STAFF SUMMARY FOR FEBRUARY 16-17, 2022

3. KELP HARVEST PLAN (CONSENT)

Today's Item **Information ☒** **Action ☐**

Receive updated proposed 2022-2026 kelp harvest plan (KHP) from Sustainable Ocean Harvest, LLC for mechanical harvest of giant kelp in administrative kelp beds 29, 30, 31, 32, 114 and 117 in Santa Barbara County

Summary of Previous/Future Actions

- FGC received proposed KHP — Dec 11-12, 2019; Sacramento
- FGC received revised KHP — Aug 19-20, 2020; Webinar/Teleconference
- **Today's receipt of updated KHP** — **Feb 16-17, 2022; Sacramento**

Background

Kelp harvesting regulations prescribe that FGC must approve a KHP before a kelp harvester may use a mechanical harvester to harvest giant kelp (*Macrocystis pyrifera*) (sections 165(c)(6) and 165.5(b)(2), Title 14, California Code of Regulations). A KHP must identify 1) how a mechanical harvester will be used while avoiding repetitive harvest from individual plants, 2) protection of bull kelp, if any, and 3) harvest near sea otter rafting sites; it must also include information covering nine topics specified in regulation such as locations, frequency, intended use, and harvesting and landing methodology. Approved KHPs must be updated and submitted for FGC approval every five years.

In accordance with regulation, in Dec 2019, Sustainable Ocean Harvest, LLC submitted a proposed five-year KHP for several administrative kelp beds (defined in Section 165.5(j)) in southern California. FGC referred the proposed KHP to DFW for review and recommendation and asked DFW to work with the applicant. Based on guidance from DFW, Sustainable Ocean Harvest, LLC incorporated modifications and submitted a revised proposed KHP to FGC in Aug 2020; The harvester has now submitted an updated proposed KHP covering 2022-2026, scheduled for receipt today (Exhibit 1). The updated proposed KHP proposes harvest in six Santa Barbara County kelp beds, specifically leasable Mainland Kelp Beds 29, 30, 31, and 32 and open Channel Island Kelp Beds 114 and 117.

Staff has provided the updated proposed KHP to DFW for its review. Potential action will be scheduled for a future meeting after receiving DFW's review and recommendation.

Significant Public Comments (N/A)

Recommendation

***FGC staff**:* Receive the updated proposed KHP under a motion to adopt the consent calendar.

Exhibits

1. Email and revised proposed KHP from Brandon Barney, received Jan 5, 2022

Motion

Moved by _____ and seconded by _____ that the Commission adopts the staff recommendations for items 3-4 on the consent calendar.

From: brandon barney [redacted]
Sent: Wednesday, January 5, 2022 1:21 PM
To: [redacted] FGC <FGC@fgc.ca.gov>; [redacted]
Subject: 2022-2025 Kelp Harvest Plan

To whom it may concern:

Sustainable Ocean Harvest, LLC hopes that the California Department of Fish and Wildlife will approve our revised Sustainable Wild Harvest plan and will be happy to make any necessary or recommended modifications to our plan.

With gratitude,

Brandon Scott Barney
Founder and Director of Research
Primary Ocean
310-571-8553 office
310-553-8830 direct
[redacted]

"Saving our planet, lifting people out of poverty, advancing economic growth... these are one and the same fight. We must connect the dots between climate change, water scarcity, energy shortages, global health, food security, and women's empowerment. Solutions to one problem must be solutions for all."
-Ban Ki-moon, Secretary-General of the United Nations

Sustainable Ocean Harvest, LLC
Southern California *Macrocystis pyrifera* Sustainable Harvest Plan 2022-2026

Executive Summary

In accordance with the regulations for mechanical harvesters of giant kelp (*Macrocystis pyrifera*) [Sections 165(c)(6) and 165.5(b)(2), Title 14, California Code of Regulations], Sustainable Ocean Harvest, LLC (SOH) submits this giant kelp harvest plan (KHP) for the open and/or leasable administrative giant kelp beds: 29, 30, 31, 32, 114 and 117 to the California Fish and Game Commission for the purpose of articulating the manner and extent of its projected sustainable giant kelp harvesting activities in Southern California for the five year period 2022-2026.

SOH giant kelp harvesting will occur in open beds only. All giant kelp beds described in this document will be utilized according to operational needs, giant kelp composition, and the health of the giant kelp bed. SOH is committed to sustainable harvesting consistent with state regulations and environmental values. SOH's sustainable harvesting will not exceed the regulated harvesting depth of four feet. SOH will avoid harvesting the same areas of giant kelp beds to ensure that the giant kelp has an adequate opportunity to regrow. SOH will only harvest the canopy and will not harvest the reproductive material and therefore will not "take" the giant kelp. SOH shall maintain its boats and equipment. Accurate state approved kelp weighing scales will be used. SOH shall maintain harvesting records. SOH shall not disturb eel or surf grass. SOH shall not harvest in marine conservation areas. SOH shall not harvest bull kelp. SOH shall avoid sea otter rafting sites when harvesting. SOH shall not harvest areas of kelp beds with bull kelp.

SOH is a wholly owned subsidiary of a giant kelp company Primary Ocean, PBC, (POPH). The United States Department of Energy - through an Advanced Research Projects Agency-Energy grant - is funding POPH, with partners, to test a state-of-the-art marine biomass cultivation structure in the ocean in California. The goal of the Department of Energy's MacroSystems project is to develop the necessary technology and machinery, and enable future production for very high-volume applications, including low carbon bioenergy. MacroSystems will reduce long term demand for wild giant kelp because it will enable the availability of significant quantities of cultivated giant kelp.

SOH's parent company, POPH, completed a giant kelp farm siting and kelp persistence analysis utilizing a dozen databases, including NOAA World Ocean Atlas and CalCOFI, databases and conducted a thorough review of existing Southern California kelp bed data. These data will ensure the sustainability of SOH's harvesting strategy. POPH's long term giant kelp supply will be produced by MacroSystems and similar cultivation systems, so SOH's harvests will be limited.

Methodology for All Sustainable Harvesting Activities

Sustainable Harvesting Methodology

SOH will rent and/or customize workboats for the sustainable mechanical harvest of giant kelp, *Macrocystis pyrifera*, from coastal kelp beds in Southern California. SOH will harvest from Fish and Wildlife designated "open" kelp beds, according to demand, environmental conditions, and kelp canopy conditions. SOH will harvest in a manner consistent with regulations. SOH will not exceed the maximum harvesting depth to protect the kelp beds. SOH will avoid harvesting the same areas of kelp beds to ensure that the kelp has an adequate opportunity to regrow. SOH shall maintain its license, and all of its weighing scales in good working order. SOH shall maintain harvesting records. SOH shall not disturb eel or surf grass. SOH shall not harvest in marine conservation areas. SOH shall not harvest bull kelp. SOH shall avoid sea otter rafting sites when harvesting.

Harvester Name and Contact

Sustainable Ocean Harvest, LLC. / Brandon Barney / 22 Navy Street #207, Venice Beach, CA

Harvesting Records

SOH shall keep harvesting landing records in triplicate using "Kelp Harvester's Monthly Report" forms which shall show the weight of each harvest, name and address of harvester, the Department of Fish and Wildlife kelp harvester number, the report period, royalty rate, balance of advance deposit (applicable to leased beds), royalty rate amount due and dates of landing, the administrative kelp bed number where plants were harvested. Primary Ocean will work with the giant kelp commercial harvesters and the Department of Fish and Wildlife and private remote sensing companies to improve the quality of the data on giant kelp beds.

Harvesting Vessel

SOH does not currently own or rent a harvesting vessel. However, we plan to develop a harvesting vessel similar to The Cultured Abalone's "Ocean Harvest."

Harvesting Operation

SOH does not currently have an independently developed harvesting operational plan. We plan to follow the approved methodologies that we have studied that have been described in giant kelp wild harvest plans that have been approved by the California Department of Fish and Wildlife. For example, some abalone industry kelp harvesters operate custom built hydraulic cutting systems that use modified agricultural equipment to cut kelp with articulating blades that operate approximately 18 inches submerged below the surface while the vessel is piloted at low speeds along the margin of the kelp canopy. In this system, which we intend to follow, cut kelp is lifted from the sea surface by a belt similar to an escalator in its function. The kelp is deposited into a net bag that can hold one ton wet kelp. After loading, the net bag is knotted to close the opening, then moved aft on the vessel into the cargo hold. This process of cutting and bagging is conducted until the desired amount of kelp has been harvested. Harvesting operations are done at slow speeds and in calm conditions. Operation of the harvesting vessel and harvesting

equipment generally requires one captain and one crew, but SOH may have additional observers present for research purposes to research advanced precision cutting technology developed by MacroSystems.

Projected Total Annual Harvest Requirement

Less than 1,900 wet tons of kelp per year, harvested variously from a combination of the beds described below on the basis of conditions and availability.

Landing Method

The bags filled with kelp will be weighed and recorded during unloading using a high quality scale used in normal fishery activities at the time of landing. Total tonnage is recorded by date and location of harvest and provided to California Fish and Wildlife along with royalty payments at month end in accordance with California kelp harvesting Regulations.

Landing Address

SOH currently does not lease a landing facility, but the likely landing address for SOH's weighing and landing activities is Berth 58, 2303 Signal Street, San Pedro, CA 90731.

Transport to Facility

Net bags filled with giant kelp will be transported directly into the SOH facility using a vessel crane and shore side lifting equipment, most likely a forklift, at the proposed facility at AltaSea in San Pedro or a similar facility in Santa Barbara or Ventura.

Repetitive Harvest Avoidance

Repetitive harvest is avoided using the system utilized by other kelp harvesters: a combination of visual spotting and overlays of prior harvesting tracks on GPS/chartplotting equipment. We will harvest on calm days with moderate tides, and cut from the margin of the bed, so that the kelp plants are not pulled from the base/holdfast. Our goal is to focus impacts on cutting the canopy on the surface. SOH will also benefit from state-of-the-art precision harvesting technology developed by POPH and its MacroSystems partners. SOH will not over harvest giant kelp beds.

Bull Kelp (Nereocystis) Avoidance

All bull kelp is avoided in our harvesting operations. Kelp canopies with greater than 10% of bull kelp are avoided and tagged for future reference using GPS.

Sea Otter Rafting Avoidance

Sea otters are known to raft alone and in groups in kelp farms, so any areas where sea otters are seen are avoided. SOH kelp harvesting vessels will operate at very slow speeds

so there is low risk to sea otters.

MPA Compliance

No kelp will be harvested from MPAs and MPAs will be avoided using GPS technology.

Marine Life Breeding Cycles

No kelp will be harvested from any kelp bed during any time period if kelp researchers recommend avoiding harvest for environmental reasons including issues related to the lifecycle of important marine life. Dr. Michael Graham, Moss Landing Marine Laboratories and Co-Editor/Managing Editor Journal of Phycology, indicated that the University of Santa Barbara Casselle Lab (and other laboratories) could provide SOH with some recommendations to enhance the sustainability of our harvesting operations based on their large-scale field-based monitoring program of kelp forests in the California current ecosystem. Their goals include assessing long-term changes due to climate and anthropogenic impacts and SOH will follow their recommendations regarding the timing of our harvests to avoid coinciding with any marine lifecycle events.

Proposed Open Beds for Sustainable Wild Harvest

SOH will harvest from each of the administrative giant kelp beds: 29, 30, 31, 32, 114, 117. SOH needs the ability to sustainably wild harvest from these open and leasable beds whenever business or research needs or kelp canopy conditions require. SOH shall maintain harvesting records, shall not disturb eel or surf grass, shall not harvest in marine conservation areas, shall not harvest bull kelp, shall avoid sea otter rafting sites when harvesting and shall not harvest areas of kelp beds with bull kelp and giant kelp.

Bed Descriptions

Bed 29: Refugio to Gato Creek, the “El Capitan” bed
Bed 30: Molino to Refugio, the “Tajiguas” bed
Bed 31: Alegria to Molino, the “Gaviota” bed,
Bed 32: Point Conception to Alegria, the “Cojo” bed, except the western portion, the Cojo SMR no-take MPA
Bed 114: Southern side of Santa Rosa island, except the eastern portion containing the MPA, South Point SMR
Bed 117: Southern side of San Miguel Island, from Cardwell Pt. to Pt. Bennett.

Administrative Bed Status

All beds described are listed as “open” by the California Department of Fish and Game.

Intended Use of Harvested Kelp

Commercial sales and research and development of giant kelp bioproducts for a range of industries including cosmetics, biomedical and agricultural use.

Estimated Harvesting Frequency per Bed

Harvesting will focus on sustainability, so it will most likely be weekly but that will vary. Giant kelp canopy is dynamic. Some weeks no harvest will happen. Some months there may be no harvest when there is no kelp. Anticipated harvest frequency is up to approximately five tons per week under normal conditions, but we may harvest less frequently. This estimate is based on estimates of the biomass produced by each kelp bed and will change based on the condition of the beds, so we will not harvest areas that we have recently harvested and will avoid any areas of beds that cannot be sustainably harvested.

Projected Monthly Tonnage

Bed 29: 0-26 tons; Bed 30: 0-26 tons
Bed 31: 0-26 tons; Bed 32: 0-26 tons
Bed 114: 0-26 tons; Bed 117: 0-26 tons

Projected Annual Tonnage

Bed 29: 0-312 tons; Bed 30: 0-312 tons
Bed 31: 0-312 tons; Bed 32: 0-312 tons
Bed 114: 0-312 tons; Bed 117: 0-312 tons

Projected 5-year Tonnage

Bed 29: 0-1,560 tons; Bed 30: 0-1,560 tons;
Bed 31: 0-1,560 tons; Bed 32: 0-1,560 tons
Bed 114: 0-1,560 tons; Bed 117: 0-1,560 tons

Estimated Harvesting Calendar: Bed 29

Harvesting of bed 29 will focus on sustainability, so harvesting will most likely be weekly but that will vary. Giant kelp canopy is dynamic. Some weeks no harvest will happen. Some months there may be no harvest when there is no kelp. Anticipated harvest frequency is up to approximately five tons per week under normal conditions, but we may harvest less frequently. This estimate is based on estimates of the biomass produced by each kelp bed and will change based on the condition of the beds, so we will not harvest areas that we have recently harvested and will avoid any areas of beds that cannot be sustainably harvested.

January 2022-2026: No harvest or very limited research harvest depending on conditions.
February 2022-2026: No harvest or very limited research harvest depending on conditions.
March 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
April 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
May 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
June 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
July 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
August 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
September 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
November 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
December 2022-2026: No harvest or very limited research harvest depending on conditions.

Estimated Harvesting Calendar: Bed 30

Harvesting of bed 30 will focus on sustainability, so harvesting will most likely be weekly but that will vary. Giant kelp canopy is dynamic. Some weeks no harvest will happen. Some months there may be no harvest when there is no kelp. Anticipated harvest frequency is up to approximately five tons per week under normal conditions. This estimate is based on estimates of the biomass produced by each kelp bed and will change based on the condition of the beds, so we will not harvest areas that we have recently harvested and will avoid any areas of beds that cannot be sustainably harvested.

January 2022-2026: No harvest or very limited research harvest depending on conditions.
February 2022-2026: No harvest or very limited research harvest depending on conditions.
March 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
April 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
May 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
June 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
July 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
August 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
September 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
November 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
December 2022-2026: No harvest or very limited research harvest depending on conditions.

Estimated Harvesting Calendar: Bed 31

Harvesting of bed 31 will focus on sustainability, so harvesting will most likely be weekly but that will vary. Giant kelp canopy is dynamic. Some weeks no harvest will happen. Some months there may be no harvest when there is no kelp. Anticipated harvest frequency is up to approximately five tons per week under normal conditions. This estimate is based on estimates of the biomass produced by each kelp bed and will change based on the condition of the beds, so we will not harvest areas that we have recently harvested and will avoid any areas of beds that cannot be sustainably harvested.

January 2022-2026: No harvest or very limited research harvest depending on conditions.
February 2022-2026: No harvest or very limited research harvest depending on conditions.
March 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
April 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
May 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
June 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
July 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
August 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
September 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
November 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
December 2022-2026: No harvest or very limited research harvest depending on conditions.

Estimated Harvesting Calendar: Bed 32

Harvesting of bed 32 will focus on sustainability, so harvesting will most likely be weekly but that will vary. Giant kelp canopy is dynamic. Some weeks no harvest will happen. Some months there may be no harvest when there is no kelp. Anticipated harvest frequency is up to approximately five tons per week under normal conditions. This estimate is based on estimates of the biomass produced by each kelp bed and will change based on the condition of the beds, so we will not harvest areas that we have recently harvested and will avoid any areas of beds that cannot be sustainably harvested.

January 2022-2026: No harvest or very limited research harvest depending on conditions.
February 2022-2026: No harvest or very limited research harvest depending on conditions.
March 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
April 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
May 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
June 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
July 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
August 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
September 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
November 2022-2026: Limited harvest, once or twice weekly, depending on conditions.
December 2022-2026: No harvest or very limited research harvest depending on conditions.

Estimated Harvesting Calendar: Bed 114

Harvesting of bed 117 will focus on sustainability, so harvesting will most likely be quarterly but that will vary. Giant kelp canopy is dynamic. Some months no harvest will happen. Some months there may be no harvest when there is no kelp. Anticipated harvest frequency is up to approximately five tons per week under normal conditions, but we may harvest less. This estimate is based on estimates of the biomass produced by each kelp bed and will change based on the condition of the beds, so we will not harvest areas that we have recently harvested and will avoid any areas of beds that cannot be sustainably harvested.

January 2022-25: No harvest or very limited research harvest depending on conditions.
February 2022-25: No harvest or very limited research harvest depending on conditions.
March 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
April 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
May 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
June 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
July 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
August 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
September 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
November 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
December 2022-25: No harvest or very limited research harvest depending on conditions.

Estimated Harvesting Calendar: Bed 117

Harvesting of bed 117 will focus on sustainability, so harvesting will most likely be quarterly but that will vary. Giant kelp canopy is dynamic. Some months no harvest will happen. Some months there may be no harvest when there is no kelp. Anticipated harvest frequency is up to approximately five tons per week under normal conditions, but we may harvest less. This estimate is based on estimates of the biomass produced by each kelp bed and will change based on the condition of the beds, so we will not harvest areas that we have recently harvested and will avoid any areas of beds that cannot be sustainably harvested.

January 2022-25: No harvest or very limited research harvest depending on conditions.
February 2022-25: No harvest or very limited research harvest depending on conditions.
March 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
April 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
May 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
June 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
July 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
August 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
September 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
November 2022-25: Very limited, once or twice monthly/quarterly, depending on conditions.
December 2022-25: No harvest or very limited research harvest depending on conditions.

Appendix I: Business Plan Executive Summary

Sustainable Ocean Harvest, LLC, shall conduct a sustainable harvest of wild giant kelp off Southern California. Sustainable Ocean Harvest supplies its harvest to its parent company which produces organic agricultural inputs used by farmers to increase plant health. Sustainable Ocean Harvest, LLC is a wholly owned subsidiary of Primary Ocean. Primary Ocean's business is currently focused on delivering environmentally friendly solutions to growers and farmers, particularly organic farmers, in California. Primary Ocean is a vertically integrated seaweed biotech and sustainability company. Born from U.S. Department of Energy ARPA-E funded seaweed cultivation research, Primary Ocean is pursuing its immediate commercialization strategy in the agricultural inputs market with plant health products for conventional and organic farmers in California and worldwide. Primary Ocean possesses a portfolio of seaweed processing technologies for the production of organic agricultural inputs (biostimulants), organic cosmetic extracts, and organic feed additives, and will continue pursuing a technology road map to include the production of medicinal foods, dietary supplements, and organic compounds for bioplastics, biotextiles, medical products including antivirals and wound dressings, and biofuels, such as bioLNG and SAF. Primary Ocean is a leading environmental startup creating jobs in California.

Primary's proprietary agricultural products reduce water, fertilizer, and pesticide requirements, regenerate eroded soils and greatly improve farmers' crop yields, quality, and profits in both conventional and organic farming systems. In head to head trials, independent research indicates Primary Ocean's organic agricultural biostimulant products are performing best in class within the environmentally key agricultural inputs market: abiotic stress management during drought.

Primary Ocean is a partner to a world class seaweed cultivation research project funded by the federal government. The University of California Santa Barbara and Irvine campuses are also key partners with teams funded with millions of dollars in research funding. European (Ocean Rainforest and Hortimare) and South American (Patagonia Seaweeds) companies who are leading in seaweed cultivation in their regions also act as key project managers and partners. We are working to develop advanced seaweed cultivation technologies across the full lifecycle of seaweed including genetics, hatchery, seeding, cultivation, and precision harvesting as a member of the MacroSystems Project. Our team consists of the leading experts for giant kelp cultivation and offshore kelp cultivation and we are working to birth an industry of seaweed farming in California with the support of the Department of Energy. Our research and technology will be shared with the state and other companies so that we can develop a seaweed cultivation industry in California that leads the world.

Seaweed cultivation technologies will provide environmental services including carbon drawdown, ocean acidification mitigation, ecosystem development, and ocean regeneration.
Primary Ocean's potential environmental impacts have been recently covered in Bloomberg, Washington Post, National Geographic, San Francisco Chronicle, Undercurrent and in the documentary film, "*They Say It Can't Be Done*." Primary Ocean's ownership and executive team consists of the most diverse team in the seaweed industry in California including black and brown investors and executives. Primary's wild harvest activities are intended to provide critical

redundancy in supply and to enable product research and development and sales while enabling seaweed cultivation research and the regulatory framework for seaweed farming to be created.

Appendix II: Current Status of the Kelp Beds Identified in the Plan

Sustainable Ocean Harvest, LLC and its parent company Primary Ocean Producers, Holdings, LLC are committed to the sustainable use of marine resources in California. Prior to the development of its kelp harvest plans, Primary consults MBC Aquatics aerial overflight data, satellite data, university researchers, NOAA databases, United States Department of Agriculture surveys, and California Department of Fish and Wildlife databases. Primary supports continued adaptive management of California's giant kelp beds and plans to work with all stakeholders to provide real time data on any of our harvesting operations, including cutting edge satellite data, collected from high resolution satellite networks that have recently been developed by Planet.com based in Silicon Valley. These satellite photographs can be a low cost augmentation to the aerial overflight data provided by MBC Aquatics and inform real time adaptive management decisions.

Primary Ocean was contracted by the Department of Energy Advanced Research Projects Agency MacroSystem team to co-design and site large scale kelp farms. Our team's system was designed and dimensioned for the geographic and environmental characteristics of Southern California where Primary Ocean conducted kelp farm siting analysis. We modeled the productivity of our proposed kelp farms using historical productivity data on nearby natural beds, including the beds in our current mechanical harvest plan. Our research has found that the kelp beds in Southern California are currently in a relatively healthy state and small scale additional harvest would have no adverse impacts. Primary Ocean has had direct conversations regarding our harvesting plans with the leading industry experts on sustainable Southern California giant kelp bed harvesting, including Doug Bush from the Cultured Abalone and Dale Glantz, the former Director of Kelco's harvesting operations. Primary Ocean is committed to following in the footsteps of successful long term sustainable mechanical harvester practices and recognizes the uncertain impacts of climate change. We have also reviewed the 2021 ESR and recent data.

Primary Ocean developed relationships with the academic experts on local kelp beds to help inform the sustainability of our plans, so we created an NSF I-Corps proposal to evaluate methane mitigating seaweed based animal feeds with the University of California Santa Barbara researcher Dr. Robert Miller. Dr. Miller leads the Santa Barbara Coastal Long Term Ecological Research (SBC LTER) program, a highly interdisciplinary effort to understand the dynamics of California's giant kelp forest ecosystems, and one of 28 NSF-supported LTER sites across the nation. Dr. Robert Miller also leads the Southern California Bight Marine Biodiversity Observation Network (SCB MBON), funded by NASA, the Bureau of Ocean Energy Management (BOEM), and NOAA, part of a national and global MBON network seeking a better understanding of marine biodiversity. Dr. Tom Bell, also of the University of California Santa Barbara joined Primary Ocean's NSF proposal after Dr. Robert Miller, and is also one of the key technology partners of our seaweed cultivation team. Dr. Bell's "*Three decades of variability in California's giant kelp forests from the Landsat satellites*" helped SOH understand the fundamental variability of giant kelp canopy in California. California's giant kelp bed researchers are working everyday to understand the beds and Primary listens to their findings and will adjust wild harvest plans accordingly. Limited harvest will enable us to establish a lower carbon supply chain that reduces our dependence on imports in our supply chain for our organic agricultural

products. We continue to conduct research on giant kelp farming to inform the permitting of giant kelp farms.