DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, JACKSONVILLE DISTRICT
ANTILLES OFFICE
FUND. ÁNGEL RAMOS ANNEX BLDG., SUITE 202
383 F.D. ROOSEVELT AVE.
SAN JUAN, PUERTO RICO 00918

January 28, 2020

Regulatory Division
South Branch
Antilles Permits Section

PUBLIC NOTICE

Permit Application Nos. SAJ-2019-03861 (SP-DCM),
SAJ-2019-03862 (SP-DCM), SAJ-2019-03865 (SP-DCM)

TO WHOM IT MAY CONCERN: The Jacksonville District of the U.S. Army Corps of Engineers (Corps) has received an application for a Department of the Army permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. §403) as described below:

APPLICANT: Loretta Roberson
Marine Biological Laboratory
7 MBL Street
Woods Hole, MA 02543

WATERWAY AND LOCATION: The project would affect navigable waters of the United States associated with the Caribbean Sea. The project would include three general sites located in the immediate vicinity of Media Luna Reef, Cayo Enrique, and Romero Reef, which are offshore cays/reefs sited in nearshore waters within La Parguera Natural Reserve, south of La Parguera fishing village, Lajas, Puerto Rico, as depicted in the attached drawings.

APPROXIMATE COORDINATES:

Description	**Latitude (DD)** **Datum: D_WGS_1994**	**Longitude (DD)** **Datum: D_WGS_1994**
SAJ-2019-03861 (SP-DCM) – Media Luna Reef Site		
Vertical Line 1 (Anchor)	17.945110°	-67.040868°
Vertical Line 2 (Anchor)	17.944970°	-67.041482°
SAJ-2019-03862 (SP-DCM) – Cayo Enrique Site		
Vertical Line 1 (Anchor)	17.957707°	-67.051185°
Vertical Line 2 (Anchor)	17.957567°	-67.051799°
SAJ-2019-03865 (SP-DCM) – Romero Reef Site		
Vertical Line 1 (Anchor)	17.951595°	-66.998147°
Vertical Line 2 (Anchor)	17.951514°	-66.998772°

Mini Array (5-Line Farm Rig)		
Anchor 1	17.951479°	-66.999047°
Anchor 2	17.951630°	-66.997872°
Buoy 1	17.951595	-66.998147°
Buoy 2	17.951514	-66.998772°
Catenary Array		
Anchor 1	17.951606°	-66.999198°
Anchor 2	17.951784°	-66.997759°
Anchor 3	17.951503°	-66.997721°
Anchor 4	17.951325°	-66.999160°
Anchor 5	17.951823°	-66.999023°
Anchor 6	17.951951°	-66.997985°
Anchor 7	17.951286°	-66.997895°
Anchor 8	17.951158°	-66.998933°
Buoy 1	17.951631°	-66.998997°
Buoy 2	17.951759°	-66.997959°
Buoy 3	17.951478°	-66.997921°
Buoy 4	17.951349°	-66.998959°

PROJECT PURPOSE:

Basic: Seaweed cultivation and harvesting

Overall: To test the performance and feasibility of a farm system for the cultivation and harvesting of tropical macroalgae species to provide year-round feed stocks for conversion to biofuels and production of valuable bioproducts. This project is funded by award DE-FOA-0000-1726-1506 from the U.S. Department of Energy Advanced Research Projects Agency-Energy (ARPA-E) Macroalgae Research Inspiring Novel Energy Resources (MARINER) program to the Marine Biological Laboratory (PI L. Roberson). The projects funded by ARPA-E's MARINER program seek to develop the tools to enable the United States to become a global leader in the production of marine biomass.

EXISTING CONDITIONS: La Parguera Natural Reserve lies on the southwest coast of Puerto Rico. The reserve is recognized for the exceptional value of its marine resources, which encompass two bioluminescent bays, a broad coastal mangrove fringe with various small lagoons, salt flats, numerous offshore mangrove islands associated with coral reefs (cays), seagrass beds, and an extensive coral reef ecosystem. As previously mentioned, the proposed project sites are specifically located in the vicinity of Media Luna Reef, Cayo Enrique, and Romero Reef, approximately 3 km, 1.8 km, and 2.3 km from the shoreline, respectively. According to the information provided by the applicant, the footprint of the proposed project would be located over sandy or muddy sea bottom devoid of epibenthic colonization or sparsely colonized by algae (i.e. Media Luna Reef site – muddy bottom with 10%-50% algal cover; Cayo Enrique site – mud bottom with 10%-50% algal cover; Romero Reef site – sandy bottom with no dominant

biological cover). Water depths at the proposed project sites range from 16 m to 25 m (52 ft to 72 ft).

PROPOSED WORK: The applicant seeks authorization to implement a three-year pilot project for the development and testing of techniques for cultivation and harvesting of the tropical seaweed *Euchema isiforme* in navigable waters of the Caribbean Sea. The project would entail the deployment of three different types of submerged seaweed cultivation structures in three stages, as follows:

Stage 1: Installation of two floating vertical lines at the proposed Media Luna Reef, Cayo Enrique and Romero Reef sites. Each vertical line structure would consist of a buoy attached to a 9 mm hollow braid polypropylene line with PVC sheathing, along which several clips containing *E. isiforme* plants would be inserted. The vertical lines would be anchored to the sea bottom using sand anchors and would maintain a clearance greater than 2.5 m from the sea surface. The floating vertical lines would remain in place for two months, after which they would be retrieved from the water. The proposed installation activities would require the use of an 18' outboard vessel. The proposed vertical line structures are intended to test the performance of the algae at different water depths and environmental conditions. This data would be used to inform the subsequent stage deployments.

Stage 2: Installation of a 5-line farm rig (Mini Array) at the Arrecife Romero site. The total dimensions of the Mini Array would be 132 m long x 3 m wide, and it would have a total grow area of 61 m long x 3 m wide. The Mini Array would consist of five 61 m long parallel, submerged grow-lines (8 mm Esterpro lines with inserted *E. isiforme* clips) suspended between two opposing 3 m spreader bars and anchors, and aligned with the tidal flows. The Mini Array would have buoys to assist in maintaining the tension of the grow-lines, which would be suspended at a minimum water depth of about 2.4 m. Two 91 kg drag-embedment anchors would be used to affix the rig structure to the sea bottom. The up-current anchor would be deployed first, followed by the remainder of the rig and then by the down-current anchor, which would be pulled to pretension the system. The grow-lines would be installed in phases, each phase separated by a week of daily field observations. Initially, the two outer grow-lines would be attached to the rig, then the centerline, and lastly the grow-lines between the inner and outer lines. The proposed Mini-Array installation activities would be conducted with the support of an 18' outboard vessel and a 19' catamaran farm service vessel. The Mini Array would stay deployed underwater for one year before being removed.

Stage 3: Installation of a macroalgae farm module (Catenary Array) at the Arrecife Romero Site. The proposed module configuration reflects the on-site requirements for sampling, maintenance and harvest, and the need for an economically viable system that is efficient to operate and sensitive to the ecological needs of La Parguera and its surrounding waters. The proposed Catenary Array module would measure 161.5 m long x 33 m wide overall, and would have a 116 m long x 33 m wide grow area. The module would have up to 60 100 m long parallel, submerged grow-lines attached at each end to curved catenary lines, the shape of which would be maintained by anchors

at both ends (8 plow anchors in total). The grow-lines would be aligned with the tidal flows and would be deployed at a minimum water depth of 3 m. The spacing and number of grow-lines would be determined by the performance of the Mini-Array. The proposed orthogonal anchor matrix is important for maintaining the desired pretension in the structure and in the grow-lines it would support. A 7 m long 1" steel chain would connect each anchor to its corresponding mooring line. A small subsurface buoy would be closely tethered to the rear of each anchor, which would facilitate the anchor inspection and retrieval as needed. The module would include four variable-displacement spar buoys (one at each corner of the array) that would allow sinking the farm system prior to a storm event. The spar buoys would protrude approximately 0.6 m from the water surface during normal operating conditions, but would be lowered to the sea bottom during storm events. The module would be marked with lighted buoys.

The Catenary Array installation activities would require the use of both the project's catamaran farm service vessel and the 18' outboard vessel. Each of the eight anchors would be lowered from the catamaran to the seabed and oriented by the other vessel. Both vessels would then be involved in the installation of the four spar buoys and framing lines. Once this 116 m long x 33 m wide rectangle is in place, the transverse and longitudinal pairs of anchors would be pulled outward to pretension the module. The catamaran would then be used to install the catenary lines and the *E. isiforme* grow-lines as a fully assembled unit requiring four connections at the spar buoys. The Catenary Array module would be retrieved from the water after one year.

Routine inspections, maintenance and monitoring of the proposed seaweed cultivation structures would be performed throughout the duration of this pilot project using the project's vessels, which would be based at the nearby Magueyes Island Field Station of the Department of Marine Sciences of the University of Puerto Rico at Mayagüez. Also, different environmental, physical, chemical, and biological parameters (such as benthic structure, types and abundance of organisms, water temperature, salinity, pH, and nutrients, among others) would be measured/assessed at the project site on a regular basis through a combination of instruments and methods (e.g. underwater temperature logger and monthly salinity, pH, and nutrients samplings). This information would be used to understand the impact of the farm systems on the environmental conditions, nutrient dynamics, and ecosystem function.

CULTURAL RESOURCES:

The Corps has determined the proposed activity within the permit area is of such limited scope there is little likelihood of impact upon a historic property; therefore, the proposed project would have "No Potential to Cause Effect".

ENDANGERED SPECIES:

The Corps has determined the proposed project may affect, but is not likely to adversely affect the federally protected Hawksbill (*Eretmochelys imbricata*), Leatherback (*Dermochelys coriacea*), Loggerhead (*Caretta caretta*), and Green (*Chelonia mydas*) sea

turtles; the federally protected Nassau grouper (*Epinephelus striatus*) and Giant manta ray (*Manta birostris*); and the federally protected Antillean manatee (*Trichechus manatus manatus*), or their habitat. Via separate letter the Corps will request U.S. Fish and Wildlife and National Marine Fisheries Services concurrence with these determinations, as appropriate, pursuant to Section 7 of the Endangered Species Act.

ESSENTIAL FISH HABITAT (EFH): This notice initiates consultation with the National Marine Fisheries Service on EFH as required by the Magnuson-Stevens Fishery Conservation and Management Act 1996. According to information provided by the applicant, the proposed project would impact muddy and sandy marine bottom, which may be utilized by various life stages of federally managed species within the U.S. Caribbean. Based on the available information, the Corps initial determination is that the proposed action would not have a substantial adverse impact on EFH or Federally managed fisheries in the Caribbean Sea. Our final determination relative to project impacts and the need for mitigation measures is subject to review by and coordination with the National Marine Fisheries Service, Habitat Conservation Division.

NOTE: This public notice is being issued based on information furnished by the applicant. This information has not been verified or evaluated to ensure compliance with laws and regulation governing the regulatory program.

AUTHORIZATION FROM OTHER AGENCIES: A Coastal Zone Management (CZM) consistency certification from the P.R. Planning Board would be required for this project.

COMMENTS regarding the potential authorization of the work proposed should be submitted in writing to the attention of the District Engineer through the Antilles Permits Section, Fund. Ángel Ramos Annex Bldg., Suite 202, 383 F.D. Roosevelt Ave., San Juan, Puerto Rico 00918, within 30 days from the date of this notice.

The decision whether to issue or deny this permit application will be based on the information received from this public notice and the evaluation of the probable impact to the associated waters of the United States. This is based on an analysis of the applicant's avoidance and minimization efforts for the project, as well as the compensatory mitigation proposed.

QUESTIONS concerning this application should be directed to the project manager, Mrs. Deborah J. Cedeño-Maldonado, in writing at the Antilles Permits Section, Fund. Ángel Ramos Annex Bldg., Suite 202, 383 F.D. Roosevelt Ave., San Juan, Puerto Rico 00918; by electronic mail at Deborah.J.Cedeno-Maldonado@usace.army.mil; or, by telephone at (787) 289-7036.

IMPACT ON NATURAL RESOURCES: Coordination with U.S. Fish and Wildlife Service, Environmental Protection Agency (EPA), the National Marine Fisheries Services, and other Federal, State, and local agencies, environmental groups, and concerned citizens generally yields pertinent environmental information that is

instrumental in determining the impact the proposed action will have on the natural resources of the area.

EVALUATION: The decision whether to issue a permit will be based on an evaluation of the probable impact including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits, which reasonably may be expected to accrue from the proposal, must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including cumulative impacts thereof; among these are conservation, economics, esthetics, general environmental concerns, wetlands, historical properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food, and fiber production, mineral needs, considerations of property ownership, and in general, the needs and welfare of the people. Evaluation of the impact of the activity on the public interest will also include application of the guidelines promulgated by the Administrator, EPA, under authority of Section 404(b) of the Clean Water Act or the criteria established under authority of Section 102(a) of the Marine Protection Research and Sanctuaries Act of 1972. A permit will be granted unless its issuance is found to be contrary to the public interest.

The US Army Corps of Engineers (Corps) is soliciting comments from the public; Federal, State, and local agencies and officials; Indian Tribes; and other Interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps to determine whether to issue, modify, condition, or deny a permit for this proposal. To make this determination, comments are used to assess impacts to endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

COASTAL ZONE MANAGEMENT CONSISTENCY: In Puerto Rico, a Coastal Zone Management Consistency Concurrence is required from the Puerto Rico Planning Board.

REQUEST FOR PUBLIC HEARING: Any person may request a public hearing. The request must be submitted in writing to the District Engineer within the designated comment period of the notice and must state the specific reasons for requesting the public hearing.

La Parguera Vicinity Map

Site Location (green dot)

0 25 50 75 100 Km

Legend

- Madia Luna
- Cayo Enrique
- Arrecife Romero
- Magueyes pier

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

Potential site map

La Parguera, Lajas PR

Marine Biological Laboratory
University of Chicago

Data source: Coastal Aquaculture Siting and Sustainability NOAA / NOS / NCCOS

Created by: Mayra Sánchez

Name: Loretta Roberson
Project: Tropical seaweed cultivation and harvesting
Date: 2 October 2019

La Parguera farm site – Mini array

Site Location (green dot)

0 20 40 60 80 Km

Legend

- Anchor
- Buoy
- Grow area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

Arrecife Romero Mini Array

La Parguera, Lajas PR

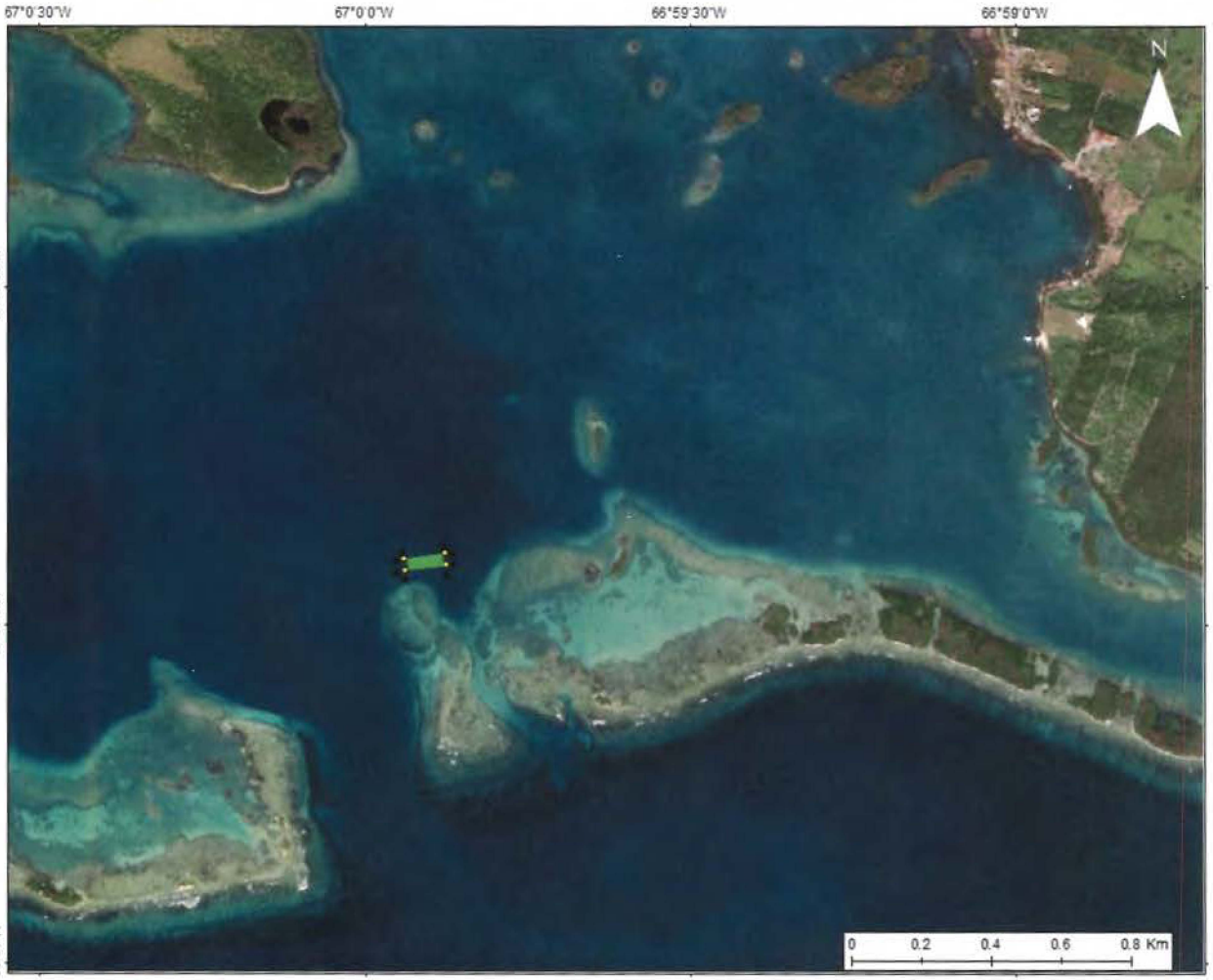
Marine Biological Laboratory
THE UNIVERSITY OF CHICAGO

Data source: Coastal Aquaculture Siting and Sustainability NOAA / NOS / NCCOS

Created by: Mayra Sánchez

Name: Loretta Roberson
Project: Tropical seaweed cultivation and harvesting
Date: 2 October 2019

La Parguera farm site – Pilot catenary array



Site Location (green dot)

0 25 50 75 100 Km

Legend

- Anchor
- Buoy
- Grow area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

Arrecife Romero Pilot Array

La Parguera, Lajas PR

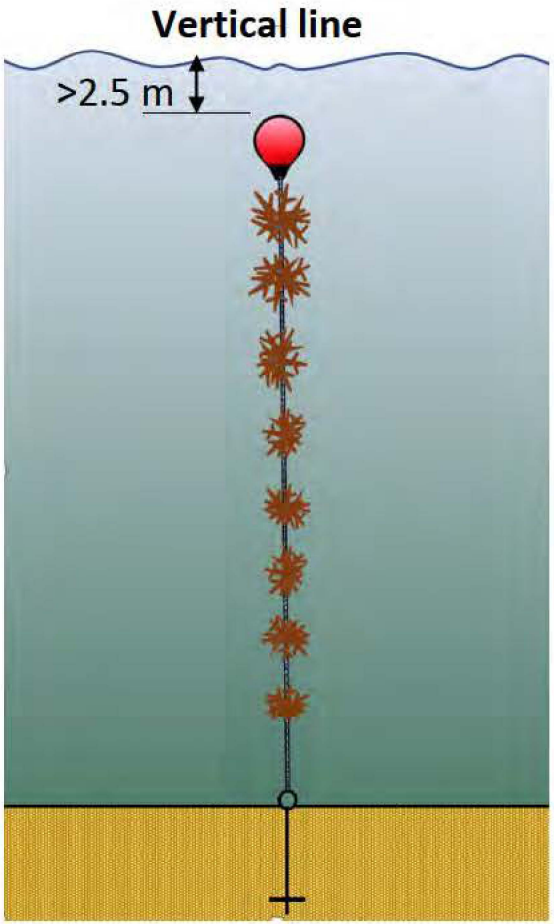
Marine Biological Laboratory
THE UNIVERSITY OF CHICAGO

Data source: Coastal Aquaculture Siting and Sustainability NOAA / NOS / NCCOS

Created by: Mayra Sánchez

Name: Loretta Roberson
Project: Tropical seaweed cultivation and harvesting
Date: 2 October 2019

Vertical Line Components



Side View

Anchor – 5/8" x 40" Screw

Buoy – 5" x 11", 105 oz. Buoyancy

Line – 3/8" Hollow braid polypropylene

Eucheuma clips – inserting into the hollow braid every 10 cm

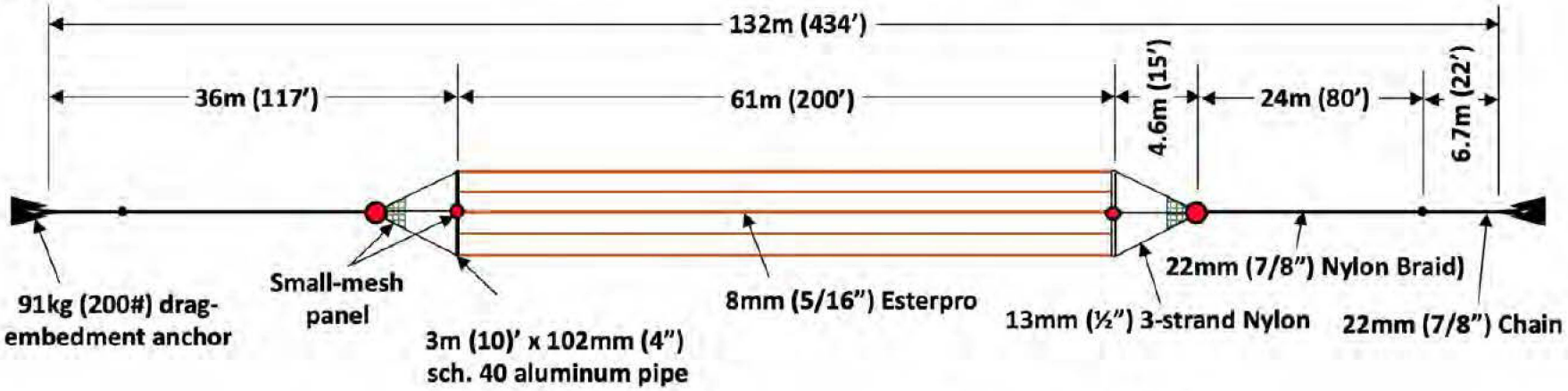
½" PVC pile line stiffener

Name: Loretta Roberson
Project: Tropical seaweed cultivation and harvesting
Date: 2 October 2019

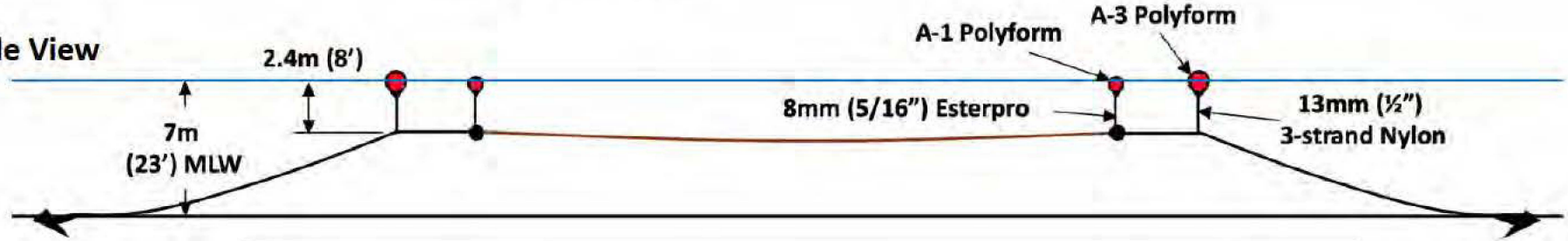
Mini farm design

61m (200'), 5-line Eucheuma Rig

Plan View



Side View



Materials list

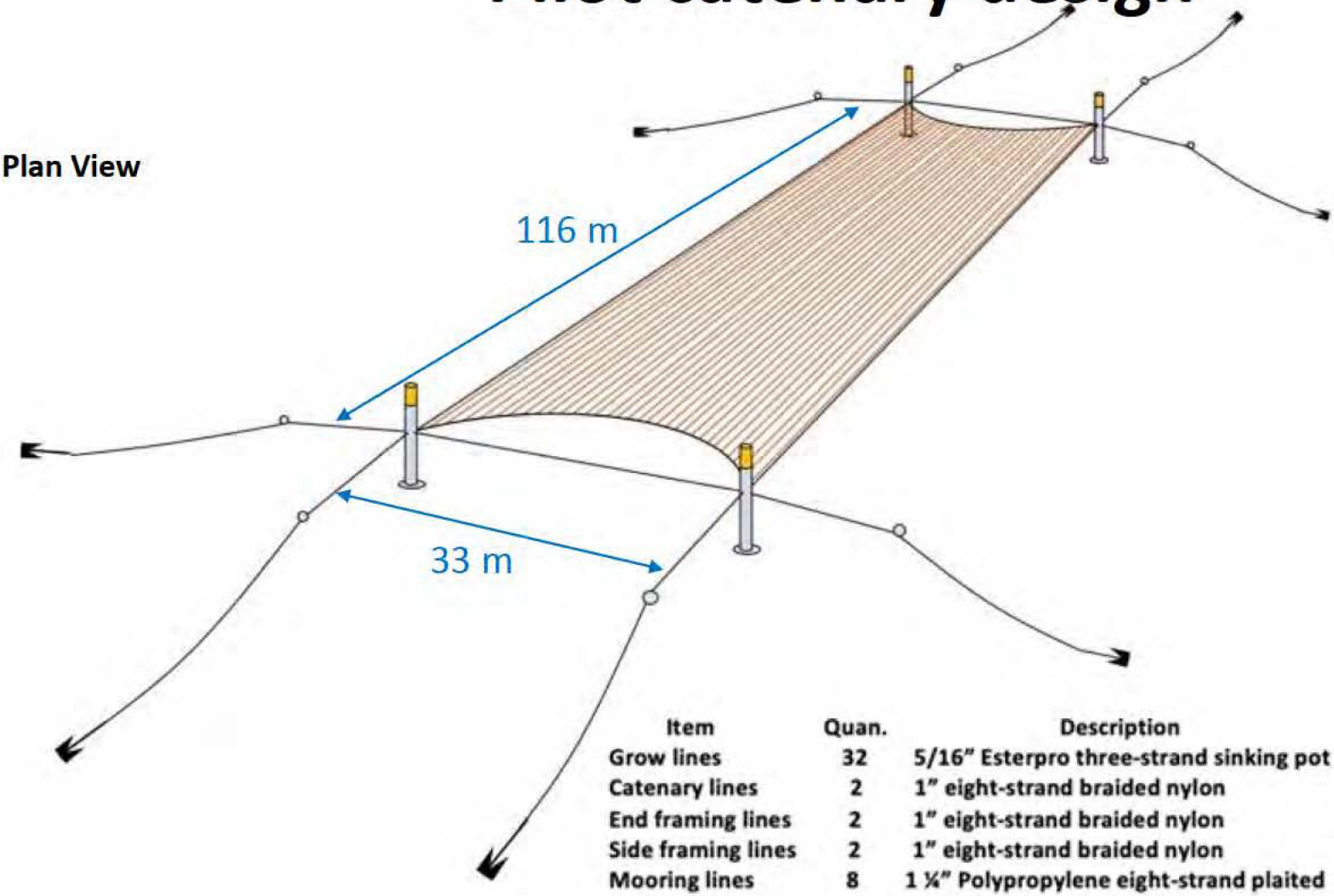
Item	Quan.	Description	Unit length	Total req'd.
Grow lines	4	8mm (5/16") Esterpro three-strand sinking pot warp	61m (200')	305m (800')
Spreader buoy lines	4	8mm (5/16") Esterpro three-strand sinking pot warp	2.9m (9.4')	11.6m (38')
Center bridle	2	13mm (½") Nylon three-strand	4.6m (15')	9.2m (30')
Outer bridles	4	13mm (½") Nylon three-strand	4.8m (15.8')	19.3m (63')
Mooring buoy lines	2	13mm (½") Nylon three-strand	2.4m (8')	4.9m (16')
Small-mesh panel	4	46cm (18") triangle of 2.5cm (1") square mesh #30 knotted nylon netting		
Mooring line	2	22mm (7/8") Nylon eight-strand plaited (4:1 scope)	25.2m (82.5')	50.3m (165')
Anchor chain	2	22mm (7/8") Galvanized open-link steel chain (1/4 shot)	6.7m (22')	13.7m (45')
Mooring buoys	2	A-3 Polyform		
Spreader buoys	2	A-1 Polyform	(All lengths nominal and do	
Anchor marker buoys	2	A-1 Polyform	not include knots or splices.)	
Anchor	2	TendOcean 91 kg (200#)		

Name: Loretta Roberson
Project: Tropical seaweed cultivation and harvesting
Date: 2 October 2019

Pilot catenary design

Name: Loretta Roberson
Project: Tropical seaweed cultivation and harvesting
Date: 2 October 2019

Plan View



Item	Quan.	Description	Unit length	Total req'd.
Grow lines	32	5/16" Esterpro three-strand sinking pot warp	200m	6400m
Catenary lines	2	1" eight-strand braided nylon	38m	76m
End framing lines	2	1" eight-strand braided nylon	33m	66m
Side framing lines	2	1" eight-strand braided nylon	106.5m	213m
Mooring lines	8	1 ¼" Polypropylene eight-strand plaited	17m	136m
Anchor chain	8	1" Galvanized open-link steel chain (1/4 shot)	7m	56m
Mooring buoys	4	TendOcean 5m variable-displacement spar buoy		
Tension buoys	8	A-5 Polyform	(All lengths nominal and do	
Anchors	8	TendOcean 700# plow	not include knots or splices.)	

Side View