



VENTURA
PORT DISTRICT

Established 1952

September 27, 2018

9250

Ms. Bonnie Rogers
U.S. Army Corps of Engineers
Los Angeles District – Regulatory Division
915 Wilshire Boulevard
Los Angeles, California 90017

Subject: Request for U.S. Army Corps of Engineers Authorization of the Proposed Ventura Shellfish Enterprise Project

Dear Bonnie:

On behalf of the Ventura Port District, I am submitting the enclosed application and supporting documents for authorization of the above-referenced project by the U.S. Army Corps of Engineers. The proposed project would establish a commercial offshore bivalve aquaculture operation based from the Ventura Harbor. The project consists of twenty 100-acre plots in federal waters of the Santa Barbara Channel in sandy bottom areas located northwest of Ventura Harbor. The sites would be used for growing the Mediterranean mussel (*Mytilus galloprovincialis*) via submerged long lines. The mussels would be grown and harvested by project growers/producers and landed at Ventura Harbor.

Detailed information regarding the project and its impacts, avoidance and minimization measures, and compliance with federal laws and regulations is provided in the attached documents.

Enclosed with this letter are a standard Corps ENG Form 4345 application and associated supplemental information including a description of the project and associated impacts, project figures depicting proposed work in Corps jurisdiction and a discussion of proposed avoidance, minimization and mitigation measures. A Biological Assessment and Essential Fish Habitat (EFH) Assessment prepared for the proposed project are also included.

1603 Anchors Way Drive Ventura, CA 93001
Tel: (805) 642-8538 / Fax: (805) 658-2249
www.venturaharbor.com

Thank you in advance for your review of this request for authorization. Please contact me at 805-642-8538 or opena@venturaharbor.com if you have any questions or require additional information.

Sincerely,

A handwritten signature in black ink, appearing to read 'Oscar Peña', with a long horizontal flourish extending to the right.

Oscar Peña
General Manager

*Enclosures: ENG Form 4345 Application
 Attachment 1. Supplemental Information Attachment
 Attachment 2. Figures 1-11
 Attachment 3. Biological Assessment, dated September 2018
 Attachment 4. EFH Assessment, dated September 2018
 Attachment 5. NOAA Siting Analysis, dated September 2018*

17. DIRECTIONS TO THE SITE

The project will consist of twenty 100-acre plots (total of 2,000 acres) located in open federal waters of the Santa Barbara Channel (Channel) in the Southern California Bight (SCB), northwest of Ventura Harbor, with approximate depths ranging from between 80 to 114 feet below sea level. The plots are approximately 3.53 miles from the shore. The closest distance to the 3-mile nautical line is a minimum of 2,900 feet from the plots, with an average closest distance of over 3,000 feet. The closest distance to the City of Ventura limit is 4.5 miles. Ventura Harbor is 4.1 miles from the closest plot (8 miles in distance to the most distant plot). The lease sites are located on sandy bottom habitat outside of any rocky reef habitat, as evaluated in Gentry et al. 2017 and illustrated by NOAA United States West Coast nautical charts (NOAA 2017a).

18. Nature of Activity (Description of project, include all features)

The proposed project will establish a commercial offshore bivalve aquaculture operation based from the Ventura Harbor in Ventura, California, focused on the cultivation of Mediterranean mussels (*Mytilus galloprovincialis*).

See Supplemental Information Attachment Pages 1-8

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

The proposed project is intended to create economic opportunities for community and marine stakeholders, produce a high value and sustainable seafood product, and provide additional economic revenue sources and commercial activity to maintain the Port of Ventura.

See supplemental Information Attachment Pages 9-17

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

Not Applicable

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards
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22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres

or

Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

In addition to the design features associated with minimizing impacts, the proposed project will incorporate a number of other resource protection measures that avoid and minimize impacts on the aquatic environment. These resource protection measures will include BMPs listed below. The proposed projects actions have the potential to degrade the biological quality (i.e. water quality, invasive species), as well as potentially cause navigational concerns. Absent mitigation and best management practices, project activities may have an adverse effect on the surrounding area. However, with the incorporation of the following BMPs, the effects would be mitigated to insignificant levels.

See supplemental Information Attachment Pages 18-32

24. Is Any Portion of the Work Already Complete? Yes No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

a. Address- N/A

City - State - Zip -

b. Address-

City - State - Zip -

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

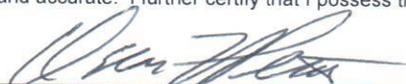
City - State - Zip -

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
CCC	Consistency Certificat	In Progress			

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.




_____ 9/28/18 _____ 2018-09-27
 SIGNATURE OF APPLICANT DATE SIGNATURE OF AGENT DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than \$10,000 or imprisoned not more than five years or both.

18. Nature of Activity

Through this application, the Ventura Port District (VPD) seeks to permit twenty 100-acre plots of ocean space for aquaculture production of the Mediterranean mussel (*Mytilus galloprovincialis*) via submerged longlines in federal waters within the Santa Barbara Channel, proximate to Ventura Harbor.¹

Project Description

The project consists of twenty 100-acre plots (total of 2,000 acres) located in open federal waters of the Santa Barbara Channel (Channel) in the Southern California Bight (SCB), northwest of Ventura Harbor, with approximate depths at the project site ranging from 80 to 114 feet below sea level, with an average depth of 98 feet. The plot locations are shown in Figure 1, with latitude and longitude coordinates for the outer corners indicated. Each of the 20 plots are 2,299.5 feet by 1,899.5 feet, for an average plot size of 100.27 acres. Each plot will contain up to 24 lines (12 end-to-end pairs), with each line consisting of 575 feet of backbone length and 250 feet of horizontal scope on each end. There will be a 50 foot setback on each end of the pairs (for a total of 100 feet of spacing between lines of adjacent parcels) and 50 foot spacing between the two center pins. Parallel lines will be spaced 150 feet apart, with a 125 foot setback at each of the long sides (for a total of 250 feet of spacing between lines of adjacent parcels).

The sites will be used for growing the Mediterranean mussel (*Mytilus galloprovincialis*) via submerged long lines (*see* Figure 2). The mussels will be grown and harvested by grower/producers who would sub-permit the plots from Ventura Port District, and the mussel product will be landed at Ventura Harbor.

Site Location

The project's twenty 100-acre plots are approximately 3.53 miles from the shore. The closest distance from the plots to the 3-mile nautical line is a minimum of 2,900 feet, with an average closest distance of over 3,000 feet. The closest distance from the growing area to the City of Ventura city limit is 4.5 miles. Ventura Harbor is 4.1 miles from the closest plot (8 miles from the most distant plot). The sub-permit sites are located on sandy bottom habitat outside of any

¹ The VPD also acknowledges the critical assistance of its other key participants who have contributed time, resources, and information to assist with this application, including the Cultured Abalone Farm, Coastal Marine Biolabs, and Ashworth Leininger Group, as well as other participants including Scripps Institution of Oceanography, University of California San Diego, National Oceanic and Atmospheric Administration (NOAA) Fisheries West Coast Region, Woods Hole Oceanographic Institution, the California Department of Fish and Wildlife (CDFW), and Marine Science Institute, Bren School of Environmental Science & Management, University of California Santa Barbara.

rocky reef habitat, as evaluated in Gentry et al. 2017 and illustrated by NOAA United States West Coast nautical charts (NOAA 2017a).

Site Selection

The project was initially proposed to be located in waters of the State of California, i.e., within the 3-mile limit. The VPD, in collaboration with its key participants (collectively the “VSE”) undertook extensive site selection public outreach that culminated in the decision to instead locate the project in federal waters so as to minimize conflicts with commercial halibut trawlers based in Ventura and Santa Barbara Harbors.

Site Selection Process Summary

The VSE team hosted a series of seven public educational workshops regarding the proposed project. (See <http://venturashellfishenterprise.com/index.html> - About VSE, scroll down to “Get Involved” and click on “Workshop Archive.”)

After these introductory workshops, VSE hosted three site selection workshops to engage with stakeholders to identify the location of the twenty 100-acre parcels within a broader area of interest identified through use of a spatial planning tool developed by researchers at University of California, Santa Barbara, Bren School of Environmental Science and Management (UCSB Bren School). While in-person workshop participation was strongly encouraged, individuals who were not able to attend the meetings were provided the opportunity to comment on site selection through a UCSB Bren School SeaSketch digital mapping and communication portal linked to the VSE website. Notice of the site selection workshops was mailed out to a list of over 500 commercial fishing vessel owners between Goleta and Port Hueneme identified by the California Department of Fish and Wildlife (CDFW); additionally, VSE coordinated with NOAA representatives and commercial fishermen to encourage their attendance. VSE also contacted all of the individuals who registered interest in the proposed project through the VSE website. During and after the site selection workshops the VPD Board of Port Commissioners received written and oral reports on the site selection process at four public meetings held in summer and fall of 2017.

The initial candidate area in state waters was selected by VSE based on marine spatial planning analysis prepared by the UCSB Bren School (Gentry et al., 2017). The site selection analysis included numerous factors related to the suitability of the candidate growing area for mussels; location in State waters near Ventura Harbor for product landing; avoidance of potential pollution sources; and avoidance of conflicts with existing subsurface leases for oil and gas pipelines, etc.

Through the stakeholder engagement process and consultation with its aquaculture specialist, Scott Lindell of Woods Hole Oceanographic Institution, it became clear that location of the project in State waters posed certain issues. Most importantly, VPD received information from local halibut trawlers that the proposed State waters candidate area was located in one of two areas statewide

designated by CDFW as halibut trawl grounds. Further, Mr. Lindell advised that a minimum 80' bottom depth (versus the initial criterion of 60' bottom depth) would reduce exposure to various mussel predator species (*e.g.*, diving ducks) and potential storm surge. Following a November 2017 public hearing, the VPD Board of Commissioners selected a federal waters alternative location, which was identified based on further refinement of the spatial planning analysis by the UCSB Bren School.

Subsequently, NOAA Fisheries Southwest District Aquaculture Coordinator, Diane Windham, connected VSE with NOAA's National Ocean Service staff, which undertook a second siting study focused on federal waters proximate to Ventura Harbor. (*See* "Coastal Aquaculture Siting and Sustainability Technical Report, Ventura Shellfish Enterprise: Aquaculture Siting Analysis Results" prepared by Coastal Aquaculture Siting and Sustainability Program, within the Marine Spatial Ecology Division of the National Centers for Coastal and Ocean Science, National Ocean Service, NOAA, dated September 6, 2018, copy attached.) The siting analysis represents an objective, data-driven approach to identify the locations within federal waters with the highest compatibility with the proposed project. The results of this siting analysis identify two alternative sites (CASS Report Alternatives 1 and 2) proximate to Ventura Harbor given equal consideration of existing use conflicts, including:

- Existing vessel traffic corridors,
- Oil and gas production,
- Commercial fishing (specifically trawl and squid fisheries), and
- Obstructions, including submerged cables and wrecks.

The two CASS Report Alternatives are both situated in the northern portion of the siting analysis study area, which was determined to have the smallest potential overlap with conflicting uses. The primary difference between the two CASS Report Alternative sites is the configuration of sub-permit areas (Figures 3 and 4). Importantly, the two sites overlap with the federal waters alternative site identified in the UCSB Bren School spatial planning analysis, indicating the area has been shown by two independent studies to have the fewest conflicts with other uses and sensitive environmental resources (Figure 5). Following a public hearing in September 2018, it is anticipated the VPD Board of Commissioners approved CASS Report Alternative 1)(also shown in Figure 1) as the preferred project site. CASS Report Alternative 2 (shown in Figure 4) is shown as an alternate site location.

Project Construction

Installation of anchors, longlines, and buoys will be performed by grower/producers in compliance with all permit requirements and VPD sub-permit conditions which will incorporate approved best management practices (BMPs). Submerged longlines consist of a horizontal structural header line, or "backbone," that is attached to the seafloor by helical screw anchors drilled into the sandy

bottom at each end and is marked and supported by a series of buoys along the central horizontal section, as shown in Figure 2. Helical screw anchors have been shown to exhibit superior holding power as compared to other anchoring systems and can be removed or cut below the surface at project decommissioning. Helical screw anchors for mussel farms in open ocean habitats have been installed all over the world, including offshore of Catalina Island, California. Helical screw anchors will be installed by a hydraulic drill with a drill head that operates from a rig lowered to the ocean floor. The helical screw anchors will be screwed approximately 10 to 20 feet deep into the sandy bottom ocean floor. Each 100-acre plot will contain up to 48 anchors for a total of 960 anchors at full project build out.

It is anticipated that the potential noise impacts from the installation of the sand screw anchors using a hydraulic drill will be minimal. The screw anchors are drilled into the seabed using a hydraulic auger controlled at the surface. The drill is submersible and is lowered with the anchor. Noise levels are very low in the water, with a relatively small (50 hp) hydraulic power pack on the installation vessel (Fielder Marine Services, New Zealand, pers.comm.). Rotation speeds are very low, which minimizes entanglement of marine species. The anchor installation disturbs less than 1 square meter of seabed on installation and once installed no rope or chain touches the sea floor, which also minimizes seabed disturbance (Fielder Marine Services, New Zealand, pers.comm.). Marine wildlife, especially cetaceans, is known to be sensitive to noise effects (e.g., NMFS 2007a). However, construction noise levels will be well within acceptable thresholds for both marine mammals and fish (ICF Jones & Stokes and Illingworth and Rodkin, Inc. 2009; NMFS 2007a). Due to the minimal noise level and area of disturbance on the sea floor, an action area of 100 feet is sufficient.

Buoys marking the corners of each parcel will identify the cultivation area for navigational safety and will comply with all regulations for height, illumination, and visibility, including radar reflection. As shown in Figure 2, permanent surface buoys for each longline will consist of two 16-inch surface corner buoys (one corner buoy supporting and marking either end of the backbone), as well as one 16-inch buoy supporting and marking the center pickup line, for a total of three surface buoys per longline. Simulated views of parcel arrays at the surface and underwater are provided in Figures 6 through 9. All surface buoys will be marked with the grower/producer name and phone number. Buoys attached to the central horizontal portion of the backbone line support the line, provide a means of lifting the backbone line to access the cultivation ropes, and determine the depth of the submerged backbone, which will vary seasonally from 15 to 45 feet below the surface. Additionally, a combination of surface and submerged buoys attached to the backbone line will be used during the mussel production cycle to maintain tension on the structural backbone line as the weight of the mussel crop increases. These will consist of 24-inch (or equivalent, with greater than 200 L buoyancy) buoys attached at required intervals along the

surface and connecting to the backbone line, in combination with smaller submerged buoys affixed directly to the backbone line. The combination of surface and submerged buoyancy is designed to create a tensioned but flexible structure that is capable of responding dynamically to surface waves and storms.

The longlines that will be utilized are thick (1-inch diameter), tensioned (to approximately 800 pounds) rope that is not conducive to wrapping around or entangling protected species. The longline configuration produces a fairly rigid tensioned structure from which the cultivation ropes, or “fuzzy ropes” are attached. Fuzzy ropes are characterized by extra filaments that provide settlement substrate for mussels to attach. Fuzzy ropes may be attached to and suspended from the backbone rope either as individual lengths or as a continuous looping single length that drapes up and down over the backbone. The length of each section or loop of fuzzy rope will be approximately 20 feet but the actual length depends on the lifting capacity of the servicing vessel. The length of the central horizontal section of backbone line will be approximately 575 feet, which will support approximately 8,000 feet of fuzzy cultivation line.

The shape of each 100-acre cultivation parcel will be a function of the geometry of the submerged backbone lines and anchoring system. Each horizontal section of the longline will be approximately 575 feet and will require an anchor scope of approximately 2.5 times depth. Therefore, in 100 feet of water depth, scope from the horizontal section of backbone to the helical screw anchor will require 250 feet on each end of the line, making a total length of 1,075 feet from anchor screw to anchor screw. A 100-acre parcel with rectangular dimensions of 1,899.5 feet by 2,299.5 feet will therefore accommodate up to 24 individual longlines (Figures 10 and 11). The submerged longline growing gear configuration will be specifically engineered for open ocean conditions with respect to size and strength of all lines, anchoring, hardware, and buoyancy.

Construction in each individual growing plot will take place only after VPD approval of a sub-permits (or other form of agreement) with the individual grower/producer. While project development is dependent on market demand, VPD estimates that full build out would occur within three to five years after project approval.

Project Operation/Cultivation Methods

The mussels will be grown and harvested by grower/producers under individual sub-permits (or other form of agreement) with VPD that incorporate all project permit conditions and BMPs. All grower/producers will be required to land their mussels at Ventura Harbor. Spat will be purchased from onshore hatcheries certified by CDFW. At the hatcheries, spat are settled on the fuzzy ropes, which is rope woven with additional loops of fiber to create additional settlement substrate and is standard industry practice. When the spat are firmly settled to the ropes, the ropes are covered with

cotton socking material to protect them from shaking off the ropes during transport to the offshore growing site and deployment. The socks hold the spat next to the rope while the mussels naturally attach with their byssal threads, by which time the cotton material naturally degrades. These ropes are then attached to the longlines and buoys, either as single sections of line or as a continuous looping strand attached in intervals.

The mussel grow-out ropes will grow to be stiff with attached mussels encasing the rope core, thus making them very unlikely sources of entanglement. As an additional precaution against entanglement, grow ropes will be attached to the head rope with a low-breaking-strength line, which will facilitate rapid detachment in the unlikely event of any interaction with the longline. To further minimize entanglement potential, a breakaway link will be installed between the surface buoys and vertical lines, similar to strategies used to mitigate potential entanglement in trap fisheries in the northeastern United States (NOAA 2008). Buoy lines between the surface and head rope are generally under tension partially equivalent to their full buoyancy and breakaway link ratings will be specific to buoy size.

Cultivated mussels grow by filtering naturally occurring phytoplankton from the ocean. Juvenile mussels will grow on lines until an intermediate size where the density of mussels on the fuzzy rope becomes limiting to further growth. At this point, a servicing vessel will lift the backbone line in order to access the fuzzy rope stocked with juvenile mussels and pull the fuzzy rope through vessel-based equipment designed to strip the mussels from the fuzzy rope, and then clean, separate, and grade the juvenile mussels by size. Juvenile mussels then will be restocked to clean fuzzy rope and covered with naturally-dissolving cotton socking at a reduced density for their second stage of grow out to market size. All these intermediate mussel-tending steps take place on the servicing vessel.

Maintenance and inspection of the longlines will be carried out at least on a monthly basis and consist of lifting the longlines out of the water and adding additional buoys as necessary to account for increased mussel weight. Inspections of the anchor ropes, anchors, and connecting ropes will be carried out monthly for the first two years following deployment, and in the event there are no marine wildlife entanglements within the first two years, may be reduced to quarterly inspections thereafter. Inspections can include a variety of techniques: recordings by depth/fish finder; remotely operated vehicle (ROV) surveys of lines; and/or monitoring performed by SCUBA divers.

Gear and planted ropes will be inspected regularly as part of a comprehensive monitoring plan, but generally the planted ropes will only be manipulated during initial stocking, intermediate harvest and restocking, and final harvest. Inspection will involve monitoring the all hardware and

rigging and surface buoys and their tension, and checking for escaped gear and potential entanglements. Examples of possible observations that would trigger concern and further investigation are (1) gaps or tangling of dropper ropes detected on depth finder or other structural anomalies, (2) fouling by objects or other marine debris detected in support buoys or buoy deployment lines, and (3) loss of function or damage to devices related to navigational safety.

Harvesting involves separating the mussels from the ropes, followed by cleaning, sorting, and bagging. When the mussels reach market size, which is expected to occur after about one year of total production time, the submerged backbone lines again will be lifted in order to access the fuzzy cultivation ropes, and mussels again will be stripped from the line, cleaned, and separated, and this time size-graded and bagged for landing at the Ventura Harbor as market-ready product. The bagged mussels will be transported to Ventura Harbor for offloading, sale, and distribution. All husbandry activities related to harvesting, grading, and restocking of mussels to cultivation lines will occur onboard the servicing vessel using specialized equipment for that purpose.

Watercraft used for planting, inspections, and harvesting will be home ported at Ventura Harbor. At full project build out 20 to 40 vessels will be traveling to the specific sub-permit sites to conduct these activities. The maximum distance traveled between the harbor and the farthest potential sub-permit area will be approximately 8 miles. Once constructed, it is projected that each sub-permit site will generate an estimated 150 trips per year to accomplish the tasks outlined above.

Landed product will comply with all testing and labeling regulations as part of the California Department of Public Health (CDPH) Shellfish Sanitation Plan and the National Shellfish Sanitation Program (NSSP) guidelines for shellfish grown in federal waters. NOAA-Seafood Inspection Program (NOAA-SIP), in collaboration with the U.S. Food and Drug Administration (FDA), recently began the process of developing NSSP-compliant sanitation protocols for bivalve shellfish cultivated in federal waters.

Organization and Governance

VPD proposes to make mussel growing area sub-permits available to a variety of grower/producers, anticipated to include existing commercial fishermen, existing commercial shellfish businesses, and startups that otherwise would be disinclined to embark on the lengthy and expensive mandatory regulatory pathway. As a requirement of their participation, grower/producers will be obligated to operate under robust environmental monitoring guidelines and BMPs incorporated into the proposed project's entitlements. While all grower/producers will be held accountable for compliance with these requirements, VPD is ultimately responsible for compliance with all permit conditions and required BMPs. All grower/producer responsibilities would be spelled out as conditions in grower/producer sub-permits with VPD, thus establishing

VPD enforcement authority for those conditions. VPD anticipates further discussions with the U.S. Army Corps of Engineers (USACE) concerning the proposed sub-permitting process once the USACE has had an opportunity to review the application.

Project Decommissioning

The project will include a decommissioning plan, which will provide for the removal of all equipment and structures in each sub-permit area associated with project activities when activities in that sub-permit are terminated. The decommissioning plan will be a requirement of each sub-permit. Financial assurances to guarantee implementation of the decommissioning plan will be required of each grower/producer and reviewed periodically.

19. Project Purpose

Objectives of the proposed project are:

1. To increase the supply of safe, sustainably produced, and locally grown shellfish while minimizing potential negative environmental impacts;
2. To enhance and sustain Ventura Harbor as a major west coast fishing port and support the local economy;
3. To provide economies of scale, pre-approved sub-permit area, and technical support to include small local producers who would not otherwise be able to participate in shellfish aquaculture;
4. To provide an entitlement and permitting template for aquaculture projects state-wide;
5. To enhance public knowledge and understanding of sustainable shellfish farming practices and promote community collaboration in achieving VSE objectives;
6. To advance scientific knowledge and state of the art aquaculture practices through research and innovation.

1. To increase the supply of safe, sustainably-produced, and locally-grown shellfish while minimizing potential negative environmental impacts

The proposed project will serve to diversify the catch and stabilize the commercial fishing fleet home-ported at Ventura Harbor. The proposed project also will provide a locally cultivated, sustainably raised food source, and significantly advance state and national goals and objectives for increased domestic aquaculture and a secure food supply. The proposed project is supported, in part, through the NOAA Sea Grant program, the goal of which is to contribute to “a safe, secure and sustainable supply of seafood to meet public demand.”

Ventura Harbor is home to one of the top fisheries off-loading harbors in the state. One of the core goals of the VSE project is to enhance the Ventura Harbor working waterfront with a sustainable and dependable seafood harvest. The project will help meet state and federal goals for the growth of domestic shellfish aquaculture to better serve the U.S. population demands for new, sustainably grown protein sources. This is consistent with the VPD’s goal of upgrading infrastructure, equipment and facilities for a modernized, efficient and safe working harbor. A 2007 California Sea Grant Extension Program report titled “Commercial Fisheries of the Santa Barbara Channel and Associated Infrastructure Needs” noted that diversification of fishing operations through the development of new fisheries could provide new business opportunities.

The proposed project offers a number of other benefits related to food supply, because at present the mussel market in the United States and locally is dominated by imports from Canada, Chile, New Zealand, and Europe. California is the third-largest consumer of shellfish in the United States, and current state production lags far behind demand. Shortfalls are met by importation,

which contributes to the state and national seafood deficit and increases our carbon footprint by the need to transport shellfish into the state from around the world.

This project will supply a locally grown mussel product to an established market with the potential for expansion. Mussels provide a high-protein, low-fat source of human nutrition. Compared with other cultivated protein sources (*e.g.*, beef, pork, chicken), mussels are a more environmentally sustainable food source, require no added feed or water, have significantly lower associated greenhouse gas emissions, and use ocean areas rather than land for production (see Table 1). The proposed project at build out would produce 9,000 to 11,000 tons of mussels for market per year. Further, by serving as a template for additional offshore shellfish-growing projects, this proposed project aims to increase the efficiency of shellfish permitting and thus provide a template to promote additional shellfish growing operations offshore of California.

Table 1
Comparison of Sustainability Indicators among Animal Production Systems

Animal Type	Food Conversion (kg feed/kg edible weight)	Protein Efficiency (%)	Nitrogen Emissions (kg/ton protein produced)	Phosphorous Emissions (kg/ton protein produced)	Land (tons edible product per HA)	Consumptive Freshwater Use (m³/ton)
Beef	31.7	5	1,200	180	0.24–0.37	15,497
Chicken	4.2	25	300	40	1.0–1.20	3,918
Pork	10.7	13	800	120	0.83–1.10	4,856
Finfish (average)	2.3	30	360	48	0.15–3.70	5,000*
Bivalve mollusks	Not fed	Not fed	-27	-29	0.28–20	0

Source: Aquaculture Workshop 2015.

Notes: kg = kilogram; HA = hectare; m³/ton = cubic meters per ton.

* Consumptive water use is difficult to compare across finfish aquaculture production systems because of variability in feed sources and depending on whether the system is freshwater or saltwater.

To minimize conflicts with other ocean uses and ensure location away from pollution sources, the proposed location was selected after multiple stakeholder workshops and consultations, noticed public meetings of the Ventura Port Commission, and utilization of two different marine spatial planning tools. (See “18. Nature of Activity” discussion.)

The proposed project is consistent with California’s Aquaculture Development Act (California Public Resources Code, Sections 826–828), which encourages the practice of aquaculture to augment food supplies, expand employment, promote economic activity and protect and better use the land and water resources of the state, and Assembly Joint Resolution 43 (2014), wherein the State Legislature states its support “to protect existing shellfish beds and access to additional acreage for shellfish farming and restoration.” The proposed project is also consistent with NOAA’s National Shellfish Initiative (NOAA 2013) and National Marine Aquaculture Policy (NOAA 2011), which seek to increase populations of bivalves in coastal waters through commercial aquaculture production and acknowledge the multiple benefits of shellfish aquaculture, including providing new jobs and business opportunities, meeting the growing demand for seafood, and providing habitat for important species. Finally, the proposed project furthers the goals of the National Ocean Policy Implementation Plan (National Ocean Council 2013), one of which is to increase efficiencies in the permitting process and encourage agency coordination to facilitate additional marine aquaculture development.

2. To enhance and sustain Ventura Harbor as a major west coast fishing port and support the local economy

The proposed project is very important to the future of Ventura Harbor. The harbor’s status as a robust commercial fishing port is vital to VPD qualifying for USACE harbor dredging funds since the harbor is not a deep water port and does not house a U.S. Coast Guard station. Absent USACE dredging funds the harbor will silt up and close.

Integral to the VPD’s mission is to provide a safe and navigable harbor that benefits fisherman. Included amongst the VPD’s goals is to maintain and enhance a safe and navigable harbor by:

- Securing federal funding to support the USACE operation and maintenance program at the harbor federal entrance;
- Dredging the Inner Harbor and preserving infrastructure;
- Providing superior Harbor Patrol, Maintenance, and related Port District services;
- Upgrading infrastructure, equipment and facilities for a modernized, efficient and safe working harbor

To meet its mission and goals the VPD allocates annual revenues to operations, maintenance and capital improvements. In FY18-19 operating revenues were approximately \$10 million and operating expenses were approximately \$8.7 million. However capital improvements totaled \$5.2M, causing the VPD to utilize approximately \$3.9 million in unrestricted reserve funds. Due to VPD reserve fund policies, this is not sustainable at this level annually. This means that some combination of increased revenues or revenue sources and alternative methods to finance some capital infrastructure projects is

necessary. Specific to the commercial fishing industry, the VSE project can play a vital role in VPD annual revenue generation that can be leveraged for the financing of commercial fishing infrastructure while creating other positive economic impacts and maintaining dredging priorities as discussed further below.

The VPD, which is an independent special district, receives approximately 88-90% of its revenues from commercial leases, boat slip fees and fish off-loading charges. The remaining funds are local property tax revenues accounting for approximately 10-12% of revenues. These property tax revenues have consistently been allocated to public safety for Harbor Patrol but do not cover these operational costs. Additionally, the VPD is expanding Harbor Patrol operations to “24-7” due to increased demand for services which further increases annual operating expenses for public safety functions.

Dredging

The VPD is completely dependent upon the USACE for the annual maintenance of the harbor’s federal entrance system, and the unloading of commercially harvested seafood at the harbor is a primary justification for this federal support. Without diversified fisheries delivering consistent fish offloading necessary to justify federal funding to USACE for Ventura Harbor dredging, the Harbor risks future entrance closures.

The entrance system includes the following components:

1. A 1,750 foot entrance channel
2. A 600,000 cubic yard sand trap
3. A 1,800 foot offshore breakwater
4. A 1,550 foot north jetty
5. A 250 foot middle jetty
6. A 600 foot south beach groin

The annual maintenance dredging of the entrance channel and sand trap currently require between \$5,000,000 and \$7,000,000 per year. The cost of maintaining the rock structures (i.e. breakwater, jetties and groin), while not occurring on an annual basis, has nonetheless averaged about \$1,280,000 per year over the last 15 years. Were it not for the federal assumption of these maintenance needs, the harbor’s federal entrance channel would simply shoal to closure, and all of the maritime interests in the harbor, both commercial and recreational would lose ocean access.

In order to avoid that possibility, in March 2012, when federal funding was inadequate for the USACE to complete the necessary dredging of the harbor entrance area, the VPD was compelled to utilize \$1,500,000 of its limited reserves to finish the dredging. It was only possible for the VPD to take that

action, however, because the USACE had already absorbed the contractor's \$1,000,000 equipment mobilization cost. Even under such limited conditions, it is simply not sustainable for the VPD to financially support the federal dredging program.

Infrastructure

One of the core goals of the VSE project is to enhance the Ventura Harbor working waterfront with a sustainable and dependable seafood harvest. This is consistent with the VPD's goal of upgrading infrastructure, equipment and facilities for a modernized, efficient and safe working harbor. The existing commercial fishing businesses generate direct revenue to the VPD in the form of commercial boat slips and fish offloading fees. These fees generate approximately \$1.2M in annual revenue that supports marina operations and some infrastructure needs. The commercial boat slip fees are highly dependent upon a stable commercial fishing fleet, which depends largely upon the ongoing success of the California Market Squid industry along with other smaller fisheries. This industry has proven resilient but unpredictable from year to year due to a variety of impacts from weather, water temperatures, and market forces, including more recently imposed tariffs on international seafood products. For example, the VPD has had years where 60 million pounds or more in squid was offloaded at the Harbor while other years the VPD has had less than 20 million pounds offloaded at the Harbor. The VPD's off-loading fees are generated largely by the squid industry; however, these fees only represent 10% of the \$1.2M in total revenue identified above (approximately \$120,000 annually).

The VPD, as part of its annual budget, prepares a 5-year capital improvement plan (CIP) which anticipates large scale projects that are necessary to maintain a modernized, efficient and safe working harbor. These needs are particularly pressing given the harbor's age, with many facilities 35-55 years in age. The scale of these projects necessitates capital financing, since annual revenues are largely utilized for ongoing operations and pay just a portion of capital improvements.

For example, a current project receiving capital financing is the Village Commercial dock replacement. This \$4.6 million project seeks to replace the dilapidated dock system, which is used primarily by 42 purse seiners and related commercial fishing vessels such as 20 light boats for the California Market Squid fleet. The project financing requires that ongoing annual VPD revenues be used to support the debt service.

In the next five to ten years, the VPD will need to finance a substantial amount of new infrastructure construction and likely dredge the inner harbor for commercial fishing boat needs and revetment maintenance, neither of which is a USACE-funded activity because it is not part of the Harbor's federal entrance. Other projects may include future replacement of an older fisheries building, reconstruction of a fish pier, replacement or addition of fish offloading cranes, modernization of fish handling facilities, worksite improvements, fish equipment storage and fleet parking needs. It is conceivable that

the VPD could finance \$20M or more in commercial fishing infrastructure costs to support ongoing operational needs. This is in addition to the \$4.6 million in debt discussed above. For illustrative purposes only, if the VPD were to borrow \$20 million over 30 years at current interest rates, the annual debt service costs to the VPD for this debt would be approximately \$1.2 million.

The VPD is subject to significant due diligence and financial “tests” in order to borrow capital project funds. While the VPD continues to meet these borrowing requirements, and maintains a strong financial position, it is clear that the VPD must seek to diversify its fisheries to support commercial fishing operational and infrastructure costs. Annual boat slip and offloading fees are used to fund ongoing fisheries and marina operations but do not provide the necessary funding to complete large-scale capital projects. Thus, the implementation of new fisheries and resulting revenues is of major importance to the VPD.

The VSE project anticipates wholesale market values of \$2.76M per 100-acre parcel or \$55.2M at full build-out of 20, 100-acre parcels. Many factors will ultimately determine actual revenue, with the most critical factor being the size of the approved project, as well as growing conditions, operational interruptions, time period to full build out, market conditions, project and operational costs, etc. However, in utilizing these initial projections the VPD is evaluating potential revenue sharing models as discussed below.

The VPD is evaluating a new revenue approach with the VSE project. The VPD will be the project permittee. As such, the VPD may consider implementing a participation fee (e.g. 3-5% of gross wholesale value) for future private grower producers, rather than just rely on fish offloading and slip fees to help fund infrastructure needs. For example, an operating fee of 3% of the gross wholesale value at full build-out as described above could generate annual revenues to the VPD of approximately \$1.65M. These funds generated will be used to support the VPD’s project administration costs and could help support future debt issued for commercial fishing infrastructure (e.g. \$1.2M annual debt service as described above). A project of a lesser scale would directly impact future VPD annual revenues that can be used in part to support the financing of ongoing commercial fishing infrastructure and harbor needs.

3. To provide economies of scale, pre-approved sub-permit area, and technical support to include small producers who would not otherwise be able to participate in shellfish aquaculture

Designed economies of scale will maximize the previously described direct and indirect secondary benefits of the proposed project. Significant expenses are associated with permitting,

environmental review, compliance with shellfish health regulations, and environmental monitoring; therefore, leasing and permitting the proposed project as one will provide economies of scale and eliminate a significant impediment to market diversification and participation by small shellfish companies or new investors. By permitting all the growing areas as a single proposed project, individual grower/producers benefit from the collective upfront permitting efforts of VPD.

As a specific example of a regulatory economy of scale, monitoring requirements such as implementation of a sediment quality monitoring plan are more efficiently handled at the VPD project scale as opposed to separate efforts by individual grower/producers. VPD, acting as the responsible party for BMP compliance, can use collective funds to monitor sediment conditions within the larger project area, offering technical sampling and reporting consistency, along with facilitating collection of a larger data set, which will offer greater opportunities to track overall project impacts. Collective sampling and reporting will also yield efficiencies in compliance review for the agencies, as VPD can act as a clearinghouse for information, handling the initial screening and vetting of information before it is transmitted to the appropriate regulatory agencies.

Project grower/producers will have access to a pooled, centralized and comprehensive monitoring and reporting program for all the growing plots. All necessary permits and entitlements will already have been obtained by VPD, making participation by the grower/producer “turn-key.” The costs to the grower/producer associated with ongoing water quality sampling and monitoring will be reduced by the efficiency of a centralized pooled program, which will in turn reduce operating costs and increase the direct benefit to the grower/producer.

Further, grower/producers will also have access to technical expertise and the accepted BMPs developed through the permitting process and described below. Similarly, grower/producers will enjoy access to centralized marketing and branding of a Ventura-specific premium seafood product grown and harvested in the proposed area.

Each of these elements of the project design contributes cumulatively to a total package, which in turn contributes positively, and materially to the ongoing operational health and vitality of the Ventura Harbor community. The costs associated with the proposed project (i.e. permitting and monitoring) would be too high for a small operation. In order for the sub-permits to be affordable for individual grower/producers, the proposed project must be a large scale project.

4. To provide an entitlement and permitting template for aquaculture projects state-wide

A major goal of the proposed project is delineation of a streamlined strategic permitting pathway that will not only facilitate the establishment of a Ventura Harbor-based shellfish operation promoting sustainable economic development, but that will more generally serve as a model to

help other entities address regulatory barriers and planning challenges that currently create impediments to the expansion of the shellfish aquaculture industry in California.

The proposed project is a unique approach to developing environmentally and economically sustainable shellfish commerce with product landed at the Ventura Harbor. This initiative is novel in several ways.

- The project proposes to produce bivalve shellfish in the offshore marine environment using cultivation practices that, although well-established worldwide, are in their infancy in the United States, particularly on the West Coast.
- The proposed project is a cooperative and collaborative effort taking place in an open-source format with state and federal regulators to establish a template for additional future shellfish growing operations in California.
- The proposal to permit a group of twenty 100-acre growing plots allows for participation by potential grower/producers who might otherwise be precluded from participation in aquaculture because of the significant regulatory burden of obtaining the required government approvals.
- The scale of the proposed project allows the individual grower/producers to benefit from centralized environmental monitoring, product safety testing, and product marketing.
- This proposed project as it is scaled will bolster the working waterfront in Ventura Harbor, providing economic benefits to VPD, its tenants, and the community.

The proposed project seeks to significantly improve the interagency review and permitting process for offshore shellfish aquaculture and create a comprehensive and efficient permitting process that is cost effective for both review agencies and applicant alike. In doing so, the overarching objective is to establish a viable and replicable permitting pathway model that satisfies the requirements of the review and permitting agencies and may be used by any prospective shellfish grower/producers to facilitate project design and aid in the evaluation of future offshore aquaculture proposals.

5. To enhance public knowledge and understanding of sustainable shellfish farming practices and promote community collaboration in achieving VSE objectives

Realizing the vision of an improved permitting process requires coordinated planning among all stakeholders to attain the full environmental and economic benefits. VPD and key VSE participants are committed to transparency, open communication, and comprehensive public education and outreach efforts. To this end, VPD and key VSE participants hosted an ongoing

series of informational public meetings to discuss the social, economic, environmental, scientific, and technological variables encompassed by the proposed project. These interactive, workshop-style meetings provided a forum for open dialog among all interested members of the general public, state and federal agency representatives, shellfish industry leaders, and environmental and scientific leaders to discuss the policy, planning, and scientific issues surrounding the establishment of a Ventura Harbor-based offshore shellfish aquaculture operation. This was a critical first step toward productive collaboration and ultimately, overall project success.

6. To advance scientific knowledge and state of the art aquaculture practices through research and innovation

The project is envisioned to include both research and education components. The project includes as additional participants, researchers and educators with the following institutions:

- UCSB Bren School
- University of California, San Diego, Scripps Institution of Oceanography
- Woods Hole Oceanographic Institute
- NOAA Fisheries West Coast Region

The project will serve an in situ working laboratory for improving shellfish aquaculture techniques and will be used as an open-water classroom. Qualified researchers affiliated with universities (i.e., UCSB Bren School, or University of Southern California, etc.), or qualified marine research institutes (i.e., Woods Hole Oceanographic Institute, Scripps Institution of Oceanography, etc.) will have access to aquaculture plots to conduct research and monitoring approved by the VPD; however, access may be limited in certain circumstances to respect grower/producer proprietary data or technology or to accommodate a grower/producer's operational and logistical needs in operating the farm. VPD will review and approve research projects in consultation with USACE, NMFS, NOAA, and any affected grower/producers. Grower/producers will be fairly compensated for the use of their vessels, equipment, and fair market value of any mussels produced or generated as part of approved research projects.

23. Description of Avoidance, Minimization, and Compensation

Avoidance of User Conflicts

As described previously, the size of the proposed project was determined based on needing to meet the project objectives, primarily Objectives 2 and 3:

2. To enhance and sustain Ventura Harbor as a major west coast fishing port and support the local economy;
3. To provide economies of scale, pre-approved sub-permit area, and technical support to include small local producers who would not otherwise be able to participate in shellfish aquaculture.

To meet its mission and goals the VPD allocates annual revenues to operations, maintenance and capital improvements. As stated in Section 19, Project Purpose, the VPD had a negative cash flow of approximately \$3.9 million in FY18-19, which was funded by use of unrestricted reserves, but is not sustainable at this level annually. As such, a combination of increased revenues or revenue sources and alternative methods to finance some capital infrastructure projects is necessary. Specific to the commercial fishing industry, the VSE project can play a vital role in VPD's annual revenue generation that can be leveraged for the financing of commercial fishing infrastructure while creating other positive economic impacts and maintaining dredging priorities. *See* Section 19 for further discussion of these issues.

There is a strong nexus between the continued receipt of federal support and the vitality of the harbor's commercial fishing operations and landings. In order to ensure that dredging continues, the harbor needs to increase the tonnage landed at Ventura Harbor in a sustainable manner. As other forms of commercial fishing are not currently a viable or sustainable option, the proposed project will significantly increase and diversify the catch landed at Ventura Harbor. A smaller scale fishery is unlikely to provide enough tonnage to ensure dredging continues.

Similarly, it is not feasible to provide economies of scale to small, local producers without a large scale operation. The operation costs, such as monitoring, permitting, and technical support, would be far too high with a smaller size. In order to have a sustainable fishing operation with a recognizable product, the proposed project needs to be a larger operation.

Siting Analysis

Once the size of the proposed project was determined, spatial planning guided the VPD in determining which area was most suitable for longline mussel cultivation with the lowest impact on existing marine uses. The initial candidate area in state waters was selected by VSE with the assistance of analysis prepared by the UCSB Bren School (using SeaSketch software), and focused on the Southern California Bight. The factors evaluated in the analysis included suitability of the candidate growing area for mussels considering water depth and ocean bottom; location in State waters near Ventura Harbor for product landing; avoidance of potential pollution sources; and avoidance of conflicts with existing subsurface leases for oil and gas pipelines, etc. The report identified areas where conflicts with or impacts by aquaculture development had the potential to affect stakeholders, the environmental health of the marine benthos, quality of ocean views, and the risk of disease spread among fish farms. Thousands of spatial plans were considered. The spatial plans indicated that for various locations within the Southern California Bight, mussel aquaculture can achieve considerable value while minimizing impacts to the existing sectors (0-5% impact). As a result of the UCSB Bren School spatial planning analysis, eight SeaSketch alternatives were identified, including an alternative in federal waters.

- SeaSketch Alternative 1 – 20 lease sites located along the 80' contour at 45-degree angle
- SeaSketch Alternative 2 – 20 lease sites along 80' contour with contiguous straight-line outer edge
- SeaSketch Alternative 3 – 20 lease sites along 80' contour with 2X2 configuration extending toward the middle of candidate area
- SeaSketch Alternative 4 – 20 lease sites along 3nm State waters line, six sites south of Pitas Pt. extended towards the middle of the candidate area
- SeaSketch Alternative 5 – 20 lease sites that follows 3 nm line intuitively
- SeaSketch Alternative 6 – 20 lease sites at 3nm line arranged in a 2X2 configuration
- SeaSketch Alternative 7 – 20 lease sites intuitively following the 3nm State waters line in a 2X2 configuration
- SeaSketch Alternative 8 – 20 lease sites outside of the 3nm State waters line, in Federal waters, arranged in two, ten parcel 2X2 configurations slightly offset.

The VSE team established criteria on which to evaluate and prioritize each siting alternative. As a result, the VSE team constructed a siting decision matrix to quantify the benefits of each potential siting configuration, and assist the VPD Board of Commissioners in its decision-making process. The stakeholder engagement process supported the identification of key factors upon which to assist siting configuration decision-making. Each of the criteria was assigned a weight based on perceived relative importance to achieving optimal operational capacity and minimizing potential user conflicts and environmental impacts. Siting alternatives were then scored using a rating system that corresponds to preferences identified by the VSE team. These criteria included:

- Approximate water depth
- Potential adverse water pollution sources

- Potential visual effects from shore
- Potential interaction with commercial and recreational fishing interests
- Subleasing or sub-permitting complexities
- Potential overlap with subsurface leases
- Environmental review complexity
- Contiguous siting
- Distance from Harbor

Through the stakeholder engagement process and consultation with its aquaculture specialist, Scott Lindell of Woods Hole Oceanographic Institution, it became clear that location of the project in State waters posed certain issues. Most importantly, VSE received information from local halibut trawlers that the proposed State waters candidate area was located in one of two areas statewide designated by CDFW as halibut trawl grounds. Further, Mr. Lindell advised that a minimum 80' bottom depth (versus the initial criterion of 60' bottom depth) would reduce exposure to various mussel predator species (*e.g.*, diving ducks) and potential storm surge. Following a November 2017 public hearing, the VPD Board of Commissioners selected a federal waters alternative (SeaSketch Alternative 8) location.

Subsequently, NOAA Fisheries Southwest District Aquaculture Coordinator, Diane Windham, connected VSE with NOAA's National Ocean Service staff, which undertook a second siting study focused on federal waters proximate to Ventura Harbor. (*See* "Coastal Aquaculture Siting and Sustainability Technical Report, Ventura Shellfish Enterprise: Aquaculture Siting Analysis Results" prepared by Coastal Aquaculture Siting and Sustainability Program, within the Marine Spatial Ecology Division of the National Centers for Coastal and Ocean Science, National Ocean Service, NOAA, dated September 19, 2018, copy attached.) The siting analysis represents an objective, data-driven approach to identify the locations within federal waters with the highest compatibility with the proposed project. The results of this siting analysis identify two alternative sites proximate to Ventura Harbor given equal consideration of existing use conflicts, including:

- Designated shipping fairways,
- Areas of high vessel density and wrecks and obstructions,
- Sensitive habitats,
- Military uses,
- Existing vessel traffic corridors,
- Oil and gas production,
- Commercial fishing (specifically trawl and squid fisheries), and
- Obstructions, including submerged cables and wrecks.

Other important considerations were the distance from Ventura Harbor and depth (25-37m). Slightly less influential parameters included wind speed and direction, wave height, surface current, and chlorophyll *a*.

The two CASS Report Alternatives are both situated in the northern portion of the siting analysis study area, which was determined to have the smallest potential overlap with conflicting uses. The primary difference between the two sites is the configuration of sub-permit areas (Figures 3 and 4). In CASS Report Alternative 1, each sub-permit area has two shorter lines in parallel, and is represented in Figure 3. CASS Report Alternative 2, shown in Figure 4, was designed as a longer “stack” of single lines within each sub-permit area, which was found to be less flexible. Since varying oceanic patterns may necessitate more design flexibility, CASS Report Alternative 1 was determined to be the most compatible configuration. CASS Report Alternative 1 will have 20 plots, each with a dimension of 2,299.5 feet by 1,899.5 feet, and an average water depth of 98 feet.

Importantly, the two CASS Report Alternative sites overlap with the federal waters alternative site (SeaSketch Alternative 8) identified in the UCSB Bren School spatial planning analysis, indicating the area has been shown by two independent studies to have the fewest conflicts with other uses and sensitive environmental resources (Figure 5). Following a public hearing in September 2018, it is anticipated the VPD Board of Commissioners approved CASS Report Alternative 1 (also shown in Figure 1) as the preferred project site. CASS Report Alternative 2 (shown in Figure 4) is shown as an alternate site location.

Measures to minimize impacts to the waters of the U.S.

The proposed project has been designed to minimize direct and indirect impacts to waters of the U.S. to the maximum extent practicable through implementation of the following measures. Please see Table 2 for details of the BMPs, the responsible party, and the enforcing agency of each measure.

Measures to minimize debris and impacts to water quality

1. Sediment Quality Monitoring Plan. A Sediment Quality Monitoring Plan shall be developed requiring monitoring of sediment conditions within the project area, including monitoring the quantity, type, and distribution of biological materials (such as shellfish, shell material, and fouling organisms) that accumulate on the seafloor. Monitoring will also include an evaluation of any changes to oxygen demand of benthic infaunal and epifaunal communities, and changes to the chemical and biochemical conditions of seafloor sediments along with a description of performance standards to meet.

If performance standards are not met, corrective actions will be outlined. The Plan will include reporting requirements, including annual report submittals to NOAA and NMFS for review. If performance standards are met for a period of time, the plan will provide for appropriately scaling down monitoring and intervals over time.

2. Spill Prevention and Response. Discharges of feed, pesticides, or chemicals (including antibiotics and hormones) in ocean waters are prohibited. Fuel, lubricants and chemicals must be labeled, stored and disposed of in a safe and responsible manner, and marked with warning signs. Precautions shall be taken to prevent spills, fires and explosions, and procedures and supplies shall be readily available to manage chemical and fuel spills or

leaks. Each grower/producer shall comply with the Spill Prevention and Response Plan (SPRP) for vessels and work barges that will be used during project construction and operations. Each grower/producer operating in the project area shall be trained in, and adhere to, the emergency procedures and spill prevention and response measures specified in the SPRP during all project operations. The SPRP shall provide for emergency response and spill control procedures to be taken to stop or control the source of the spill and to contain and clean up the spill. The SPRP shall include, at a minimum: (a) identification of potential spill sources and quantity estimates of a project specific reasonable worst case spill; (b) identification of prevention and response equipment and measures/procedures that will be taken to prevent potential spills and to protect marine and shoreline resources in the event of a spill. Spill prevention and response equipment shall be kept onboard project vessels at all times; (c) a prohibition on at-sea vessel or equipment fueling/refueling activities; and (d) emergency response and notification procedures, including a list of contacts to call in the event of a spill; (e) assurance that all hydraulic fluid to be used for installation, maintenance, planting, and harvesting activities shall be vegetable based.

3. Aquaculture Gear Monitoring and Escapement Plan. Include in overall management plan an aquaculture gear monitoring and escapement plan. Any farm gear that has broken loose from the farm location shall be retrieved. The farm site shall be visited at minimum twice per month to examine the aquaculture gear for potential loss or non-compliant deployment, including inspections for fouling organisms. Any organisms that have a potential to cover the sea floor will be removed and disposed of at an identified upland facility. A Marine Debris Management Plan shall also be prepared that includes (a) a plan for permanently marking all lines, ropes, buoys, and other facility infrastructure and floating equipment with the name and contact information of the grower/producer; (b) a description of the extent and frequency of maintenance operations necessary to minimize the loss of materials and equipment to the marine environment resulting from breakages and structural failures; and (c) a description of the search and cleanup measures that would be implemented if loss of shellfish cultivation facility materials, equipment, and/or infrastructure occurs.
4. Decommissioning Plan. A decommissioning plan for the timely removal of all shellfish, structures, anchoring devices, equipment, and materials associated with the shellfish cultivation facility and documentation of completion of removal activities will be a requirement of each permit or sub-permit. Financial assurances to guarantee implementation of the plan will be in place and reviewed periodically.

Measures to prevent spread of invasive species

1. Cultivation of Spat Offsite. Only hatchery-reared mussel spat grown at a facility certified by CDFW will be used in order to ensure that spat are free of introduced invasive species, parasites, and pathogens; however, natural mussel spat collected on farm grown-out lines and buoys may also be harvested and cultivated.

2. Invasive Species. Grower/producers operating in the project area shall be required to receive training from NMFS to identify potential invasive species and how to properly dispose of such invasive species if discovered.

Measures to prevent navigational impacts

1. Update NOAA Charts. VPD to submit to the NOAA Office of Coast Survey: (a) the geographical coordinates of the facility boundaries obtained using a different geographic position unit or comparable navigational equipment; (b) as-built plans of the facility and associated buoys and anchors; (c) each grower/producer's point of contact and telephone number; and (d) any other information required by the NOAA Office of Coast Survey to accurately portray the location of the shellfish cultivation facility on navigational charts.
2. Notice to Mariners. No less than 15-days prior to the start of in-water activities associated with the installation phase of the project, VPD shall submit to (a) the U.S. Coast Guard (for publication in a Notice to Mariners); and (b) the harbormasters (for posting in their offices of public noticeboards), notices containing the anticipated start date of installation, the anticipated installation schedule, and the coordinates of the installation sites. During installation, VPD shall also make radio broadcast announcements to the local fishers' emergency radio frequency that provide the current installation location and a phone number that can be called for additional information.

Measures to prevent impacts to threatened or endangered species

The enclosed Biological Assessment evaluates the potential effects of the VSE project on federally protected species. In addition to the BMPs identified below, the Biological Assessment identifies certain design features that minimize potential impacts, including marine mammal entanglement. With the incorporation of appropriate avoidance and minimization measures, a preliminary determination has been made that the project may affect, but is not likely to adversely affect any federally-listed threatened or endangered species, or cause adverse modification to federally designated critical habitat.

1. Marine Wildlife Entanglement Plan. No less than once per month, each grower/producer operating on a VPD lease shall visually inspect all ropes, and equipment via depth/fish finders to determine if any entanglement of a marine mammal has occurred and to ensure that (a) no lines have been broken, lost or removed; (b) all longlines, anchor lines, and buoy lines remain taught and in good working condition; and (c) any derelict fishing gear or marine debris that collects in the growing gear is removed and disposed of at an identified onshore facility. All equipment and materials accidentally released or found to be missing from the facility during monthly inspections, including buoys, floats, lines, ropes, chains, cultivation trays, wires, fasteners, and clasps, shall be searched for, collected, properly disposed of onshore, and documented in the annual inspection report. Monitoring shall occur monthly for the first two years following deployment and, in the event that there are

no marine wildlife entanglements within the first two years, may be reduced to quarterly inspections thereafter.

Inspections shall include recordings by depth/fish finder or ROV surveys of lines and/or monitoring performed by SCUBA divers. Recorded video shall be provided along with the annual report described above. Any maintenance issues including wear, loosening, or fatigue of materials shall be remedied as soon as possible. All incidents of observed whale entanglement shall be immediately reported to SOS WHALe. Any other marine wildlife (i.e., other marine mammals, turtles) observed to be entangled will be immediately reported to NOAA Fisheries Marine Mammal Stranding Network Coordinator, West Coast Region, Long Beach Office. Only personnel who have been authorized by NOAA Fisheries and who have training, experience, equipment, and support will attempt to disentangle marine wildlife. If possible, the grower/producer shall document and photograph entangled wildlife and the entangling gear material.

2. Predator Control. Potential predator species will be identified. Specified humane methods of predator deterrence will be utilized, favoring non-lethal methods. No controls, other than non-lethal exclusion, shall be applied to species that are listed as threatened or endangered.
3. Marine Wildlife Observer. A Marine Wildlife Observer shall be present on each project construction vessel during all construction activities, including the installation of long lines and anchoring systems. The observer shall monitor and record the presence of all marine wildlife (marine mammals and sea turtles) within 100 yards of the work area. The observer shall have the authority to halt operations if marine wildlife are observed or anticipated to be near a work area and construction activities have the potential to result in injury or entanglement of marine wildlife. In addition, all work (including vessel motors) will be halted if a cetacean is observed within the monitoring area or if a pinniped or sea turtle is observed within 50 yards of the work area. Work may commence after the observed individuals have moved out of the monitoring area.

Observers' reports on marine mammal monitoring during construction activities shall be prepared and submitted to NOAA Fisheries on a monthly basis. Reports shall include such information as the (1) number, type, and location of marine mammals observed; (2) the behavior of marine mammals in the area of potential sound effects during construction; (3) dates and times when observations and in-water project construction activities were conducted; and (4) dates and times when in-water construction activities were suspended because of marine mammals.

VPD shall prepare a list of qualified marine wildlife observers who meet the following minimum qualifications: visual acuity in both eyes (correction is permissible) sufficient to discern moving targets at the water's surface with ability to estimate target size and distance; (2) use of binoculars or spotting scope may be necessary to correctly identify the target; (3) advanced education in biological science, wildlife management, mammalogy, or related fields (bachelor's degree or higher is preferred); (4) experience and ability to conduct field observations and collect data according to assigned protocols (this may

include academic experience); (5) experience or training in the field identification of marine mammals (cetaceans and pinnipeds) and sea turtles; and (6) ability to communicate orally, by radio or in person, with project personnel to provide real time information on marine wildlife observed in the area, as needed.

4. Entanglement Prevention. Grow-ropes will be attached to the head rope with a low-breaking-strength twine (4-millimeter (0.16-inch) diameter; <1,000 pounds), which will facilitate rapid detachment in the unlikely event of any interaction with the longline. A 1,100-pound breakaway link will be installed between the surface marking buoys and the vertical lines.
5. Marine Wildlife Education. Each grower/producer will be required to provide bi-annual (twice per year) marine wildlife education to its employees regarding proper procedures relating to marine wildlife. The training curriculum will include identifying the presence of specified marine wildlife and procedures for avoiding impacts to marine wildlife during operations. These procedures will include (1) reducing speed and observing the distances from marine life specified in Wildlife-7; (2) providing a safe path of travel for marine mammals that avoids encirclement or entrapment of the animal(s) between the vessel and growing apparatus; (3) if approached by a marine mammal, reducing speed, placing the vessel in neutral and waiting until the animal is observed clear of the vessel before making way; (4) avoiding sudden direction or speed changes when near marine mammals; (5) refraining from approaching, touching or feeding a marine mammal; and (6) immediately contacting their supervisor and other identified parties/agencies identified in Wildlife-1 should an employee observe an injured marine mammal.
6. Lighting. All growing area operations shall be completed during daylight hours. No growing area operations will be conducted at night and no permanent artificial lighting of the shellfish cultivation facility shall occur, except for that associated with the use of navigational safety buoys required by the U.S. Coast Guard.
7. Vessel Management. Vessels in transit to and from the growing area shall maintain a distance of 100 yards from any observed cetacean and 50 yards between any observed pinniped or sea turtle. If cetaceans are observed within 100 yards or pinnipeds or sea turtles observed within 50 yards, the vessel shall reduce speeds to 12 knots or less until it is the appropriate distance (as required by this condition) from the particular marine life. If a cetacean is heading into the direct path of the vessel (i.e., approaching a moving vessel directly into the bow), the vessel shall shut off the engine until the cetacean is no longer approaching the bow and until a greater separation distance is observed. If small cetaceans are observed bow-riding, and the vessel is operating at speeds of 12 knots or less, the vessel shall remain parallel to the animal's course and avoid abrupt changes in direction until the cetaceans have left the area.
Each sighting of a federally listed threatened or endangered whale or turtle shall be recorded and the following information shall be provided:

- a. Date, time, coordinates of vessel

- b. Visibility, weather, sea state
- c. Vector of sighting (distance, bearing)
- d. Duration of sighting
- e. Species and number of animals
- f. Observed behaviors (feeding, diving, breaching, etc.)
- g. Description of interaction with aquaculture facility

**Table 2: Ventura Shellfish Enterprise
Proposed Best Management Practices to Mitigate Potential Adverse Project Impacts**

Measure	Description of Measure	Responsible Party	Enforcing Agency
Seed supply – 1	Cultivation of Spat Offsite. Only hatchery-reared mussel spat grown at a facility certified by CDFW will be used in order to ensure that spat are free of introduced invasive species, parasites, and pathogens; however, natural mussel spat collected on farm grow-out lines and buoys may also be harvested and cultivated.	Grower/Producer ²	Ventura Port District (VPD) and CDFW
Sediment quality – 1	Sediment Quality Monitoring Plan. A Sediment Quality Monitoring Plan shall be developed requiring monitoring of sediment conditions within the project area, including monitoring the quantity, type, and distribution of biological materials (such as shellfish, shell material, and fouling organisms) that accumulate on the seafloor. Monitoring will also include an evaluation of any changes oxygen demand of benthic infaunal and epifaunal communities, and changes to the chemical and biochemical conditions of seafloor sediments along with a description of performance standards to meet. If performance standards are not met, corrective actions will be outlined. The Plan will include reporting requirements, including annual report submittals to NOAA and NMFS for review. If performance standards are met for a period of time, the plan will provide for appropriately scaling down monitoring and intervals over time.	VPD to prepare plan Third-party consultant hired by VPD to conduct monitoring	NOAA and NMFS
Wildlife – 1	Marine Wildlife Entanglement Plan. No less than once per month, each grower/producer operating on a VPD lease shall visually inspect all ropes, cables, and equipment via depth/fish finders to determine if any entanglement of a marine mammal has occurred and to ensure that (a) no lines have been broken, lost or removed; (b) all longlines, anchor lines, and buoy lines remain taught and in good working condition; and (c) any	Grower/Producer to inspect and respond VPD to identify disposal facility	VPD and NOAA Fisheries

² Note that all Grower/Producer responsibilities will be spelled out as conditions in grower/producer sub-permits with VPD, thus establishing VPD enforcement authority for those conditions.

	<p>derelict fishing gear or marine debris that collects in the growing gear is removed and disposed of at an identified onshore facility. All equipment and materials accidentally released or found to be missing from the facility during monthly inspections, including buoys, floats, lines, ropes, chains, cultivation trays, wires, fasteners, and clasps, shall be searched for, collected, properly disposed of onshore, and documented in the annual inspection report. Monitoring shall occur monthly for the first two years following deployment and, in the event that there are no marine wildlife entanglements within the first two years, may be reduced to quarterly inspections thereafter.</p> <p>Inspections shall include recordings by depth/fish finder or ROV surveys of lines and/or monitoring performed by SCUBA divers. Recorded video shall be provided along with the annual report described above. Any maintenance issues including wear, loosening, or fatigue of materials shall be remedied as soon as possible. All incidents of observed whale entanglement shall be immediately reported to SOS WHALe. Any other marine wildlife (i.e., other marine mammals, turtles) observed to be entangled will be immediately reported to NOAA Fisheries Marine Mammal Stranding Network Coordinator, West Coast Region, Long Beach Office. Only personnel who have been authorized by NOAA Fisheries and who have training, experience, equipment, and support will attempt to disentangle marine wildlife. If possible, the grower/producer shall document and photograph entangled wildlife and the entangling gear material.</p>		
Wildlife – 2	<p>Predator Control. Potential predator species will be identified. Specified humane methods of predator deterrence will be utilized, favoring non-lethal methods. No controls, other than non-lethal exclusion, shall be applied to species that are listed as threatened or endangered.</p>	<p>VPD to identify potential predator species and deterrence methods Grower/Producer to implement identified methods as necessary</p>	<p>Any methods of predator control are subject to prior approval of VPD, U.S. Fish and Wildlife Service, and NOAA Fisheries</p>
Wildlife – 3	<p>Marine Wildlife Observer. A Marine Wildlife Observer shall be present on each project construction vessel during all construction activities, including the installation of long lines and anchoring systems. The observer shall monitor and record the presence of all marine wildlife (marine mammals and sea turtles) within 100 yards of the work area. The observer shall have the authority to halt operations if marine wildlife are observed or anticipated to be near a work area and construction activities have the potential to result in injury or entanglement of marine wildlife. In addition, all work (including vessel motors) will be halted if a cetacean is observed within the monitoring area or if a pinniped or sea turtle is observed within 50 yards of the work area. Work may commence after the observed individuals have moved out of the monitoring area.</p>	<p>VPD to identify qualified Marine Wildlife Observers and submit monthly observers' reports Growers/Producers to assure a qualified observer is present during construction activities and that observers' directives are heeded</p>	<p>VPD and NOAA Fisheries</p>

	<p>Observers' reports on marine mammal monitoring during construction activities shall be prepared and submitted to NOAA Fisheries on a monthly basis. Reports shall include such information as the (1) number, type, and location of marine mammals observed; (2) the behavior of marine mammals in the area of potential sound effects during construction; (3) dates and times when observations and in-water project construction activities were conducted; and (4) dates and times when in-water construction activities were suspended because of marine mammals.</p> <p>VPD shall prepare a list of qualified marine wildlife observers who meet the following minimum qualifications: visual acuity in both eyes (correction is permissible) sufficient to discern moving targets at the water's surface with ability to estimate target size and distance; (2) use of binoculars or spotting scope may be necessary to correctly identify the target; (3) advanced education in biological science, wildlife management, mammalogy, or related fields (bachelor's degree or higher is preferred); (4) experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience); (5) experience or training in the field identification of marine mammals (cetaceans and pinnipeds) and sea turtles; and (6) ability to communicate orally, by radio or in person, with project personnel to provide real time information on marine wildlife observed in the area, as needed.</p>		
Wildlife – 4	<p>Entanglement Prevention. Grow-ropes will be attached to the head rope with a low-breaking-strength twine (4-millimeter (0.16-inch) diameter; <1,000 pounds), which will facilitate rapid detachment in the unlikely event of any interaction with the longline. A 1,100-pound breakaway link will be installed between surface marking buoys and the vertical lines.</p>	Grower/Producer	VPD
Wildlife – 5	<p>Marine Wildlife Education. Each grower/producer will be required to provide bi-annual (twice per year) marine wildlife education to its employees regarding proper procedures relating to marine wildlife. The training curriculum will include identifying the presence of specified marine wildlife and procedures for avoiding impacts to marine wildlife during operations. These procedures will include (1) reducing speed and observing the distances from marine life specified in Wildlife-7; (2) providing a safe path of travel for marine mammals that avoids encirclement or entrapment of the animal(s) between the vessel and growing apparatus; (3) if approached by a marine mammal, reducing speed, placing the vessel in neutral and waiting until the animal is observed clear of the vessel before making way; (4) avoiding sudden direction or speed changes when near marine mammals; (5) refraining from approaching, touching or feeding a marine</p>	<p>VPD to prepare training curriculum Grower/Producer to provide training</p>	VPD and NOAA Fisheries

	mammal; and (6) immediately contacting their supervisor and other identified parties/agencies identified in Wildlife-1 should an employee observe an injured marine mammal.		
Wildlife – 6	Lighting. All growing area operations shall be completed during daylight hours. No growing area operations will be conducted at night and no permanent artificial lighting of the shellfish cultivation facility shall occur, except for that associated with the use of navigational safety buoys required by the U.S. Coast Guard.	Grower/Producer	VPD and U.S. Coast Guard
Wildlife – 7	Vessel Management. Vessels in transit to and from the growing area shall maintain a distance of 100 yards from any observed cetacean and 50 yards between any observed pinniped or sea turtle. If cetaceans are observed within 100 yards or pinnipeds or sea turtles observed within 50 yards, the vessel shall reduce speeds to 12 knots or less until it is the appropriate distance (as required by this condition) from the particular marine life. If a cetacean is heading into the direct path of the vessel (i.e., approaching a moving vessel directly into the bow), the vessel shall shut off the engine until the cetacean is no longer approaching the bow and until a greater separation distance is observed. If small cetaceans are observed bow-riding, and the vessel is operating at speeds of 12 knots or less, the vessel shall remain parallel to the animal's course and avoid abrupt changes in direction until the cetaceans have left the area. Each sighting of a federally listed threatened or endangered whale or turtle shall be recorded and the following information shall be provided: <ul style="list-style-type: none"> a. Date, time, coordinates of vessel b. Visibility, weather, sea state c. Vector of sighting (distance, bearing) d. Duration of sighting e. Species and number of animals f. Observed behaviors (feeding, diving, breaching, etc.) g. Description of interaction with aquaculture facility 	Grower/Producer	U.S. Coast Guard
Wildlife – 8	Invasive Species. Grower/producers operating in the project area shall be required to receive training from NMFS to identify potential invasive species and how to properly dispose of such invasive species if discovered.	Grower/Producer	NMFS or entity delegated by NMFS to conduct training

Storage and disposal of supplies – 1	<p>Spill Prevention and Response. Discharges of feed, pesticides, or chemicals (including antibiotics and hormones) in ocean waters are prohibited. Fuel, lubricants and chemicals must be labeled, stored and disposed of in a safe and responsible manner, and marked with warning signs. Precautions shall be taken to prevent spills, fires and explosions, and procedures and supplies shall be readily available to manage chemical and fuel spills or leaks. Each grower/producer shall comply with the Spill Prevention and Response Plan (SPRP) for vessels and work barges that will be used during project construction and operations. Each grower/producer operating in the project area shall be trained in, and adhere to, the emergency procedures and spill prevention and response measures specified in the SPRP during all project operations. The SPRP shall provide for emergency response and spill control procedures to be taken to stop or control the source of the spill and to contain and clean up the spill. The SPRP shall include, at a minimum: (a) identification of potential spill sources and quantity estimates of a project specific reasonable worst case spill; (b) identification of prevention and response equipment and measures/procedures that will be taken to prevent potential spills and to protect marine and shoreline resources in the event of a spill. Spill prevention and response equipment shall be kept onboard project vessels at all times; (c) a prohibition on at-sea vessel or equipment fueling/refueling activities; and (d) emergency response and notification procedures, including a list of contacts to call in the event of a spill; (e) assurance that all hydraulic fluid to be used for installation, maintenance, planting, and harvesting activities shall be vegetable based.</p>	VPD to prepare SPRP and provide training to growers/producers Growers/Producers to implement VPD-prepared SPRP	U.S. Army Corps of Engineers, U.S. Coast Guard, California Office of Emergency Services
Storage and disposal of supplies – 2	<p>Aquaculture Gear Monitoring and Escapement Plan. Include in overall management plan an aquaculture gear monitoring and escapement plan. Any farm gear that has broken loose from the farm location shall be retrieved. The farm site shall be visited at minimum twice per month to examine the aquaculture gear for potential loss or non-compliant deployment, including inspections for fouling organisms. Any organisms that have a potential to cover the sea floor will be removed and disposed of at an identified upland facility. A Marine Debris Management Plan shall also be prepared that includes (a) a plan for permanently marking all lines, ropes, buoys, and other facility infrastructure and floating equipment with the name and contact information of the grower/producer; (b) a description of the extent and frequency of maintenance operations necessary to minimize the loss of materials and equipment to the marine environment resulting from breakages and structural failures; and (c) a description of the search and cleanup measures that would be implemented if loss of shellfish cultivation facility materials, equipment, and/or infrastructure occurs.</p>	VPD to prepare plan Growers/Producers to implement plan	VPD and U.S. Army Corps of Engineers

Storage and disposal of supplies -3	Decommissioning Plan. A decommissioning plan for the timely removal of all shellfish, structures, anchoring devices, equipment, and materials associated with the shellfish cultivation facility and documentation completion of removal activities will be a requirement of each permit or sub-permit. Financial assurances to guarantee implementation of the plan will be in place and reviewed periodically.	Grower/Producer to prepare and implement approved plan VPD to approve plan	U.S. Army Corps of Engineers
Navigation - 1	Update NOAA Charts. VPD to submit to the NOAA Office of Coast Survey: (a) the geographical coordinates of the facility boundaries obtained using a different geographic position unit or comparable navigational equipment; (b) as-built plans of the facility and associated buoys and anchors; (c) each grower/producer's point of contact and telephone number; and (d) any other information required by the NOAA Office of Coast Survey to accurately portray the location of the shellfish cultivation facility on navigational charts.	VPD	NOAA
Navigation - 2	Notice to Mariners. No less than 15-days prior to the start of in-water activities associated with the installation phase of the project, VPD shall submit to (a) the U.S. Coast Guard (for publication in a Notice to Mariners); and (b) the harbor masters (for posting in their offices of public noticeboards), notices containing the anticipated start date of installation, the anticipated installation schedule, and the coordinates of the installation sites. During installation, VPD shall also make radio broadcast announcements to the local fishers' emergency radio frequency that provide the current installation location and a phone number that can be called for additional information.	VPD	U.S. Coast Guard

Monitoring Plans

Conditions within the project area will be monitored throughout the proposed project's implementation to ensure compliance with all permit requirements and to evaluate all effects, including beneficial effects, of the growing areas. Monitoring will be conducted according to a robust monitoring programs designed to evaluate the proposed project's potential effects on the following factors:

- The seafloor and benthic environment beneath and in the vicinity of the facilities, including biological, physical, and chemical conditions
- Wildlife interactions including marine mammals, sea turtles, fish, and seabirds
- Marine debris, including lost and broken gear

As noted in Table 2, a sediment quality monitoring plan, aquaculture gear monitoring and escapement plan, and a decommissioning plan will be developed in conjunction with the permit

review process. These plans will be developed through iterative review with the appropriate regulatory agencies.

Figures

Figure 1- Project Location

Figure 2- Detailed Plan for Shellfish Longlines

Figure 3- CASS Report Alternative 1

Figure 4- CASS Report Alternative 2

Figure 5- CASS Report Alternative 1 Overlaid with SeaSketch Alternative 8

Figure 6- Simulated View of Parcel Array at the Surface: 100-Acre Plot

Figure 7- Simulated View of Parcel Array at the Surface

Figure 8- Simulated View of the Parcel Array Underwater

Figure 9- Simulated View of Parcel Array Underwater with Anchor Line

Figure 10- Parcel Array Overview

Figure 11- Parcel Array Overview Backbone Details

Attachments

Biological Assessment

Essential Fish Habitat Assessment

NOAA CASS Study

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Dudek. 2017a. Draft Initial Study Checklist for the Ventura Shellfish Enterprise Project. Prepared by Dudek. Prepared for Ventura Port District. September

Dudek. 2017b. Draft Ventura Shellfish Enterprise Environmental Impact Report. Prepared by Dudek. Prepared for Ventura Port District. May.

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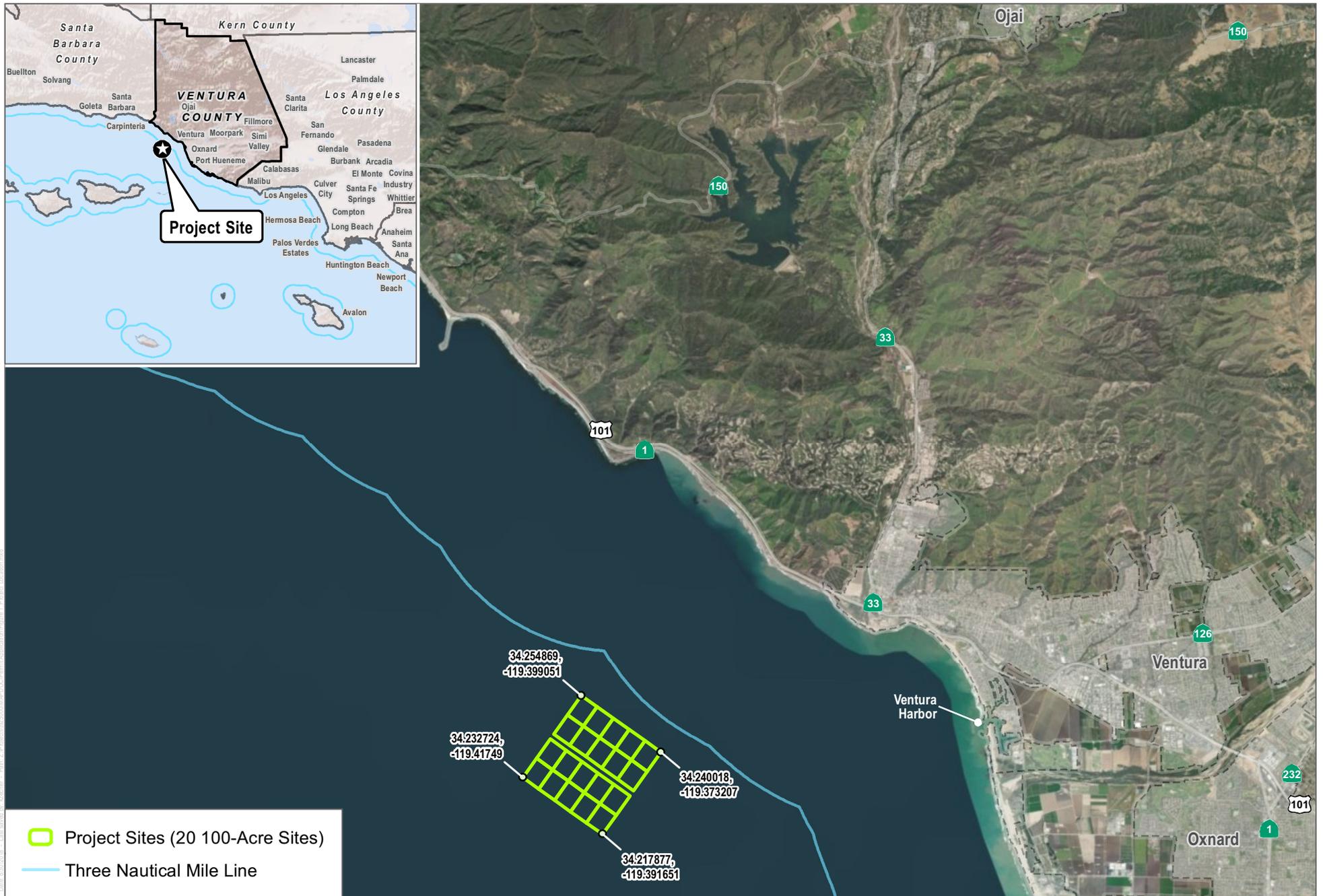


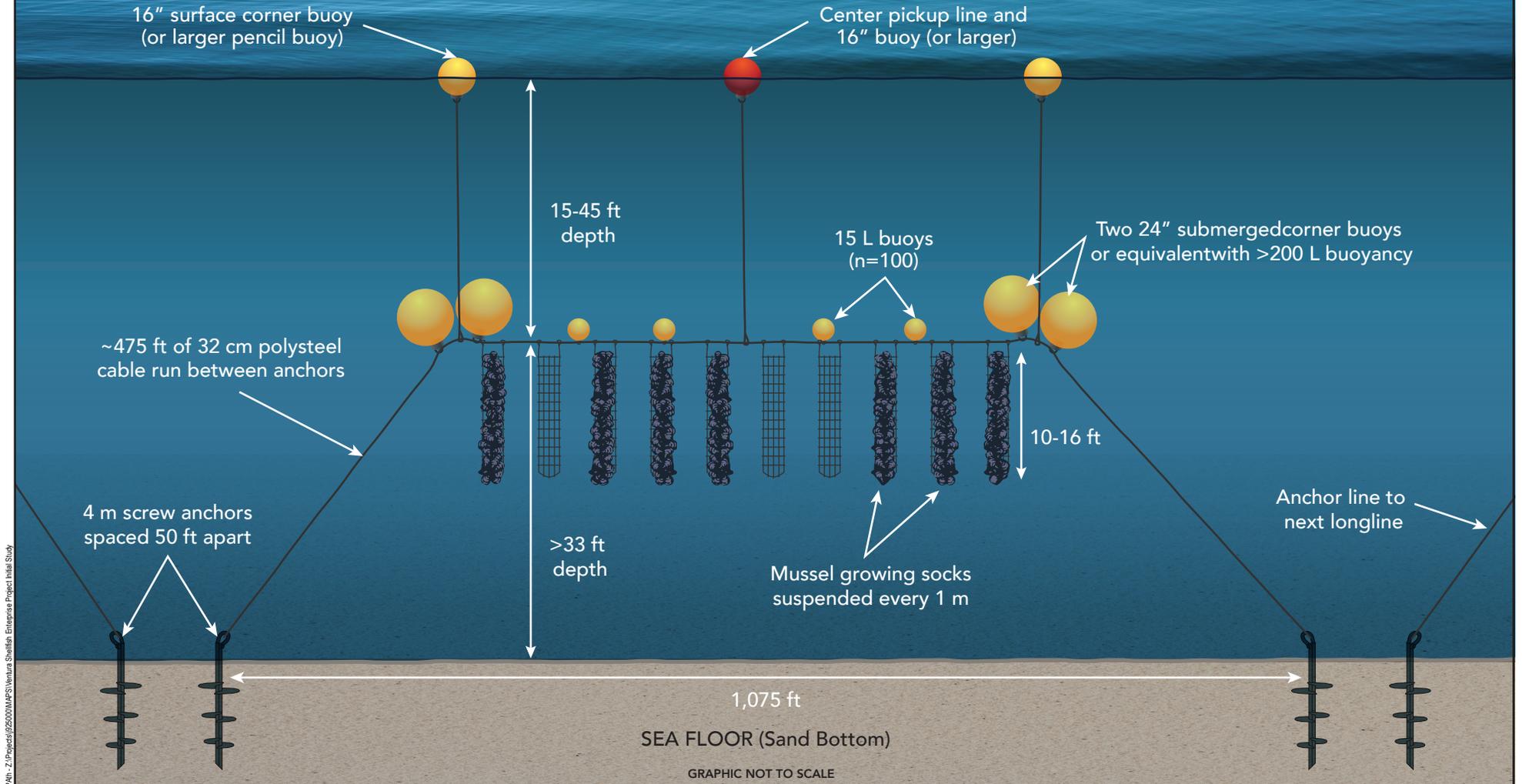
FIGURE 1
Project Location

Ventura Shellfish Enterprise Project

General Plan for Submerged Longlines

GENERAL OBSERVATIONS:

- Anchor lines should have 2.5:1 slope from anchor to submerged corner buoy
- Submerged buoyancy keeps lines tight despite surface waves and storms

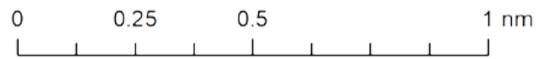
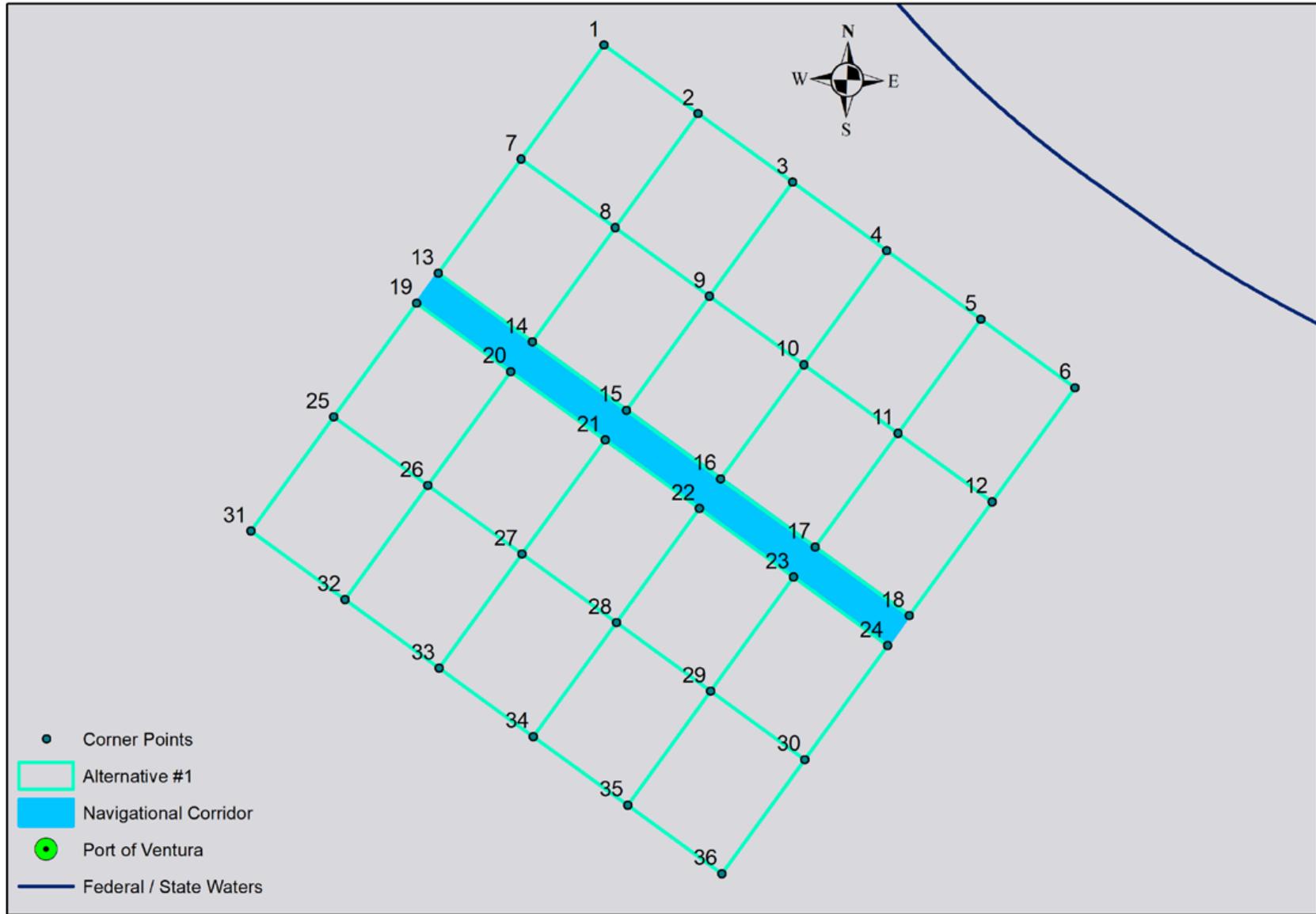


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FIGURE 2

Detailed Plan for Shellfish Longlines

Ventura Shellfish Enterprise Project



NOAA National Centers for Coastal Ocean Science
Coastal Aquaculture Siting and Sustainability



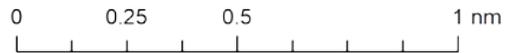
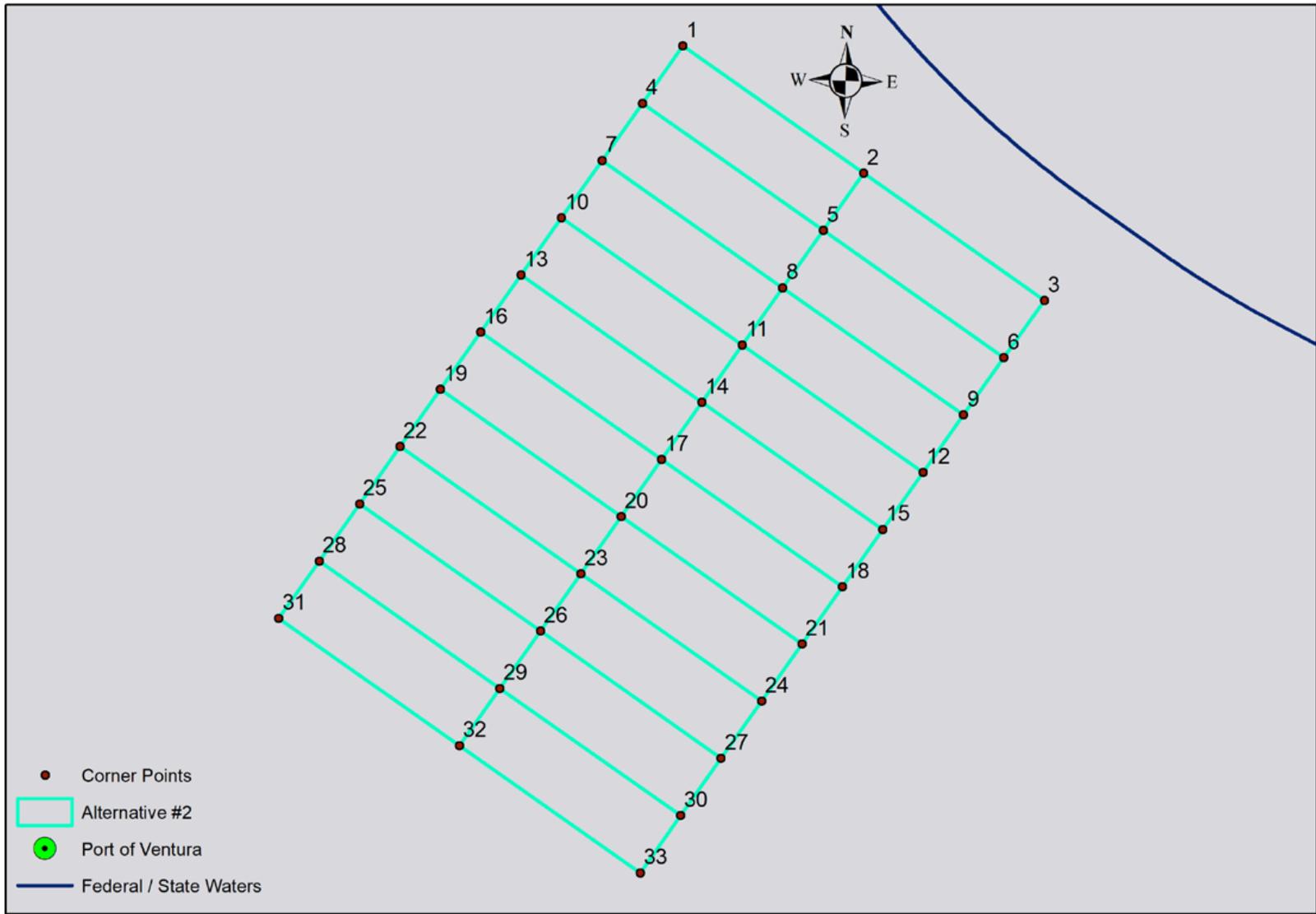
SOURCE: NOAA 2018

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FIGURE 3

Proposed Project (CASS Report Alternative 1)

Ventura Shellfish Enterprise Project



NOAA National Centers for Coastal Ocean Science
Coastal Aquaculture Siting and Sustainability

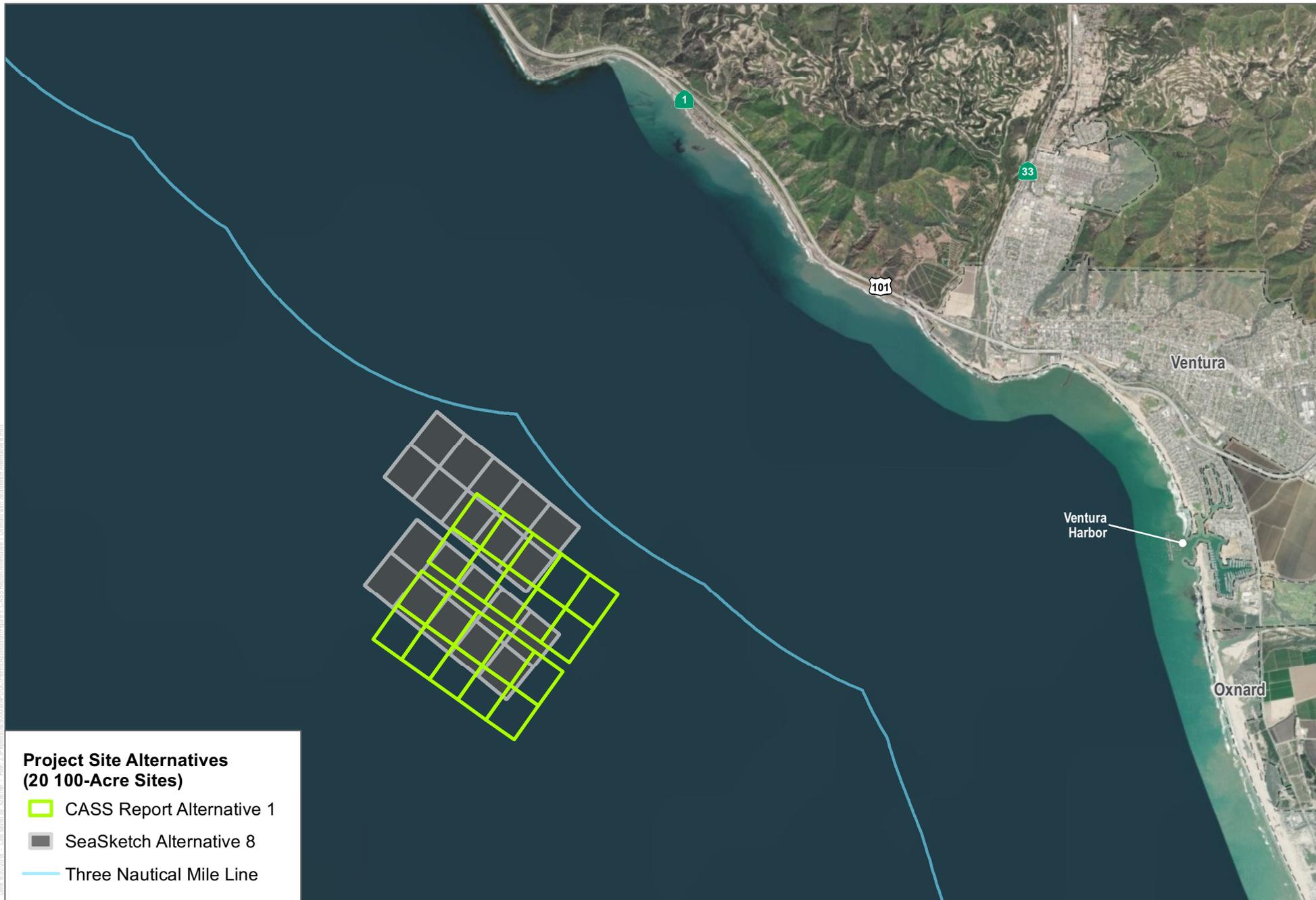


SOURCE: NOAA 2018

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FIGURE 4
Proposed Alternative (CASS Report Alternative 2)

Ventura Shellfish Enterprise Project



SOURCE: NAIP 2016

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FIGURE 5
CASS Report Alternative 1 Overlaid with SeaSketch Alternative 8

Ventura Shellfish Enterprise Project

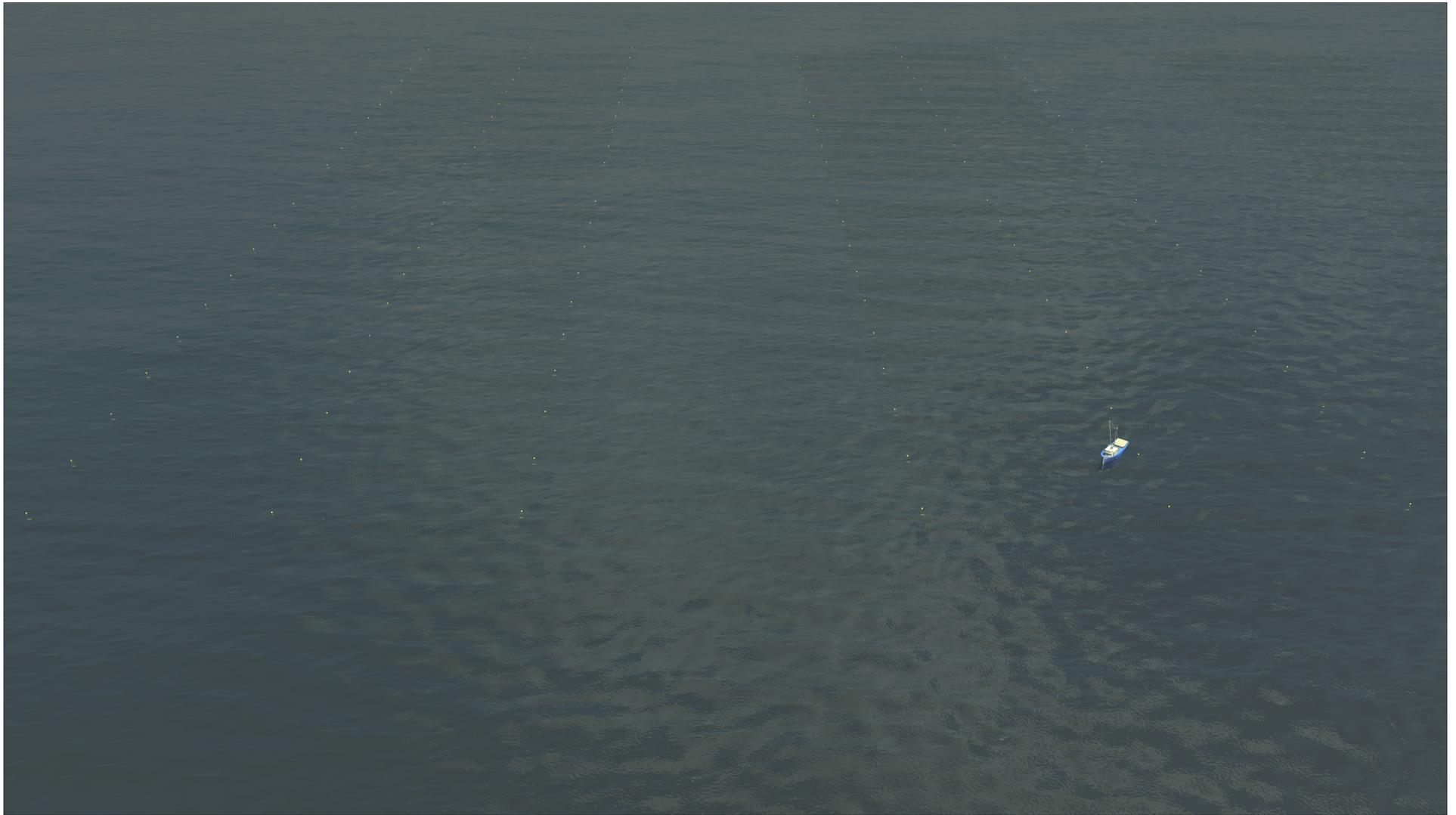


FIGURE 6

Simulated View of Parcel Array at the Surface: 100 Acre Plot

Ventura Shellfish Enterprise Project

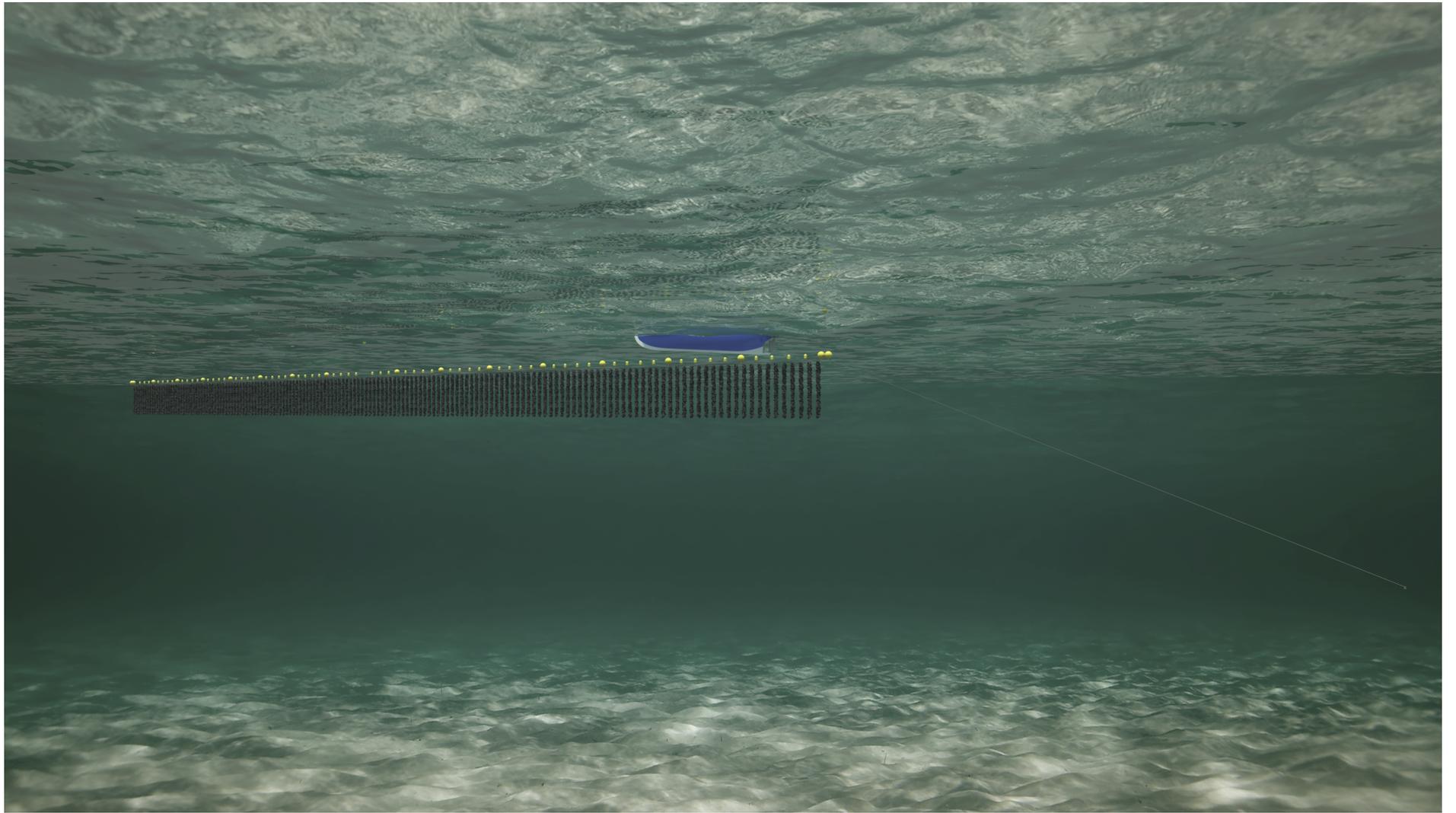
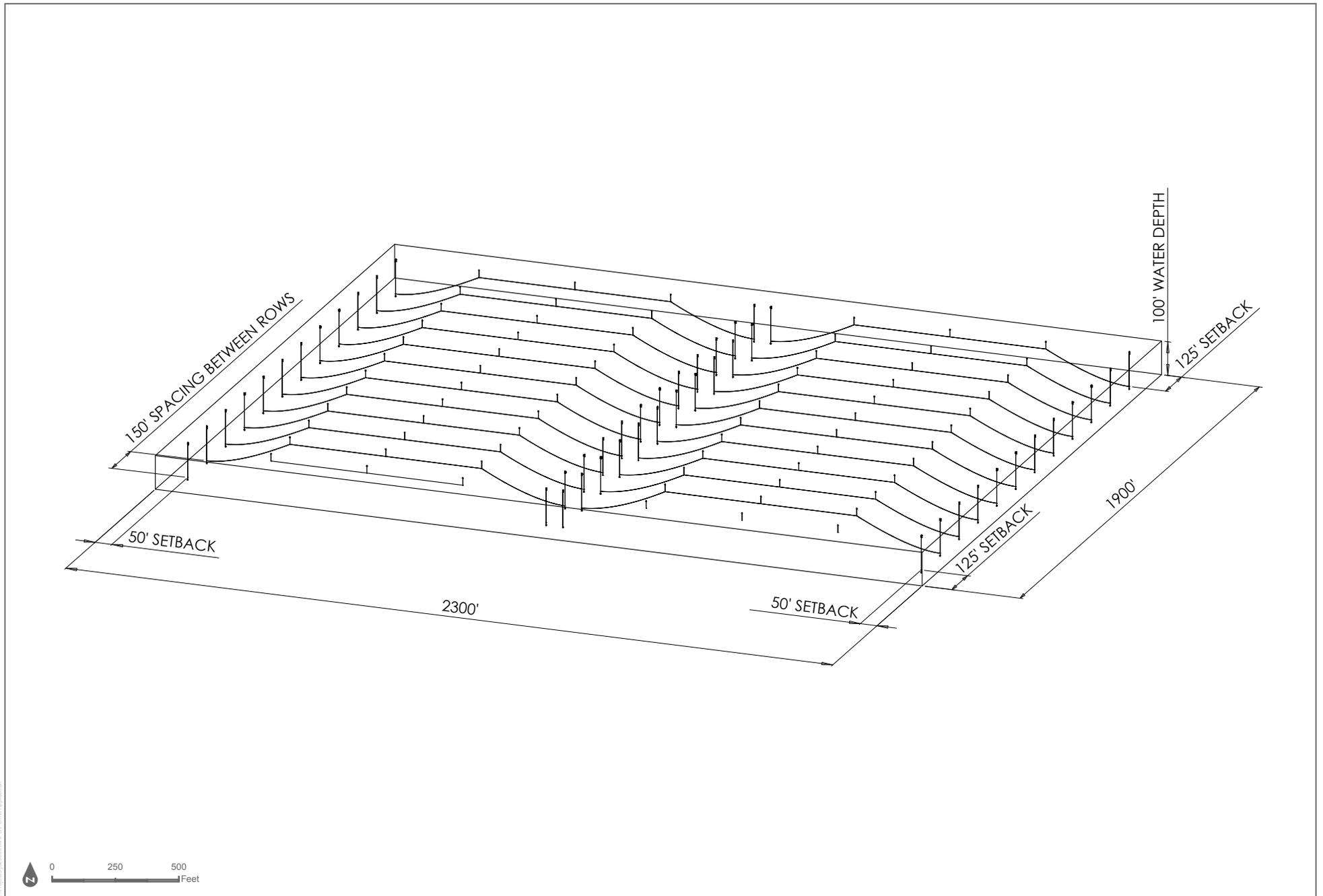


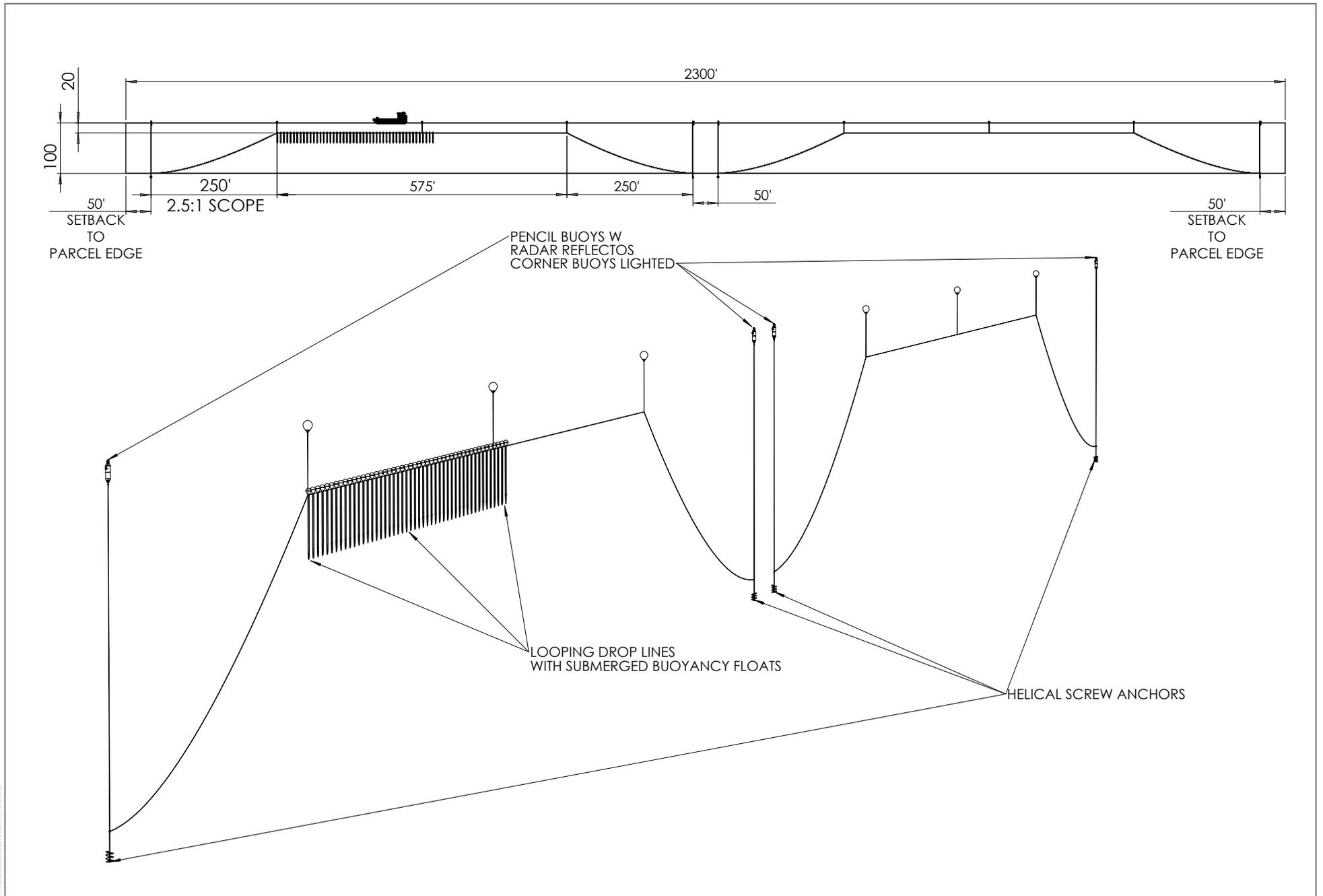
FIGURE 9

Simulated View of Parcel Array Underwater with Anchor Line

Ventura Shellfish Enterprise Project



SOURCE: VSE 2018
 DATE OF PREPARATION: 9/19/18



SOURCE: VSE 2018