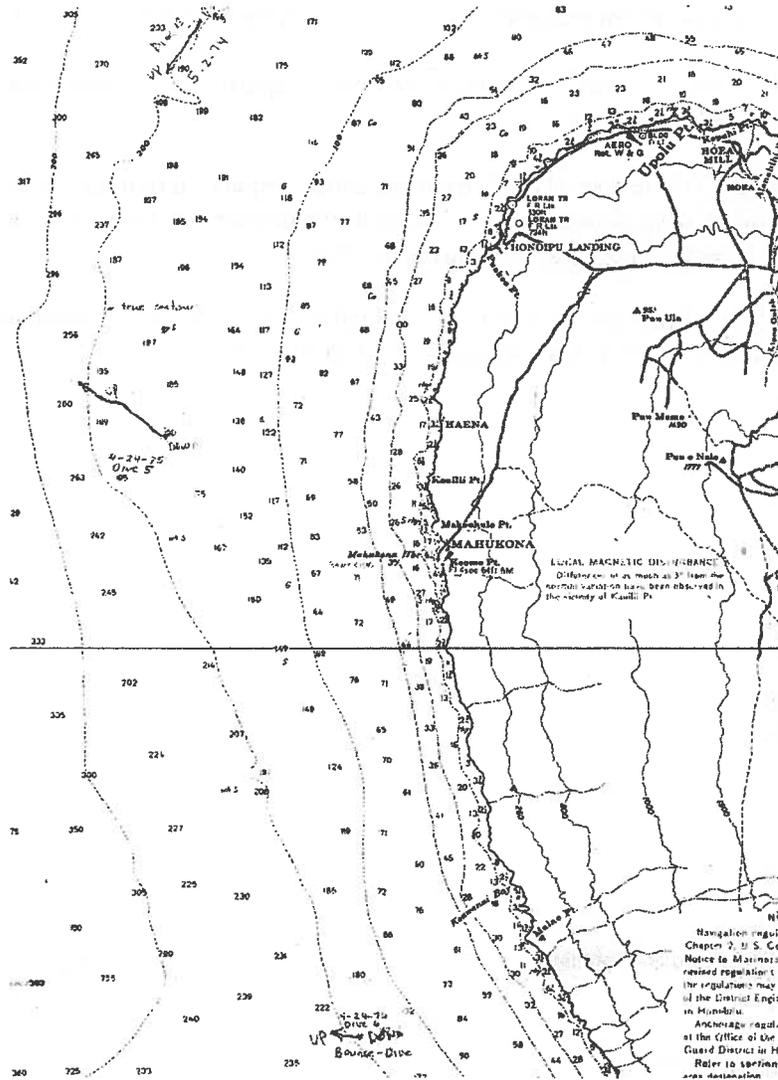


Figure 2. Map of Star II dives in 1974-75 off leeward West Hawaii.

#### IV. References

Grigg, R.W. 2002. Precious corals in Hawaii: Discovery of a new bed and revised management measures for existing beds. *Marine Fisheries Review*, 64(1):13-20.

Grigg, R.W. 1974 -75. Star II dive logs, Archives, Department of Oceanography, University of Hawaii, Honolulu, Hawaii.

Hawaii Oceanic Technology (HOT) Environmental Impact Statement, Ahi Aquaculture Project, Kohala Coast, Hawaii. 2009. Unpublished document, Tetra Tech, Inc. 737 Bishop Street, Suite 3020, Honolulu, Hi. 96813

US DOC. 1980. FMP for the precious coral fishery of the Western Pacific region. U.S. Dept. Commerce, NOAA. Fed. Regist. 45(180):60957-60981.

Attachment 5

Management Plan

1. GENERAL DESCRIPTION

SUMMARY

- 1) location of proposed aquaculture farm (include water depth, general site description);

State Marine Waters off of the North Kohala Coast, approximately three miles (2.6 nautical miles) due southwest of Malae Point. The site is in 1320 feet of water.

- 2) number of acres and square feet; 247 acres and 10,759,320 ft<sup>2</sup>

- 3) longitude and latitude coordinates; The center of the ocean lease site is 20°05'40.00" N 155°55'40.00" W

- 4) acres and/or square footage of exclusive use (if any);

Fishermen are allowed to fish around the Oceanspheres, but not above or below them. For safety reasons, all boaters are asked to keep 100' from the Oceansphere surface buoy. For liability reasons, the public is asked not to swim or SCUBA dive anywhere in the ocean lease area.

- 5) fish species to be cultured; *Thunnus Obesus*, big eye tuna and *Thunnus Albacares* yellowfin tuna

- 6) hatchery and/or stock techniques; Hatchery from broodstock caught in Hawaiian waters. The fish will be spawned in land based tanks and grown to 5 pounds in size at PACRC, Hilo and/or NELHA. The tuna will be transfer to the Oceansphere in ship board holding tanks and pumped down into the Oceanspheres.

EXHIBIT 8

- 7) Oceansphere description and diagrams (i.e. size of cages, number of cages, type of cages (submersible and/or surface cages), moorings, Coast Guard regulations regarding surface obstructions, cage mesh;
- 8) Oceansphere construction plan (deployment, construction, anchoring);
- 9) Operations (species biology, spawning, stocking, feeding, farm biology, population genetics, disease, harvesting, productive lifespan and farm waste, rearing, breeding, harvesting, damage assessments, maintenance, cleaning of cages);
- 10) work vessel(s) (type, location of anchorage); Three work boats of approximately 35 feet will be used as well as a specialized harvest/feed boat, which will be anchored within Kawaihae Commercial Harbor.
- 11) number of crew; 10
- 12) work hours: 6 am till 6 pm daily and 24/7 on call staff and salvage company, 24/7 monitoring of Oceanspheres at shore station and via Internet.
- 13) estimated total annual production numbers; 6,000 tons of Ahi per year, average biomass in lease site, 2,016 tons
- 14) how cages will be removed. An A frame on the specialized workboat will haul the Oceansphere out of the water and on deck for removal.

## LOCATION

Pursuant to Section 13-5-34 HAR, Hawaii Oceanic Technology, Inc. requests a Board Permit to allow an ocean lease for open ocean aquaculture offshore of Malae Point, North Kohala, Hawai'i (see Figure 1-1 in the CDUA). The open ocean aquaculture operation will occupy the surface and water column of the State marine waters and submerged lands classified in the Resource Subzone per section 13-5-13 (5) HAR. This use is consistent with the Conservation District, and the Resource Subzone, as identified in section 13-5-24 R-1 i.e. Aquaculture. The open ocean aquaculture site will be located in waters of 1,320 feet (402.34 meters) depth, over soft sand substrate, exposed to good current flows. For these reasons, we expect to see minimal environmental impacts (see attached Final Environmental Impact Statement). Because of its depth, and the paucity of the bottom biota, there is minimal use of the area at present. The proposed site lies one mile outside the Hawaiian Islands Humpback Whale National Marine Sanctuary off Malae Point (Figure 1-1 in the CDUA). The open ocean aquaculture operations site will be 3 miles (2.6 nautical miles) southwest of Malae Point off the North Kohala coast. The

center of the site is 20°05' 40.00" N 155°55' 40.00" W consisting of approximately 247 acres of open ocean or one square kilometer with sides of approximately 3,200 feet per side. The water depth at the site is 1,320 feet (402.34 meters). The 12 Oceanspheres will be evenly distributed within the ocean lease site (see Figure 2 in CDUA). The Oceanspheres will be submerged to a depth of below 65 feet (20 meters) from the water surface.

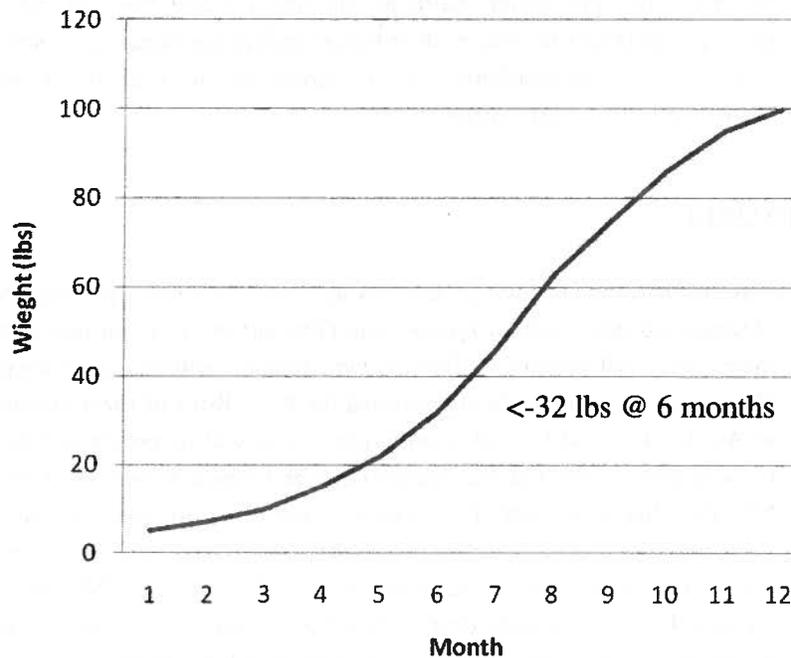
## **SPECIES CULTURED**

Hawaii Oceanic Technology intends to raise 6,000 tons per year of yellowfin tuna (*Thunnus albacares*) and/or bigeye tuna (*Thunnus obesus*) in an open ocean location 2.6 miles (4.2 kilometers) offshore in twelve submerged Oceanspheres called Oceanspheres when fully operational by 2013. Both of these species are referred to as Ahi by the local Hawai'i community. Tuna will be grown out from eggs and will be supplied by the Pacific Aquaculture & Coastal Resources Center (PACRC) or NELHA hatchery until the company develops its own hatchery facility. Each Oceansphere will be fitted with an automated feed dispenser within the top side buoy. The tuna will be hatched at PACRC and or NELHA and grown to Oceansphere transferable size in land-based tanks. The tuna will be transferred to the open ocean Oceanspheres when they are approximately 12 inches in length and 4-5 pounds in weight, and will be grown to one hundred pounds in size. The tuna will be placed in the holding tank of a ship and transported from Hilo Harbor and/or Kawaihae Harbor to the proposed ocean lease site, where they will be pumped through a hose into the submerged Oceanspheres. The tuna will be harvested at sea for transport to Kawaihae Commercial Harbor and to a Kona-based fish processor and distributor, or through Hilo Harbor to a Hilo-based processor and distributor, where they will be prepared for shipping to the US mainland, Japan, and local markets.

### **Total Farm Biomass**

When all twelve Oceanspheres are deployed the Average Total Biomass for the farm will be 2,016 tons of Ahi with average tuna size of 32 lbs after 6 months of growth (see below Tuna Growth Curve).

## Tuna Growth Curve in OS



### OCEANSPHERE DESCRIPTION

The Oceansphere is a design for an environmentally responsible, economically sustainable method for open ocean mariculture. The Oceansphere was conceived and designed with one objective in mind, to be the embodiment of a next generation way to farm seafood in the open ocean that solves the problems associated with past fish farming practices. The Oceansphere is designed to be in deep ocean where there are constant currents and large volumes of water that can readily mix with and mineralize effluents so that nothing ever touches the ocean floor. The Oceansphere is necessarily large (54 meters in height with a 54 meter diameter) in order to allow for low stocking densities which will minimize disease transmission and allow the fish being raised within the ability to swim and school as they do in the wild. The Oceansphere is designed to incorporate a host of high technology telecommunication and telemetry systems that allow it to automatically stay in position against the currents using a dynamic positioning system (DPS) that keeps the Oceansphere on station using computer-automated control employing both satellite global positioning systems (GPS)/Inertial Navigation Systems (INS) and 24/7 land-based radio telemetry control. Monitoring systems will also be used to assess water quality, observe fish health, determine optimum feeding cycles by seeing when fish are satisfied, and to avoid allowing excess feed to be spent into the environment. Monitors will make sure hatches get properly sealed so as to avoid escapes, to observe the approach of both human and non-human predators. The

data from the monitors will be transmitted to a shore station and managed with a sophisticated command and control software package 24/7. Redundant telecommunication and telemetry systems will be used by the command and control software to adjust enclosed electric thrusters to keep the Oceansphere stable against currents. Should an Oceansphere power supply be interrupted, battery power will keep systems operating for up to 72 hours until company or salvage crews can get on site and undertake repairs. The Command and control system will keep the individual Oceanspheres from bumping into each other and will notify operators if an Oceansphere strays off station. Though these technologies may sound futuristic, the fact is that everything described above has already been used in a number of military and oil industry applications. The Oceansphere is a system integrated with sub-systems used routinely in other industries.

### **Hybrid Solar Ocean Thermal Energy Conversion Power System**

The Oceansphere will use a hybrid solar ocean thermal energy conversion (SOTEC) power system (referred to as the Persistent Oceanic Power System or POP system - patent application USPTO # 11/849,338) using a combination of electricity production and storage elements (batteries) to meet the energy demand of the Oceanspheres. The power system will supply energy to all systems that compose the Oceansphere including thrusters, telecommunications and buoy. Sufficient power will be supplied to maintain the Oceansphere in position against a range of currents speeds. Measured current meter data shows that currents average 0.4 knots, with maximum speeds of 1.5 knots in the vicinity of the ocean lease site (FEIS, Appendix B, Current Report by Dr. Roger Lukas).

At the core of the system is a Stirling engine that will generate electricity with a piston that is driven by the contraction and expansion of a refrigerant that is sealed within the engine. Solar energy will supply the hot side of the system needed to expand the refrigerant. Surface seawater will supply the cold side of the system needed to contract the refrigerant. Seawater will be pumped through a heat exchanger to cool the enclosed and sealed refrigerant which is internal to the Stirling engine. Seawater is separate from the refrigerant. As part of the heat exchanger process the temperature of the extracted seawater will increase slightly by 0.25 degrees centigrade. It will then undergo a cooling process before being returned to the ocean surface.

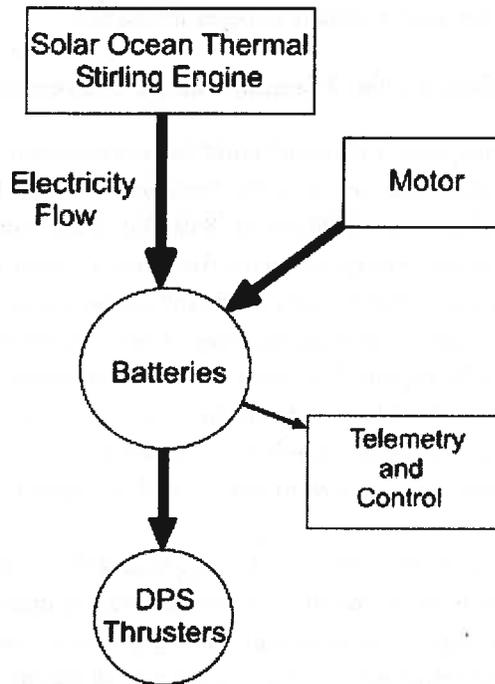
Oceansphere hybrid SOTEC power generating elements are as follows:

- Solar ocean thermal Stirling engine
- Backup motor using biodiesel fuel
- Central battery storage

Power will be supplied to the electric thrusters, telecommunication, telemetry and monitoring systems. Batteries are the direct source of power for the dynamically

positioning thrusters and have a three day lifetime without charging. Should the engines stop working, battery power will provide ample time for company crews and/or salvage crews to be on site and affect remediation. The Stirling engine SOTEC system and biodiesel motor will connect in parallel to the battery bank and will maintain the charge on the batteries to produce continuous power.

## Hybrid Power Generator



The Oceansphere will be friendly to its occupants and to marine mammals and other ocean wildlife. It will not have any sharp surfaces or dangling lines to entangle wildlife (See Figure 3 in the CDUA). The Oceansphere will be composed of an exoskeleton with an anodized aluminum or epoxy based frame integrated with anti-fouling netting with one-square-inch stitching made from 0.08-inch- (0.002-meter-) diameter Dyneema or other government approved ocean fish farm netting. The netting will be able to withstand 5,000 pounds per square inch of pressure, which will prevent sharks from biting through and keep the inhabitants safe from predation. The Oceanspheres will be untethered to the ocean bottom and have some attributes of a submarine such as ballast and ballast control that will allow it to be lowered to specific depths and raised on command. The power for the Oceansphere is based on the company's patent pending renewable energy solar

ocean thermal energy conversion power system. The system is a hybrid solar ocean thermal energy conversion (SOTEC) system that will be used to supply power to all of the Oceansphere systems and will keep batteries charged in case the power plant itself stops working (Figure 3). There will be a topside buoy attached to the Oceansphere that will have GPS, Iridium, WiMAX, mesh networking equipment as well as Coast Guard required transponder and hazard warning lights. The hazard lights are standard equipment on navigational buoys and will be visible horizontally for a two mile circumference.

## **CONSTRUCTION PLAN**

The first Oceansphere will serve as a “pilot” or “prototype” system that we hope to have in placed in late 2010 or early 2011 depending upon permitting time frames. The construction will be managed by a qualified ship building firm. Components will be sourced from a variety of manufacturers, consolidated and shipped to Kawaihae harbor where the final assembly will take place. Then the Oceansphere will be towed to the lease site. All necessary permits will be obtained.

When the first Oceansphere is at the lease site all systems will be tested for a period of time to determine and fix problems. Operational procedures will be established and documented. Staff will be trained in both operational procedures and procedures associated with wildlife management including whales, dolphins, sea turtles and monk seals. Once management is satisfied that all systems are go, fish will be transferred to the Oceansphere from the hatchery and grow-out will begin.

The company will necessarily go through a complete grow-out season in order to make sure that all systems operate as planned and so that best practices can be operationalized and documented.

Additional Oceanspheres will be built and deployed according to the published schedule assuming there are no set backs with the pilot Oceansphere.

## **OPERATION PLAN**

Operations for the Hawaii Oceanic Technology Ahi Aquaculture Project include feeding, maintenance, and harvesting activities, as described below. Hawaii Oceanic Technology will provide at least 22 full-time equivalent jobs by year five, with an average salary of \$51,500. Employees will a Site Manager, 3 Oceansphere operators, Operations Coordinator, 5 Seaman, 3 Biologists, 4 Divers and 5 Laborers. Additionally, Hawaii Oceanic Technology activities will provide the marine community with contracts for salvage, transportation, Oceansphere maintenance, assistance with harvesting, and fish processing. Hawaii Oceanic Technology will follow best management practices in the operation of this project.

The operations team will consist of divers, seamen and technicians who will be employed to maintain the topside buoy and systems associated with it. As required the Oceansphere will be raised from its location below the water to the surface where internal repairs can take place if necessary. All Oceanspheres can be monitored remotely via the Internet. A sophisticated command and control software system will be in place that gives controllers the ability to observe all camera and monitoring systems. If systems are not working within expected tolerances, a maintenance team will be sent to the Oceansphere to fix systems as required.

Feeding the tuna will be automated to the greatest extent possible. Feed will be dispersed on a daily basis. Feed flow will be carefully controlled to avoid any spillage or excess feeding. When the fish stop eating the feed will be turned off. Feed will be transported to the Oceanspheres approximately every four weeks.

Once fish within the Oceansphere have reached market size, approximately 100 pounds, harvest operations will begin. The company will be working with several seafood distributors who will consolidate orders. The orders will be filled on demand so that we can supply the freshest product to market. Tuna will be harvested by using an internal net and divers. The Oceansphere will be raised to the surface, divers will be deployed. An internal net will shepherd tuna to the harvest port and divers will shepherd the tuna into the port which will be a padded conveyor that takes the tuna to the harvest boat where they will be euthanized and put on ice. The harvest boat will take the tuna to either Hilo or Kawaihae where the distributor will receive the required amount and transport the tuna to their processing facility. The tuna will then be gutted and gilled and packed on ice in shipping containers then transported to the airport for shipping to buyer destinations.

**Feeding.** Ahi require two pounds of dry feed for every pound of wet weight that they grow; for example, 200 lbs (90.7 kilograms) of dry feed will be required to grow a 100-lb (45.4 kilograms) tuna. Dry feed will be purchased from a commercial supplier and will be inspected by the Hawai'i Department of Agriculture and our own scientists for the presence of pathogens and/or other toxic substances. If such substances exist the feed will not be accepted for delivery. The source of the feed is determined by the supplier, however, the company will request that the source be from sustainable stocks. Hawaii Oceanic Technology will specify the content of the feed and quality standards and will attempt to meet or exceed existing standards for organic feed (presently no such standards exist, but federal and international standards groups are working on an organic feed profile). No soy or grains of any kind are expected to be used as part of the feed. Ahi are carnivores (meat eaters) not herbivores (vegetable eaters) and the company intends to use a fish feed that contains components consistent with the usual Ahi diet and nutritional profile. Additionally, Hawaii Oceanic Technology will contract with Hawai'i Institute of Marine Biology (HIMB) fish pathologist to inspect feed for the presence of disease pathogens and/or other toxic substances.

When fully operational the company will require 1,000 tons (900 metric tons) of feed stock per month. This supply will be received at Kawaihae Harbor. The feed will be loaded into a vessel for shipment to the ocean lease site. Feed will be dispensed with an automated feed dispenser built into the surface buoy of the aquaculture Oceansphere. No ground transportation of feed is anticipated other than within the Kawaihae Harbor area.

Food will be transported to the lease site once a month. The company will investigate supplementing the fish-based feed stock with algal protein and Omega 3 and 6 oils supplied by local sources when available to reduce the need for acquiring feed from outside Hawai'i. Automated feeding observation systems used in Norway and other locations will monitor feeding behavior. When the tuna are sated, this information will be used to maximize the feeding efficiency.

**Maintenance and Tuna Health Inspections.** Maintenance teams will be deployed almost daily (weather permitting) to inspect the Oceansphere and observe the health of the tuna. Oceanspheres being serviced will be raised to around fifteen feet before divers will begin their work if required. Once maintenance is completed, the Oceanspheres will be sent back to their original depth with the center at 180 feet (55 meters). Workers will visit the site every work day to maintain Oceanspheres and to supervise delivery of feed.

Ongoing fish health will be monitored with on board monitoring systems including video cameras and other devices that measure fish growth. Mortalities can occur through natural, physical or pathological means. The company will test mortalities through a contract with Hawai'i Institute of Marine Biology (HIMB) fish pathologists. The State Aquaculture Veterinarian will be notified if there is presence of disease and advice and comment will be solicited. The Oceansphere will be equipped with a variety of monitoring equipment that can be observed from anywhere on the internet. Video cams will be used to observe tuna feeding behavior, presence of mortalities, presence of predators, Oceansphere integrity, presence of poachers, currents, water quality and of course positioning status. Most observation requirements will be automated and viewable remotely via the Internet. Command and control software will allow for human intervention if needed.

Periodically, Oceanspheres will be disassembled for at the land based maintenance site for refitting before redeployment.

**Harvesting** Tuna will be harvested from the Oceansphere at sea by landing the fish onto work boats using padded conveyors. The Oceansphere will be raised and a harvest hatch will be opened and fitted with a padded conveyor that will not allow escapes. The fish will be shepherded to the conveyor using nets and divers. The harvested fish will be euthanized and put on ice onboard, then transported to a fish processing center. The fish will be transported to Kawaihae Harbor and transhipped to Kona, or transported to Hilo Harbor and transhipped to Hilo for delivery to existing wholesalers/distributors for processing and shipping.

A portion (approximately 10%) of the harvest will be prepared for wholesalers and distributors on the Islands of Hawai'i, O'ahu, Maui, and Kaua'i. Where possible, product will be put on a refrigerated delivery truck and sent to neighboring islands via container barges.. The majority of the harvest will be iced and shipped via air freight to wholesalers and distributors on the US mainland and Japan.

Hawaii Oceanic Technology will work with existing fish processors who have approved waste management practices and policies. In addition, Hawaii Oceanic Technology will encourage these fish processing companies to provide its waste stream to local companies that will convert the resource into a viable input to livestock feed, a source of feedstock for renewable energy production, and a viable source of omega 3 and 6 fatty acids for vitamin supplement industry. By managing the waste in this manner, Hawaii Oceanic Technology intends to keep this waste out of the island's landfills and the receiving waters of the U.S.

Periodically, Oceanspheres will be disassembled at the OOA site and placed on a ship for transport to the maintenance site at Kawaihae Commercial Harbor for overhaul before being redeployed.

## **Hybrid Solar Ocean Thermal Energy Conversion Power System**

The Oceansphere will use a hybrid solar ocean thermal energy conversion (SOTEC) power system (referred to as the Persistent Oceanic Power System or POP system - patent application USPTO # 11/849,338) using a combination of electricity production and storage elements (batteries) to meet the energy demand of the Oceanspheres. The power system will supply energy to all systems that compose the Oceansphere including thrusters, telecommunications and buoy. Sufficient power will be supplied to maintain the Oceansphere in position against a range of currents speeds. Measured current meter data shows that currents average 0.4 knots, with maximum speeds of 1.5 knots in the vicinity of the ocean lease site (FEIS, Appendix B, Current Report by Dr. Roger Lukas).

At the core of the system is a Stirling engine that will generate electricity with a piston that is driven by the contraction and expansion of a refrigerant that is sealed within the engine. Solar energy will supply the hot side of the system needed to expand the refrigerant. Surface seawater will supply the cold side of the system needed to contract the refrigerant. Seawater will be pumped through a heat exchanger to cool the enclosed and sealed refrigerant which is internal to the Stirling engine. Seawater is separate from the refrigerant. As part of the heat exchanger process the temperature of the extracted seawater will increase slightly by 0.25 degrees centigrade. It will then undergo a cooling process before being returned to the ocean surface.

Oceansphere hybrid SOTEC power generating elements are as follows:

- Solar ocean thermal Stirling engine
- Backup motor using biodiesel fuel
- Central battery storage

Power will be supplied to the electric thrusters, telecommunication, telemetry and monitoring systems. Batteries are the direct source of power for the dynamically positioning thrusters and have a three day lifetime without charging. Should the engines stop working, battery power will provide ample time for company crews and/or salvage crews to be on site and affect remediation. The Stirling engine SOTEC system and biodiesel motor will connect in parallel to the battery bank and will maintain the charge on the batteries to produce continuous power.

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copy for: DLNR, Office of Conservation and Coastal Lands  
Contact: Laura Thielen

**MAUI TOMORROW FOUNDATION, INC.**

**Protecting Maui's Future**

April 6, 2009

- Mark Sheehan  
*President*
- Rob Parsons  
*Vice President*
- Trip Lynch  
*Treasurer*
- Judith Michaels  
*Secretary*
- Lance Holter
- Richard Michaels
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 DEPT. OF LAND &  
 NATURAL RESOURCES  
 STATE OF HAWAII

**RE: Comments on Hawaii Oceanic Technology Ahi Aquaculture Project**

Aloha Mr. Spencer;

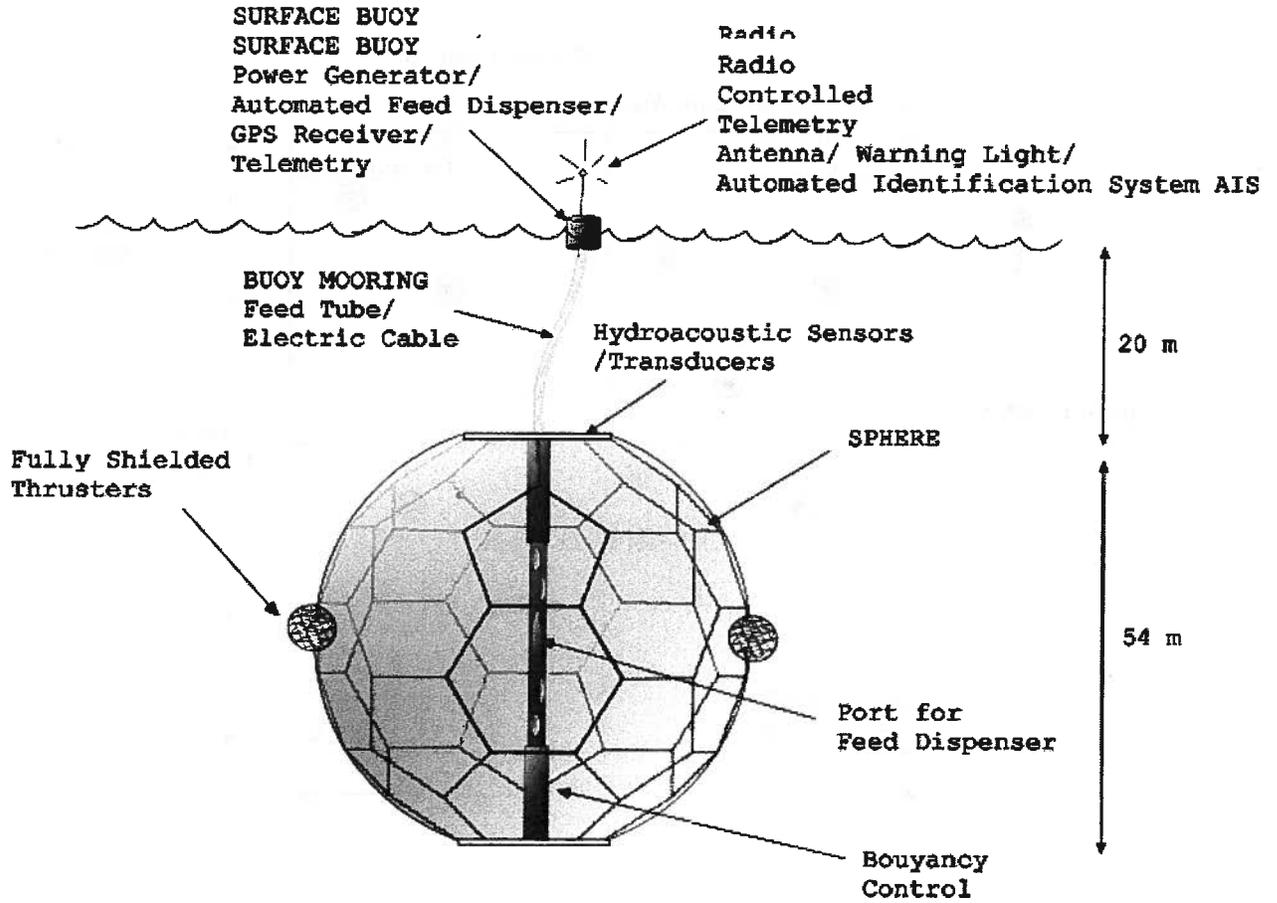
Maui Tomorrow Foundation, Inc. wishes to comment on the draft Environmental Impact Statement for Hawaii Oceanic Technology's Ahi Aquaculture project. The plan to use 247 acres off the north Kohala coast of the island of Hawaii to hold 12 orb-like cages for growing tuna for export raises many concerns and is inadequately addressed in this document.

**Environmental, Social, and Economic Issues**

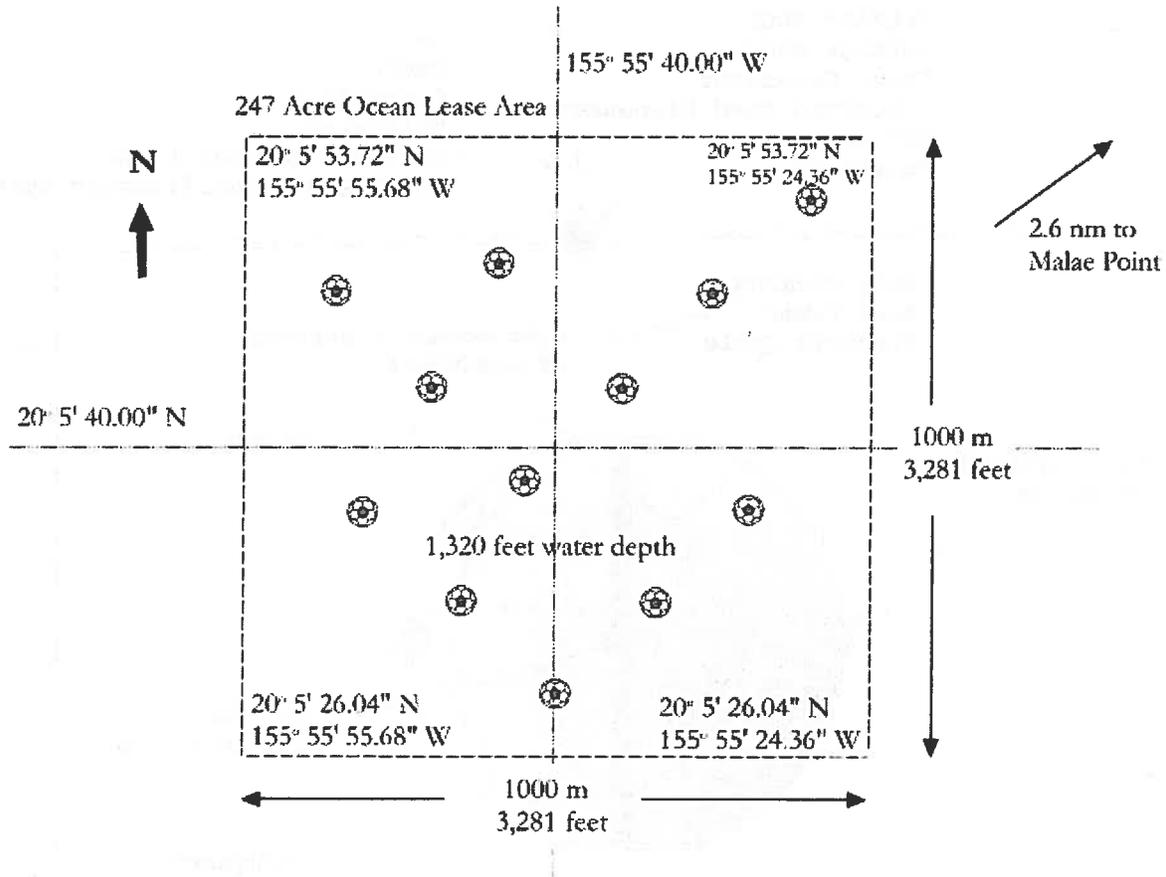
Because Hawaii Oceanic Technology's farming facility would take up such a large area off the north Kohala coast (247 acres), conflicts of interest involving use of fishing grounds for both recreational and commercial fishermen are likely. Fish farming tends to bring the price of fish down because these farms produce such an abundance of fish and flood the market. Fish farm companies are able to charge less for their product due to cheaper overhead costs when compared to the expenses related to commercial fishing operations (pursuing wild fish) due to fuel costs and crew time. Recreational and charter boat operations suffer due to a loss of customers as these farms take up space and pollute the water and wild fish stocks.

In spite of the above-mentioned lower overhead costs, this industry has failed to demonstrate that ocean fish farming is financially sustainable as most existing farms have been found to require large amounts of funding from government or other sources in order to continue operations.

Diagram of Oceansphere - not to scale



## Arrangement of Oceanspheres in lease site



## 2. EXISTING CONDITIONS ON PARCEL

**Ownership.** The offshore waters are owned by the State of Hawaii, and are administered by the Department of Land and Natural Resources.

**Resources.** The deep water and rocky basalt bottom and coarse sand substrate supports very little flora or fauna. A survey of activity in nearby areas showed that here was negligible public use of the immediate area (for additional information on land use, refer to the accompanying environmental impact statement). The proposed project will not impede access to these areas. The area is not a significant habitat for birds. There is no historical significance to the site.

**Presence of Threatened or Endangered Species.** The area lies outside the Hawaii Island Humpback Whale National Marine Sanctuary, and humpback whales may transit the site and area during winter months. However, no entanglement risk

or other adverse interactions are expected, because the Oceanspheres will not be tethered and there will be taut mesh on the Oceansphere frames. No adverse interactions are expected. Other endangered species do not frequent the area. In any case an endangered species and marine mammal management plan will be developed with the advice and consent of NOAA and DLNR/DAR.

**Constraints.** None. The area is part of State Marine Waters, but is not subject to heavy surf action because of the water depth. The Oceanspheres will be untethered to the ocean bottom, with a dynamic positioning system (DPS) that keeps the Oceansphere on station using computer-automated control employing both satellite global positioning systems (GPS)/Inertial Navigation Systems (INS) and 24/7 land-based radio telemetry control.

**Existing land uses.** There are no existing structures in the proposed lease area.

**Existing Conservation District Use Permits.** None.

**Access.** The deep water offshore lease area can only be reached by boat or other watercraft.

**Soils.** The area of the proposed lease has a depth of 1,320 feet (402.34 meters). The seafloor geology classification of the subject site would be rocky basalt bottom with sand areas.

### 3. PROPOSED LAND USES ON PARCEL

**Description of proposed Land Use.** The open ocean aquaculture site will occupy the surface and water column of the State marine waters and submerged lands classified in the Resource Subzone per section 13-5-13 (S), and section 13-5-24 R-1 AQUACULTURE.

**Site Plan.** See Figure 2 in the CDUA.

**Relationship to other land uses.** The site is more than two and one-half miles from important coastal fishing grounds, and is approximately 10 miles west from the closest State of Hawai'i FAD buoy (Buoy XX). The site was specifically chosen to be away from official shipping lanes that emanate from Kawaihae harbor south of the proposed site. The Oceanspheres will also be submerged with their top to a depth of below 65 feet (20 meters), removing any possibility of becoming a hazard to navigation. Due to the distance from land and depth of water, this area is far removed from all forms of public recreation except for deep sea sport fishing. This area is indistinguishable from all other waters offshore of the Kohala coast and should not interfere with this activity.

**Expected timing.** The operation will ramp up slowly, reaching capacity within five years. The first Oceansphere pilot system will be deployed in late 2010, with two

more Oceanspheres deployed in 2011. Four additional Oceanspheres will be deployed in 2012 and five more Oceanspheres in 2013 until all 12 Oceanspheres are operational at the lease site.

**Monitoring strategies.** A long term water quality monitoring program will be implemented at the Hawaii Oceanic Technology's expense, as part of the NPDES requirements, to track impacts on water quality and benthic habitat. The specific details of parameters, sites and frequency of sampling will be determined in consultation with the State Department of Health Clean Water Branch, as part of the process of obtaining the NPDES permit.

**Environmental Impact Statement.** The Final Environmental Impact Statement has been delivered and accepted as of July 7, 2009.

#### **4. REPORTING SCHEDULE**

**Time duration of management plan:** The management plan shall remain in effect for the full duration of the lease. Modifications to the plan driven by development of best practices and operational necessities will be reported to authorities as required.

**Annual reporting schedule:** Hawaii Oceanic Technology will be subject to annual reporting requirements under the Aquaculture License law. A copy of the annual report will be provided to DLNR, along with the reports from the water quality monitoring program, as appropriate.

**Annual reporting requirements:** The Aquaculture License law requires details on number of protected animals on the farm. The water quality monitoring program will provide raw data, analysis and interpretation of the germane parameters., Third party independent reviewers of data and other observations will be obtained as necessary.