INITIAL STUDY
Prepared Pursuant to the
California Environmental Quality Act

PROJECT: Hog Island Oyster Company Shellfish Farm in Arcata Bay (Application Number 2020-03)

LEAD AGENCY: Humboldt Bay Harbor, Recreation, and Conservation District

This document is the Final Initial Study / Mitigated Negative Declaration (IS/MND) for the Hog Island Oyster Farm in Arcata Bay. This Final IS/MND includes changes that were made to the Draft IS/MND in response to comments received from agencies and the public. Material changes are shown in underline/strikethrough format. Minor editorial changes are not shown in underline/strikethrough format.

FINAL
July 1, 2021

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Section 1.0 Introduction

1.1 Purpose of this Document

This initial study (IS) assesses the environmental effects of developing a new shellfish culture operation by Hog Island Oyster Company (HIOC) in Arcata Bay, California. The name of the project is HIOC Shellfish Farm in Arcata Bay (the HIOC Project). This IS was prepared pursuant to the requirements of the California Environmental Quality Act (CEQA) and in compliance with the State CEQA Guidelines (Title 14, California Administrative Code, Section 1400 et seq.).

The Humboldt Bay Harbor, Recreation, and Conservation District (District) is the state lead agency under CEQA. The District must evaluate the environmental impacts of the HIOC Project when considering whether to approve the HIOC Project. The IS serves as an informational document to be used in planning and decision-making, and does not recommend approval or denial of the HIOC Project.

1.2 Scope of this Document

This document evaluates the HIOC Project's potential impacts related to the following topics:

- aesthetics
- agricultural and forestry resources
- air quality
- biological resources
- cultural resources
- energy
- geology and soils
- greenhouse gas emissions
- hazards and hazardous materials
- hydrology and water quality
- land use and planning
- mineral resources
- noise
- population and housing
- public services
- recreation
- transportation
- tribal cultural resources
- utilities and service systems
- wildfire
- mandatory findings of significance

1.3 Impact Terminology

The following general terms are used in this IS to describe the significance of impacts that could result from the HIOC Project:

- The HIOC Project is considered to have *no impact* if the analysis concludes that the HIOC Project could not affect a particular resource topic.

- An impact is considered *less than significant* if the analysis concludes that the HIOC Project would cause no substantial adverse change to the environment and that impacts would not require mitigation.
- An impact is considered *less than significant with mitigation* if the analysis concludes that the HIOC Project would cause no substantial adverse change to the environment with the inclusion of mitigation measures identified by the lead agency.
- An impact is considered *significant* if the analysis concludes that the HIOC Project would cause substantial adverse change to the environment that could not be reduced to less-than significant levels by the inclusion of identified mitigation measures.

1.4 General Information

1. **PROJECT TITLE:** Hog Island Oyster Company (HIOC) Shellfish Farm in Arcata Bay
2. **LEAD AGENCY/CONTACT NAME AND ADDRESS:** Humboldt Bay Harbor, Recreation and Conservation District, P.O. Box 1030, Eureka, CA 95502-1030. Adam Wagschal, Deputy Director, (707) 443-0801, awagschal@humboldtbay.org
3. **PROJECT LOCATION:** Tidelands in Arcata Bay, California (parcel 506-121-001-000)
4. **PROJECT SPONSOR'S NAME AND ADDRESS:** Hog Island Oyster Company, 20215 Shoreline Hwy 1, Marshall, CA 94940. John Finger, Owner, (415) 602-9281, john@hogislandoysters.com.
5. **GENERAL PLAN DESIGNATION:** Natural Resources
6. **ZONING:** Natural Resources/Water
7. **DESCRIPTION OF THE PROJECT:** refer to Section 3.0 below
8. **SURROUNDING LAND USES AND SETTING:** refer to Section 2.0 below

9. OTHER PUBLIC AGENCIES WHOSE APPROVAL IS REQUIRED:

Level	Agency	Type of Approval, Permit or Consultation
Local	Humboldt Bay Harbor, Recreation & Conservation District	Harbor District Permit
State	California Coastal Commission	Coastal Development Permit
State	North Coast Regional Water Quality Control Board	Clean Water Act Section 401 Water Quality Certification*
Federal	United States Army Corps of Engineers	Clean Water Act Section 404* and Rivers and Harbors Act Section 10
Federal	National Marine Fisheries Service	Consultation on Endangered Species Act Section 7 and Magnuson-Stevens Act
Federal	U.S. Fish and Wildlife Service	Consultation on Endangered Species Act Section 7
***Note: Corps of Engineers issued a final rule in January 2021 stating that "In general, the placement of bivalve shellfish mariculture structures on the bottom of a navigable waterbody, or into the substrate of a navigable waterbody does not result in discharges of dredged or fill material into waters of the United States that are regulated under Section 404 of the Clean Water Act." (86 FR 2744). Because of uncertainty associated with implementation of this final rule, Clean Water Act approvals may or may not apply to this project.**		

10. HAVE CALIFORNIA NATIVE AMERICAN TRIBES TRADITIONALLY AND CULTURALLY AFFILIATED WITH THE PROJECT AREA REQUESTED CONSULTATION PURSUANT TO PUBLIC RESOURCES CODE SECTION 2108.3.1? IF SO, HAS CONSULTATION BEGUN? The following tribes have been contacted, consistent with Assembly Bill 52, to understand whether they will want to be consulted on for the proposed HIOC Project:

- Wiyot Tribe – Eddie Koch and Ted Hernandez
- Bear River Band of the Rohnerville Rancheria – Erika Collins
- Blue Lake Rancheria – Janet Eidsness

The tribes received a pre-consultation email on December 8, 2020.

Section 2.0 Surrounding Land Uses and Setting

Humboldt Bay is a complex ecosystem and valuable resource for California and the nation because of its natural resources, aesthetic appeal and recreational opportunities, ecological services, economic benefits, and vital transportation links. Visitors and Humboldt County residents value Humboldt Bay for its natural and anthropogenic attributes. The biota that use the bay are diverse and ecologically important locally and globally. The habitat in the bay provides resources for strong commercial fisheries, including crabs, bivalves, and finfish, and habitat for shorebird and waterfowl migrants (i.e., the Pacific Flyway). The Humboldt Bay area hosts more than 400 plant species, 300 invertebrate species, 100 fish species, and 260 bird species, including those that rely on the bay as they travel the Pacific Flyway. Based on 2019 estimates, the largest nearby urban concentrations are in Arcata to the north (population approximately 18,431) and Eureka to the south (population approximately 26,710) (U.S. Census Bureau. 2020). Smaller towns along the peninsula, from north to south, include Manila, Samoa, and Fairhaven (Figure 1).

The upland area adjacent to the HIOC Project is relatively undeveloped, especially to the north near the Mad River Slough. There are several trail systems that include the Ma-le'l Dunes Park that travel along the Pacific Ocean. The dunes are Bureau of Land Management (BLM) land and the south parking lot for the park is located approximately 0.5 miles west of the HIOC Project (Figure 2). North of the Ma-le'l Dunes Park is Humboldt Bay National Wildlife Refuge land owned by the U.S. Fish and Wildlife Service (USFWS). To the east of this refuge there are agricultural, pasture, and ranching lands and State Highway 255. Finally, along the northern and northeastern shoreline of Arcata Bay there is the Mad River Slough Wildlife Area and McDaniel Slough Restoration Project owned by the California Department of Fish and Wildlife (CDFW), which is located approximately 0.8 miles northeast of the HIOC Project. This area connects to the Arcata Marsh and Wildlife Sanctuary. There is a portion of the Mad River Slough Wildlife Area that is emergent wetlands located west of the HIOC Project parcel, approximately 700 feet from the nearest proposed culture area.

The majority of the nearby upland development is to the west of the HIOC Project. There is an old mill site (Sierra Pacific Industries lumber mill) that operated from approximately 1950 to 2016 (Figure 2). The current owner purchased the site in 2017 and has plans to create a business park, including a cannabis grow site. There are also several small businesses and lodging located along the New Navy Base Road that runs along the shoreline of Arcata Bay. Single family residences increase closer to Manila, which are located approximately 0.25 miles from the HIOC Project parcels and approximately 0.5 miles from proposed shellfish aquaculture activities. Based on 2019 estimates, the town of Manila has a population of approximately 784 (City-Data 2020).

Humboldt Bay encompasses roughly 17,759 acres at mean high water (MHW) and is separated into ~~three~~ 3 geographic segments: South Bay, Entrance Bay, and Arcata Bay. The HIOC Project is located in Arcata Bay next to the Mad River Slough (Figure 1). Figure 1 also shows the geographic extent of Arcata Bay and the start of Entrance Bay used in this analysis. Arcata Bay is approximately 8,481 acres (1,127 acres subtidal and 7,354 acres intertidal) at MHW, with a tidal range of approximately -2.0 feet to +8.5 feet mean lower low water (MLLW).

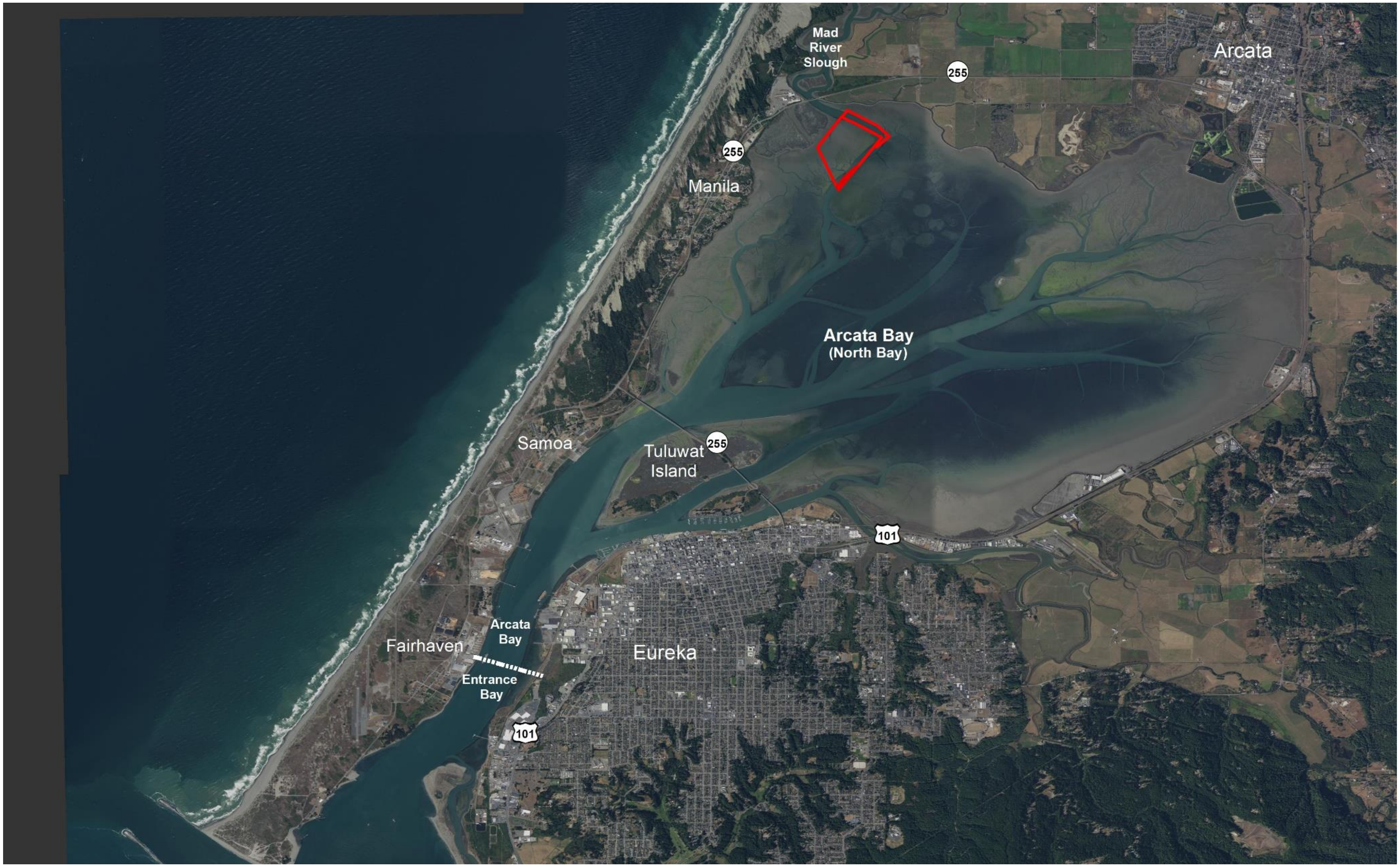

Figure 1: HIOC Project Vicinity Map

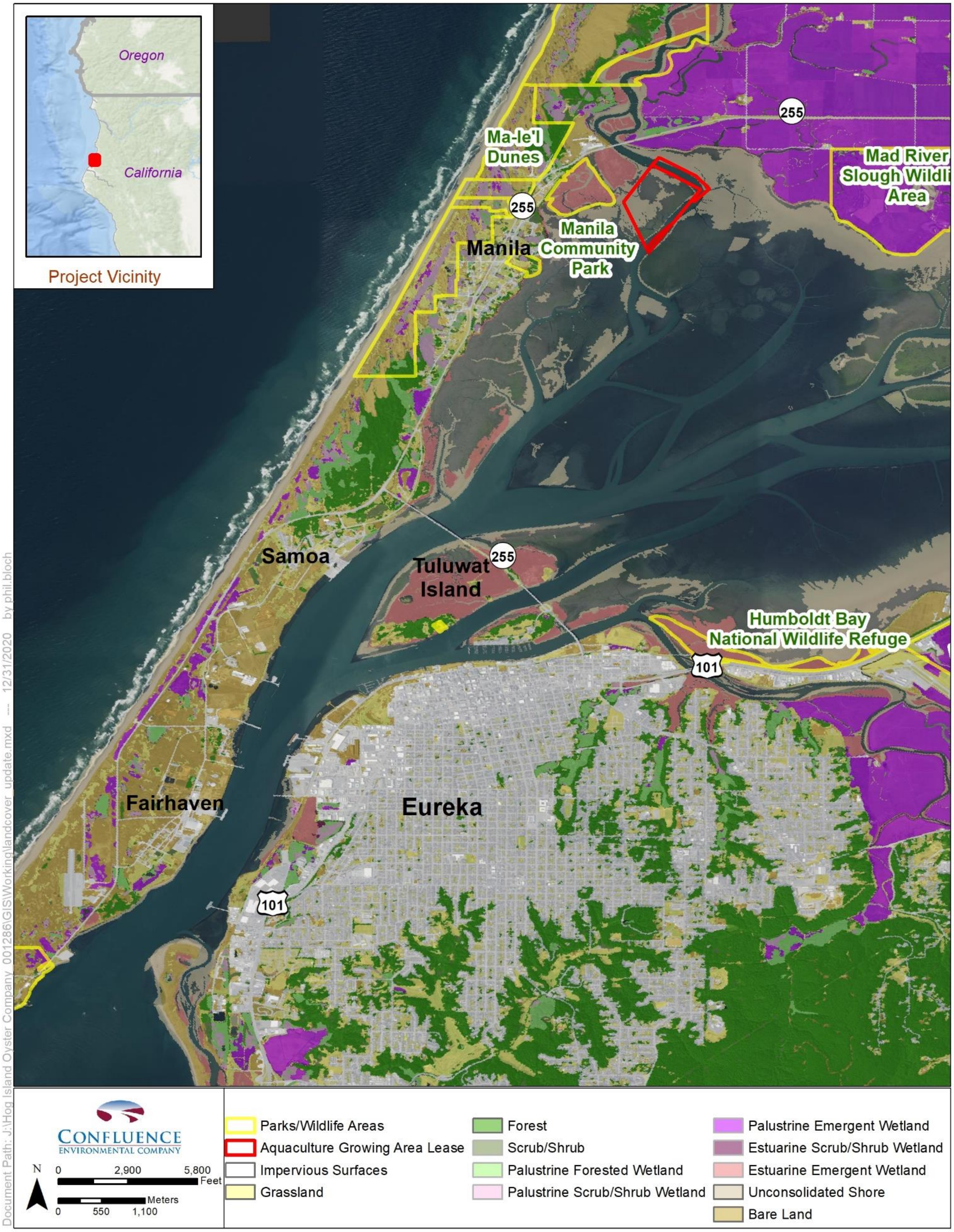

Figure 2: Upland Habitat and Developed Areas adjacent to the HIOC Project

According to the Coastal and Marine Ecological Classification Standards (CMECS) mapped in 2009, native eelgrass (*Zostera marina*) is the dominant habitat of Arcata Bay (38.6%) followed by mudflats (27.7%) (NOAA 2012). Eelgrass in Arcata Bay is primarily limited by depth (Gilkerson 2008). Surveys at the project site in 2009 (NOAA 2009) and 2020 (Lummis 2020) did not find eelgrass growing at higher elevations where culture is proposed, although there were small patches of eelgrass in ponded areas and deeper channels that will be avoided by the HIOC Project (Figure 3). Eelgrass cover near the project site in Mad River Slough north of SR 255 has contracted in recent years, possibly in response to eelgrass wasting disease, which has been observed in that area and is associated with historic eelgrass declines (Gilkerson, pers. comm., 2021). It is notable that there is macroalgae (primarily ulvoids) in the project area that show up on aerial imagery, but these plants are not part of the regulated submerged aquatic vegetation community.

As described below (Section 3.4), the HIOC Project is located in mudflat habitat at an elevation range of +1.6 feet to +4.6 feet MLLW. HIOC will also be conducting annual eelgrass surveys prior to gear placement until gear is fully installed at the site, expected to be approximately 5 years. By siting the activities at elevations that primarily avoid eelgrass, using surveys to appropriately site gear, and incorporating the recommended 5-meter ~~(16 foot)~~ buffer from eelgrass ~~beds~~ cover based on California Eelgrass Mitigation Policy (CEMP) guidance for eelgrass ~~beds~~cover, impacts to eelgrass will be fully avoided by the shellfish aquaculture gear.[1]

The non-native eelgrass (*Z. japonica*), which is listed as an invasive and noxious weed and is an 'A' rated pest by California Department of Food and Agriculture, has been documented in Humboldt Bay in the past but may not be currently present. Ramey et al. (2011) noted several areas where *Z. japonica* was detected and treated between 2004-2010. The closest area to the HIOC Project site was a patch of high marsh *Z. japonica* near Manila where approximately 30.65 square meters of *Z. japonica* were present in 2010. Management actions were initially effective at reducing the number and size of *Z. japonica* patches. It is notable that HIOC Project activities would not occur as high in the intertidal zone as compared to where *Z. japonica* is typically located.

Humboldt Bay eelgrass experts report that *Z. japonica* has not been observed since 2015 and may be extirpated from Humboldt Bay (Shaughnessy, pers. comm., 2021; Tyburczy, pers. comm., 2021; Gilkerson, pers. comm., 2021). The disappearance of *Z. japonica* coincides with a marine heat wave period, which affected high intertidal communities and may have created conditions unsuitable for *Z. japonica*.

Z. japonica was established in many bays north of Humboldt Bay, and may occur at tidal elevations used for aquaculture. However, modern aquaculture is not associated with the introduction nor spread of *Z. japonica*. Indeed, several growers have supported *Z. japonica* management efforts and work with resource agencies to help eradicate the noxious weed from Humboldt Bay.

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[1] The CEMP definition for an eelgrass bed includes: "areas of vegetated eelgrass cover (any eelgrass within 1 m^2 quadrat and within 1 m ~~[3 feet]~~ of another shoot) bounded by a 5 m ~~[16 foot]~~ wide perimeter of unvegetated area" (NMFS 2014). The project will avoid eelgrass ~~beds~~ cover as defined by CEMP~~, including~~ by using a ~~16-foot~~5 meter wide unvegetated ~~permimeter~~buffer around existing identified eelgrass ~~beds~~cover.

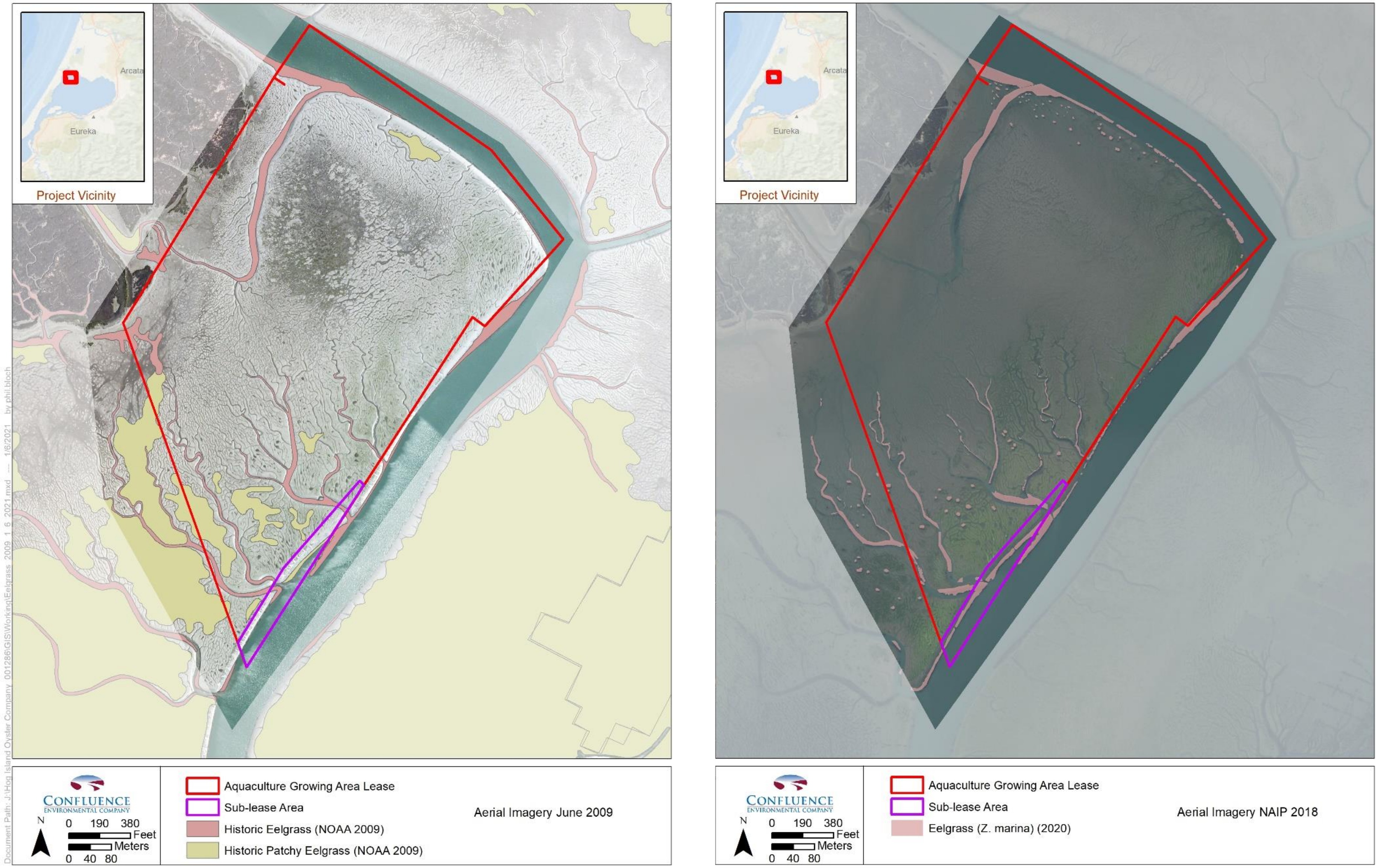

Figure 3: Eelgrass Current and Historical Presence in the HIOC Project Area

Major changes in Humboldt Bay that have resulted in impacts to the habitat of Arcata Bay include diking and filling of salt marsh habitat from the 1880s to the 1980s, which resulted in significant impacts, including channel confinement, gradient increase, and ongoing erosion of residual salt marsh habitat (Schlosser and Eicher 2012). The amount of salt marsh habitat in Humboldt Bay is less than 10% of what it was historically (from 9,000 acres to about 900 acres currently). Portions of the diked former tidelands around Humboldt Bay, particularly in the Arcata Bottoms, are used for agriculture, primarily livestock grazing for dairy and beef production. The Mad River and Eel River deltas provide the primary agricultural resources in Humboldt County (HCDCDS 2003). Agricultural lands are protected under the California Land Conservation Act to preserve a maximum amount of open space and agricultural land for the state's economic resources, and maintain a food supply for future residents rather than have unnecessary conversions for urban use.

Arcata Bay is also the main location for shellfish aquaculture, which covers approximately 3.4% of the bay, both within eelgrass habitat and mudflats (NOAA 2012 based on 2009 field mapping). Arcata Bay and the Mad River Slough have a long tradition of oyster aquaculture, dating back over 100 years for the native oyster (*Ostrea lurida*) and into the 1950s for Japanese oyster species – Pacific oyster (*Crassostrea gigas*) and Kumamoto oyster (*C. sikamea*) (Barrett 1963). Both Japanese oyster species are still cultured in Humboldt Bay, as well as Manila clams (*Tapes philippinarum*).

There are ~~five~~5 companies currently farming shellfish in the bay, using various methods to culture clams in subtidal areas and oysters in both subtidal and intertidal areas. There are approximately 90 raft type structures (or 2 acres) culturing shellfish in subtidal areas, 35 of which are managed by Pacific Seafood Company (Pacific) – previously known as Coast Seafoods Company. Additionally, there are approximately 287 acres of intertidal areas cultured, of which approximately 279 acres are managed by Pacific. Historically, as many as 1,000 intertidal acres were used for on-bottom oyster culture (SCH #2015082051). In the late 1990's, shellfish companies adopted near-bottom (i.e., cultch-on-longlines and rack and bag) methods and reduced the amount of acres cultured.

In addition to the existing culture, there are ~~three~~3 other efforts aside from the HIOC Project underway in Humboldt Bay that may also allow for expanded shellfish culture operations. The first ~~two~~2 are the District's Humboldt Bay Intertidal Mariculture Pre-Permitting Project and Yeung Oyster Farm. These projects are being analyzed in the same Draft Environmental Impact Report (DEIR) under SCH #2017032068, and include up to 136 acres of intertidal culture in Arcata Bay. The third project is the District's Humboldt Bay Subtidal Mariculture Pre-Permitting Project (SCH #2013062068), which was fully permitted in 2019 and allows for up to 20 acres of subtidal culture. These areas are currently being leased for shellfish and seaweed culture. As described below, the HIOC Project includes up to 30 acres of cultivation within approximately ~~40~~34 acres available for shellfish aquaculture activities. Compared to the 3.4% of Arcata Bay that had shellfish aquaculture in 2009 (NOAA 2012 based on 2009 field mapping), the HIOC Project, Yeung Oyster Farm, and District Pre-Permitting Projects increase in cultivated footprint represents approximately 1.7% of Arcata Bay.

Section 3.0 Project Description

The following sections provide an overview of the HIOC Project, including:

- Project Scope and Goals
- Best Management Practices (BMPs)
- Project Area
- Proposed Species and Culture Methods
- Reporting

3.1 Project Scope and Objectives

HIOC has a total lease area of 110 acres. Within this area, HIOC seeks permitting to cultivate up to 30 acres within a 34~~40~~-acre area available for shellfish aquaculture on leased, intertidal areas in northwest Arcata Bay. The project objectives are as follows:

- Produce premium oysters to meet demand from HIOCs restaurants as well as provide sustainable seafood for local markets.

- Develop a shellfish farm to complement HIOC's existing shellfish Hatchery Facility located near Samoa.

- Create additional job opportunities and sustainable economic development for Humboldt Bay and local jurisdictions.

- Locate oyster beds in areas with optimal growing conditions to maximize efficiency and limit the spatial footprint of the farm.

3.2 Mitigation Measures and Best Management Practices

HIOC seeks to avoid and minimize negative environmental impacts through adherence to specific mitigation measures and BMPs (Table 1). ~~These~~The various mitigation measures and BMPs have been developed over many years, with input from multiple agencies and other shellfish aquaculture companies in Humboldt Bay and other estuaries of California. Note that the specific mitigation measures that are used to avoid or minimize potential environmental impacts will be discussed under the relevant topics within this IS document. The BMPs noted below are part of typical operations, and a result of federal and state laws that require these common practices.

BMPs are intended to ensure that the HIOC Project maintains a high standard that is environmentally responsible. BMPs may also be applied to improve or provide a beneficial impact even where no significant impact has been identified. In contrast, mitigation measures are changes that would reduce or minimize the project's significant adverse environmental impacts. While BMPs have been made a part of the HIOC Project, they do not constitute mitigation measures by definition, as they are not required to reduce potentially significant impacts to less than significant levels (see

CEQA Guidelines § 15071(e). Regardless of the terminology, HIOC is committed to implementing all identified mitigation measures and BMPs.

Table 1. Proposed Mitigation Measures and Best Management Practices (BMPs)

#	Topic	Mitigation Measure or BMP
Mitigation Measures		
Mit-1	Marine Debris	HIOC will implement a marine debris management plan (Appendix A). At the time of harvest of each cultivation area, HIOC will carry out a thorough inspection to locate and remove any loose, abandoned or out of use equipment and tools. All floating bags and baskets will be marked or branded with the HIOC's name and phone number.
Mit-2	Eelgrass (*Zostera marina)* Protection	HIOC will install racks, intertidal longline systems, and other aquaculture gear at least 5 horizontal meters~~(or 16 feet)~~ from native eelgrass (*Zostera marina*) ~~beds~~cover. This will not prevent continued cultivation in areas where eelgrass moves into the project site. HIOC is expected to install gear incrementally. Before gear is installed in new areas, eelgrass will be mapped in culture areas using unmanned aerial vehicles (UAV) and/or verified using ground surveys to identify eelgrass ~~beds~~cover and establish 5 meter horizontal buffers. Eelgrass surveys will be ~~considered valid pre-installation surveys if performed less than 2-years~~conducted annually during the eelgrass growing season (May to September) prior to gear installation until gear is fully installed at the site.
Mit-3	Vessel Anchors	HIOC will anchor vessels outside of areas containing eelgrass.
Mit-4	Vessel Routes	HIOC will establish a vessel route to access its leases that avoids known native eelgrass (*Z. marina*) ~~beds~~cover, and maintain a no wake zone within a 1,000-foot buffer north of Tuluwat Island to avoid black brant (*Branta bernicla*) gritting sites in the winter (December 15-April 30).
Mit-5	Channel Buffers	HIOC will establish a 10-foot buffer from the top of bank of channels. Culture equipment will not be installed in the buffer areas.
Mit-6~~5~~	Pacific Herring (*Clupea pallasii*) Avoidance	In any cultivation beds within or adjacent to eelgrass ~~beds~~cover (in the event that eelgrass moves into the project site), HIOC will conduct visual surveys for Pacific herring spawn prior to conducting activities during the herring spawning season (October to April). If herring spawn is present, HIOC will suspend activities in the areas where spawning has occurred until the eggs have hatched and spawn is no longer present (typically 2 weeks).
Mit-7~~6~~	Cultural Resources	HIOC will comply with the Harbor District Protocol agreed upon between the Harbor District and the Blue Lake Rancheria, Bear River Band of Rohnerville Rancheria, and Wiyot Tribes regarding the inadvertent discovery of archaeological resources, cultural resources, or human remains or grave goods (Appendix B).
BMPs		
BMP-1	Vessel Maintenance and Fueling	HIOC will maintain all vessels used in culture activities to limit the likelihood of release of fuels, lubricants, or other potentially toxic materials associated with vessels due to accident, upset, or other unplanned events. HIOC will use marine grade fuel cans that are refilled on land, and HIOC carries oil spill absorption pads and seals wash decks or isolates fuel areas prior to fueling to prevent contaminants from entering the water.
BMP-2	Vessel Motors	HIOC will use highly efficient 4-stroke outboard motors. All motors will be muffled to reduce noise.
BMP-3	Fish and Wildlife	During vessel transit, harvest, maintenance, inspection, and planting operations, HIOC will avoid approaching, chasing, flushing, or directly disturbing shorebirds, waterfowl, seabirds, or marine mammals.
BMP-4	Bed Marking	HIOC culture beds will be marked with a long PVC pole to provide information to boaters of the location of shellfish aquaculture gear. ~~HIOC will provide a map of the culture bed locations and post the maps at the closest boat launch and adjacent wildlife area and on the District's website.~~
BMP-5	Bed Mapping	HIOC will provide a map of the culture bed locations and post the maps at the closest boat launch and adjacent wildlife area and on the District's website.

#	Topic	Mitigation Measure or BMP
BMP-6	Wetland Buffer	HIOC has adopted a minimum of a 200-foot buffer between the wetlands associated with the Mad River Slough Wildlife Area and the proposed culture area. Culture equipment will not be installed in the buffer areas.
BMP-7	Bed Access	Vessels may cross areas with eelgrass when the predicted tidal height is +4 feet MLLW or greater by putting the engine in neutral and drifting across areas where eelgrass is present. This type of approach will be used when weather and tidal elevations permit.

3.3 Project Area

HIOC has executed two2 lease agreements for approximately 110 acres of intertidal area in the northwestern part of Arcata Bay, adjacent to the Mad River Slough channel (Figure 4). The majority of this area (~90 acres) is leased from Security National Properties Holding Company, LLC. HIOC has also entered into a sub-lease exchange with Humboldt Bay Oyster Company (HBOC), granting HIOC approximately 20 acres to the northwest of the main culture area in exchange for approximately 3 acres of culture area in the southern portion (identified as the "Sub-lease Area" on Figure 4). HBOC's operation is not included as part of this application. HIOC's lease boundaries would be clearly marked with a combination of 10-foot long by 2-inch wide white polyvinyl chloride (PVC) pipes that are marked vertically with the lease number and horizontally with two2 strips of reflective tape to mark corners.

Currently, there is no commercial scale aquaculture activity in the HIOC Project area, although there was some small pilot-level testing to ensure that shellfish would grow in this area. The HIOC Project area contains a stable mix of channels and high intertidal flats. The tidal elevation of the flats appears to be too high to sustain significant eelgrass resources, which persists primarily in the wetted channels and depressions in and adjacent to the project area. Reviews of historical mapping (NOAA 2012, Schlosser and Eicher 2012), and comparison to current mapping conducted in 2020 by University of California Santa Cruz (LumisLummis 2020), suggests that eelgrass distribution in the HIOC Project area is similar to the 2009 distribution (Figure 3). Continuous eelgrass beds are primarily confined to tidal channels in the Mad River Slough area. Current mapping of historic 'patchy' eelgrass beds suggests that these areas may be either smaller than depicted historically, the mapping units were defined differently than the current CEMP eelgrass bed definition, or historic mapping may have overstated the area of these patches. It is notable that there are also differences in methods, and eelgrass is dynamic and varies both seasonally and annually throughout Humboldt Bay. The HIOC Project area is at a sufficiently high tidal elevation (above +1.6 feet MLLW) where eelgrass is not expected to be consistently present in the areas proposed for culture until sea level rise may make conditions suitable for eelgrass to persist outside of the channels and depressions on-site.

3.4 Proposed Species and Culture Methods

HIOC proposes to grow the three3 species of oyster that have been historically cultivated in Arcata Bay – Pacific oysters (*Crassostrea gigas*), Kumamoto oysters (*Crassostrea sikimea*), and the native "Olympia" oyster (*Ostrea lurida*) – with a primary focus on Pacific oysters. HIOC's hatchery and nursery operations are already permitted to produce these species and will provide a steady, local seed supply.

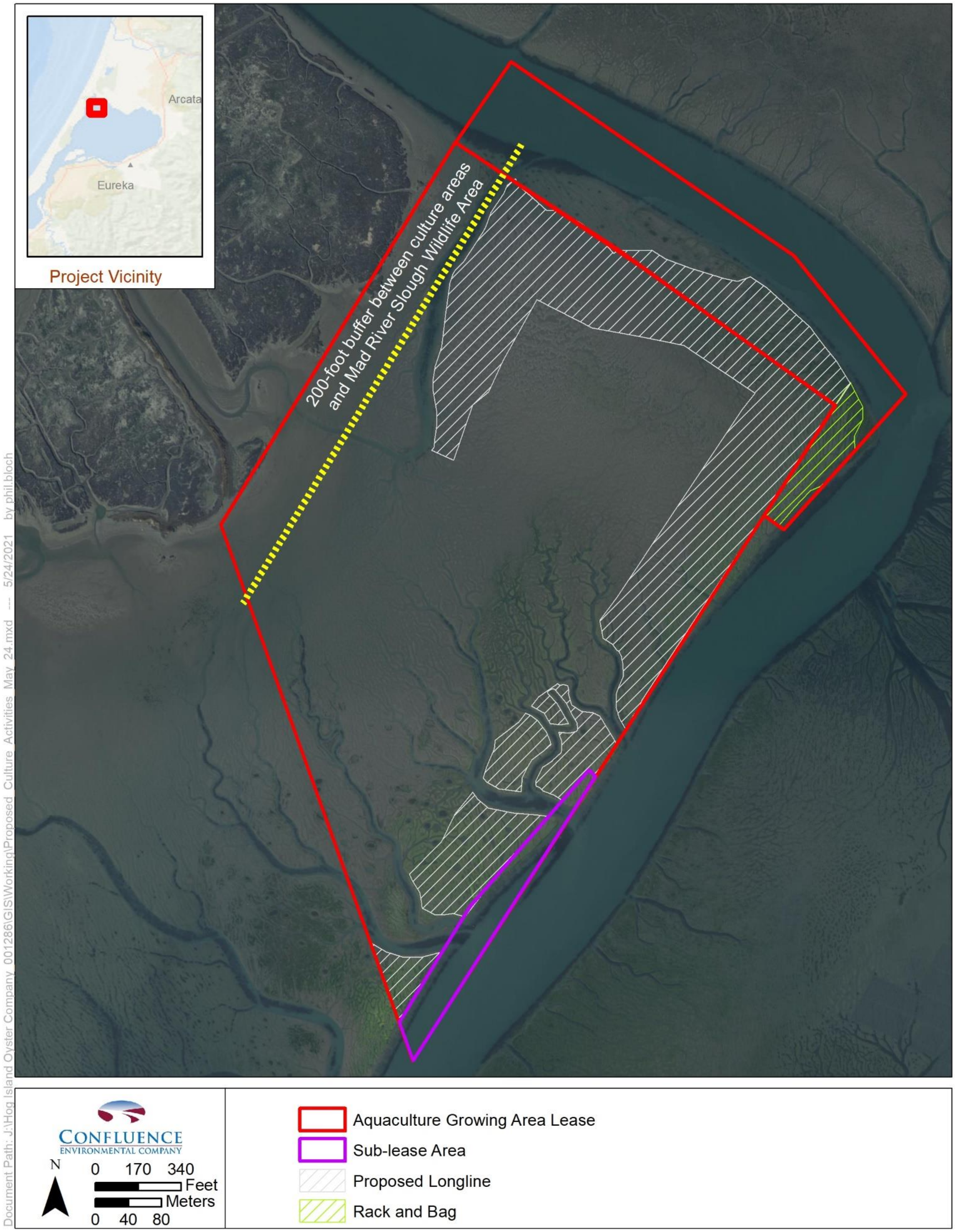

Figure 4: Project Map and Vicinity (Figure Updated from Draft IS)

HIOC will employ exclusively near-bottom culture methods, using bags or baskets on intertidal longlines (up to 27 acres), with a small amount (up to 3 acres) of "raised rack and bag" culture. The intertidal longline methods include the use of SEAPA-type culture baskets or "tipping bags." These methods are described in more detail below (Section 3.4.1). The proposed HIOC Project would be phased in over a 5-year period, with an initial focus on those areas already classified as Conditionally Approved by the California Department of Public Health (Appendix C). Harvested oysters would be processed at HIOC's Hatchery Facility in Samoa, California, and sold primarily within HIOC's family of California seafood restaurants.

Proposed culture areas will avoid eelgrass beds by working at higher tidal elevations ranging from +1.6 feet to +4.6 feet MLLW and incorporating a ~~16-foot~~5 meter buffer from eelgrass cover when installing shellfish aquaculture gear.

3.4.1 Intertidal Longline Systems

The primary culture method would be intertidal longlines equipped with either SEAPA-type culture baskets (Figure 5) or tipping bags (Figure 6). The potential interactions with the surrounding environment and SEAPA-type culture or tipping bags are very similar. These culture methods are treated the same in recent permitting efforts with the California Coastal Commission (CCC) and Corps in Tomales Bay (Corps 2019, CCC 2019), and recent literature discussing potential environmental effects are coming to similar conclusions (discussed below in Section 4.0). These intertidal longline systems may be deployed with or without floats that harness tidal energy to "tumble" the oysters. HIOC proposes up to 27 acres of this longline culture system, installed over a 5-year timeline. Basket-on-longline systems (distinct from cultch-on-longline) have emerged as a lower impact method for shellfish culture, allowing farm labor to maintain gear and animals with minimal impact to the surrounding benthic environment due to less need to access the culture plots by foot (Dumbauld and McCoy 2015).

Figure 5: Intertidal Longline Systems with SEAPA-style Baskets at Low Tide

Note: photo taken at the HIOC Tomales Bay operation.

Figure 6: Tipping Bags with Floats at High Tide

Note: photo has floats when the tide is high for flipping action; taken at the HIOC Tomales Bay operation.

Intertidal longline systems used by HIOC are proposed to be 100 to 300 feet long, where possible, with anchor posts at both ends and supporting posts typically every 8 feet. Individual lines are spaced at approximately 3 feet, with an additional space of 15 feet between grouped blocks of 4 lines to provide easement for boat access – also called a boat easement. The anchor posts are proposed to be galvanized steel pipe T-stakes, or other suitable materials, and are used to maintain line tension. The supporting posts in between are proposed to be made of schedule 80, 2-inch PVC. Intertidal longline systems can be 1 foot to 4 feet in elevation above the ground. Lines between the posts are plastic coated with a steel core. Covering that inner line is an outer sleeve that reduces wear.

Intertidal longline systems can hold either bags or baskets, with or without floats. Longline support posts and anchors (endposts) are driven using sledgehammers, hand-held post pounders, and/or a gas or pneumatic hand-held post pounder. Posts are removed by first loosening them by twisting with a pipe wrench and then tying a clove hitch around pipes and pulling them out using a boat-mounted crane. Material used in end posts has a serviceable life of at least 15 years. Based on these general layout and construction parameters, Table 2 ~~(provided below)~~ gives an estimate of how much gear might be associated with the proposed farm layout.

Table 2. Proposed Gear Quantities for Intertidal Longline System Lengths and Areal Groupings

Longline Units	# of SEAPA Baskets	# of Tipping Bags	# of Vertical Support Pipes (2" diameter)
100-foot Longline	40	80	12
300-foot Longline	120	240	37
A block of 8x300-foot Longlines (~one acre)	960	1,920	296

Tipping bags attached on longlines are made of durable VEXAR and are typically 2-foot by 3-foot with ½-inch mesh. These bags are attached to the line using a stainless-steel snap hook or plastic clip that connects to a plastic bearing. Bags attached to long lines have a small crab float attached to them opposite of the attachment to the long line. Floats are attached to the bag using 3/8-inch poly line. SEAPA baskets are typically 2-foot by 4-foot by 1.5-foot in diameter and are made of HDPE. After stocking the bags or baskets with oysters they are transported to the growing areas via work vessel. The vessel runs alongside the longlines and bags/baskets are clipped directly onto the line. Additional details and images on the installation of intertidal longline systems can be found in Figure 7.

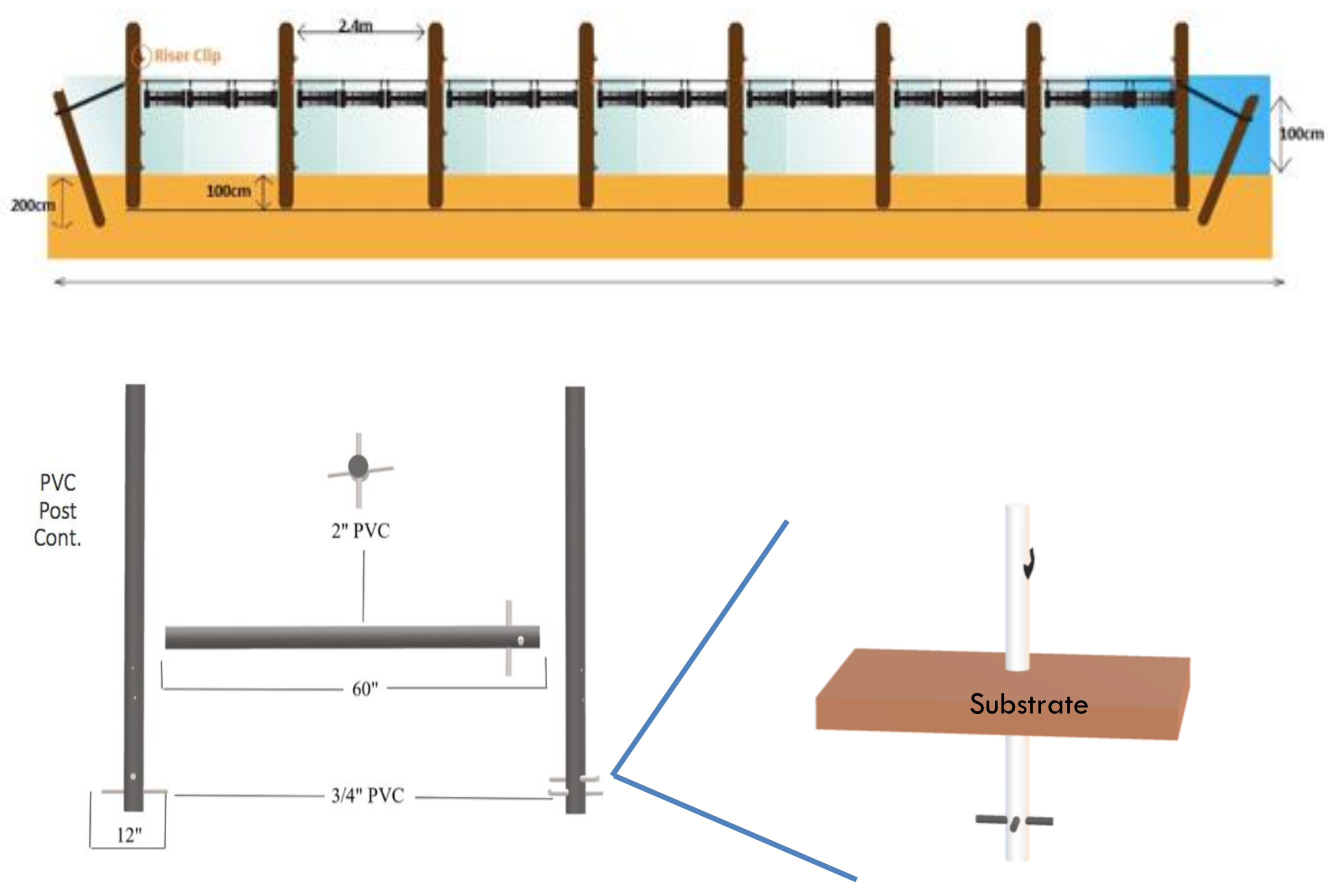

Figure 7: Longline Schematic with Anchor System and Pole Spacing between Anchors
Note: typical 4 by 100-foot longline sets with 15-foot boat easements. Top = tipping bags with float; Bottom = SEAPA baskets.

3.4.2 “Rack and Bag” System

HIOC also proposes up to 3 acres of “raised rack and bag” systems (Figure 8). Racks are proposed to consist of a 2-foot by 8.5-foot rebar frame to which 4, ½-inch VEXAR mesh bags measuring 2-foot by 3-foot are attached. After racks are stocked with oysters they are placed into the rows by a work vessel during a high tide. On the next low tide series (usually the same or following day), the racks are organized and placed into the notch on their 4 PVC pipe legs. PVC pipe legs are typically 12 inches to 24 inches above grade. A row of racks is typically 100 feet to 300 feet long with 2.5 feet between each rack (front to back). Rows of racks run parallel to each other. There are proposed to be ~~two~~2 rows of racks with 3 feet of space between them (left to right) and then a 12 feet to 15 feet space until the next ~~two~~2 rows (Figure 9). Racks are monitored and tipped monthly during their grow-out period. On a quarterly basis after initial planting, racks can be culled and graded. The harvest of racks entails the crew removing the racks from their PVC legs and placing them on a vessel for transport, usually done with 2 feet to 3 feet of water to allow the vessel to come up alongside the rows of racks for easier handling by the crew. All culling and grading would take place at HIOC’s Hatchery Facility. Final harvest of racks is typically 9 to 12 months after the initial planting date.

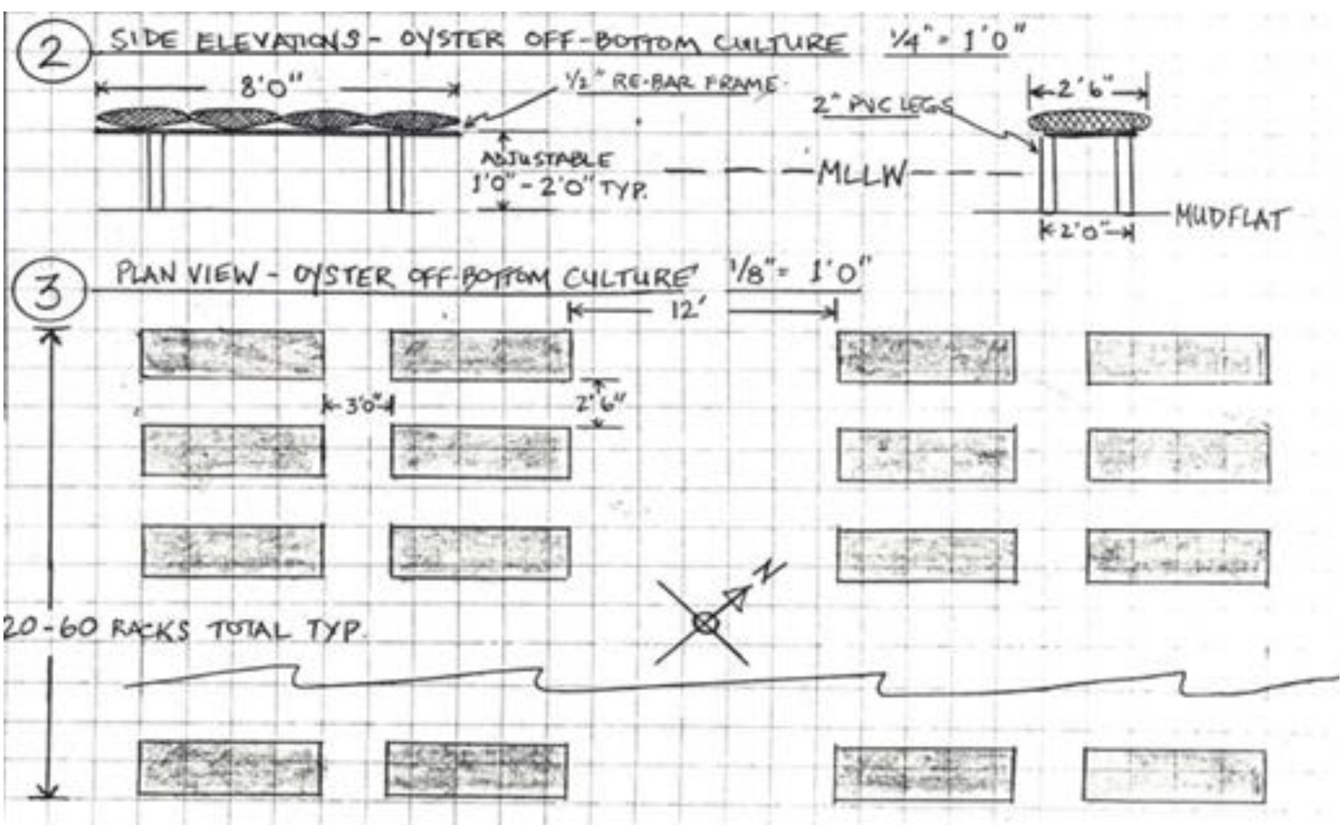

Figure 8: Raised Rack and Bag Culture Schematic

Figure 9: Aerial View of Rack and Bag
Note: photo taken at the HIOC Tomales Bay operation.

3.4.3 Unmanned Aerial Vehicle (UAV) Survey

According to Mit-2, HIOC will conduct a pre-installation survey during periods of high growth, as described in the CEMP. UAV surveys are performed with high resolution cameras that record the GPS location for each aerial photo. Ground resolution of imagery tends to be approximately 1-inch pixels or higher resolution. Photos are collected along transects with a high degree of spatial overlap so that each point within the survey area is typically recorded on 4 or more photos. These photos are subsequently combined into an image that is geospatially registered for analysis known as an orthomosaic using commercially available software. Imagery is then interpreted using a combination of supervised and unsupervised image classification methods to characterize eelgrass cover and other habitat features. The accuracy of the classification is assessed using a combination of ground observations and synthetic ground observations (very high resolution ground imagery).

The Corps has published guidance for eelgrass delineation reports (Nelson 2018). HIOC plans to use method 5 (Aerial Photography) identified in that guidance for a tier 1 eelgrass delineation. This method is recommended for instances where the project is avoiding eelgrass beds. Post-construction eelgrass surveys are not required when eelgrass is avoided. However, an as-built survey will be conducted using aerial imagery to confirm the location of installed aquaculture gear.

HIOC currently uses drone-based (i.e., UAV surveys) aerial eelgrass surveys in Tomales Bay, which is an approved method to avoid eelgrass and establish buffers from gear for the CCC (2019) and Corps (2019).

3.4.4 Planting, Harvest, and Maintenance Activities

Once gear is installed, bags or baskets installed on longlines will be maintained during a combination of high and low tide periods. Approximately one-half of site visits are expected to occur during tides exceeding +4 feet MLLW, which will result in complete avoidance of eelgrass. During these tidal conditions, staff can traverse from the channel edges across eelgrass areas without engine operations to avoid impacts to eelgrass resources. Once within the boat lanes, HIOC staff will either anchor vessels outside of eelgrass areas and maintain lines on foot or use the boat to move between lines. Note that HIOC estimates that vessels will only make 2 to 4 round trips weekly between HIOC's Hatchery Facility and the project site, using low draft, shallow-bottom skiffs that can pass over eelgrass at appropriate tides without grounding. Given that HIOC will not be cultivating within eelgrass beds, trampling is not anticipated to be a concern.

The typical production cycle includes "planting out" baskets of seed oysters, bi-weekly to monthly checks on equipment condition and shellfish growth and health, and harvest. To maintain optimal stocking densities baskets will be periodically collected, returned to HIOC's Hatchery Facility, graded, and redistributed to additional baskets. Harvest involves a final collecting of baskets, which are processed, graded, and prepared for distribution at HIOC's facility. Depending on the species, harvest may occur anywhere from ~~one~~1 year (*C. gigas*) to ~~two~~2 or ~~three~~3 years (*C. sikimea* and *O. lurida*) after planting.

HIOC has identified conceptual longline configurations (Figure 10). As described in Section 3.4.1, longlines would be installed in blocks where there are 4 longlines installed at 3-foot spacing and then a 15-foot boat lane. Larger boat lanes of 30 to 40 feet would occur after up to 20 blocks. The larger boat lanes and channels would be marked. In general, HIOC will mark the perimeters of each group of 4 lines (or each row of racks), with numbered PVC poles/pipes. HIOC will mark the 30-40 foot access channel with larger PVC pipes, including triangular red or green markings pointing to direction of travel. As described in Mit-2, newly installed gear will not be installed within 5 meters of any eelgrass beds mapped in the most recent annual eelgrass survey.

HIOC's planting, harvest and maintenance activities would be carried out on these lease areas either during low tides when cultivation gear is exposed and HIOC staff can walk within the culture areas or via skiffs (in the case of accessing culture areas at higher water levels). To move staff, shellfish and equipment between cultivation areas and HIOC's Hatchery Facility, HIOC would make use of a variety of different outboard motor powered, flat bottomed skiffs. Maintenance activities on HIOC's lease areas will include periodically flipping, shaking, inspecting and collecting cultivation equipment (cultivation baskets, racks) for sorting. This activity is carried out primarily using hand labor and tools.

3.4.5 Vessel Use and Transit Route

HIOC would make use of several vessels, including low draft, 20-foot and 24-foot skiffs and possibly a custom 40-foot vessel equipped with a hydraulic crane for assisting in planting and harvest operations during higher tides. All vessels are low draft, shallow-bottom skiffs that can access intertidal areas without grounding at low tides. HIOC estimates that these vessels will make ~~up to two~~2 to 4 round trips weekly between HIOC's Hatchery Facility and the project site (Figure ~~10~~11). As noted above, not all of these trips would occur during a low tide because some maintenance/harvest trips can be done during a higher tide when the vessel does not need to anchor or ground for access.

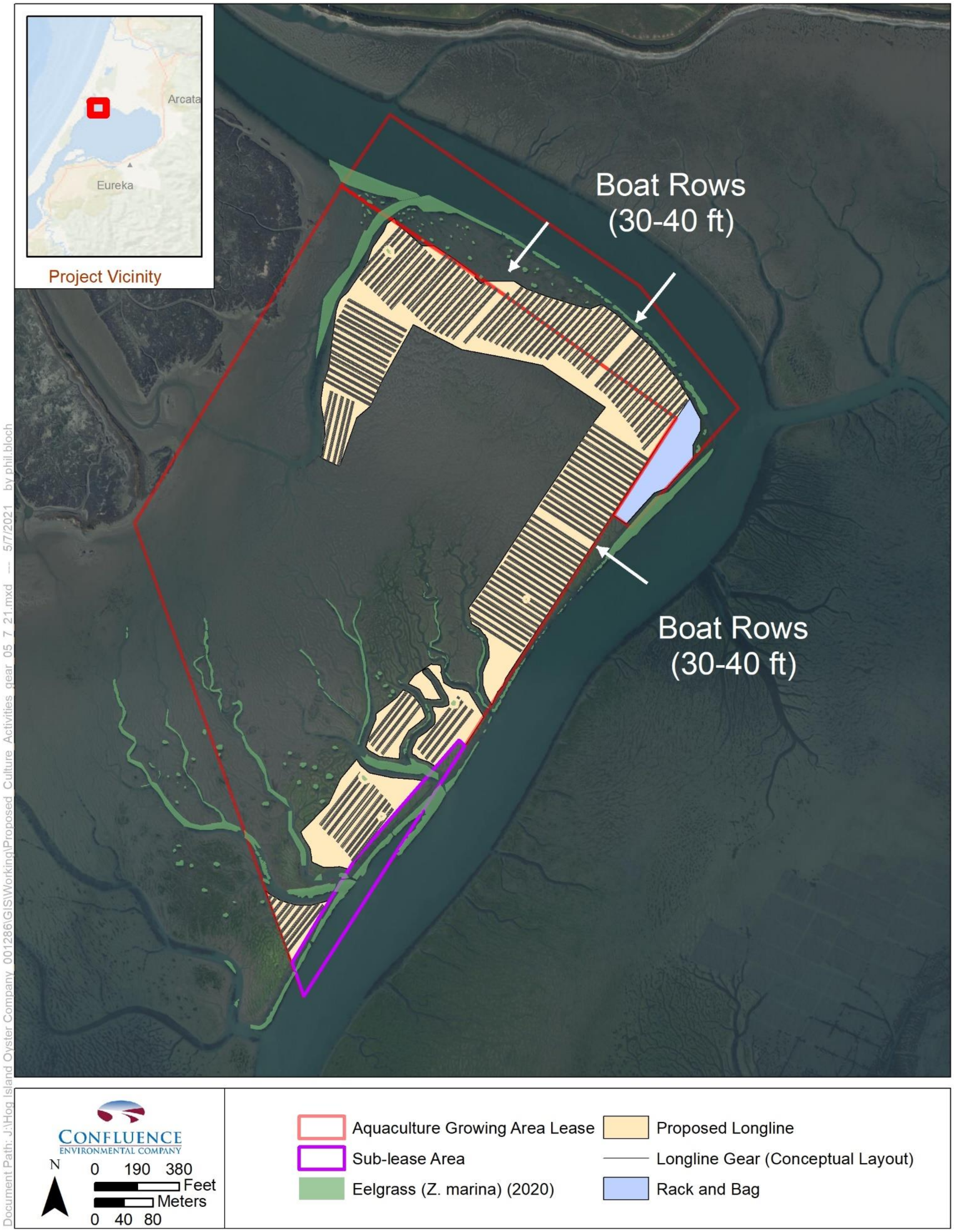

Figure 10: Conceptual Configuration of Longlines <u>(new Figure not included in the Draft IS)</u>

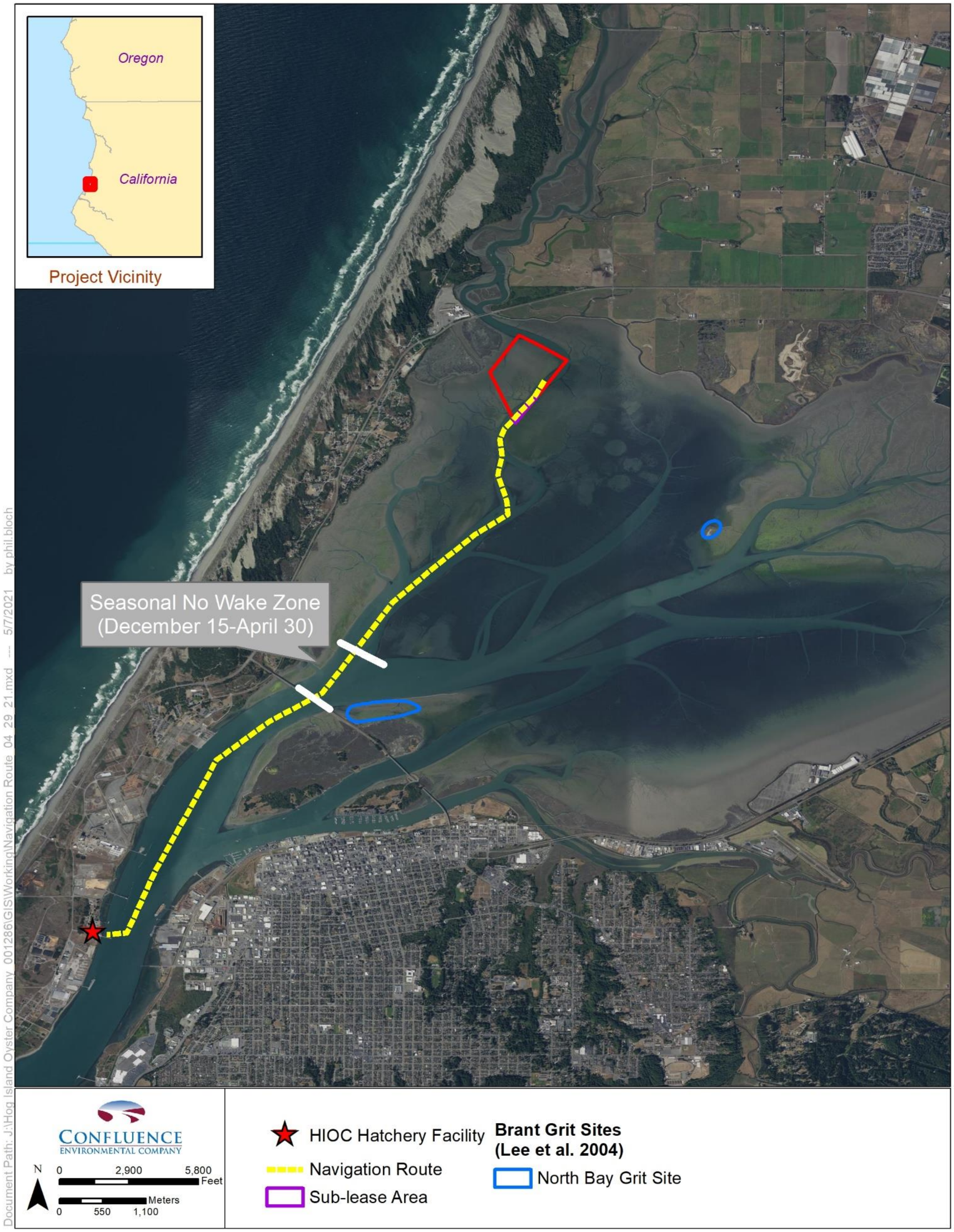

Figure 11~~0~~: Proposed Transit Route for HIOC Project (Figure Updated after Draft IS)

Section 4.0 Checklist and Evaluation of Environmental Impacts

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED: The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

❑ Aesthetics	❑ Agricultural and Forestry Resources	❑ Air Quality
✓ Biological Resources	❑ Cultural Resources	❑ Energy
❑ Geology/Soils	❑ Greenhouse Gas Emissions	❑ Hazards & Hazardous Materials
❑ Hydrology/Water Quality	❑ Land Use/Planning	❑ Mineral Resources
❑ Noise	❑ Population/Housing	❑ Public Services
✓ Recreation	❑ Transportation	❑ Tribal Cultural Resources
❑ Utilities/Service System	❑ Wildfire	❑ Mandatory Findings of Significance

DETERMINATION: On the basis of this initial evaluation:

❑ I find that the proposed Project **would not** have any significant effects on the environment, and a **NEGATIVE DECLARATION** will be prepared.

✓ I find that although the proposed Project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the Project have been made by or agreed to by the Project proponent. A **MITIGATED NEGATIVE DECLARATION** will be prepared.

❑ I find that the proposed Project **may** have a significant effect on the environment, and an **ENVIRONMENTAL IMPACT REPORT (EIR)** is required.

❑ I find that the proposed Project **may** have a "potentially significant impact" or 'potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An **EIR** is required, but it must analyze only those effects that remain to be addressed.

❑ I find that although the proposed Project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier **EIR** or **NEGATIVE DECLARATION** pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier **EIR** or **NEGATIVE DECLARATION**, including revisions or mitigation measures that are imposed upon the proposed Project, nothing further is required.

____________________________________   ____________

Humboldt Bay Harbor, Recreation and Conservation District   Date

I. **AESTHETICS**. Would the Project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Have a substantial adverse effect on a scenic vista?			X	
B) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?				X
C) In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point." If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?			X	
D) Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?			X	

DISCUSSION

Aes-A: Scenic Vistas. State Highway 101, which travels along the eastern shoreline of Arcata Bay, is eligible for designation as a State Scenic Highway. Highway 101 is located approximately 3 miles from the proposed HIOC Project area. The closest road to the HIOC Project area is the New Navy Base Road, which transitions to State Highway 255 across the Mad River Slough, and then into Samoa Boulevard. These roads are not designated as State Scenic Highways, and the closest view from the road to the HIOC Project area is approximately 0.25 mile.

The HIOC Project would increase shellfish aquaculture operations in Arcata Bay, thereby potentially increasing the visibility of the operations to the public. The HIOC Project would also increase the presence of workers and vessels on the bay. HIOC gear would be located in intertidal areas and visible from the shoreline or the water (i.e., boaters) during low tide. However, shellfish aquaculture gear is an existing characteristic of the Arcata Bay. For example, the proposed HIOC culture area would occur adjacent to an existing rack and bag culture operation. The *Humboldt County General Plan*, adopted October 23, 2017, acknowledges that shellfish aquaculture is an important industry associated with port development (Policy ED-P11). The type of gear proposed by HIOC does not typically extend more than 2 feet above the surface of the bay, with the most exposure occurring during low tides. Based on daylight low tides, which are a smaller portion of the tidal cycle, gear would be visible for approximately 30% of the year. Overall, views of shellfish aquaculture operations are common in Arcata Bay and consistent with the current aesthetic character of the area. Therefore, this potential impact is expected to be less than significant.

Aes-B: Scenic Resources. No scenic resources would be damaged. Therefore, no impact is expected.

Aes-C: Visual Character. The HIOC Project would expand shellfish aquaculture operations within areas of Arcata Bay. The visual character would become less "natural" under the proposed project, but would be consistent aesthetically with current activities on the bay. For example, there is an existing rack-and-bag culture operation adjacent to the HIOC Project area. The majority of land to the north and northeast includes trails, wildlife preserves/sanctuaries, and agricultural land. The project will not significantly impact views from any residences, which are located at least 0.3 miles west of the HIOC Project area. The low profile of the gear used in the operations, and the fact that the gear will be submerged for large portions of the year, further minimizes the visual impact to the HIOC Project area, adjacent roadways, and surrounding properties. Therefore, this potential impact is expected to be less than significant.

Aes-D: Light or Glare. The HIOC Project would involve temporary increased lighting from vessels and workers to enable occasional work at night. The type of lighting would include flood lights potentially used for short intervals, boat spotlights for navigation, and crews with headlamps. Other light sources in the area include cars traveling along State Highway 255, and businesses located west of the project site. The project site is located at least 0.3 miles from any residences, thereby reducing the impact of any lighting on residential uses.

This lighting could be viewed by people on the shoreline, but because the lights would typically be distant from these viewers (by 0.25 mile or more), the effect would be negligible. People on the bay (i.e., boaters) would be exposed to the lights at a closer distance, but the increased lighting would generally improve boating safety, and views would not be adversely affected. Therefore, this potential impact is expected to be less than significant.

II. **AGRICULTURAL AND FORESTRY RESOURCES**. In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X
B) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				X
C) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?				X
D) Result in the loss of forest land or conversion of forest land to non-forest use?				X
E) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?				X

DISCUSSION

Ag-A through Ag-E: There is no agricultural land, forest land, or area zoned as agricultural or forest land near the HIOC Project site that would be impacted. The HIOC Project would have a beneficial effect on agricultural resources by increasing the footprint of shellfish culture in Humboldt Bay. There would be no negative impacts on agricultural resources, and the proposed land use is consistent with existing zoning, including zones designated by the Humboldt County Code (Section 313-5.4). The use is also consistent with policies pertaining to this part of the bay described in the *Humboldt Bay Management Plan* under Section 2.3.2 (District 2007) and the goals described in the *Humboldt Bay Eelgrass Comprehensive Management Plan* under Section 3.2 (Merkel and Associates 2017). Therefore, no impact is expected.

III. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the Project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Conflict with or obstruct implementation of the applicable air quality plan?			X	
B) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?			X	
C) Expose sensitive receptors to substantial pollutant concentrations?			X	
D) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?			X	

DISCUSSION

Air-A and Air-B: Air Quality Standards. The HIOC Project area is located in the North Coast Air Basin and is under the jurisdiction of the North Coast Unified Air Quality Management District (NCUAQMD). The North Coast Air Basin is in "nonattainment" status with respect to particulate matter smaller than 10 microns in diameter (PM10) under California regulations, but is in attainment of all other State and federal ambient air quality standards.

Small vessels associated with shellfish aquaculture operations have combustion engines that generate particulate matter. The proposed HIOC Project would involve the use of several vessels, including low draft, 20-foot and 24-foot skiffs and possibly a custom 40-foot vessel equipped with a hydraulic crane for assisting in planting and harvest operations during higher tides. HIOC estimates that these vessels will make ~~up to two~~2 to 4 round trips weekly between HIOC's Hatchery Facility and the HIOC Project site with highly efficient 4-stroke outboard motors. The vessel engines would contribute to a minor net increase in emissions of particulate matter. Given the small size and limited quantity of vessels, their contribution to PM10 levels in Humboldt Bay is negligible.

Moreover, the District lacks direct jurisdiction over air quality, and thus lacks direct authority to require mitigation for potential air quality impacts. However, the NCUAQMD regulates vessel engine emissions pursuant to several air quality plans. CEQA addresses circumstances such as this through reliance by lead agencies on the regulatory oversight of responsible agencies carrying out statewide policy. Specifically, State CEQA Guidelines Section 15064(h) establishes a procedure that allows lead agencies, including the District, to rely on the environmental standards promulgated by other regulatory agencies, such as the NCUAQMD, with respect to pollutant regulation. The NCUAQMD has adopted several air quality management plan elements, including a *PM10 Attainment Plan* (NCUAQMD 1995).

HIOC would comply with the *PM10 Attainment Plan* adopted by the NCUAQMD and all attendant regulations. This conclusion is supported by the following BMPs:

BMP-1 Vessel Maintenance and Fueling: HIOC will maintain all vessels used in culture activities to limit the likelihood of release of fuels, lubricants, or other potentially toxic materials associated with vessels due to accident, upset, or other unplanned events.

HIOC will use marine grade fuel cans that are refilled on land, and HIOC carries oil spill absorption pads and seals wash decks or isolates fuel areas prior to fueling to prevent contaminants from entering the water.

BMP-2 Vessel Motors and Other Motors: HIOC will use highly efficient 4-stroke outboard motors . All motors are muffled to reduce noise.

While these BMPs are not required to reduce impacts to be less than significant, these are standards that are used by HIOC and others in Humboldt Bay. Therefore, the impacts to air quality standards are expected to be less than significant.

Air-C and Air-D: Air Quality Effects on People. The HIOC Project would not create any substantial pollution concentrations or objectionable odors. Additionally, there are no sensitive receptors or a substantial number of people in the immediate vicinity of the HIOC Project area. The adjacent roadways (e.g., New Navy Base Road, State Highway 255, Samoa Boulevard) and associated car emissions would overwhelm any potential contribution to pollution or odors by the HIOC Project. Therefore, the impact is expected to be less than significant.

IV. **BIOLOGICAL RESOURCES**. Would the Project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?		X		
B) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?		X		
C) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?			X	
D) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?		X		
E) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				X
F) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan?				X

DISCUSSION

Bio-A: Effects on Candidate, Sensitive, or Special-status Species. The following species are identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, by the CDFW as state-listed species, or by NMFS or USFWS under the Endangered Species Act (ESA).

Bio-A Existing Conditions – Species

Two species, Pacific herring (*Clupea pallasii*) and black brant (*Branta bernicla nigricans*) are also considered due to public concern for these species (e.g., Audubon Society, local hunters, CDFW pre-consultation), which are regulated under CDFW as the trustee agency for fish and wildlife resources (CEQA Guidelines 15386(a)). Effects to these species are also discussed under **Bio-D** (Effects to the movement of any native resident or migratory fish or wildlife species).

Common Name	Scientific Name	Status[1]
Fish		
Pacific lamprey	*Entosphenus tridentatus*	SSC
Green sturgeon, southern DPS	*Acipenser medirostris*	FT/CSSC. Designated critical habitat in Humboldt Bay.
White sturgeon	*A. transmontanus*	SSC
Coho salmon, southern Oregon, northern California ESU	*Oncorhynchus kisutch*	FT/ST
Chinook salmon, California coastal ESU	*Oncorhynchus tshawytscha*	FT
Steelhead, Northern California DPS	*Oncorhynchus mykiss*	FT
Coastal cutthroat trout	*Oncorhynchus clarki*	CSSC
Longfin smelt	*Spirinchus thaleichthys*	ST
Pacific herring	*Clupea pallasii*	N/A
Birds		
California brown pelican	*Pelecanus occidentalis californicus*	FP
Western snowy plover	*Charadrius nivosus*	FT/CSSC
Marbled murrelet	*Brachyramphus marmoratus*	FT/SE
Black brant	*Branta bernicla nigricans*	CSSC
Marine Mammals		
Harbor seal	*Phoca vitulina*	Protected under the Marine Mammal Protection Act (MMPA)
Harbor porpoise	*Phocaena phocaena*	Protected under the MMPA
California sea lion	*Zalophus californiaus*	Protected under the MMPA

Notes: DPS = Distinct Population Segment; ESU = Evolutionarily Significant Unit.
[1] Status abbreviations: FT = Federally listed as threatened; ST = State-listed as threatened; CSSC = California Species of Special Concern; FP = Fully protected in California.

A brief summary of these species and potential use of the HIOC Project area are described below. Potential effects to these species or habitat are provided after the summary of each species.

Pacific Lamprey. The Pacific lamprey is the largest lamprey in California, and adults can be up to 40 centimeters (cm) long, and is a highly valued resources by Native American tribes of the Pacific Northwest and California (CDFW 2020a). Pacific lamprey are widely distributed throughout the coast of California (e.g., Klamath and Eel rivers) and inland to watersheds in the Central Valley (e.g., San Joaquin River and Putah Creek). Similar to salmon, lamprey populations may be anadromous or resident and have a number of distinct runs.

Adult migrations through Humboldt Bay and into tributary streams have been documented in the spring. In 2011 to 2013, upstream Pacific lamprey migrants were collected by CDFW in the Freshwater Creek fish weir between February and June, and downstream migrants were observed between March and July (Ricker et al. 2014). There was no indication whether these lamprey were spring-run adults that spawned and immediately migrated back to the ocean or whether they had remained in the freshwater for a longer period of time.

Pacific lamprey spend most of their life in fresh or marine water, rather than estuaries. There are numerous tributaries to Humboldt Bay which Pacific lamprey may use to spawn. Estuaries are important to Pacific lamprey for foraging, holding, and transitioning from freshwater to marine waters, but interactions with lamprey in the HIOC Project area are considered negligible. Therefore, impacts to Pacific lamprey will not be further discussed below.

Green Sturgeon. The green sturgeon is a long-lived, slow-growing fish species. Mature males range from 4.5 to 6.5 feet in fork length and they do not mature until they are at least 15 years old, whereas mature females range from 5 to 7 feet in fork length and do not mature until they are at least 17 years old (Kelly et al. 2007). The maximum ages of adult green sturgeon are likely to range from 60 to 70 years. The southern distinct population segment (DPS) green sturgeon generally occur from Graves Harbor, Alaska to Monterey, California (Moser and Lindley 2007).

Moser and Lindley (2007) indicated that green sturgeon may use coastal bays as foraging habitat due to their high productivity. Based on acoustic tagging data conducted in 2007 and 2008 (USFWS unpublished data), green sturgeon move in channels, as would be expected for larger fish. However, 97% of observations occurred at two detection locations: Arcata Channel and North Bay Main Channel near the Samoa Bridge (Figure ~~11~~12). Relatively few observations occurred in the Mad River Channel. A follow-up survey of sturgeon use of Humboldt Bay by NMFS and USFWS (Goldsworthy et al. 2016) indicated that the sturgeon primarily used the Arcata Channel and were observed feeding on northern anchovy (*Engraulis mordax*) approximately 3.2 to 6.6 feet below the water's surface in the channel. Fish were observed in Mad River Slough, near the project site using the channel. ~~The~~Finally, the fish were ~~also~~observed in the intertidal zone for short forays, potentially following ~~the~~ anchovies into shallower habitat. These fish were originally tagged in the Sacramento River in 2011, and are considered part of the Southern Distinct Population Segment.

Tracking studies in San Francisco Bay suggest that directional movement of sturgeon in shallow areas (between 6 feet to 10 feet) occurs for less than 30 minutes at a time (Kelly et al. 2007). It is notable that mudflats in Humboldt Bay are typically shallower than the study in San Francisco Bay. In addition, the Kelly et al. (2007) study indicated that green sturgeon that exhibit non-directional movement, likely for foraging, are most common at depths ranging from 26.3 feet to 39.4 feet. The observations in Humboldt Bay (Figure ~~11~~12) suggest that the large number of detections (148,997) near the extreme north end of Arcata Channel, likely represents an area where feeding is occurring. These detections are adjacent to an area occupied by existing culture (oyster cultch-on-longline culture with 2.5-foot spacing) and extensive mudflat habitat without shellfish aquaculture operations. Acoustic receivers in other channels have had low numbers of detections, showing that tagged sturgeon were present in the vicinity for a shorter duration compared to other areas. One interpretation of this data is that these areas were used primarily for migration activities. Overall, the HIOC Project area is not likely to be accessed significantly by green sturgeon except for some limited amounts of potential foraging behavior.

White Sturgeon. White sturgeon is also a long-lived, slow-growing anadromous fish. Mature males range from 2.5 feet to 3.5 feet and they do not reach sexual maturity until about 10 to 12 years, while mature females range from 3 feet to 4.5 feet and do not sexually mature until they are 12 to 16 years (CDFW 2020b). Maximum ages of adult white sturgeon have been known to be nearly 100 years, although more commonly, fish collected in California are no more than 27 years. White sturgeon generally occur from Alaska to Ensenada, Mexico (CDFW 2020b).

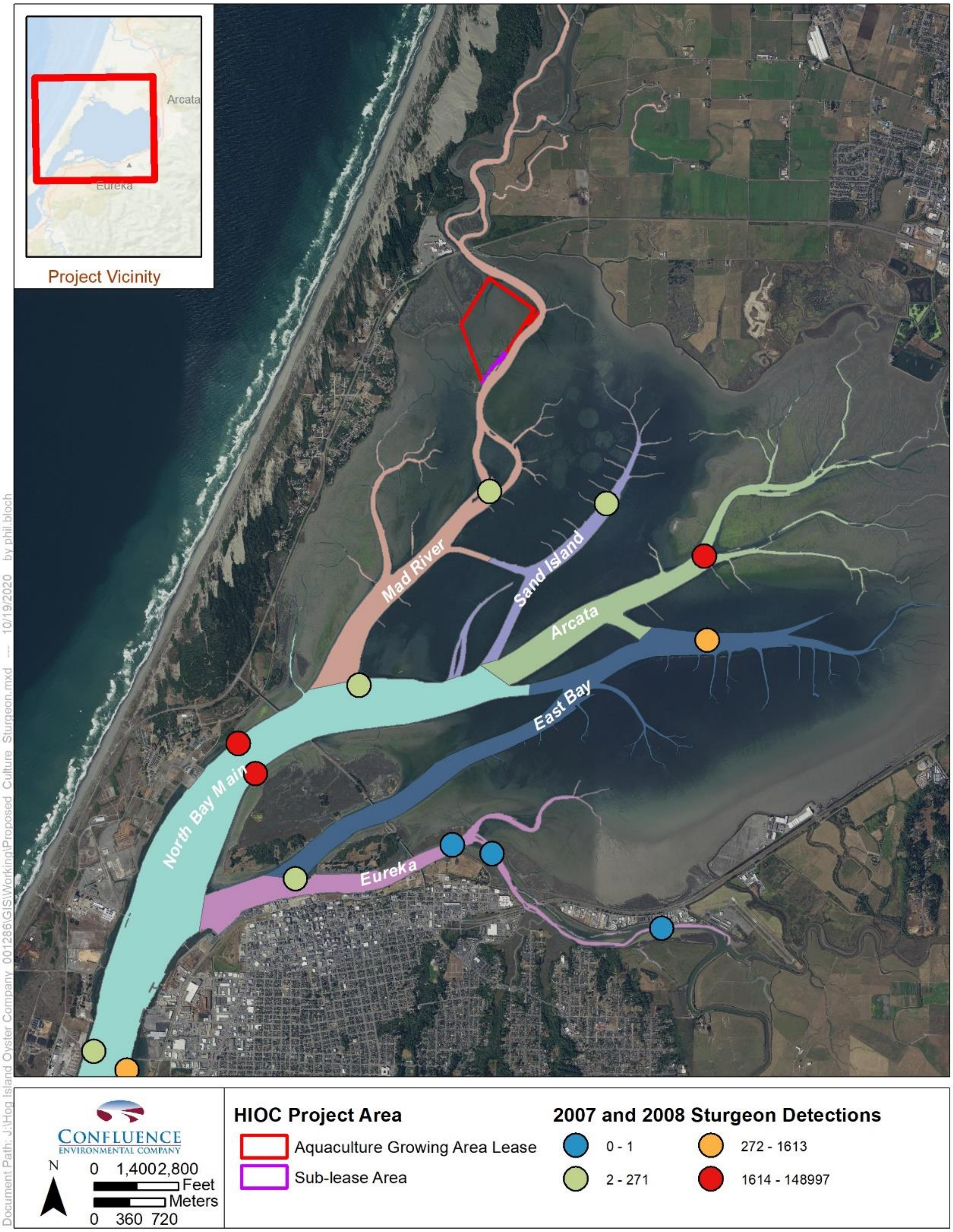

Figure ~~11~~12. Green Sturgeon Use of Humboldt Bay
Source: USFWS unpublished data

The only known self-sustaining spawning population of white sturgeon in California is in the Sacramento River, although spawning is believed to also occur in the San Joaquin, Klamath, and Eel rivers (Israel et al. 2009). While white sturgeon are not expected to spawn in any of the Humboldt Bay tributaries, adults and sub-adults likely use the bay for foraging habitat. Similar to green sturgeon, burrowing shrimp are a key prey item for white sturgeon. Juvenile white sturgeon have been shown to prefer water greater than 41 feet in the Columbia River (McCabe and Tracy 1994). Juvenile and adult white sturgeon prefer deeper water, although they are occasionally found foraging in shallower habitats (Israel et al. 2009, CDFW 2020b).

Coho and Chinook Salmon, Steelhead, and Coastal Cutthroat Trout (Salmonids). Salmonid life history is characterized by periods of adult upstream migration, spawning and egg development, fry and juvenile development, juvenile downstream migration, and stream-estuary rearing. Adult salmonids are primarily in Humboldt Bay from November to April, and juveniles can be present year-round (Table 3). There are smaller spawning streams in Humboldt Bay, and a critical salmonid spawning area located in the Eel River, which is south of Humboldt Bay along the coast (Schlosser and Eicher 2012). There are no river mouths near the HIOC Project area.

Table 3. Timing of Salmonid use of Humboldt Bay

Species	Life Stage	Timing											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Coho salmon	Adult	■	■	■								■	■
	Juvenile		■	■	■	■	■	■	░	░	░	░	░
Steelhead	Adult	■	■	■	■								■
	Juvenile	░	░	■	■	■	■	■	■	■	░	░	░
Chinook salmon	Adult	■										■	■
	Juvenile					■	■	■	■				
Coastal cutthroat	Adult	■	■	■	■								■
	Juvenile					░	░	■	■	■	░	░	

░ Based on limited description
■ Based on clear timing description

Sources: Wallace and Allen 2007, Schlosser and Eicher 2012, Pinnix et al. 2013, Ricker et al. 2014, Wallace and Allen 2015

Channels within marsh habitats may be of particular importance to juvenile salmonids because of the high insect and invertebrate prey resources and potential refuge from predators (Bottom et al. 2005). There is significant use of the tidal portions of Humboldt Bay tributaries, including Freshwater Creek, Elk River, Jacoby Creek, and Salmon Creek by juvenile salmonids (Wallace 2006, Wallace and Allen 2007, Wallace and Allen 2015). While this stream-estuary transition area is very important for salmonid survival, most of the Humboldt Bay sloughs are contained between levees and the adjacent marshes were converted to pasture lands over the last 150 years. The closest stream-estuary transition area to the HIOC Project area is Jacoby Creek, located over 3 miles to the southeast.

Once in Humboldt Bay, salmonids reside in freshwater estuaries and then migrate quickly to the ocean. A study by Pinnix et al. (2013) used acoustic transmitters that were surgically implanted into out-migrating coho salmon smolts. Although salmonids will migrate from freshwater to the ocean throughout the spring and summer, the data from Pinnix et al. (2013) indicates that individual coho salmon smolts will reside in Humboldt Bay an average of 15 to 22 days before migrating out to the open ocean. The researchers also reported that the coho salmon studied primarily used deep channels and channel margins during their migration. The average residence time for salmonids in the freshwater estuaries was reported by Wallace and Allen (2007) for juvenile salmonids, including Chinook salmon, coho salmon, cutthroat trout, steelhead, with typically a shorter residence time (i.e., 4 to 128 days) for coho salmon and Chinook salmon and longer residence time (i.e., 4 to 385 days) for steelhead and coastal cutthroat trout. Bay residence is associated with the mouth of spawning streams (e.g., Freshwater Creek, Elk River, Jacoby Creek, Salmon Creek) and then the migration route to the ocean, and none of these areas are close to the proposed shellfish aquaculture activities.

During out-migration, prey resource abundance in estuaries is critical to juvenile salmonid survival. Juvenile Chinook salmon and coho salmon have similar diets that primarily consist of fish and benthic invertebrates (Brodeur et al. 2007). As salmonids grow and move out to the open ocean, they transition from a less piscivorous diet (i.e., including more amphipods and crab larvae) to one that consists largely of high lipid content fish (Daly et al. 2011). Dungeness crab larvae may also be an important factor in seasonal migration in Humboldt Bay. For example, Wild and Tasto (1983) reported that the spring arrival of Dungeness crab larvae in nearshore ocean waters coincided with the northward migration of adult salmonids along the West Coast.

Longfin Smelt. Longfin smelt are small, pelagic fish (CDFW 2020c). Longfin smelt are known to occur in Humboldt Bay, but little is known regarding their distribution, abundance, or life history. The longfin smelt is a short-lived (generally 2 years) species. Adults spawn in low salinity or freshwater areas within the lower reaches of coastal rivers and the buoyant larvae are swept into more brackish waters where they rear and then move to marine waters. Spawning is believed to occur in tributary watersheds to Humboldt Bay between November and April when water temperatures are below 16°C. Longfin smelt forage on small organisms in the water column (e.g., phytoplankton, barnacle larvae, euphausids) and other small crustaceans (Gustafson et al. 2010), and are primarily pelagic fish. There is limited influence on these resources from the HIOC Project. Therefore, impacts to longfin smelt will not be further discussed below.

Pacific Herring. Pacific herring are small, pelagic fish (also considered forage fish, but not a special-status species as defined above). However, there is an important commercial and cultural fishery in California. The species is managed through the *Pacific Herring Fishery Management Plan* (CDFW 2020d). Herring use Humboldt Bay primarily for spawning and nursery habitat. Herring are present along the coast and make some exploratory excursions into Entrance Bay until they are ready to spawn. This is similar to the pattern of the San Francisco Bay herring stock (Moser and Hsieh 1992, Bollens and Sanders 2004). Adults will hold in deep channels of estuaries to ripen for up to two weeks and then move to shallow areas to spawn. Pacific herring were collected as part of the mid-water assemblage in North Bay between 2003 and 2005 (Pinnix et al. 2005). The general trend of herring abundance included low numbers in March, peak abundance from April through June, and then low numbers again from August to October. Overall, there are not many deep areas in Humboldt Bay for adult herring to remain long-term, but the bay is used extensively for nursery habitat of larval and juvenile fish.

Rabin and Barnhart (1986) reported that Pacific herring spawn in both North and South bays, but most spawning occurs in the northern end of the bay. The authors indicated that this is possibly due to an interaction between herring and freshwater inflows where low-salinity conditions may stimulate herring spawning. Although eelgrass is the principal substrate used for spawning in Humboldt Bay, the densest beds did not have spawn deposition during the most recent surveys (Mello 2007). A typical spawning event involves the deposition of herring eggs on approximately 300 acres of eelgrass in North Bay (Mello and Ramsay 2004). This represents less than 10% of available eelgrass used in each spawning event.

California Brown Pelican. The California Brown Pelican, a subspecies of the Brown Pelican (*Pelecanus occidentalis*), ranges widely along the U.S. West Coast. The Brown Pelican (entire species) was federally listed as endangered, and the California subspecies was listed as endangered by the State of California, due to widespread reproductive failures linked to environmental contaminants such as DDT. It was state and federally delisted in 2009. However, the subspecies remains protected by the State of California.

The California Brown Pelican nests in the Channel Islands, in southern California, as well as in Mexico, but occurs widely along the U.S. West Coast as far north as British Columbia, Canada (Jaques et al. 2008). They feed in estuaries and nearshore ocean waters, plunge-diving to capture small schooling fishes near the water's surface. Communal roosting occurs year-round as pelicans move up and down the coast, and this roosting appears to have several important functions such as predator detection and avoidance, assistance with finding prey, and socialization (Jaques et al. 2008). Pelicans roost on sandbars, pilings, jetties, breakwaters, and offshore rocks, sometimes in large communal roosts that can number in the thousands. In Humboldt Bay, roosting has been reported on Sand Island (high count of 350 pelicans in summer), oyster racks (high counts of just over a hundred pelicans in summer and fall), jetties, mudflats, and manmade structures (Jaques et al. 2008). They are most abundant in Humboldt Bay from summer through mid-fall (Nelson 1989).

Western Snowy Plover. The Western Snowy Plover nests along the Pacific coast from Damon Point, Washington to Bahia Magdalena, Baja California, Mexico (USFWS 2007). Degradation and use of habitat for human activities has been largely responsible for the decline in Snowy Plover breeding populations; other important threats to the Snowy Plover are mammalian and avian predators, and human disturbance (Page et al. 1995). In the Humboldt Bay region, Western Snowy Plovers primarily breed and winter on ocean-fronting beaches (Brindock and Colwell 2011) although small numbers of plovers have been documented nesting on gravel bars of the Eel River (Colwell et al. 2011). Nonbreeding Western Snowy Plovers infrequently occur on the interior of Humboldt Bay (Colwell 1994), but mostly in the South Bay on sandier substrates rather than on softer substrates associated with mudflats in North Bay.

Marbled Murrelet. The Marbled Murrelet occurs along the Pacific coast from Alaska to California, foraging nearshore in marine subtidal and pelagic habitats for small fish and invertebrates (USFWS 1992). Nesting occurs in mature, coastal coniferous forest with nest cups built on large branches in tall trees. In California, nesting occurs primarily in Del Norte and Humboldt counties, but occurs south to Santa Cruz County. The loss of old-growth forest is a primary reason for this species' decline (USFWS 1992). In California, Marbled Murrelets nest in redwoods greater than 200 years old (Nelson and Waaland 1997).

Marbled Murrelet forage in nearshore marine subtidal and pelagic habitats along the Pacific coast for small fish and invertebrates (USFWS 1992). The birds forage in nearshore waters usually within about 1.2 miles of the coastline. They feed on a variety of fish and marine invertebrates. They exhibit a breadth in diet that allows them to take advantage of whatever fish prey resources are available in their forage areas. An at-sea density of murrelets along the outer coast near the entrance to Humboldt Bay was reported as 3 to 5 birds per square kilometer (Miller et al. 2012).

Marbled Murrelets are unlikely to occur in the HIOC Project area, as their foraging habitat (i.e., subtidal channels and open bay habitats) does not overlap with the areas proposed for shellfish culture in Arcata Bay. Therefore, impacts to Marbled Murrelet will not be further discussed below.

Black Brant. The black brant is a sea goose that relies on Pacific coastal habitats. Brant nest in the arctic, including areas in Alaska and western Canada during the summer nesting season (Pacific Flyway Council 2018). The majority of the brant population (over 75%) migrate directly to wintering areas in Baja California and mainland Mexico, but approximately 10% of the population use coastal bays from Alaska to California for wintering (i.e., the Pacific Flyway). Black brant are a part of the Pacific Flyway, and managed as a hunted species with a population objective of 162,000 birds. The Pacific Flyway Management Plan, a joint management plan prepared for the Pacific Flyway Council, the Commonwealth of Russian States, the Dirección General de Conservación Ecológica de Recursos Naturales, the USFWS and the Canadian Wildlife Service, for the Pacific population of brant (*Brant Management Plan*) recommends protecting critical brant habitat in the species' range, including pursuing mitigation (i.e., avoidance, minimization, and compensatory mitigation) for loss or degradation of eelgrass beds, grit sites, and loafing sites.

Humboldt Bay is an important wintering area and spring staging site for brant in the Pacific Flyway. Stillman et al. (2015) report that nearly 60% of the brant wintering in Mexico rely on Humboldt Bay as a spring staging site for northward migration. In the bay, black brant feed most commonly on native eelgrass (Ward et al. 1997, 2005; Moore et al. 2004). Eelgrass varies in quantity and quality, and is unavailable to brant during two high tides per day, making the achievement of energy demands challenging (Clausen 2000, Moore and Black 2006). Brant have been documented repeatedly returning to eelgrass beds that are relatively high in quality (high density, biomass, and nutrient content), and have been seen waiting over eelgrass beds until tides recede (Moore and Black 2006), suggesting that brant are making foraging decisions based on prior experience and performance. This observation also suggests that eelgrass quality is important to the ability of brant to meet energetic demands for migration.

Harbor Seal. Harbor seals are widely distributed throughout the northern Atlantic and Pacific oceans. They occur along coastal waters, river mouths, and estuaries (Burns 2008, Lowry et al. 2008). Harbor seals consume a variety of prey, but small fishes predominate in their diet (Tallman and Sullivan 2004). In Northern California, pupping peaks in June and lasts about two weeks; pups are weaned in ~~four~~4 weeks (Burns 2008). Foraging occurs in a variety of habitats, from streams to bays/estuaries to the open ocean (Eguchi and Harvey 2005). Harbor seals breed along the Humboldt County coast and inhabit the area throughout the year (Sullivan 1980). Harbor seals use Humboldt Bay as a pupping and haul-out area (Ougzin 2013, Archibald 2015). Other nearby haul-out sites are located in Trinidad Bay and the mouths of the Mad River (western bank) and Eel River (both banks). Harbor seals will also occasionally haul-out on mudflats near shellfish aquaculture sites. Note that the closest primary haul-out location to the HIOC project is more than 1.0 mile away towards the southern end of the Mad River channel (Ougzin 2013).

Harbor Porpoise. Harbor porpoises are distributed throughout the coastal waters of the North Atlantic, North Pacific Oceans, and the Black Sea. In the North Pacific, they range from Point Conception, California, to as far north as Barrow, Alaska, and west to Russia and Japan (Gaskin 1984, Angliss and Allen 2009, Carretta et al. 2009). Harbor porpoises from California to the inland waters of Washington have been divided into ~~six~~6 stocks (Carretta et al. 2009), with ~~three~~3 additional stocks occurring in Alaskan waters (Angliss and Allen 2009). Porpoises from Humboldt County are included in the SONCC stock that extends from Point Arena, California, to Lincoln City, Oregon (Carretta et al. 2009). Harbor porpoises have been observed throughout the year at the entrance to and within Humboldt Bay, usually as single individuals but sometimes in groups, with a maximum size of 12 animals (Goetz 1983). Abundance peaks between May and October, and porpoises are most abundant in Humboldt Bay during the flooding tide.

California Sea Lion. California sea lions are restricted to middle latitudes of the eastern North Pacific. There are ~~three~~3 recognized management stocks: (1) U.S. stock from Canada to Mexico, (2) western Baja California stock, and (3) Gulf of California stock (Lowry et al. 2008, Carretta et al. 2009). Breeding colonies only occur on islands off southern California, along the western side of Baja California, and in the Gulf of California (Heath and Perrin 2008). California sea lions feed on fish and cephalopods, some of which are commercially important species such as salmonids, Pacific sardines (*Sardinops sagax*), northern anchovy, Pacific mackerel (*Scomber japonicus*), Pacific whiting (*Merluccius productus*), rockfish, and market squid (*Loligo opalescens*) (Lowry et al. 1991, Lowry and Carretta 1999, Weise 2000, Lowry and Forney 2005). California sea lions do not breed along the Humboldt County coast. However, non-breeding or migrating adults may occur in Humboldt Bay year-round.

Bio-A Potential Impacts – Species and Habitat

The following discussion includes potential HIOC Project-related impacts on the species discussed above. Note that based on the discussion within the existing conditions section, Pacific lamprey, longfin smelt, and marbled murrelets will not be discussed further because they do not overlap with the HIOC Project area or no impacts would occur to these species based on the proposed activities associated with a shellfish aquaculture operation. In addition, the discussion associated with potential impacts to resources identified under Bio-A concludes with a discussion of habitat impacts.

Bio-A1: Entanglement of Green and White Sturgeon. As an anadromous species, sturgeon swim among diverse structures in rivers, embayments, and the ocean. They have the sensory ability to detect structures and the swimming ability to avoid them, making it unlikely that green sturgeon would collide or become entangled with shellfish aquaculture gear or cultured shellfish. Shellfish culture has occurred for decades in West Coast embayments (including Humboldt Bay) where sturgeon occur, and there is no known record (anecdotal or otherwise) of a sturgeon ever becoming entangled in the gear or stranding in intertidal areas during feeding. Entanglements noted in the literature are associated with marine mammals with fishing gear or associated with deepwater floating culture off the West Coast (Price et al. 2016), not within intertidal areas.

Green sturgeon appear to be particularly common in the North Bay Main Channel and Arcata Channel (refer to Figure ~~11~~12; USFWS unpublished data), and frequently migrate between the Samoa Bridge and Sand Island. Based on acoustic tagging data, it appears that sturgeon may be using the intertidal habitat above Arcata Channel for foraging, but limited acoustic data in the upper parts of the bay suggest that green sturgeon may have less use or lower residency times in Mad River Slough. Overall, the HIOC Project site is located in areas that are not significantly used by green sturgeon (refer to Figure ~~11~~12 above). These observations, though limited, were confirmed in a field visit by NMFS and USFWS where the acoustic data indicated green sturgeon were feeding close to the Arcata Channel but not extending into the shallow areas to the north near the Mad River Slough where the HIOC Project area is located (Goldsworthy et al. 2016).

In addition, the tidal elevation of the HIOC project site reduces the potential for interactions with green sturgeon. The areas adjacent to tidal channels and subtidal channels are likely to be more frequently used than the higher elevation shallow intertidal habitat where aquaculture gear will be located. Green sturgeon will occasionally migrate from the major channels of North Bay onto the adjacent tideflats; however, observations of sturgeon in San Francisco Bay were most common at a mean depth of 17.4 feet (Kelly et al. 2007). Combined with these data, and direct observations from Humboldt Bay that indicate foraging into shallow areas adjacent to the main channels, it is unlikely that green sturgeon would occur in the shallow areas proposed for use by HIOC.

Patten and Norelius (2016) compared the difference between density of green sturgeon feeding pits with and without structured habitat in Willapa Bay, which has similar ecological characteristics as Humboldt Bay (i.e., extensive eelgrass beds and significant amounts of shellfish cultivation). Results of the study suggested that sturgeon feeding frequency is lower when eelgrass is present (>25% areal coverage). Feeding pit frequency was higher in areas with oyster cultch-on-longlines and no eelgrass but still lower compared to areas without gear. Overall, the study concluded that structured habitat (e.g., dense eelgrass, shellfish ground culture, oyster longlines) is not a preferred foraging area for green sturgeon, but these areas can be used by green sturgeon. More importantly, the study also confirmed that use of the shallow areas directly adjacent to channels was targeted by sturgeon during feeding.

Moser et al. (2017), studied green sturgeon benthic feeding habits by comparing feeding pit densities in areas with eelgrass (both native and non-native species), shellfish aquaculture (clam and oyster ground culture), and mudflat habitat without structure. Similar to the Patten and Norelius (2016) study, Moser et al. (2017) confirmed that green sturgeon have significant preference for bare intertidal mudflats compared to areas with bottom culture~~and areas where dwarf eelgrass (*Zostera japonica)* is abundant. Dwarf eelgrass is a non-native eelgrass species that tends to have smaller shoots and is found at higher tidal elevations than its native cogener~~. It is notable that shellfish culture methods from this study were ground culture, which has different potential effects from the culture methods that are proposed in the HIOC Project area. Compared to ground culture activities studied in the Moser et al. (2017) research, intertidal longline systems (e.g., SEAPA baskets and tipping bags) and rack and bag culture has a small portion of gear that is in the sediment and even the area with gear in the water column is a small portion of the total plot area. Across 30-acres of longline systems, PVC support posts and galvanized pipe end anchors will occupy a maximum of approximately 350 square feet and 26 cubic yards of intertidal habitat. Aquaculture gear would occupy approximately 114 cubic yards of the water column which represents approximately 0.11% of the water column at mean tide level. Feeding is observed in areas with this type of culture method that maintains mudflat areas without changing the sediment surface.

Use of key foraging habitat potentially used by sturgeon for shellfish aquaculture is naturally minimized due to the location of culture areas in shallow intertidal habitat. If sturgeon do occur in these areas, they would be able to access the mudflats between the intertidal longline systems, and even wider spaces within the boat rows. Sturgeon may encounter shellfish gear during foraging forays into intertidal areas. Sturgeon are particularly well-suited to navigate through and around shellfish aquaculture gear as their bony scutes provide protection from bumping and scraping against objects with which they may come in contact. Most importantly, shellfish gear is not designed to trap organisms and because gear tends to be planted in rows with spaces under and around the gear. Even during low water, sturgeon should be capable of exiting by moving along rows of gear or under the gear. Refer to Bio-A9 for additional discussion of circulation and sediment movement within longline gear.

No stranded or entangled sturgeon have been detected in any areas where intertidal longline systems or rack and bag culture occurs in the 25-year history since near-bottom culture methods were introduced into Humboldt Bay, or in other estuaries with a longer history of using near-bottom culture methods (Dumbauld et al. 2015). Documented stranding events of sturgeon tend to be associated with river flood flows where sturgeon become stranded in diversion structures (Thomas et al. 2013). The lack of either documented sturgeon strandings or longlines being dragged or damaged when sturgeon are resident in the bay (April-October) suggest that sturgeon are unlikely to be suffering mortality or injuries as a result of aquaculture activities. ~~Further, proposed intertidal longline systems and rack and bag culture would be outside of areas where sturgeon have been observed in Humboldt Bay.~~

Because sturgeon primarily use the channels, HIOC will avoid impacts related to green sturgeon through incorporation of the following mitigation measure:

Mit-5 Channels: HIOC will establish a 10-foot buffer from the top of bank of channels. Culture equipment will not be installed in the buffer areas.

Although there can be access through these areas, the buffer will require avoidance of gear installation into these locations. Therefore, with the incorporation of this mitigation measure, HIOC Project would have a less than significant impact to green sturgeon. Impacts to white sturgeon would be similar to those discussed above for green sturgeon and also less than significant.

Bio-A2: Impacts of Structures on Fish Species. There are certain species that tend to avoid structure while there are other species that tend to be structure-oriented. A review of the existing literature that evaluates activities similar to the proposed activity (i.e., near-bottom culture) does not support the conclusion that shellfish aquaculture adversely impacts fish. For example, Forrest et al. (2009), a review of over 200 papers associated with near-bottom shellfish aquaculture, indicated that effects to fish are often neutral or positive. Adding shellfish aquaculture gear to mudflat habitat in Arcata Bay can provide an increase in prey resources along the near channel habitat where many species appear to forage (discussed under Bio-A5 in more detail below).

The amount of fish that use oyster cultch-on-longlines was studied in Humboldt Bay by Pinnix et al. (2005), which compared eelgrass, oyster longlines, and open mudflat habitat. The study reported more fish in oyster longlines and eelgrass compared to mudflats, although it was skewed due to a couple of samples that had two orders of magnitude higher forage fish abundances. A more recent study that worked to expand upon the observations of the Pinnix et al. (2005) study through a Saltonstall-Kennedy Grant (Confluence et al. 2019) also reported elevated abundances of forage fish in culture vs. mudflat areas, of one order of magnitude.

Abundances of fish were similar in eelgrass sites with and without culture in the Pinnix et al. (2005) study; however, community composition was slightly different. Oyster longlines and rack and bag systems typically had more bottom-oriented or structure-oriented species such as sculpin, surfperch, and rockfish, while eelgrass had smaller species such as bay pipefish. These results agreed with other studies comparing fish communities in areas with shellfish aquaculture gear and eelgrass habitat (Hudson 2016, Confluence et al. 2019). Gear in the water column may also create flow refugia that larval forage fish utilize (Confluence et al. 2019). In contrast, Dumbauld et al. (2009) reported that a more common result is that community-level indices (abundance and diversity) are equivalent across habitats, reporting that: "few statistically significant differences in density were found among the >20 species of fish and crabs collected at intertidal locations."

Based on the amount of unstructured habitat or intertidal mudflats present in Arcata Bay (up to 2,806 acres), the amount of habitat affected (~1%) is a small portion of what is available. That does not mean that there is no change to these habitats, only that the change is limited to a relatively small component of Arcata Bay and the changed area will be used in a similar manner to other habitat types present (i.e., a transitional area from unstructured to structured habitat). The net change for the entire HIOC Project lease area in terms of added gear is a small proportion overall. The species that may avoid these areas are not limited by food availability. Additionally, the potential to increase food resources within culture areas, especially culture areas within unstructured habitat, may be a benefit to many of the higher trophic organisms using Arcata Bay. Therefore, the HIOC Project structures would have a less-than-significant impact to fish species.

Bio-A3: Impacts on Salmonids. Salmonids that use Humboldt Bay are either migrating to freshwater systems for spawning as adults or migrating from freshwater systems to the ocean as juveniles. Adult salmonids are primarily in Humboldt Bay from November to April, and juveniles can be present year-round (refer to Table 3 above). Salmonid spawning streams that drain into Arcata Bay include Freshwater Creek, Elk River, Salmon Creek and other smaller watersheds. The Eel River (south of Humboldt Bay) is also recognized as a critical spawning area for coho salmon, Chinook salmon, steelhead trout, and cutthroat trout (Schlosser and Eicher 2012). For the most part, salmonids likely use the main channels in Arcata Bay for migration but can also migrate into shallow areas for feeding.

The HIOC Project would not pose an impact to migration or feeding behavior for salmonids. Shellfish aquaculture gear, if present, is low profile and includes natural spaces between rows of gear to allow for migration. Based on radiotelemetry studies conducted by the USFWS (Brenkman et al. 2007), juvenile salmonids will orient to their perception of the bottom depth—whether that be relatively featureless sand or intertidal longline systems or rack and bag culture that are colonized with macroalgae. Depending on the tidal cycle, fish can easily swim over, around, or through shellfish aquaculture gear, if necessary. According to ~~one~~1 study using coho salmon smolts (Pinnix et al. 2013), the fish typically remained in deeper water and the deepest portion of tidal channels where they were unlikely to encounter activities or gear related to shellfish aquaculture.

Juvenile salmonids, which will use shallow areas more frequently, have been shown to use shellfish aquaculture gear as nursery habitat and would not be impacted in terms of migration behaviors. For example, Simenstad and Eggars (1991) reported that densities of a harpacticoid copepod (*Tisbe* sp.), an important prey item for some juvenile salmonids, were enhanced in areas of oyster culture compared to bare mudflat. Densities of gammarid amphipods and cumaceans (principally *Cumella vulgaris*), which are important prey items for juvenile Chinook and coho salmon, were enhanced at ~~one~~1 site but depressed at another site. Brooks (1995) found that *Corophium acherusicum*, another critical prey resource for salmonids, was enhanced in actively cultured oyster beds. Brooks (1995) also reported greater densities of gammarid amphipods and small tellinid clams. Finally, Rumrill and Poulton (2004) investigated differences in the benthic invertebrate community between near-bottom oyster cultch-on-longline plots, eelgrass control plots, and eelgrass reference sites in Humboldt Bay. Results of the study showed that invertebrate biomass was highest in the near-bottom oyster longline plots and lowest in some of the eelgrass reference sites. It was also noted that invertebrate biomass was lowest in on-bottom oyster sites that had been suction dredge harvested.

Research indicates that both adult and juvenile salmonids may not frequently use the intertidal portions where shellfish aquaculture occurs. If present, there is no indication that migration or feeding behavior would be impacted from the presence of longlines or rack and bag systems. It is notable that the current methods of longlines (e.g., tipping bags, SEAPA baskets, cultch-on-longline) are showing to be similar based on reviews by the federal agencies and other research (Confluence 2016a,b, NMFS 2016, USFWS 2016, Ferriss et al. 2019). There is also a new study that is looking at fish use of shellfish culture areas in Hood Canal, Washington, that includes these various types of longline culture methods. The studies are reporting that there may be more feeding opportunities provided on shellfish gear compared to bare mudflats. Therefore, the HIOC Project would have a less-than-significant impact to salmonids.

Bio-A4: **Effects to Western Snowy Plover Foraging Habitat.** In the Humboldt Bay region, Western Snowy Plovers primarily breed and winter in ocean-fronting beaches (Brindock and Colwell 2011) although small numbers of plovers have been documented nesting in gravel bars of the Eel River (Colwell et al. 2011). Nonbreeding western snowy plovers are not expected to occur in intertidal habitats in Humboldt Bay. However, individuals may occasionally forage in the bay, particularly in the South Bay where sandier substrates occur south of the bay entrance. The HIOC Project area represents habitat that will be used infrequently, if at all, by western snowy plovers, and areas used for foraging will mainly remain available. Therefore, the HIOC Project is expected to have a less than significant impact on western snowy plovers. No critical habitat for western snowy plovers has been designated within the interior of Humboldt Bay (77 FR 36727) and, thus, the project will have no impact to critical habitat.

Bio-A5: **Effects to Roosting California Brown Pelicans.** California brown pelicans and other waterbirds, including double-crested cormorants (*Phalacrocorax auritus*) and terns (*Sterna* spp.), use docks, rafts, and other gear (e.g., SEAPA baskets) in Humboldt Bay as roosting habitat. During maintenance and harvesting, HIOC personnel will access the shellfish plots causing roosting pelicans and other birds to abandon their roosts. These disturbances have energetic costs associated with flight while searching for alternative roost sites. However, roost sites are not limited in Humboldt Bay due to the abundance of docks and other structures that receive limited (or no) human disturbance. Therefore, this impact is considered less than significant.

Bio-A6: Effects to Benthic Fauna. Changes to the benthic fauna from the addition of shellfish aquaculture gear has been studied by multiple authors throughout the West Coast. These studies generally support the assertion that aquaculture gear provides similar benefits to benthic invertebrate abundance and variation compared to other structured habitats (e.g., eelgrass). Hosack et al. (2006) reported that benthic invertebrates were strongly associated with habitat type, and structured habitats (oyster beds and eelgrass) had higher species abundance than other habitat types. Earlier work by Hosack (2003) reported that important fish prey organisms, such as harpacticoid copepods, exhibited higher densities in both dense eelgrass and oyster habitats than sand or mudflats. Similarly, Simenstad and Fresh (1995) noted that the diversity of epibenthic harpacticoid copepods was higher on active ground oyster culture plots with 3-year old oysters present compared to an inactive plot where oysters and eelgrass were present.

These observations parallel those of Ferraro and Cole (2007, 2011, 2012), Kellogg et al. (2018), and the recent analysis in the 2020 Nationwide Permit 48 (NWP 48) from the U.S. Army Corps of Engineers (Corps) under 85 FR 57298 (Corps 2020). The Ferraro and Cole (2007, 2011, 2012) work looked at oyster on-bottom culture in ~~three~~3 different estuaries along the West Coast. The authors reported that oyster habitat had the highest values for mean species richness, abundance, and biomass of benthic invertebrates, and was considered the same as eelgrass habitat in terms of the potential to provide prey resources. In addition, both eelgrass and oyster habitats had significantly more prey resources than unstructured habitats such as mud or sandflats. The recent Kellogg et al. (2018) study in the Chesapeake Bay looked at benthic invertebrates as an indication of ecological health associated with floating and on-bottom culture gear. The study found no significant negative impacts on the benthic invertebrate community structure from the presence of gear or oysters, and number of invertebrates inside the farm sites were higher compared to outside.

Finally, the Corps (2020) NWP 48 analysis summarized the existing literature associated with impacts from shellfish aquaculture activities. The document included an understanding of the effects to benthic fauna both as encrusting organisms and within the substrate. Encrusting invertebrates occur on the gear placed in intertidal areas, and can include both non-native and native species (NRC 2010). Invertebrates in the substrate have been shown to support large populations of fish, crabs, and other animals (Dumbauld et al. 2015, Powers et al. 2007). Overall, the literature indicates that shellfish aquaculture can provide structured habitat that generally support a more diverse community compared to mud or sandflats.

As discussed above, Rumrill and Poulton (2004) investigated differences in the benthic invertebrate community between cultch-on-longline plots, eelgrass control plot, and eelgrass reference sites in Humboldt Bay. Results of the study showed that invertebrate biomass was highest in the experimental oyster longline plots and lowest in some of the eelgrass reference sites. It was also noted that invertebrate biomass was lowest in oyster ground culture sites that had been suction dredge harvested. In addition to biomass, the composition of the invertebrate communities was not significantly different between the longline plot and eelgrass control plot. This study provides evidence that oyster longline aquaculture using cultch-on-longline methods does not significantly change the species composition to benthic invertebrate communities compared to eelgrass habitat. Similar results would be expected for rack and bag systems. This same conclusion was also noted in Dumbauld et al. (2009), which concluded that the results of the Rumrill and Poulton (2004) work related to the similarity of benthic infaunal abundance in the culture plots compared to eelgrass plots: “may have arisen not simply due to flow dispersing biodeposits, but because both aquaculture and control areas included eelgrass, which has characteristic effects on sediment.” In other words, the presence of eelgrass was the primary determinant in benthic infaunal abundance and not the added structure related to the shellfish gear.

The literature supports the conclusion that oyster aquaculture and gear provides similar foraging habitat and species composition as found in other structured environments (e.g., eelgrass), and may provide more benthic invertebrates and epibenthic invertebrates than mudflat habitat because of the addition of surface area for colonization by organisms. The literature indicates that these changes provide an advantage to smaller organisms or to organisms that use these areas as rearing habitat during certain life history stages. This conclusion is consistent with NMFS (2016), which stated that: “studies suggest that the forage-related impacts of disturbance to and suppression of eelgrass resulting from shellfish culture have very limited impacts on forage, because managed shellfish sites are themselves inhabited by forage species.” Therefore, the HIOC Project would have a less-than-significant impact to the benthic fauna community.

Bio-A7: Fouling Organisms and Nonnative Species. Fouling and non-indigenous species (NIS) concerns are associated with either the introduction of new NIS organisms to Humboldt Bay or providing habitat for and supporting the continuing expansion for NIS that are established in Humboldt Bay. There is also a concern that the cultured species themselves are non-native and could lead to naturalization into the bay.

~~Boyd et al.~~Ruiz and Geller (~~2002~~2018) conducted a census of NIS ~~throughout~~at 4 bays in California, including 10 sampling locations in Humboldt Bay ~~from~~in ~~August 2000 to December 2001~~2015. ~~Fouling invertebrates were sampled at 21 intertidal sites and 5 marina locations.~~ No samples were collected in shellfish aquaculture areas, although an older study (Boyd et al. 2002) did sample from shellfish aquaculture locations in the bay. Samples were collected on plates (for hard structure organisms), from~~Benthic invertebrates were collected at 87 stations. Fish were surveyed using seines, traps, and trawls at over 300 locations~~ grab samples (for soft sediment invertebrates), and from pump and plankton net tows (for macro-zooplankton communities) in Humboldt Bay. Additional genetic analysis was conducted in the study, especially for plankton because they cannot be identified using morphological characteristics. The following is a summary for each type of sampling method:

- **Plates:** Out of ~~95~~ 260 ~~organisms~~ morphospecies~~identified in Humboldt Bay~~, ~~14 species were found in oyster growing areas~~35 species were considered NIS, with the highest density (up to 25 species) of NIS in the Woodley Island Marina area.

- **Grab Samples:** Out of 136 morphospecies, 13 species were considered NIS.

- **Pump/Plankton Tow Samples:** Out of 104 morphospecies, 2 species were considered NIS. Only copepods were identified as NIS in the samples.

~~The~~ Based on a previous survey in Humboldt Bay (Boyd et al. 2002), the nonnative species identified were from ~~nine~~ 9 different groups: (1) marine algae, (2) sponges, (3) anemones, (4) ~~a~~ limpets, (5) Pacific oysters (cultured), (6) ~~a~~ copepods ~~commonly found in oysters~~, (7) amphipods, (8) bryozoans, and (9) ~~a~~ tunicates ~~(*Botrylloides* sp.)~~. The Ruiz and Geller (2018) study largely agreed with these categories, but also included 3 new NIS that had not been previously recorded: a bryozoan (*Cradoscrupocellaria bertholletii*), and 2 Asian gastropods (*Philine auriformis and P. orientalis*). The authors reported that, overall, Humboldt Bay had a high number of native species and few NIS. Ruiz and Geller (2018) concluded by saying, "Our surveys detected surprisingly few new NIS records across the four bays based on morphological analysis."

~~The list of NIS sampled from Humboldt Bay were compared to surveys of NIS in San Francisco Bay (Cohen and Carlton 1995).~~ The majority of introductions in Humboldt Bay were from the long history of maritime commerce, including both commercial shipping and shellfish aquaculture~~, in Humboldt Bay~~ (e.g., introductions from ballast water or in marine algae historically used as packing material for oysters). Boyd et al. (2002) indicated that most organisms were likely present in Humboldt Bay for over 100 years, except for more recent introductions of some tunicates. This is consistent with the more recent introductions reported from Ruiz and Geller (2018). New introductions that were identified are primarily associated with commercial shipping activity, especially from vessels that transit between San Francisco Bay and Humboldt Bay.

One of the main ways in which historic oyster operations contributed to NIS in Humboldt Bay was from the shells of oyster spat imported from Japan. Beginning in the 1930's, the California Department of Fish and Game (now CDFW) helped to introduce Pacific oysters from Japan to revive the oyster industry in Humboldt Bay (Barrett 1963). Legacy introductions from this activity are evident from the pattern of exotic marine algae species found in Humboldt Bay. The distribution of *Lomentaria hakodatensis* and *Sargassum muticum* was primarily reported in Entrance Bay and to a lesser extent in North Bay. Boyd et al. (2002) specifically noted that these species occurred in oyster growing areas of North Bay. During surveys by SHN (2015), *S. muticum* was observed but not considered common in the proposed Coast Seafoods shellfish farm expansion areas and *L. hakodatensis* was not reported. When *S. muticum* was observed, it was usually a single plant (~3 feet long) emanating from the sediment surface, likely attached to a rock or other structure just under the surface layer such as shell.

While there are legacy introductions from oyster operations in Humboldt Bay, current operations involve several stringent management measures to avoid introductions. Most seed for the farm will be provided by HIOC's Hatchery Facility, which is certified by CDFW. HIOC is also a participant in a disease prevention program (the "Shellfish High Health Program") sponsored by the Pacific Coast Shellfish Growers Association (PCSGA). This program requires examination of larval oyster seed from West Coast hatcheries by a USDA-certified Shellfish Pathologist. Interstate and foreign export into California must be certified and regulated by a CDFW permit. The hatcheries that export shellfish seed submit inspection reports on a regular basis to CDFW, and the importation of seed from established hatcheries is allowed only if the hatchery has a minimum 2-year history of documented absence of disease. HIOC also maintains its operations independent from activities in other estuaries. HIOC does not move equipment between sites, and any equipment that is put into use in Humboldt Bay is thoroughly decontaminated and cleaned prior to use in the bay. Given these management measures to control for disease and NIS, it is unlikely that current oyster operations would result in new NIS introductions.

HIOC also has standard practices that reduce the potential for NIS to spread on their gear. The bags and baskets used by HIOC are removed when harvested and cleaned of any invasive species at their upland facility. Most gear is dried out and pressure washed before the next use. The long-term hard surfaces include the support pipes, which represents a small amount of surface area compared to the rest of the gear (e.g., support posts). Overall, there does not appear to be a significant spread of invasive species in the bay, and the fouling organisms that do colonize culture gear when it is available are seen in the literature as a benefit to foraging species like salmonids and birds, as discussed above and in Section Bio-A9.

In terms of naturalization of the culture species into Humboldt Bay, there is limited evidence that there are wild sets of oysters outside of the farmed areas. When oysters area observed, there are typically gaps in year classes, which suggest that successful spawning events do not occur on an annual basis in Humboldt Bay. The oyster species imported into California tolerate water temperatures below 70°F well enough to permit them to grow, but not necessarily to reproduce or for larvae to develop (Barrett 1963, Elliott-Fisk et al. 2005). Ruesink et al. (2005) notes that spatfall only occurs in "restricted locations that retain larvae and exceed critical temperatures for several weeks." The authors identified water temperatures exceeding 18°C to 20°C as critical thresholds for spawning and temperatures exceeding 16°C as a critical threshold for larval development of *C. gigas*. At present, natural recruitment is only documented to occur regularly in 3 locations in north America – British Columbia, Canada, Hood Canal, Washington, and Willapa Bay, Washington (Ruesink et al. 2005). This is why these species have to be incubated in hatcheries for several weeks before they are placed on the tideflats for grow-out.

While densities of naturalized oysters appears to be low in Humboldt Bay, and other West Coast bays, there are occasional successful spatfalls and oysters may naturally develop in areas where suitable substrate and conditions exist in Humboldt Bay. Much of the Mad River Slough vicinity lacks suitable substrate for development of oysters, which limits the potential for establishment of naturalized oysters. ~~Structured habitat is also limiting in terms of locations where oysters can settle and grow. Recent r~~Reviews of potential effects from non-native oyster naturalization into bays in which they are planted has resulted in a conclusion that this is a low risk due to hydrography of the system (short residence time), lack of suitable substrate for settlement, including reviews from Drakes Estero (NRC 2009) and Willapa Bay (Carlton 1992). Based on the 80+ year history of culturing non-native oysters in Humboldt Bay, there do not appear to be adverse impacts from non-native bivalves, displacement of native species, or significant establishment of Pacific oysters and Kumamoto oysters in areas outside of Humboldt Bay. A similar conclusion was reached in the Pre-Permitting Efforts (SCH #2017032068, SCH #2013062068).

The HIOC Project occurs in the context of ~~more thanapproximately287~~ acres of existing oyster aquaculture that primarily uses *Crassostrea gigas*. The project adds a negligible increase in the quantity of oysters grown in Humboldt Bay. These existing operations and the current naturalized oyster population is the baseline that this project is contributing to. In this context, the HIOC Project represents a very low risk of additional introductions of naturalized oysters to Humboldt Bay. Where these oysters occur in the future is likely to be places that they would occur whether or not this project occurs.

Concerns about NIS were also raised for Drakes Estero where the existing shellfish aquaculture gear contained an invasive tunicate (*Didemnum* sp.). Mercer et al. (2009) surveyed the benthic community adjacent to cultured areas and reported that "the abundance of epifaunal organisms was not significantly affected by presence of the ascidian mats." None of the NIS identified in oyster growing areas in Humboldt Bay were considered invasive (Boyd et al. 2002), and these organisms are not expected to affect the native benthic community or the Humboldt Bay environment. The more recent surveys by Ruiz and Geller (2018) in marinas and areas with heavy vessel use only identified a few examples of *Didemnum* sp., the closest of which was approximately 3 miles from the HIOC Project site. The area surrounding the HIOC Project site already has shellfish aquaculture gear operated by Humboldt Bay Oyster Company, and no invasive species have been observed on their existing gear.

There is very little gear that is left out in the bay for longer periods of time.For example, the bags and baskets used by HIOC are removed when harvested and cleaned of any invasive species at their upland facility. Most gear is dried out and pressure washed before the next use. Long-term hard surfaces include the support pipes, which represents a small amount of surface area compared to the rest of the gear. On the contrary, theThe majority of literature related to organisms that colonize shellfish aquaculture gear are considered to provide additional food resources for fish and larger invertebrates (see discussion above). Therefore, the HIOC Project would have a less than significant impact related to fouling organisms and NIS.

Bio-A8: Effects to Carrying Capacity. Carrying capacity, also termed "ecological carrying capacity," is defined by Ocean Studies Board and NRC (2010) as:

> *The stocking or farm density above which 'unacceptable ecological impacts' begin to manifest. From a practical standpoint, this process begins with the level of culture that can be supported without leading to significant changes to ecological processes, species, populations or communities in the growing environment.*

The most robust carrying capacity analysis conducted in Humboldt Bay was created for the Pre-Permitting Project (District and SHN 2015). This included an analysis of up to 1,202 acres of shellfish aquaculture operations in Arcata Bay (or 55.02 metric tons dry tissue weight), which were all modeled as adults to maximize potential filtration pressure. According to the analysis, filtration pressure was shown to range between 5% and 9%, which indicates that the "vast majority of carbon fixed by phytoplankton remains available to non-cultured species." In addition, the phytoplankton turnover rate was calculated to replace itself several times per day. Overall, the analysis concluded that the existing and proposed culture would have some cumulative effect on Humboldt Bay food resources, but there is an abundance of food available and cultured species will not significantly affect the food resources in the bay. This was considered a conservative result, given that the analysis only calculated change to phytoplankton and did not account for other sources of carbon productivity (e.g., detritus, benthic microalgae, biodeposits). Note that this analysis was based on significantly more shellfish aquaculture operations than currently exist or are proposed in Humboldt Bay. The total acreage of existing intertidal shellfish aquaculture farms within Humboldt Bay is approximately 287 acres which, when combined with the HIOC Project's proposed 30 acres and the District's Pre-Permitting Project and Yeung Oyster Farm's proposed 136 acres of intertidal culture, would total 453 acres, or approximately 38% of the production previous analyzed by the District.

Other indicators of ecological carrying capacity include poor growth and high mortality of the oysters. There have been no reports of poor growing conditions for the existing cultured oysters in Arcata Bay. Therefore, impacts associated with carrying capacity are considered less than significant.

Bio-A9: Effects to Habitats. The HIOC Project proposes to grow oysters on up to 30 acres within a 4034-acre area of intertidal habitat available for shellfish aquaculture within Arcata Bay and within a 110-acre lease area. The proposal is to add shellfish aquaculture gear over a 5-year period, using a slow growth rate (5- to 10-acres/year), and in areas that avoid eelgrass. As described above in Section 3.0 (Project Description), gear will not be present on this entire area or at all times of the culture cycle. Intertidal longline systems are separated by approximately 3 feet, and grouped blocks of 4 lines are separated by 15 feet with a boat easement. Rack and bag systems are also separated by 3 feet with 12-foot boat easements. Bags and baskets are removed during harvest periods and cleaned off-site.

~~Adding~~Unlike a dike or dock, adding shellfish aquaculture gear to mudflat habitat will not change the habitat but will change how species interact with the additional structured habitat. For example, macroalgae are generally more abundant in areas with aquaculture gear due to increased opportunities for attachment and structure present that can collect drift resources compared to the sandy substrate of intertidal sandflat habitat, although this additional resource would be reduced during harvest or maintenance activities. Other species interactions (e.g., benthic invertebrates, fish, birds, mammals) are discussed throughout this section. For example, adding shellfish aquaculture gear to mudflat habitat can provide an increase in prey resources along the near channel habitat where many species appear to forage. Conversely, there are species that use Humboldt Bay that prefer areas of unstructured habitat (e.g., flatfish, black brant). Overall, interactions between shellfish aquaculture gear and species in Arcata Bay is generally positive and species have used the area consistently over the 100-year history of aquaculture in Humboldt Bay.

Shellfish aquaculture can also cause changes to sediment quantity and sediment quality. Note that sediment quality, as it relates to historic dioxin and other contaminants, is discussed in Section VII below. Shellfish aquaculture gear has a localized effect on sediment distribution and tidal circulation. As water is slowed by frictional effects of the culture gear, sediment deposition and organic content can increase (Rumrill and Poulton 2004). Rumrill and Poulton (2004) reported a deposition of fine sediments in 5-foot spaced single-hung longlines using cultch-on-longline methods in May 2003 (up to 95 mm), which was eroded by July 2003 (down to 51 mm). The authors gave no indication whether this was a significant change or if this change persisted. Typically, the detection limit for this type of study is 80 mm (Hannam and Mouskal 2015), which indicates that this change observed by Rumrill and Poulton (2004) is minor. It is anticipated that longlines with tipping bags or SEAPA baskets and rack and bag areas will have similar, although possibly slightly greater, effects.

For example, a study was conducted in Willapa Bay on potential changes in water circulation around an intertidal longline system that included tipping bags (Confluence 2016a) paired with previous work in the region (Banas and Hickey 2005). A boat-based Acoustic Doppler Current Profiler survey was conducted in Willapa Bay to measure current speed and direction up-current, down-current, and within culture beds. The major effects of the longlines with tipping bags included:

- Differences in current speeds and current direction within and outside of culture are not significant.
- Differences in current speeds and current direction up-current and down-current of culture are not significant.

- Current speed and direction with depth and at discrete distance intervals along each transect are highly variable.
- Complex circulation patterns exist because of a naturally complex seabed (eelgrass, channels, bed roughness).

Tidal currents would be one of the forces contributing to sediment transport and sediment distribution in the area of proposed tipping bag culture gear on the mudflat, but they are not the most active means for sediment transport. Studies have shown that sediment transport within channels and adjacent to channels is more active than on mudflats (Banas and Hickey 2005, Forrest et al. 2009). Intertidal longline systems, and other types of intertidal culture methods (e.g., rack-and-bag), are sited away from channels and high enough up (in elevation) on the mudflats that they will not interact significantly with the sediment being transported in the channels. In addition, sediment on the mudflats is relatively cohesive and cannot be readily eroded by tidal currents. Therefore, the intertidal longline systems and rack and bag areas do not have a significant effect on tidal currents or the sediment transport processes associated with tidal currents.

Most information on the potential for deposition to become significant conclude that this potential is small (<100 mm) and happens in an inconsistent manner so that localized changes of this magnitude would not have an adverse effect on the environment. The amount of sediment that potentially accumulates will depend on the orientation of the shellfish aquaculture gear in relation to wind-waves, and adjustments can be made to the gear to reduce this potential impact if it is observed by HIOC. Given the amount of mapping and monitoring that will occur during the project (i.e., annual UAV surveys until gear is installed per Mit-2), if sediment accumulation is noted, then it would be quickly fixed.

Certain shellfish aquaculture practices can also impact eelgrass habitats, although these impacts are ~~viewed by regulatory agencies as~~ temporary and sustainable with shellfish aquaculture activities. Current monitoring efforts on Pacific Seafood (formerly Coast Seafoods) shellfish culture beds in Humboldt Bay using basket methods similar to the proposed culture methods by HIOC suggest that there is no difference in eelgrass cover inside culture areas compared to adjacent reference areas (Merkel and Associates 2021). This suggests that eelgrass will expand if suitable conditions exist, regardless of whether culture gear is present or absent. According to the proposed reissuance and modification of Nationwide Permits (85 FR 57298) by the Corps (2020), "Bivalve shellfish mariculture activities and submerged aquatic vegetation have existed next to each other for hundreds of years (Ferriss et al. 2019), which demonstrates the temporary nature of the impacts of these activities on seagrasses and the resilience of seagrasses to the periodic disturbances caused by these activities." Additional positive effects to benthic invertebrates and fish that use these estuaries were identified by NMFS (2016) and others.

HIOC will avoid impacts related to eelgrass and other habitats through incorporation of the following mitigation measures and BMP:

Mit-1 Marine Debris: HIOC will implement a marine debris management plan (Appendix A). At the time of harvest of each cultivation area, HIOC will carry out a thorough inspection to locate and remove any loose, abandoned or out of use equipment and tools. All floating bags and baskets will be marked or branded with the HIOC's name and phone number.

Mit-2 Eelgrass Protection: HIOC will install racks, intertidal longline systems, and other aquaculture gear at least 5 horizontal meters~~ (or 16 feet)~~ from native eelgrass (*Zostera marina*) ~~beds~~cover. This will not prevent continued cultivation in areas where eelgrass moves into the project site.

HIOC is expected to install gear incrementally. Before gear is installed in new areas, eelgrass will be mapped in culture areas using unmanned aerial vehicles (UAV) and/or verified using ground surveys to identify eelgrass ~~beds~~cover and establish 5 meter horizontal buffers. Eelgrass surveys will be conducted annually during the eelgrass growing season (May to September) ~~considered valid pre-installation surveys if performed less than 2 years~~ prior to gear installation until gear is fully installed at the site.

Mit-3 Vessel Anchors: HIOC will anchor vessels outside of areas containing eelgrass.

Mit-4 Vessel Routes: HIOC will establish a vessel route to access its leases that avoids known native eelgrass (*Z. marina*) ~~beds~~cover, and maintain a no wake zone within a 1,000-foot buffer north of Tuluwat Island to avoid black brant (*Branta bernicla*) gritting sites in the winter (December 15-April 30).

Mit-5 Channels: HIOC will use a 10-foot buffer from the top of bank of channels. Culture equipment will not be installed in the buffer areas.

BMP-7 Bed Access: Vessels may cross areas with eelgrass when the predicted tidal height is +4 feet MLLW or greater by putting the engine in neutral and drifting across areas where eelgrass is present. This type of approach will be used when weather and tidal elevations permit.

~~The HIOC Project would minimize potential interaction between eelgrass and shellfish aquaculture gear based on tidal elevation. According to the *Humboldt Bay Eelgrass Comprehensive Management Plan*, "the upper limits capable of supporting continuous eelgrass habitat were estimated to range from approximately 0.3 to 0.4 m MLLW [+1.0 to +1.3 feet MLLW], while patchy eelgrass associated with pool forming depressions and intertidal channels capable of retaining water during low-tide was found to extend up to 1.4 m MLLW [+4.6 feet MLLW]" (Merkel and Associates 2017). Other observations indicate eelgrass resources can occur as high as +1.5 m (+4.9 feet MLLW) in pooling environments (NOAA 2014), although eelgrass has not been observed that high in the intertidal in the HIOC Project area (Lummis 2020).~~

The tidal elevation where culture is being proposed (+1.6 feet to +4.6 feet MLLW) compared to the upper limit of continuous eelgrass in Arcata Bay (+1.0 feet to +1.3 feet MLLW) means that the proposed HIOC Project avoids the majority of potential eelgrass resources by culturing at a higher elevation. In addition, HIOC will use mitigation measures to avoid placing gear within existing eelgrass beds. While patchy eelgrass can extend up to +4.6 feet MLLW, the location of eelgrass in the HIOC Project area was mapped in 2020 and documented areas of both patchy and continuous eelgrass will be avoided. Further avoidance measures will be used during gear installation for both eelgrass and channels (i.e., Mit-2 and Mit-5). Based on an evaluation of historical eelgrass data (Schlosser and Eicher 2012) and current eelgrass distribution, the tidal elevation of the mudflats where culture is proposed appears to be potentially too high to sustain most eelgrass. Eelgrass in the project vicinity may occur in ponded depressions or deeper channels where eelgrass can avoid desiccation and heat stress. The project incorporates buffers to eelgrass approved by the CCC and Corps in recent approvals for HIOC's shellfish farm in Tomales Bay (Corps 2019, CCC 2019). In evaluating shellfish aquaculture in Washington State, NMFS determined that shellfish aquaculture incorporating the proposed buffer "is not expected to diminish eelgrass density or function of existing eelgrass" (NMFS 2016).

A 5-meter buffer around mapped eelgrass cover is included within the CEMP's definition to, in part, capture spatial and temporal changes in eelgrass distribution. For example, data from Grette Associates (2005, 2008, 2009) indicated that the shoreline edge of eelgrass can expand or contract laterally by up to 4 to 5 meters annually. In addition, eelgrass patches that persisted beyond a season were at least 0.3 m^2 in area with minimum shoot density of 3 shoots per 0.25 m^2. The CEMP identifies the basis for the 5-meter distance as "To encompass fluctuating eelgrass distribution and functional influence around eelgrass cover."

HIOC plans to install 5 to 10 acres per year over a 5-year period, with eelgrass surveys prior to installation to ensure that eelgrass is avoided and other potential impacts (e.g., sediment accumulation) can be monitored and adaptively managed. Given that the HIOC Project will be phased over time and the fact that HIOC plans to install gear both within and outside of the eelgrass growth periods identified in the CEMP, conducting an annual survey between May and September will provide sufficient information to evaluate potential project impacts. It is notable that all of these measures have been used by HIOC in their existing Tomales Bay operation with success. These are the same methods that have been used and approved by both CCC (2019) and the Corps (2019).

If eelgrass does move into areas where gear is installed, post-installation, the literature supports a conclusion that culture operations will not significantly impact eelgrass cover and may provide some benefits, particularly for eelgrass located at the high intertidal elevations found within the project site. Potential recruitment of eelgrass into shellfish aquaculture plots is driven by ~~three~~3 main mechanisms. First, by providing a larger boundary layer and slowing water current speed, shellfish may increase recruitment of floating seeds as they travel singly or within detached reproductive shoots. Retention of seedlings could be facilitated by the off-bottom aquaculture gear by affecting currents and potentially intercepting floating wrack, although the density and type of gear can also impede seed dispersal (Tallis et al. 2009). Additionally, seed dispersal is typically limited outside of an eelgrass bed; approximately 80% of seeds travel within 33 feet of parent plants (Ruckelshaus 1996, Orth et al. 2006). Most eelgrass adjacent to the HIOC Project would be located further than 33 feet from parent plants. Second, by filtering seawater and increasing sediment organic content, bivalves provide superior conditions for seed germination. Eelgrass seed germination is dependent on burial depth, with the highest germination occurring at the anaerobic/aerobic interface (Bigley 1981). Seeds buried below this depth have very low germination and are essentially lost from the population. The presence of shellfish may reduce currents thereby facilitating seed retention, sediment deposition and seed burial to a depth that is appropriate for germination. Third, shellfish may increase the survival of seedlings, which have very high mortality rates, by increasing light levels, nutrients, and protecting against erosion and herbivory (Ruckelshaus 1996, Orth et al. 2006).

Presence of oyster longlines has the potential to result in shading effects on the substrate beneath the lines. Given that longlines will be installed 5 m from existing eelgrass cover and longlines are only a maximum of 4 feet in height off the substrate, there is no potential for longlines to shade existing eelgrass cover. Eelgrass would only be affected if it moves into or near cultivated areas. Again, this would be evidence that HIOC's cultivation supports, not hinders, eelgrass habitat, as has been observed on its existing Tomales Bay farm (CCC 2019). Where eelgrass moved into planted areas in Humboldt Bay, light levels beneath oyster longlines were measured and found to have decreased by as much as 35% compared to reference sites (Rumrill and Poulton 2004). However, the change in light level did not impact eelgrass because the longlines moved with the tide and the shaded area shifted.

The potential for shading effects from flip bags (similar to the longline methods that use tipping bags) within eelgrass beds was evaluated in a study in Washington State in 2016 (Confluence 2016b). Based on field measurements over a 4-week period and physical modeling, it was shown that light levels are slightly reduced under flip bags with PAR levels reduced by 14-23% compared to adjacent reference areas. Overall light levels were substantially higher than eelgrass minimum requirements for growth both under aquaculture gear and in adjacent reference areas. Physical modeling showed that essentially all areas, including areas directly underneath floating gear, receive direct sunlight for at least 50% of the day. Therefore, even if eelgrass moved into areas with longlines, shading does not appear to significantly affect eelgrass cover beneath the longlines because of the shift in the shaded area throughout the day.

While the primar~~i~~ly way in which the HIOC Project will mitigate for potential impacts to habitat is through avoidance of eelgrass and eelgrass-disturbing activities, eelgrass that moves into the culture area would not be restricted from colonizing into the farm. Shellfish aquaculture can work within eelgrass beds, and gear does not significantly change the system. In other words, shellfish gear works within the functions of the habitat and can even improve conditions for eelgrass. Upon incorporation of the above mitigation measures, the impacts to habitat will be less than significant.

Bio-C: Effects to Wetlands. Wetlands, including in Humboldt Bay, provide numerous functions including primary production, flood protection, nutrient removal/transformation, wildlife habitat and recreational opportunities. With the addition of shellfish culture, all these functions continue. Cultured shellfish can contribute to water quality by removing/converting nutrients and other matter in the water column. However, this is most beneficial in systems other than Humboldt Bay that are experience eutrophication. Kellogg et al. (2018) quantified the ecological benefits and impacts of oyster aquaculture in Chesapeake Bay. Water quality, especially related to nutrient removal, was one of the main measurements to understand effects associated with floating and on-bottom culture (i.e., caged grow-out areas). The study's results for water quality indicated that there were few impacts, positive or negative, detected from the oyster aquaculture operations. However, the authors calculated a removal of 21 to 372 pounds (lbs) of nitrogen and 3 to 49 lbs of phosphorus per farm per year. As stated by the Corps (2020; 85 FR 57336), "Oyster mariculture [aquaculture] activities may not provide identical ecological functions and services and functions as natural oyster reefs, but cultivated oysters do provide some of these functions and services without substantial investment of public funds (Kellogg et al. 2018) that may be needed for restoration activities." Similar concepts were discussed in other studies that provided an understanding of what benefits shellfish aquaculture can provide that have been lost due to the historical loss of shellfish biomass through overharvesting (e.g., NRC 2010, Alleway et al. 2019). Additionally, as described in other sections of this IS document, certain wildlife species benefit from the habitat provided by shellfish culture equipment and cultured shellfish. The HIOC Project does not include the removal of any wetlands, placement of fill, or any other interruption or impact to wetland areas. Therefore, the HIOC Project is expected to have a less than significant impact on wetlands.

Bio-D1: Effects to Wintering and Migrating Shorebird Populations. Studies have found that bird responses to the presence of shellfish aquaculture gear have been variable, with the abundance and density of some species being higher while other species numbers are lower. For example, Connolly and Colwell (2005) observed 17 different bird species using the intertidal habitat in Humboldt Bay associated with oyster cultch-on-longline culture. Abundance of most species (7 shorebirds and 4 wading birds) were shown to be more abundant on oyster longline plots compared to adjacent mudflat habitat not containing culture, and ~~three~~3 species (marbled godwit [*Limosa fedoa*], long-billed curlew [*Numenius americanus*] and dunlin) showed mixed results depending on location. A consistent observation by shellfish growers on the West Coast for a variety of culture gear types is that ~~Dunlin~~dunlin often roost on top of shellfish aquaculture gear. Great blue heron occur in Humboldt Bay, but a full study of interactions between these birds and other shorebirds has not been studied in the bay. Connolly and Colwell (2005) concluded their study by indicating: "Overall, birds did not appear to avoid longline areas as compared to adjacent tidal flats. Rather, many species were more abundant and diversity was greater on longline plots."

The only shorebird from the Connolly and Colwell (2005) study that showed lower abundance in longline plots was the black bellied plover. The authors concluded that the greater bird abundances on longline plots were likely in response to increased foraging opportunities or greater prey diversity present because shorebird densities are commonly correlated with the densities of their principal prey (see references cited within).

Mid-sized birds, such as ~~Dunlin~~dunlin, can forage in slightly deeper water (by probing with their bills). Kelly et al. (1996) studied on-bottom culture and found that least sandpipers may forage on oyster bags and willets were attracted to aquaculture plots, while western sandpipers, black-bellied plovers, and dunlin often forage between oyster bags and were less abundant in aquaculture areas. The authors suggest that greater use of control plots by black-bellied plovers may be a result of greater abundance of their principal prey items, or factors related to reduced foraging efficiency related to their visual foraging methods.

van den Hout et al. (2010) conducted a study on predator escape tactics comparing nearshore and farshore foraging species. Nearshore species utilized shoreline habitats that could obscure predator approach (e.g., beach-cast wrack and cover provided by rocks and other habitat structures) and relied on quick escape movements, whereas the farshore species foraged in open mudflats and relied on "many eyes" to detect predators and employed coordinated aerial escape flight maneuvers. The HIOC Project is located in a nearshore environment and can provide similar cover to evade predation. This is further supported by Kelley et al. (1996). While Kelly et al. (1996) suggested that aquaculture equipment could increase risk of predation by raptors, they also observed that foraging least sandpipers remained on the ground beneath oyster racks during attacks by a peregrine falcon, and suggested that the aquaculture areas may have provided increased cover and protected them from predation.

Compared to the Kelly et al. (1996) study of on-bottom culture, both the Connolly and Colwell (2005) and HTH (2015) studies looked at shorebird use of near-bottom oyster cultch-on-longline aquaculture areas. No behavioral differences in shorebird use within the plot were observed (e.g., shorebirds readily foraged under the lines). Shorebirds were observed by HTH (2015) to first access the area when water levels were low enough for shorebirds to stand and forage, and they continued to forage until water levels rose to levels that forced them to cease foraging and leave the site. During the recordings, larger marbled godwits would arrive before small species (i.e., small sandpipers), as the smaller birds can only access the sites when fully exposed or in very shallow water. Although the camera imagery represents a small sample size, the images recorded using trail cameras that recorded images at fixed intervals throughout tidal cycles from HTH (2015) in Humboldt Bay areas where Pacific Seafood (formerly Coast Seafoods) grows oysters confirm the previous findings of Connolly and Colwell (2005), and suggest that shorebird foraging occurred irrespective of the presence of longlines. Shorebird presence in or out of aquaculture areas was primarily dependent on water levels and access to food resources in shallow water or exposed mudflat.

Although marine birds feed at shellfish aquaculture sites, the aquaculture sites themselves do not necessarily attract larger numbers of birds compared to non-cultured areas (Hilgerloh et al. 2001). For instance, Žydelis et al. (2006) found that natural environmental attributes were the primary determinants of densities of wintering surf scoters and white-winged scoters in Baynes Sound, British Columbia, where the primary type of cultivation is Manila clam culture. Moreover, the authors found that shellfish aquaculture variables did not necessarily predict bird densities for the scoter species studied. According to Žydelis et al. (2006), these findings suggest that winter scoter populations and the shellfish aquaculture industry may be mutually sustainable because there was no evidence of a negative impact on scoter populations at the current level of shellfish farming practiced in Baynes Sound. It is notable that in 2001, Baynes Sound had over 20% of habitat used for shellfish culture (Carswell et al. 2006).

The effect that shellfish aquaculture has on marine birds depends on the species involved, the type and intensity of cultivation activity, and the habitats affected. Most studies have described the effects of shellfish aquaculture as being neutral (Roycroft et al. 2004, Žydelis et al. 2006) or even beneficial (Connolly and Colwell 2005, Kirk et al. 2007, Caldow et al. 2007, Žydelis et al. 2009). Culture gear may provide perching and resting areas for local birds (especially cormorants and gulls) when not occupied by personnel performing oyster culture duties.

HIOC anticipates only 2 to 4 roundtrip vessel trips per week to the farm site, including trips during high tide where no anchoring or grounding of vessel is necessary. This small addition of boat traffic to Humboldt Bay will be indistinguishable from existing vessel traffic and will not result in significant increases in disturbances to shorebirds as compared to the existing environment.

In addition, HIOC would comply with the following BMPs:

> **BMP-3 Fish and Wildlife:** During vessel transit, harvest, maintenance, inspection, and planting operations, HIOC will avoid approaching, chasing, flushing, or directly disturbing shorebirds, waterfowl, seabirds, or marine mammals.
>
> **BMP-6 Wetland Buffer:** HIOC has adopted a minimum of a 200-foot buffer between the wetlands associated with the Mad River Slough Wildlife Area and the proposed culture area. Culture equipment will not be installed in the buffer areas.

While there is no potential impact from the HIOC Project that would need to be mitigated regarding potential interactions with wintering and migrating shorebird populations, ~~this is still a common BMP that provides~~these BMPs provide consistency with federal laws and allow for more space between the HIOC Project and areas used by shorebirds. Based on the above analysis, potential impacts to wintering and migrating shorebird populations would be less than significant.

Bio-D2: Effects to Pacific Herring. Herring use Humboldt Bay primarily for spawning and nursery habitat. Herring broadcast spawn adhesive eggs on substrate and vegetation in Humboldt Bay. Herring spawn may adhere to any suitable substrate, including vegetation, rocks, shell fragments, and other hard surfaces (Barnhart 1988).

Rabin and Barnhart (1986) reported that Pacific herring spawn in both North and South bays, but most spawning occurs in the northern end of the bay. Eelgrass is the principal substrate used for spawning in Humboldt Bay. A typical spawning event involves the deposition of herring eggs on approximately 300 acres of eelgrass in North Bay (Mello and Ramsay 2004). This represents less than 10% of available eelgrass used in each spawning event. Spratt (1981) characterizes the herring population as "very small in relation to the spawning area available" suggesting that herring spawning in Humboldt Bay are unlikely to be limited by availability of suitable substrate.

There is some limited potential overlap between Pacific herring and the HIOC Project area. Adult herring use subtidal channels adjacent to spawning areas prior to spawning. Based on data and communications from CDFW about past and current spawning locations, the East Bay channel and Arcata channel are likely locations for pre-spawning holding activities (Mello 2007, Ray, pers. comm., 2015). The majority of spawning activities primarily occur in the East Bay area. These areas would be avoided by the HIOC Project. Limited spawning has been documented in the Mad River

Slough area where the HIOC Project is proposed (Mello and Ramsay 2004, Mello and Stroud 2005, Mello 2007).

In addition, HIOC would comply with the following mitigation measure:

> **Mit-6~~5~~ Pacific Herring:** In any cultivation beds within or adjacent to eelgrass ~~beds~~cover (in the event that eelgrass moves into the project site), HIOC will conduct visual surveys for Pacific herring spawn prior to conducting activities during the herring spawning season (October to April). If herring spawn is present, HIOC will suspend activities in the areas where spawning has occurred until the eggs have hatched and spawn is no longer present (typically 2 weeks).

This mitigation would avoid interactions between herring spawn (if present) and shellfish aquaculture operations. Upon incorporation of the above mitigation measure, the impacts to Pacific herring will be less than significant.

Bio-D3: Effects to Marine Mammals. Harbor seals occur in Humboldt Bay and are known to haul out on mudflats in Arcata Bay. However, the primary haul-out locations are identified in South Bay associated with pupping locations (Gemmer 2002, Ougzin 2013). Ougzin (2013) documented that 88% of seals foraged within 8 miles of their primary haul-out site. The closest primary haul-out location to the HIOC project is more than 1.0 miles away near Sand Island, which indicates that the HIOC Project area is not a primary haul-out location but could be accessed for foraging. California sea lions also occur in Humboldt Bay and occasionally are observed loafing on artificial structures. These marine mammals are expected to primarily use channels for movement and foraging rather than the intertidal areas where shellfish aquaculture would be placed. Thus, the placement of aquaculture gear is not expected to occur in areas important to their movement. Further, even if moving through intertidal areas during high tides, shellfish aquaculture gear is not expected to restrict movements of marine mammals, as these species would readily navigate among the gear.

In addition, HIOC would comply with the following BMP:

> **BMP-3 Fish and Wildlife:** During vessel transit, harvest, maintenance, inspection, and planting operations, HIOC will avoid approaching, chasing, flushing, or directly disturbing shorebirds, waterfowl, seabirds, or marine mammals.

While there is no potential impact from the HIOC Project that would need to be mitigated regarding potential interactions with marine mammals, it is still a common BMP that provides consistency with federal laws. Based on the above analysis, potential impacts to marine mammals would be less than significant.

Bio-D4: Effects to Black Brant. Black brant feed primarily on eelgrass. The HIOC Project will avoid eelgrass. While there may be portions of the mudflat that would be unavailable to birds during a low tide, these areas are not considered suitable foraging habitat for black brant.

This is supported by studies of black brant and shellfish aquaculture interactions have occurred in Humboldt Bay which evaluated shellfish farming activities within dense eelgrass ~~beds~~cover. HT Harvey & Associates (HTH) conducted a survey in April 2015 (HTH 2015) within oyster longline aquaculture (aquaculture plots) and adjacent reference plots. The oyster longline aquaculture gear studied extends up to 3 feet above the sediment surface and occurs in eelgrass ~~beds~~cover.

The HTH (2015) survey indicated that tidal height is the most influential driver in black brant use of an area. During high tides, black brant were observed at similar densities in aquaculture plots (mean density=1.0 birds/acre) and reference plots (mean density=1.3 birds/acre). During low tides, black brant were consistently observed at higher densities in reference plots (mean density=2.6 birds/acre) compared to aquaculture plots (mean density=0.1 birds/acre). Supplemental time-lapse recordings demonstrated that black brant forage in both aquaculture and reference plots when water is sufficiently high to swim, but are less abundant in plots with oyster longlines at lower tides when the gear is exposed. The study authors postulated that the presence of lines during low tide interfered with black brant movement and led to the birds preferentially using areas with eelgrass cover that were adjacent to near-bottom culture plots.

Monitoring in Humboldt Bay during the 2017-2018 wintering and migratory period found no significant difference in black brant usage in culture and adjacent reference plots (HTH 2018), suggesting that earlier observations may be the result of eelgrass abundance within culture areas rather than the presence of culture gear. HTH (2018) found that black brant use is comparable or higher within culture areas compared to adjacent areas, particularly during higher tides when feeding in eelgrass beds may not be available to black brant. It appears that brant may occur at higher concentrations in areas with aquaculture gear where feeding opportunities may exist during higher water levels. A previous study by HTH also evaluated brant utilization of existing shellfish aquaculture plots and concluded: "brant were not deterred from accessing foraging sites that were directly adjacent to aquaculture structure (e.g., along channels adjacent to aquaculture plots). This suggests that impact acreages used for impact assessment should include only the boundaries of the structures and not additional buffer areas that are not directly impacted by aquaculture practices" (HTH 2015).

The study was conducted again in 2020 (HTH 2021). This study's results suggest that "three seasons of sampling [show] that optimal combinations of tide direction and water depth are the primary drivers of brant activity patterns, with newly exposed moderate and low water conditions optimal for foraging. Existing narrow cultch aquaculture plots often appear to attract brant as much or more than similar, nearby plots that lack aquaculture gear, and all three culture plot types [narrow cultch, wide cultch and wide baskets] have attracted more brant than the Control plots at high water depths." The authors suggest that brant use aquaculture areas at similar rates to non-aquaculture areas, and that at high tide aquaculture areas provide dual foraging opportunities where brant may forage on eelgrass wrack or fouling communities associated with culture gear in addition to rooted eelgrass resources.

Collectively, this evidence suggests that black brant's preferred method of foraging is in shallow water when tidal height provides sufficient access to rooted eelgrass. The presence of shellfish gear can affect their foraging only during relatively short periods when the gear impedes their ability to easily swim through aquaculture plots (i.e., when the gear starts to be exposed). All other times, feeding can occur in and around shellfish gear. ~~Further, b~~Because brant appear to only avoid the area directly occupied by the shellfish gear, the 5 meter buffer from eelgrass ~~beds~~cover required under Mit-2 and 10-foot buffer from channels required under Mit-5 should avoid any disturbance to brant foraging within existing eelgrass beds and in adjacent areas. The seasonal avoidance of known brant gritting sites during vessel transit routes will further reduce potential impacts (Mit-4).

Habituation to the same stimulus is also a generally recognized concept, as discussed in Rankin et al. (2009). As Nisbet (2000) notes, often research effects on bird disturbance "have been directed primarily towards cataloguing adverse effects of disturbance and…often mis-cited, selectively cited, or overstated such effects." This is not to suggest that disturbance does not occur or that it does not have an adverse effect on brant or other birds when it does occur; the references to habituation provide context about the environment where the interaction is occurring. Brant in Humboldt Bay will be encountering numerous similar stimuli from boats during their wintering periods.

Schmidt (1999) found that brant in Humboldt Bay spend less than 2% of time on alert or flying behaviors compared to 36% of time spent feeding. Schmidt (1999) noted that "there were many times when large slow-moving boats elicited no apparent response from brant." Schmidt (1999) also noted that "Habituation was apparent at the mid-channel, where people digging clams often approached to within 20 m while brant continued to feed." These observations clearly suggest that there is a degree of habituation to boat traffic by brant in Humboldt Bay.

HIOC will only be adding an additional 2 to 4 roundtrip trips to and from the project site each week, a small increase in the overall boat traffic in Humboldt Bay. Brant are utilizing portions of North Bay near aquaculture gear (for example, an identified roosting site is located in close proximity to Coast Seafood's aquaculture operation) and near channels with significant existing vessel traffic. This is evidence that brant have become habituated to these conditions in a manner where a slight increase in vessel activity is unlikely to result in significant additional flushing or create additional energetic demands for brant.

Therefore, impacts to blank brant are considered less than significant.

Bio-E: Local Policies. There are numerous riparian habitats and other sensitive natural communities that have been identified by local governments, CDFW, and USFWS in the vicinity of the HIOC Project area. These natural communities provide habitat for year-round and migrant species, recreation, environmental interpretation, and preservation of aesthetic resources. The City of Arcata's Marsh and Wildlife Sanctuary also provides wastewater treatment. Specific areas managed by local, state or federal entities protecting riparian habitats and other sensitive natural communities include:

- The Humboldt Bay National Wildlife Refuge Complex, owned and managed by the USFWS. https://www.fws.gov/refuge/humboldt_bay/

- The Arcata Marsh and Wildlife Sanctuary, owned and managed by the City of Arcata. https://www.cityofarcata.org/340/Arcata-Marsh-Wildlife-Sanctuary
- CDFW Ecological Reserves and Wildlife Areas: https://wildlife.ca.gov/Lands/Places-to-Visit: Including the following areas in Humboldt County: Big Lagoon Wildlife Area, Eel River Wildlife Area, Elk River Wildlife Area, Fay Slough Wildlife Area, Headwaters Forest Ecological Reserve, Mad River Slough Wildlife Area, and South Spit Wildlife Area

Plans protecting biological resources in the vicinity of the HIOC Project include the Local Coastal Programs, the Open Space Element of the *Humboldt County General Plan*, comprehensive conservation plans (CCPs), and recovery plans for listed species.

Local Coastal Programs and other relevant documents include:

- District Humboldt Bay Management Plan, http://humboldtbay.org/sites/humboldtbay2.org/files/documents/hbmp2007/HumBayMgmtPLAN_print.pdf
- California Coastal Commission Sea Level Rise Policy Guidance, https://www.coastal.ca.gov/climate/slrguidance.html
- District Humboldt Bay Sea Level Rise Adaptation Planning Project, http://humboldtbay.org/humboldt-bay-sea-level-rise-adaptation-planning-project
- Humboldt County Humboldt Bay Area Plan Sea Level Rise Vulnerability Assessment, https://humboldtgov.org/DocumentCenter/View/62872/Humboldt-Bay-Area-Plan-Sea-Level-Rise-Vulnerability-Assessment-Report-PDF
- Humboldt Bay Area Plan of the Humboldt County Local Coastal Program, https://humboldtgov.org/1678/Local-Coastal-Plan-Update
- Humboldt Bay National Wildlife Refuge Comprehensive Conservation Plan, https://www.fws.gov/refuge/Humboldt_Bay/what_we_do/planning.html
- California Eelgrass Mitigation Policy (CEMP), https://www.cakex.org/sites/default/files/documents/cemp_oct_2014_final.pdf
- Humboldt Bay Eelgrass Comprehensive Management Plan, http://humboldtbay.org/eelgrass-management-plan

These plans and policies call for providing maximum public access and recreational use of the coast; protecting wetlands, rare and endangered habitats, environmentally sensitive areas, tidepools, and stream channels; maintaining productive coastal agricultural lands; directing new development to already urbanized areas; protecting scenic beauty; and locating coastal energy facilities such that they have the least impact. The District's Humboldt Bay Management Plan includes objectives to expand the amount of sustainable aquaculture within Humboldt Bay (District 2007).

One of the main focuses of the Local Coastal Programs and management plans is on eelgrass in Humboldt Bay, including the response to sea level rise. Sea level rise is likely to affect the distribution of eelgrass in the future. Humboldt Bay is predicted to experience the most rapid rates of relative sea level rise on the U.S. West Coast (Shaughnessy et al. 2012, Patton et al. 2017, Laird 2018). Eelgrass is predicted to respond to sea level rise by moving upslope as deeper water habitats become unsuitable due to insufficient light levels, and higher elevation areas provide sufficiently brief exposure conditions to support eelgrass persistence (Merkel and Associates 2017). Projections for eustatic sea level rise suggest a rate of approximately 0.63 mm/year at Humboldt Bay, and 61 to 65 cm by 2100 for northern California (NRC 2012). As stated above, eelgrass may move upslope in response to sea level rise, including moving into the HIOC Project area. HIOC's existing shellfish farm in Tomales Bay provides empirical evidence that eelgrass ~~beds~~ that moves into HIOC's farm area can thrive and continue to coexist with HIOC's shellfish cultivation (CCC 2019).

The Harbor District has led the development of the Humboldt Bay Eelgrass Comprehensive Management Plan (Merkel and Associates 2017). This plan provides an ecosystem based management approach to ensure the greatest benefits to eelgrass and eelgrass function by facilitating more efficient regulatory processes for projects in the bay and providing a long term eelgrass habitat conservation strategy. CEMP (2014) identifies eelgrass management and protection objectives and delineates the ways eelgrass resources should be characterized and protected. The project is consistent with CEMP methodologies, recommendations, and conservation measures.

The *Humboldt County General Plan* was adopted October 23, 2017. The Biological Resources section of the Conservation and Open Space Elements describes the policies for preservation of natural resources, management of production of resources, outdoor recreation, and public health and safety.

The HIOC Project, with inclusion of mitigation measures (see above for eelgrass-specific measures), would not conflict with described plans and policies. Therefore, there would be no impact.

Bio-F: Conservation Plans. Other than the plans and policies described above, there are no habitat conservation plans (HCPs) or other community plans that the HIOC Project would conflict with in terms of the proposed shellfish aquaculture activities. Therefore, there would be no impact.

V. CULTURAL RESOURCES. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?		X		
B) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?		X		
C) Disturb any human remains, including those interred outside of formal cemeteries?		X		

DISCUSSION

CR-A through CR-C: Cultural Resources. The HIOC Project would be implemented in intertidal areas (mudflats) where no cultural or historic resources are known to be present. Although cultural and historic resources are not expected to occur, there are measures in place to provide an inadvertent discovery plan in the event that something is discovered. Very little soil disturbance would occur as part of the HIOC Project (i.e., the only soil disturbance would involve the installation of stakes and posts to support shellfish gear), although there would be some amount of disturbance when placing gear. HIOC would comply with the following mitigation measure:

> **Mit-76 Cultural Resources:** HIOC will comply with the Harbor District Protocol agreed upon between the Harbor District and the Blue Lake Rancheria, Bear River Band of Rohnerville Rancheria, and Wiyot Tribes regarding the inadvertent discovery of archaeological resources, cultural resources, or human remains or grave goods (Appendix B).

Additional information on the inadvertent discovery plan protocols are discussed below under tribal cultural resources. Potential impacts to cultural resources would be less than significant with mitigation incorporated.

VI. ENERGY. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?				X
B) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?				X

DISCUSSION

Energy-A and Energy-B: Impacts from Energy Use. The information provided recently for the Pre-Permitting Project and Yeung Farm (SCH #2017032068) provides a detailed background into the state and regional energy resources and use. The main energy resource that would be used by HIOC is gasoline and diesel for vessels to transport employees, products, and culture gear.

The HIOC Project would result in ~~up to two~~2 to 4 round trips weekly between HIOC's Hatchery Facility and the HIOC Project Area with highly efficient 4-stroke outboard motors. While these trips would consume fuel, the amount of fuel required is a negligible increase in regional demand and an insignificant amount relative to the more than 19 billion gallons of fuel sold in the state as of 2015 (California Energy Commission 2019). This fuel use would not result in the need for new or expanded sources of energy or infrastructure to meet the energy demands of the HIOC Project. Therefore, there no impact is anticipated.

VII. GEOLOGY AND SOILS. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.			X	
ii) Strong seismic ground shaking?				X
iii) Seismic-related ground failure, including liquefaction?			X	
iv) Landslides?				X
B) Result in substantial soil erosion or the loss of topsoil?				X
C) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?				X
D) Be located on expansive soil, as defined by the California Building Code (2007), creating substantial direct or indirect risks to life or property?				X
E) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				X
F) Directly or indirectly destroy a unique paleontological resource or site or unique geological feature?		X		

DISCUSSION

Geo-A: Risks to People or Structures. There are numerous fault lines near the HIOC Project area, as well as the intersection of ~~three~~3 tectonic plates. As such, the area is highly susceptible to seismic activity. However, the HIOC Project would not add any fixed structures to the landscape that would be susceptible to seismic damage, nor would it put existing structures at greater risk. The HIOC Project area is level and lacks structures that could become unstable and injure workers. The sediment could be subject to liquefaction, which would pose a minor risk to workers; however, the risk is considered very low, given that (1) liquefaction of the type that would be a risk to workers is uncommon, and there is no historical evidence of liquefaction in Humboldt Bay; (2) workers would be at the HIOC Project area only temporarily, and no people would inhabit the area; and (3) workers would be near vessels and safety equipment, including personal floatation devices. Therefore, impacts related to seismic risks are expected to be less than significant.

Geo-B: Erosion. Through a study of sedimentation at shellfish culture sites in Humboldt Bay similar to the proposed HIOC Project area, Rumrill and Poulton (2004) found that "fine sediments were deposited and eroded in an inconsistent manner." However, based on the study results, there appears to be a net increase in sediment accumulation, not a loss, at these sites. A minor amount of net sediment deposition, rather than erosion, is expected when shellfish gear is placed in tidelands. Therefore, no impact is expected.

Geo-C: Instability. The HIOC Project would not involve the construction of any permanent structures, and is not expected to affect the potential for onsite or offsite landslides, lateral spreading, subsidence, liquefaction, or collapse. Therefore, no impact is expected.

Geo-D: Expansive Soils. There may be expansive soils in the HIOC Project area; however, the project would not add enclosed or habitable structures (buildings) to the landscape. There would also be no substantial risk to life or property from HIOC Project development. Therefore, no impact is expected.

Geo-E: Wastewater Disposal. The HIOC Project does not involve the development of new wastewater disposal systems. Workers employed through the HIOC Project would use existing facilities (restrooms) at HIOC's Hatchery Facility, which has adequate wastewater capacity. Therefore, no impact is expected.

Geo-F: Unique Paleontological Resource. The HIOC Project is located in intertidal habitat of Humboldt Bay. While there may be tribal cultural resources, as described in Section V and Section XVIII, the proposed culture methods used by HIOC would not significantly disturb the sediment surface in this project area. HIOC would comply with the following mitigation measure:

> **Mit-7~~6~~ Cultural Resources:** HIOC will comply with the Harbor District Protocol agreed upon between the Harbor District and the Blue Lake Rancheria, Bear River Band of Rohnerville Rancheria, and Wiyot Tribes regarding the inadvertent discovery of archaeological resources, cultural resources, or human remains or grave goods (Appendix B).

Additional information on the inadvertent discovery plan protocols are discussed below under tribal cultural resources. Potential impacts to unique paleontological resources would be less than significant with mitigation incorporated.

VIII. GREEN HOUSE GAS EMISSIONS. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?			X	
B) Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?				X

DISCUSSION

GHG-A: Greenhouse Gas Emissions. Greenhouse gas emissions would result from the use of small internal combustion engines associated with use of several vessels, including low draft, 20-foot and 24-foot skiffs and possibly a custom 40-foot vessel equipped with a hydraulic crane for assisting in planting and harvest operations during higher tides. HIOC estimates that these vessels make ~~up to~~2 to 4 ~~two~~ round trips weekly between HIOC's Hatchery Facility and the HIOC Project Area with highly efficient 4-stroke outboard motors. The amount of greenhouse gases generated by these activities would be less than significant.

GHG-B: Plans, Policies, or Regulations Regarding Greenhouse Gases. State of California legislation (Senate Bill 375 and Assembly Bill 32) seeks to reduce greenhouse gas emissions through the practice of smart-growth or mixed-use development. The HIOC Project does not include any upland construction or mobile sources (other than the vessels described above) that could be a potentially significant source of greenhouse gas emissions. The HIOC Project would not conflict with plans, policies, or regulations on greenhouse gas emissions. Therefore, no impact is expected.

IX. **HAZARDS AND HAZARDOUS MATERIALS**. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?			X	
B) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?			X	
C) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
D) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?			X	
E) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?				X
F) Impair implementation of, or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
G) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?				X

DISCUSSION

Haz-A through Haz-C: Transport, Use, Release, or Emission of Hazardous Materials. The only hazardous materials that would be associated with the HIOC Project are fuel and lubricants for vessels and other motors, including for internal combustion engines for the vessels described above. Use of these materials is common in Humboldt Bay and does not represent a significant hazard to the environment or people. HIOC Project personnel would follow all current and standard safety and cleanup protocols for fueling and lubricating engines. To further minimize the potential for spills, common BMPs are used for anyone operating vessels in Humboldt Bay. HIOC uses the following BMPs in their standard operations:

BMP-1 Vessel Maintenance and Fueling: HIOC will maintain all vessels used in culture activities to limit the likelihood of release of fuels, lubricants, or other potentially toxic materials associated with vessels due to accident, upset, or other unplanned events.

HIOC will use marine grade fuel cans that are refilled on land, and HIOC carries oil spill absorption pads and seals wash decks or isolates fuel areas prior to fueling to prevent contaminants from entering the water.

BMP-2 Vessel Motors: HIOC will use highly efficient 4-stroke outboard motors. All motors are muffled to reduce noise.

Overall, potential impacts from hazardous materials used by the HIOC Project would be less than significant. Note that there would be no impact for Haz-C because the HIOC Project area is not within one-quarter mile of an existing or proposed school.

Haz-D: Known Hazardous Sites. Historic land uses around Humboldt Bay have contributed to legacy sediment contamination of both polychlorinated biphenyls (PCBs) and dioxins. The primary source of dioxins in Humboldt Bay is from wood preservative use at lumber mills until the 1980s, which included the use of pentachlorophenol (Zalewski 2011). These contaminants may bind to sediments and can be remobilized by ground disturbing activities.

Humboldt Bay is on the 303(d) list of water bodies impaired due to dioxin and PCB contamination and dairy cattle ranching (SWRCB 2020). There is a former pulp mill and operational lumber mill with known historic dioxin and PCB contamination that is located <0.5 miles from the HIOC Project area. Studies in the Mad River Slough area reported that dioxin concentrations in shellfish were at or below levels found in background conditions associated with food resources throughout the U.S. (PSI 2007). The Mad River Slough is also spot sampled by the Wiyot Tribe under U.S. EPA's CWA§106 program for water temperature, specific conductivity, salinity, dissolved oxygen concentration, pH, and turbidity (Wiyot Tribe 2020). Available years of data include 2004 to 2012 and then 2015. Based on the data summaries, the only water quality exceedances occurred for dissolved oxygen (<6.0 mg/L) on February 2, 2007, and August 24, 2007.

Because the HIOC Project area is located in intertidal habitat in Arcata Bay, it is unlikely that this area included historical uses that would have resulted in contamination. There are contaminated sites located on the margins of the bay next to the Mad River Slough, but hazardous materials are not expected to reach the HIOC Project sites at concentrations that would have any impact on the HIOC Project's workers. In addition, the project's proposed culture method, which only requires the installation of longline stakes within the sediment, limits the potential for sediment disturbance. Therefore, the potential impact is expected to be less than significant.

Haz-E: Aircraft/Airport-related Safety. The only nearby airport is Murray Field, which is a public airport approximately 4 miles from the nearest HIOC Project boundary. Airplanes landing and departing from this airport are not expected to be a hazard for the HIOC Project's workers. Therefore, no impact is expected.

Haz-F and Haz-G: Emergency Response and Fire Hazards. The HIOC Project would not have any effect on an adopted emergency response plan or emergency evacuation plan because it would not impede emergency response or evacuation routes or procedures. Also, because the HIOC Project area is in intertidal area, there is no risk of wildfires. Therefore, no impacts are expected.

X. HYDROLOGY AND WATER QUALITY. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?			X	
B) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?				X
C) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner, which would:			X	
i) Result in substantial erosion or siltation no- or off-site;			X	
ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;			X	
iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or			X	
iv) Impede or redirect flood flows?			X	
D) In flood hazard, tsunamic, or seiche zones, risk release of pollutants due to project inundation?			X	
E) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?			X	

DISCUSSION

Hyd-A: Water Quality and Discharge Standards. The HIOC Project would increase shellfish aquaculture operations in Arcata Bay. The project would not involve waste discharge. No additives, feed, or chemicals will be used in shellfish aquaculture operations (other than fuel for the work vessels). Changes to water quality would be minor, include standard BMPs for vessel operation (see below), and would not violate any water quality standards.

BMP-1 Vessel Maintenance and Fueling: HIOC will maintain all vessels used in culture activities to limit the likelihood of release of fuels, lubricants, or other potentially toxic materials associated with vessels due to accident, upset, or other unplanned events.

HIOC will use marine grade fuel cans that are refilled on land, and HIOC carries oil spill absorption pads and seals wash decks or isolates fuel areas prior to fueling to prevent contaminants from entering the water.

BMP-2 Vessel Motors. HIOC will use highly efficient 4-stroke outboard motors. All motors will be muffled to reduce noise.

Therefore, the impact is considered less than significant.

Hyd-B: Groundwater. The HIOC Project would not involve the use of groundwater. Therefore, no impact is expected.

Hyd-C: Erosion and Siltation. Shellfish aquaculture has a localized effect on sediment distribution and tidal circulation. As water is slowed by frictional effects of the shellfish aquaculture gear, sediment deposition and organic content can increase (Rumrill and Poulton 2004, Forrest et al. 2009). A study of sedimentation at oyster cultch-on-longline sites in Humboldt Bay (Rumrill and Poulton 2004), which are similar to the gear proposed in the HIOC Project area, found that "fine sediments were deposited and eroded in an inconsistent manner." The greatest elevation change was an increase of 95 mm. Localized changes of this magnitude would not have an adverse effect on the environment. Therefore, this impact is considered less than significant.

Hyd-D: Flood Hazard. The HIOC Project would occur entirely in an intertidal area of Arcata Bay. The project will not result in any surface runoff or flooding, affect flood hazard areas, tsunami areas, or seiche zones. Therefore, no impact is expected.

Hyd-E: Water Quality Control Plan. Proposed HIOC Project activities would temporarily mobilize a minor amount of sediment. For example, when stakes are placed or a vessel comes in contact with the bay bottom, sediment may be mobilized. However, the amount of sediment mobilized from near-bottom shellfish aquaculture operations is very low compared to the quantities of sediment mobilized during stormy conditions (e.g., strong winds). There is also potential for release of hazardous materials from internal combustion engines. However, potential impacts would not be expected to substantially degrade water quality. Furthermore, shellfish are filter feeders, which have been found to have a positive impact on water quality. Ecosystem modeling and mesocosm studies indicate that restoring shellfish populations to even a modest fraction of their historic abundance could improve water quality and aid in the recovery of seagrasses (Newell and Koch 2004). However, this benefit is likely small due to the fact that the HIOC Project area is not showing signs of eutrophication.

Even more importantly, shellfish aquaculture operations area dependent on excellent water quality conditions to produce a quality product for human consumption. Because of this incentive, shellfish aquaculture companies like HIOC have consistently been heavily involved in policies and studies to improve water quality in the bays and estuaries where they have products (Dewey et al. 2011). Examples of some ancillary benefits of the shellfish aquaculture industry include:

- Working with local jurisdictions and regulators to identify and eliminate point and non-point source pollution, including agricultural, industrial, and municipal discharges.
- Participating and providing input on regulatory updates to ensure that high water quality standards are included in local, state, and federal policies.
- Lobbying state and federal legislatures for improvements to water quality and developing water quality standards (e.g., shellfish industry contribution to the enactment of the Clean Water Act in 1972).

- Maintaining ownership or leases of large aquatic areas and upland, thereby eliminating the risk of environmentally deleterious uses.
- Participating in and collecting water quality samples as part of monitoring programs with federal and state agencies (e.g., National Shellfish Sanitation Program) to track water quality trends and identify areas targeted for improvement. These efforts have directly resulted in numerous areas now being determined suitable for shellfish harvesting and have provided data for other target areas with opportunities for improvement.
- Donating to local and state organizations to improve water quality conditions within the estuaries that shellfish aquaculture occurs.
- Organizing and participating in beach cleanup events that collect marine debris from both shoreline development and shellfish aquaculture operations.
- Actively engaging in efforts to quickly remediate and clean up oil spills and other hazardous waste sites to protect water quality and the health of shellfish.

Therefore, the impact to water quality is considered less than significant.

XI. LAND USE AND PLANNING. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Physically divide an established community?				X
B) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?				X

DISCUSSION

Land-A: Division of Community. The HIOC Project involves shellfish aquaculture operations in Arcata Bay. There is no construction that would involve creating a physical barrier to movement dividing an established community. Therefore, no impact is expected.

Land-B: Land Use Policy Conflicts. The District's *Humboldt Bay Management Plan* designates the intertidal portion of the HIOC Project area for conservation and mariculture (*Humboldt Bay Management Plan* § 2.2). The HIOC Project area is within Arcata Bay, a sub-area of Humboldt Bay where aquaculture is identified as a generalized preferred use within the *Humboldt Bay Management Plan*. The *Humboldt Bay Management Plan* contemplates mariculture operations within the entire HIOC Project area, noting that the "use of the Bay for aquaculture or mariculture is expected to remain primarily within Arcata Bay, which includes areas that have been leased previously by the District, the cities, or the State of California for mariculture purposes . . . The combining use designation reflects a determination in this Plan that mariculture activities are generally appropriate within the designated area" (*Humboldt Bay Management Plan* § 2.3.3). The HIOC Project is also consistent with the plan's goal of supporting commercial aquaculture and the plan's policy to identify additional aquaculture activities (Policy HFA-5). The plan recognizes the need to balance harbor, recreation, conservation and mariculture uses of the bay.

The Humboldt County General Plan similarly states: "At the present time the North Bay is the heart of the local aquaculture industry, and the resource protection policies in this section and elsewhere in this plan are designed to foster the expected growth of this industry" (Humboldt County 2017). In summary, the HIOC Project would be consistent with zoning and adopted plans for the HIOC Project area as a permitted use. Therefore, no impact is expected.

XII. MINERAL RESOURCES. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?				X
B) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X

DISCUSSION

Min-A and Min-B: Mineral Resources. The HIOC Project would increase shellfish aquaculture operations in Arcata Bay. It would have no effect on mineral resources. Therefore, no impact is expected.

XIII. **NOISE**. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			X	
B) Generation of excessive groundborne vibration or groundborne noise levels?				X
C) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X

DISCUSSION

Noise-A through Noise-C: Noise. The HIOC Project would increase shellfish aquaculture operations on Arcata Bay. Its primary noise effect would be caused by the addition of small vessels with internal combustion engines. These would generate noise similar to that generated by other small vessels on the bay. The HIOC Project vessels would not be heard from sensitive receptors, especially considering a standard BMP used by HIOC for boat motors:

> **BMP-2 Vessel Motors.** HIOC will use highly efficient 4-stroke outboard motors. All motors are muffled to reduce noise.

The project would also cause temporary noise effects during the installation of aquaculture gear, but the noise generated is likely similar to ambient noise conditions at shoreline locations (e.g., cars along the road along the shoreline or other boats on the water). Because the HIOC Project's noise generation would be typical of what already occurs in Humboldt Bay, noise impacts are expected to be less than significant.

XIV. **POPULATION AND HOUSING**. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Induce substantial unplanned population growth in an area, either directly (e.g., by proposing new homes and/or businesses) or indirectly (e.g., through extension of roads or other infrastructure)?				X
B) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?				X

DISCUSSION

Pop-A through Pop-B: Population and Housing. The HIOC Project would increase shellfish aquaculture operations on Arcata Bay. It is not expected to have any effect on population and housing. It may create as many as 4 to 6 new jobs, but those jobs are expected to be filled primarily by people who already live in the region. The effect would not be substantial. Therefore, no impacts are anticipated.

XV. PUBLIC SERVICES. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Fire protection?				X
B) Police protection?				X
C) Schools?				X
D) Parks?				X
E) Other public facilities?				X

DISCUSSION

Pub-A through Pub-E: Public Services. The proposed HIOC Project would not create increased demand for public services. Approximately 4 to 6 people would be employed; they would likely already live in the local community and so would not represent a new burden on public services. The effect would not be substantial. Therefore, no impacts are expected.

XVI. **RECREATION**. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				X
B) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				X

DISCUSSION

Rec-A: Recreation. The HIOC Project would not increase use of existing neighborhood and regional parks or other recreational facilities. Approximately 4 to 6 people would be employed by the HIOC Project, but they would likely already live in the local community and so would not represent a new burden on recreational facilities. The impact to existing neighborhood and regional parks or other recreational facilities from the HIOC Project are considered to be no impact.

Rec-B: Recreational Facilities. The HIOC Project does not include recreational facilities. Approximately 4 to 6 additional people would be employed by the project, but they would likely already live in the local community and so would not represent a new burden on recreational facilities. Even with the additional people employed by the project, they would not result in an expansion of a recreational facility. Hence, no impacts are expected.

XVII. TRANSPORTATION. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?				X
B) Conflict or be inconsistent with CEQA Guidelines Section 15064.3, subdivision (b)?				X
C) Substantially increase hazards due to a geometric design features (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?		X		
D) Result in inadequate emergency access?				X

DISCUSSION

Trans-A, Trans-B, and Trans-D: Traffic Levels, Patterns, and Emergency Access. The HIOC Project would not increase the local population. Up to 4 to 6 people employed under the project would park at HIOC's Hatchery Facility or along adjacent streets to the facility. HIOC's existing facility includes at least 40 parking spaces and there is ample parking available for new employees. The potential impacts would occur only in Humboldt Bay, as discussed below under Trans-C, and is limited to areas outside of navigation channels (i.e., in intertidal areas where vessel activity is limited). There would not be a conflict with circulation system, transit, roadways, pedestrian facilities, CEQA guidelines, or emergency access. Therefore, no impact is expected.

Trans-C: Hazards. The HIOC Project does not add to road features (e.g., sharp curves or dangerous intersections), but does add gear to the intertidal environment in Humboldt Bay. In terms of potential transportation hazards, there is the potential for interaction with recreational vessels. Recreation and shellfish aquaculture are both identified as preferred general uses in Arcata Bay (District 2007), although recreational use of the bay is mostly separated from shellfish aquaculture use by both timing and type of habitat. For example, there is an informal boat launch located approximately 1,500 feet from the nearest corner of the lease area and potential gear that would be placed in higher intertidal habitat (+1.6 feet to +4.6 feet MLLW). While recreational boaters primarily use the channels and not intertidal habitats, the addition of shellfish aquaculture gear could interfere with the movement of vessels (e.g., boats, kayaks) within those intertidal areas.

This interference would occur only when the tides are high enough for vessels to move through the intertidal areas, but so low that that the vessels couldn't move readily over the gear. Shellfish aquaculture gear proposed by HIOC would extend from the bay bottom by a maximum of 3 feet based on the height of the poles (refer to Figures 5-8 above). Tipping bags can extend slightly higher depending on tidal or wave action. This gear is likely to be exposed approximately 30% of the year, during which time boaters would be naturally restricted from the area during low tide events. When the area is inundated, shallow-draft vessels could access the HIOC Project area. Empty space among the gear would allow smaller watercraft (e.g., kayaks) to move about, but in some cases only in ~~two~~2 directions (e.g., parallel to rows of longlines or racks). Vessel movement in subtidal areas, including in the primary navigation channels in Arcata Bay, would not be affected.

To minimize potential hazards, beds will be marked with long PVC poles. There are 12- to 15-foot rows between blocks of 4 longlines or 2 rows of racks for boats to use (i.e., boat easements), and HIOC will inform the District of the location of beds in Arcata Bay and post the locations at the closest boat launch~~, as per BMP-4~~. While there may be some delays or restricted movement of vessels within specific intertidal areas, these ~~measures~~ BMPs are in place to avoid conflicts with recreational boaters.

> **BMP-4 Bed Marking.** HIOC culture beds will be marked with a long PVC pole to provide information to boaters of the location of shellfish aquaculture gear. ~~HIOC will also inform the District of the location of the beds and they will be posted on the District's website.~~
>
> **BMP-5 Bed Mapping.** HIOC will provide a map of the culture bed locations and post the maps at the closest boat launch and adjacent wildlife area and on the District's website.
>
> **BMP-6 Wetland Buffer:** HIOC has adopted a minimum of a 200-foot buffer between the wetlands associated with the Mad River Slough Wildlife Area and the proposed culture area. Culture equipment will not be installed in the buffer areas.

The HIOC Project may also result in accidental loss of shellfish aquaculture gear or other debris into Humboldt Bay. Because the equipment is placed in intertidal areas, it is subject to various natural forces including tide, wind, waves and ultraviolet radiation. As a result, there is potential for equipment to become loose, wash away or otherwise escape into the environment. Escaped shellfish aquaculture gear may pose a hazard to users of the bay, including boaters (kayakers, stand-up paddle boarders, canoers, wind surfers) and scuba divers. When encountered, marine debris associated with shellfish gear may damage boat bottoms or engines, snag on trailing lines or otherwise impair navigation. Recreational users of the bay may encounter escaped gear in shallow intertidal areas, which may then make transit of these areas more hazardous, particularly if escaped gear is wholly or partially buried in the substrate and thus hidden from view.

HIOC routinely inspects intertidal longline systems and rack and bag culture during monthly maintenance work and during harvest. Any pipes or racks disturbed during the harvest are re-secured or removed if damaged. Any identified loose pipes or debris are removed from the culture area. During replanting, pipes and racks are straightened out and replaced as needed. Debris management was incorporated into the HIOC Project as a mitigation measure:

> **Mit-1 Marine Debris.** HIOC will implement a marine debris management plan (Appendix A). At the time of harvest of each cultivation area, HIOC will carry out a thorough inspection to locate and remove any loose, abandoned or out of

use equipment and tools. All floating bags and baskets will be marked or branded with the HIOC's name and phone number.

Overall, the impacts to transportation hazards will be less than significant with mitigation incorporated.

XVIII. TRIBAL CULTURAL RESOURCES. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Would the project cause substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
i) Listed or eligible for listing in the California Register of Historical Resources, or in the local register of historical resources as defined in Public Resources. Code Section 5020.1(k), or		X		
ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.		X		

DISCUSSION

Tribe-A: Tribal Cultural Resources. As discussed under cultural resources above, the HIOC Project would be implemented in intertidal areas (mudflats). While there is very little soil disturbance that would occur as part of the HIOC Project (i.e., the only soil disturbance would involve the installation of stakes and posts to support shellfish gear), there is the potential that placement of gear could disturb cultural or archeological resources. In order to protect potential impacts, HIOC would comply with the following mitigation measure:

> **Mit-7~~6~~ Cultural Resources:** HIOC will comply with the Harbor District Protocol agreed upon between the Harbor District and the Blue Lake Rancheria, Bear River Band of Rohnerville Rancheria, and Wiyot Tribes regarding the inadvertent discovery of archaeological resources, cultural resources, or human remains or grave goods (Appendix B).

The measures detailed out in Appendix B, and provided recently in the Pre-Permitting Project and Yeung Oyster Farm (SCH #2017032068), include an inadvertent discovery plan, including the following protocols:

1. The party who made the discovery shall be responsible for immediately contacting, by telephone, the District.
2. Ground-disturbing activities shall be immediately stopped if potentially significant historic or archaeological materials are discovered. Examples include, but are not limited to, concentrations of historic artifacts (e.g., bottles, ceramics) or prehistoric artifacts (chipped

chert or obsidian, arrow points, groundstone mortars and pestles), culturally altered ash-stained midden soils associated with pre-contact Native American habitation sites, concentrations of fire-altered rock and/or burned or charred organic materials, and historic structure remains such as stone-lined building foundations, wells or privy pits. Ground-disturbing HIOC Project activities may continue in other areas that are outside the discovery locale.

3. An "exclusion zone" where unauthorized equipment and personnel are not permitted shall be established (e.g., taped off) around the discovery area plus a reasonable buffer zone by the District, or party who made the discovery.
4. The discovery locale shall be secured (e.g., 24-hour surveillance) as directed by the District if considered prudent to avoid further disturbances.
5. Upon learning about a discovery, the District shall be responsible for immediately contacting by telephone the contacts listed below to initiate the consultation process for its treatment and disposition:
    a. Tribal Historic Preservation Officers (THPOs) with Blue Lake Rancheria, Bear River Band, and Wiyot Tribe; and
    b. Other applicable agencies involved in HIOC Project permitting (e.g., the Corps, California Coastal Commission, etc.).
6. In cases where a known or suspected Native American burial or human remains are uncovered, the Humboldt County Coroner (707-445-7242) shall also be notified immediately.
7. Ground-disturbing HIOC Project work at the find locality shall be suspended temporarily while the District, THPOs, a consulting archaeologist, and other applicable parties consult about appropriate treatment and disposition of the find. Ideally, a treatment plan may be decided within 3 working days of discovery notification and the field phase of a treatment plan may be accomplished within 5 days after its approval, however, circumstances may require longer periods for data recovery.
8. Any and all inadvertent discoveries shall be considered strictly confidential, with information about their location and nature being disclosed only to those with a need to know. The District shall be responsible for coordinating any requests by or contacts to the media about a discovery.
9. Ground-disturbing work at a discovery locale may not be resumed until authorized in writing by the District.
10. Final disposition of all collected archaeological materials shall be documented in a data recovery report and its disposition decided in consultation with Tribal representatives.

Therefore, potential impacts to tribal cultural resources would be less than significant with mitigation incorporated.

XIX. UTILITIES AND SERVICE SYSTEMS. Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas facilities, the construction or relocation of which could cause significant environmental effects?				X
B) Have insufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?				X
C) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it does not have adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				X
D) Generate solid waste in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?				X
E) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?				X

DISCUSSION

Util-A through Util-C: Wastewater and Stormwater. HIOC Project employees would use the restrooms at the existing HIOC Hatchery Facility. The HIOC Project would not discharge wastewater or stormwater or involve consumption of water. Therefore, no impact is expected.

Util-D and Util-E: Solid Waste. The gear proposed by HIOC for the HIOC Project can be re-used for several years. However, the project would generate waste that would go to a landfill. This waste would include gear from shellfish aquaculture operations that is worn past re-use and other disposable materials. Local landfills would have the capacity to accept this relatively small amount of waste. The HIOC Project would maintain compliance with federal, state, and local statutes and regulations related to solid waste. Therefore, no impacts are expected.

XX. WILDFIRE. If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Substantially impair an adopted emergency response plan or emergency evacuation plan?				X
B) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of wildfire?				X
C) require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?				X
D) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?				X

DISCUSSION

Wildfire-A through Wildfire-D: The proposed HIOC Project occurs in intertidal habitat of Arcata Bay. Due to the presence of water, the HIOC Project does not pose a risk of creating wildfires. No impact is expected.

XXI. MANDATORY FINDINGS OF SIGNIFICANCE.	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
A) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?		X		
B) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects).		X		
C) Does the project have environmental effects, which will cause substantial adverse effects on human beings, either directly or indirectly?				X

DISCUSSION

Findings-A: No. With the mitigation measures described above, the HIOC Project would not degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory.

Findings-B: No. As generally described above, shellfish aquaculture activities do not intrinsically have significant environmental effects. The assessment above, and in Appendix D, is applicable within the context of current and other planned activities in Humboldt Bay. Improvements to water quality by having an industry that is dependent on excellent water quality conditions is a benefit to the bay overall. An assessment of cumulative effects on Arcata Bay (Appendix D) concludes that the project will not result in significant cumulative environmental effects. With the mitigation measures described throughout this IS document, the potential cumulative impacts are expected to be less than significant.

Findings-C: No. The HIOC Project would increase the amount of shellfish aquaculture in Arcata Bay and no aspect of the project is expected to cause substantial adverse effects on human beings, either directly or indirectly.

Section 5.0 Reference List

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Section 6.0 List of Preparers

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Appendix A
Marine Debris Management Plan

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Appendix A: Hog Island Oyster Company Marine Debris Management

Hog Island Oyster Company (HIOC) worked closely with local citizens to address marine debris management in Tomales Bay.Humboldt Bay, basing their strategy on HIOC's experience at its Tomales Bay operations. HIOC will participate in organizing bay-wide cleanups with growers and other interested parties in Humboldt Bay. HIOC also helps organize a yearly bay clean-up event on California Coastal Clean Up Day.

The specific action items that are part of the marine debris management plan include:

- Regularly educate staff on the issues of marine debris. Ensure that all staff do not litter.
- HIOC will strive to continually improve gear, so that breakage and scattering of debris is minimized.
- Avoid the use of any single-use materials. Minimize waste generation, practicing the principals of reduction, re-usereuse, recycling, and recovery. Purchase materials with a long a life span, preferably reusable but at least recyclable
- Secure all buoys/floats properly to minimize loss.
- When tossing out loose bags or bundles of lightweight seed bags, ensure that all bags are either heavy enough not to drift away or secured/anchored to prevent drifting or movement. All loose bags shall be secured within two 2 weeks of being tossed out if not sooner.
- Avoid leaving tools, loose gear, and construction materials on leases and surrounding area for longer than one 1 week. All materials staged on leases shall be secured to prevent movement and or burial.
- All floating bags and baskets will be marked or branded with HIOC's name and phone number.
- If a culture method is unsuccessful, or is not in use for over a period of one1 year, all materials will be promptly removed.
- At a minimum, leases and surrounding areas shall be patrolled for lost and broken gear monthly. Patrols should occur as soon as possible or at least within two2 weeks of any high wind or storm event.
- HIOC will participate in quarterly bay clean-ups, which include walking the bay, shoreline, and wetlands, to get toaccess hard-to-reach areas. An itemized list of any and all debris (including shellfish gear) collected will be recorded and communicated to other growers. With, with the goal being to reduce the total volume of debris that is accumulating in Humboldt Bay.

- HIOC will submit an annual report of its clean-up activities and compliance with this management plan to the Humboldt Bay Harbor, Recreation, and Conservation District; California Coastal Commission; California Department of Fish and Wildlife; and National Marine Fisheries Service. Annual reporting will identify the amount and type of shellfish gear collected during clean-up events.
- If consistent discoveries of certain gear types are made during clean-up events, HIOC will evaluate gear loss reduction measures and will consider alternative gear types or practices.
- HIOC will work with and collaborate with local community and other coastal clean-up people/organizations to coordinate bay-wide clean-up efforts. All trash will be collected (including non-shellfish items) at all times.

Appendix B

Protocols for Inadvertent Archaeological Discoveries for Ground Disturbing Project Permits, Leases, and Franchises

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Appendix B: Protocols for Inadvertent Archaeological Discoveries for Ground Disturbing Project Permits, Leases, and Franchises

Hog Island Oyster Company (HIOC) has a total lease area of 110 acres. Within this area, HIOC seeks permitting to cultivate oysters in up to 30 acres within a 34-acre area available for shellfish aquaculture on leased, intertidal areas in northwest Arcata Bay near the Mad River Slough. The following information was revised from recent permitting documents related to shellfish aquaculture projects in Humboldt Bay. The information and protocols described in this document are modified from the Humboldt Bay Harbor, Recreation and Conservation District (the District) documents (SCH #2015082051 and #2017032068).

Humboldt Bay is the ancestral heartland of the Wiyot Indians, whose native language is affiliated with the Algonquian language family and who had occupied the bay area for at least 2,000 years by the time the first recorded European maritime explorers entered the bay in 1806 and the first American towns were established in 1850. There are hundreds of known and undiscovered archaeological sites around Humboldt Bay that evidence Wiyot history and prehistory. Today, citizens of Wiyot ancestry are affiliated with ~~three~~3 federally_recognized tribes located in the ancestral homeland: Blue Lake Rancheria, Bear River Band of the Rohnerville Rancheria, and the Wiyot Tribe at Table Bluff Reservation.

B.1 Applicable Laws

A number of state and federal historic preservation laws, regulations, and policies address the need to manage potentially significant and/or sensitive (e.g., human remains) archaeological and Native American resources identified during permit review or discovered inadvertently.

- California Environmental Quality Act (CEQA) – Requires analysis by the Lead Agency under CEQA, to determine if a proposed project will cause a significant impact to "historical resources" including archaeological and Native American sites. Project approval may be conditional; for example, avoidance or mitigation (data recovery) of known archaeological resources, monitoring of ground-disturbing activities in identified sensitive areas by local tribal representatives and/or professional archaeologists, and implementation of protocols for inadvertent archaeological discoveries.

- Section 106 of the National Historic Preservation Act (NHPA) – Requires analysis by the Lead Federal Agency and consultation with the California State Historic Preservation Officer (SHPO), Advisory Council on Historic Preservation (ACHP), culturally affiliated Native American tribes, and others, as appropriate, to "resolve adverse effects" on "historic properties" including archaeological and Native American sites. Section 106 is the key federal historic preservation law, and final approval of the undertaking may be conditional as specified in a legally binding agreement among the parties.

Several laws and their implementing regulations ~~spell out~~specify evaluation criteria to determine what constitutes a significant site or a significant discovery:

- California Register of Historical Resources criteria (California Code of Regulations, Title 14, Chapter 3, Section 15064.5), for archaeological and Native American resources qualifying for consideration under CEQA.
- National Register of Historic Places criteria (36 CFR 63), qualifying for consideration under NHPA Section 106 and the National Environmental Policy Act (NEPA).

State laws call for specific procedures and timelines to be followed in cases when human remains are discovered on private or non-federal public land in California. It includes penalties (felony) for violating the rules for reporting discoveries, or for possessing or receiving Native American remains or grave goods:

- Section 7050.5 of the California Health and Safety Code and Section 5097.98 of the Public Resources Code (PRC) outline requirements for handling inadvertent discoveries of human remains, including those determined to be Native American with or without associated grave goods, found on private or non-federal public lands. PRC 5097.99 (as amended by SB 447) specifies penalties for illegally possessing or obtaining Native American remains or associated grave goods.

Another California law imposes strong civil penalties for maliciously digging, destroying, or defacing a California Indian cultural or sacred site:

- California NHPA of 2002 (Chapter 1.76 of the PRC 5097.993 - 5097.994), imposes civil penalties including imprisonment for up to ~~one~~1 year and/or fines up to $10,000 per violation, for persons who unlawfully and maliciously excavate upon, remove, destroy, injure, or deface a Native American historic, cultural, or sacred site that is listed or may be listed in the California Register of Historic Resources.

B.2 Standard Operating Procedures

The following standard operating procedures for addressing inadvertent archaeological discoveries shall apply to all phases and aspects of work carried out under the authority of the District for those parties that obtain a permit, lease, or franchise for projects that involve ground-disturbing activities within its jurisdiction. It shall apply as well to the District's activities involving ground disturbances. In all cases, these standard operating procedures shall apply to their respective employees, officers and agents, including contractors whose activities may potentially expose and impact significant or sensitive resources.

The intent is to avoid or minimize direct or indirect impacts to significant archaeological or Native American discoveries that may qualify for inclusion in the California Register of Historical Resources and/or the National Register of Historic Places.

These standard operating procedures are intended to serve as standard guidelines to the District for compliance with CEQA, NHPA Section 106, and NEPA requirements for considering inadvertent archaeological discoveries.

Responsibility for Retaining Services of As-Needed Professional Archaeologist

If an inadvertent discovery of archeological resources, human remains and/or grave goods occurs, the District or those parties that obtain a permit, lease, or franchise shall be responsible for retaining as-needed services of a qualified Archaeologist, meaning the individual meets the Secretary of the Interior's Professional Standards for an Archaeological Principal Investigator and/or is listed as Registered Professional Archaeologist (see website at www.rpanet.org). The professional will provide as-needed services to conduct rapid assessments of potentially significant archaeological finds discovered during the HIOC Project implementation.

Designated Points of Contact (POC) for Notification of Discoveries

The District, those entities that obtain a permit, lease, or franchise from the District, their construction contractor(s), and other applicable local, state or federal agencies shall each designate a representative who shall act as its official Point of Contact (POC) and who shall be notified immediately upon the inadvertent discovery of an archaeological find or the inadvertent discovery of human remains and /or grave goods during HIOC Project implementation.

The federally recognized Blue Lake Rancheria, Bear River Band of the Rohnerville Rancheria, and Wiyot Tribe each has citizens that recognize Wiyot ancestry. Each Tribe's appointed Tribal Historic Preservation Officer (THPO) is designated as the POC (Table B-1) and shall be immediately notified by the District's POC should an archaeological site (with or without human remains) be inadvertently discovered. The District POC is also listed below.

Table B-1. Designated Tribal and Harbor District Points of Contact

Tribe	Address	Office Telephone	Cultural Staff*
Blue Lake Rancheria	428 Chartin Road P.O. Box 428 Blue Lake, CA 95525	(707) 668-5101x1037 Fax (707) 688-4272 Cell (530) 623-0663	Janet Eidsness, THPO
Bear River Band of the Rohnerville Rancheria	266 Keisner Road Loleta, CA 95551	(707) 733-1900x233 Fax (707) 733-1972 Cell (707) 502-5233	Erika Collins, THPO
Wiyot Tribe	1000 Wiyot Drive Loleta, CA 95551	(707) 733-5055x107 Fax (707) 733-5601	Ted Hernandez, THPO
Harbor District	601 Startare Drive Eureka, CA 95501	(707) 443-0801 Fax (707) 443-0800 Cell (707) 496-2088	Adam Wagschal, Deputy Director

*Contacts identified as of 11/24/2020
THPO = Tribal Historic Preservation Officer

B.3 Inadvertent Archaeological Discovery (General)

The general inadvertent archaeological discovery measures detailed out in this section were recently provided in the Pre-Permitting Project and Yeung Oyster Farm (SCH #2017032068), and include the following:

1. The party who made the discovery shall be responsible for immediately contacting, by telephone, the District.
2. Ground-disturbing activities shall be immediately stopped if potentially significant historic or archaeological materials are discovered. Examples include, but are not limited to, concentrations of historic artifacts (e.g., bottles, ceramics) or prehistoric artifacts (chipped chert or obsidian, arrow points, groundstone mortars and pestles), culturally altered ash-stained midden soils associated with pre-contact Native American habitation sites, concentrations of fire-altered rock and/or burned or charred organic materials, and historic structure remains such as stone-lined building foundations, wells or privy pits. Ground-disturbing HIOC Project activities may continue in other areas that are outside the discovery locale.
3. An "exclusion zone" where unauthorized equipment and personnel are not permitted shall be established (e.g., taped off) around the discovery area plus a reasonable buffer zone by the District, or party who made the discovery.
4. The discovery locale shall be secured (e.g., 24-hour surveillance) as directed by the District if considered prudent to avoid further disturbances.
5. Upon learning about a discovery, the District shall be responsible for immediately contacting by telephone the contacts listed below to initiate the consultation process for its treatment and disposition:
    a. THPOs with Blue Lake Rancheria, Bear River Band, and Wiyot Tribe; and
    b. Other applicable agencies involved in HIOC Project permitting (e.g., the Corps, California Coastal Commission, etc.).
6. In cases where a known or suspected Native American burial or human remains are uncovered, the Humboldt County Coroner (707-445-7242) shall also be notified immediately.
7. Ground-disturbing HIOC Project work at the find locality shall be suspended temporarily while the District, THPOs, a consulting archaeologist, and other applicable parties consult about appropriate treatment and disposition of the find. Ideally, a treatment plan may be decided within 3 working days of discovery notification and the field phase of a treatment plan may be accomplished within 5 days after its approval, however, circumstances may require longer periods for data recovery.
8. Any and all inadvertent discoveries shall be considered strictly confidential, with information about their location and nature being disclosed only to those with a need to

know. The District shall be responsible for coordinating any requests by or contacts to the media about a discovery.

9. Ground-disturbing work at a discovery locale may not be resumed until authorized in writing by the District.
10. Final disposition of all collected archaeological materials shall be documented in a data recovery report and its disposition decided in consultation with Tribal representatives.

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Appendix C

Sampling Plan for Hog Island Oyster Company (HIOC) and Humboldt Bay Oyster Company (HBOC)

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SAMPLING PLAN
FOR
HOG ISLAND OYSTER COMPANY (HIOC)
HUMBOLDT BAY OYSTER COMPANY (HBOC)

HIOC TRACT A AND
HBOC 2020 SUBLEASE PARCEL
IN HUMBOLDT BAY

March 2020

I. INTRODUCTION

The main goal of this sampling plan is to define sampling criteria and conditions, including general adverse pollution condition(s) (APC), that meet standards of the National Shellfish Sanitation Program (NSSP, 2017) for a potential water quality evaluation of proposed shellfish lease area. The potential water quality evaluation is for purposes of classifying the shellfish growing area in accordance with the NSSP for the issuance of a Shellfish Growing Area Certificate. A completed certificate application for this area has not been submitted nor accepted by the California Department of Public Health (CDPH) as of March 3, 2020. CDPH classifies growing areas and assesses water quality using fecal coliform concentrations (FC) in the growing area in conformance with NSSP standards and conditions. CDPH has agreed to train and certify water quality samplers, coordinate to set up preliminary water quality stations and define general APC sampling targets. Once a completed growing area application is accepted by CDPH, a formal sanitary survey of the area including evaluations of actual and potential pollution sources can commence and the water quality data that has been collected in accordance with conditions of this sampling plan will be evaluated for purposes of classifying the area.

There are two adjacent proposed shellfish areas, HIOC Tract A (Tract A) and HBOC 2020 Sublease Parcel (Sublease Parcel). **Tract A** is a 94 acre trapezoid-shaped parcel in Humboldt Bay approximately 1,300 feet southeast of the Mad River Slough bridge (Highway 255). The area is primarily on mud flats west of the Mad River Channel. The southeastern edge of the tract enters the channel. The northern border of the tract is parallel to the south side of the Mad River Channel and the eastern border of the tract is parallel to the west side of the Mad River Channel after the first meander (bend). **Sublease Parcel** is a 20 acre L-shaped parcel that wraps around the northern and upper eastern borders of Tract A. The entire northern border of Tract A is shared with Sublease Parcel. The entire outer edge border (the side opposite to Tract A) is in the Mad River Channel.

A large tidal channel connected to the Mad River Channel enters the proposed areas near the northwest corner of the both parcels and exits approximately in the center of the western perimeter line of Tract A.

The east side of the proposed growing areas overlap portions of a currently *Conditionally Approved* classified growing area in rainfall Zone C represented by Water Quality (WQ) Sampling Station 20 and in rainfall Zone E represented by WQ 26 and WQ 25 (not shown on map). The remaining portion of the proposed area is unclassified and therefore considered *Prohibited*.

This sampling plan will use existing WQ 20 and WQ 26 for monitoring FC, along with WQ 81, established on December 2, 2019, and WQ 83, established February 25, 2020 (Table 1). These new stations are in and adjacent to the aforementioned unnamed tidal channel inside the proposed area near the western perimeter line and northwestern perimeter corner, respectively. These new stations are preliminary and may not be the final compliance stations for the growing area when it is classified. These sampling stations were selected with the intent to capture potential sources of pollution in accordance with APC sampling. After initial samples are collected, there is flexibility to target additional adverse conditions not currently defined in this plan. There may be additional pollution sources not accounted for by the preliminary stations. If there are additional pollution sources or the proposed stations are not sufficient to address all potential sources of pollution, additional WQ stations may need to be added.

A previous version of this Sampling Plan (January 2020) established WQ 82 because it was written only considering the classification request for Tract A. This version replaces WQ 82 with WQ 83 to incorporate Sublease Parcel because the position of the new station is more representative of the two areas combined.

The primary goal of this sampling plan is to evaluate water quality in the unclassified portions of Tract A and Sublease Parcel under adverse conditions. Additional goals are to compare the FC results from new stations WQ 81 and WQ 83 to existing stations WQ 20 and WQ 26 to evaluate which stations would best represent the proposed growing area. In order to compare WQ at the stations, samples should be collected from the stations on the same date and as close in time as possible. Stations 20, 26, 81 and 83 should be sampled and evaluated using the APC sampling strategy, as described in Section II. A. below.

If it is determined that stations WQ 81 and/or WQ 83 are closer to potential pollution sources and best represent the proposed growing area or additional best representative sampling stations are identified, then 30 samples from each station would need to be collected under conditions defined in Section II below, in accordance with the NSSP Model Ordinance Chapter IV @.02 requirements for a new growing area. At least 5 samples must be collected per calendar year to ensure current data is used in determining a geometric mean for classification.

For purposes of classifying the growing area, water quality monitoring can only be conducted by persons who have been trained by CDPH staff in the procedures outlined in the sampling protocol (Table 2). Samples collected by persons not trained by CDPH staff will not be used in the data set to classify the growing area.

Table 1. Water Quality Stations.

WATER QUALITY STATION	LATITUDE	LONGITUDE	DESCRIPTION
WQ Station #20	40.8588	-124.141	Mad River Channel Below First Meander
WQ Station #26	40.85376	-124.147	HIOC Tract West of Mad River Channel
WQ Station #81	40.85959	-124.1486	HIOC Tract West Tidal Channel
WQ Station #83	40.868677	-124.145613	Mad River Channel Southeast of Northwest Tidal Channel
WQ Station #82 (INACTIVE)	40.86214	-124.1465	HIOC Tract Northwest Tidal Channel (INACTIVE)

Table 2. Company Personnel Currently Certified to Collect Samples.

COMPANY NAME	CERTIFIED SAMPLER NAME	DATE OF CERTIFICATION
HBOC	Colin Goetz	October 28, 2019
HBOC	Todd Van Herpe	October 28, 2019
HIOC	Lucas Sawyer	January 13, 2020
HIOC	Justin Mojnnier	January 13, 2020
HIOC	Chad Martel	January 13, 2020

II. SAMPLING FOR *CONDITIONALLY APPROVED* EVALUATION

A. ADVERSE POLLUTION CONDITION SAMPLING

Samples to be used for evaluating the classification should be collected during adverse conditions as defined below whenever possible. Samples collected on consecutive days after a rainfall event are encouraged. This sample strategy can show how long it takes for water quality samples to reduce to acceptable levels of FC after rainfall events, if such impacts exist.

Adverse conditions are defined as:

1. Sub-threshold Rainfall: Any period of rainfall less than or equal to 0.50 inches in 24-hours as close to 0.50 inches as possible.

2. Storm Period: Any period 6 to 24 hours following a recorded moving maximum 24-hour rainfall total of 0.50 to 3.0 inches.

3. Post-storm Period: Any period 24 hours to 5 days following a recorded moving maximum rainfall total of >0.50 inches in 24 hours, on a daily basis.

    a. Samples collected more than 24 hours after a maximum recorded 24-hour rainfall total greater than 3.0 inches are useful for determining a rainfall closure length.

All samples must be collected on an Ebb (outgoing) tide. An ebb tide is defined as any period between one hour after the high tide point and up until the low tide point.

For purposes of determining the maximum moving 24-hour rainfall total, the rain gauge at the NWS Eureka California station (https://www.wrh.noaa.gov/eka/obs/getcgr.php?wfo=eka&sid=eka&obs=eka) should be used, or an alternate rain gauge selected by CDPH if the NWS gauge is unavailable.

B. ADVERSE POLLUTION CONDITION STANDARDS

The NSSP standards for the APC strategy for the *Conditionally Approved* classification are: the geometric mean cannot exceed 14 most probable number per 100 milliliters (MPN/100 ml) and no more than 10 percent of samples can exceed 43 MPN/100 ml, with a minimum of 30 samples collected and analyzed prior to evaluating the classification.

C. DRY PERIOD SAMPLING

During dry periods, samples may be collected and will count towards the minimum 30 samples for classification indicated above. No more than one sample per day may be collected per station for the classification dataset. If the proposed areas are classified but there is insufficient data to evaluate the effect of rainfall on water quality, conservative rainfall rules will be instituted and any measurable rainfall will result in closure of the areas. The conservative rainfall rules will be in place until sufficient data is collected during adverse conditions to determine alternate rainfall thresholds and closure lengths.

All samples must be collected on an Ebb (outgoing) tide. An ebb tide is defined as any period between one hour after the high tide point and up until the low tide point. Any samples not collected on the ebb tide will not be utilized in the classification data set.

III. SAMPLING PLAN PROVISIONS

The following provisions of Section III need to be met in order for collected water quality samples to be used for determining the appropriate shellfish growing area classification.

1. Hog Island Oyster Company (HIOC), Humboldt Bay Oyster Company (HBOC) or CDPH-trained designee will arrange for the collection, transportation and analysis of all samples necessary for this initial sampling of the proposed growing area in accordance with the standards and guidelines in the current edition of the NSSP Model Ordinance (2017), and for associated costs.

2. HIOC, HBOC or CDPH-trained designee will follow the applicable water sampling procedures outlined in Appendix A to this plan.

3. HIOC, HBOC or CDPH-trained designee will provide its sampling personnel with all equipment and supplies needed for sample collection, preservation, and transportation to the laboratory named below. A list of equipment and supplies needed is included in the sampling protocol provided as Appendix A to this plan.

4. Laboratory analyses will be microbiological analyses of water samples for fecal coliform bacteria according to the NSSP approved method.

5. Any laboratory utilized by HIOC, HBOC or CDPH-trained designee to perform analysis of shellfish and shellfish growing waters must be evaluated by the Food and Drug Administration or by the Environmental Laboratory Accreditation Program (ELAP) and found in conformance with NSSP provisions. The closest laboratory to the proposed area is: Humboldt County Public Health Laboratory (529 I Street, Eureka, CA 95501).

6. HIOC, HBOC or CDPH-trained designee will transport or arrange for the shipment of samples to the laboratory. Immediately after collection, samples shall be packed in an insulated cooler kept at 1°-10° C with frozen gel packs (not wet ice). The sample must arrive at the laboratory at or below the water temperature of the sample's collection site. Samples must arrive at the laboratory such that laboratory staff can begin the testing procedure within 30 hours of sample collection. It is highly preferable to have samples arrive at the laboratory within four (4) hours of collection. The submitter shall direct the laboratory to analyze samples for fecal coliform and

salinity; the latter may be omitted if the submitter can provide reliable field measurements for salinity.

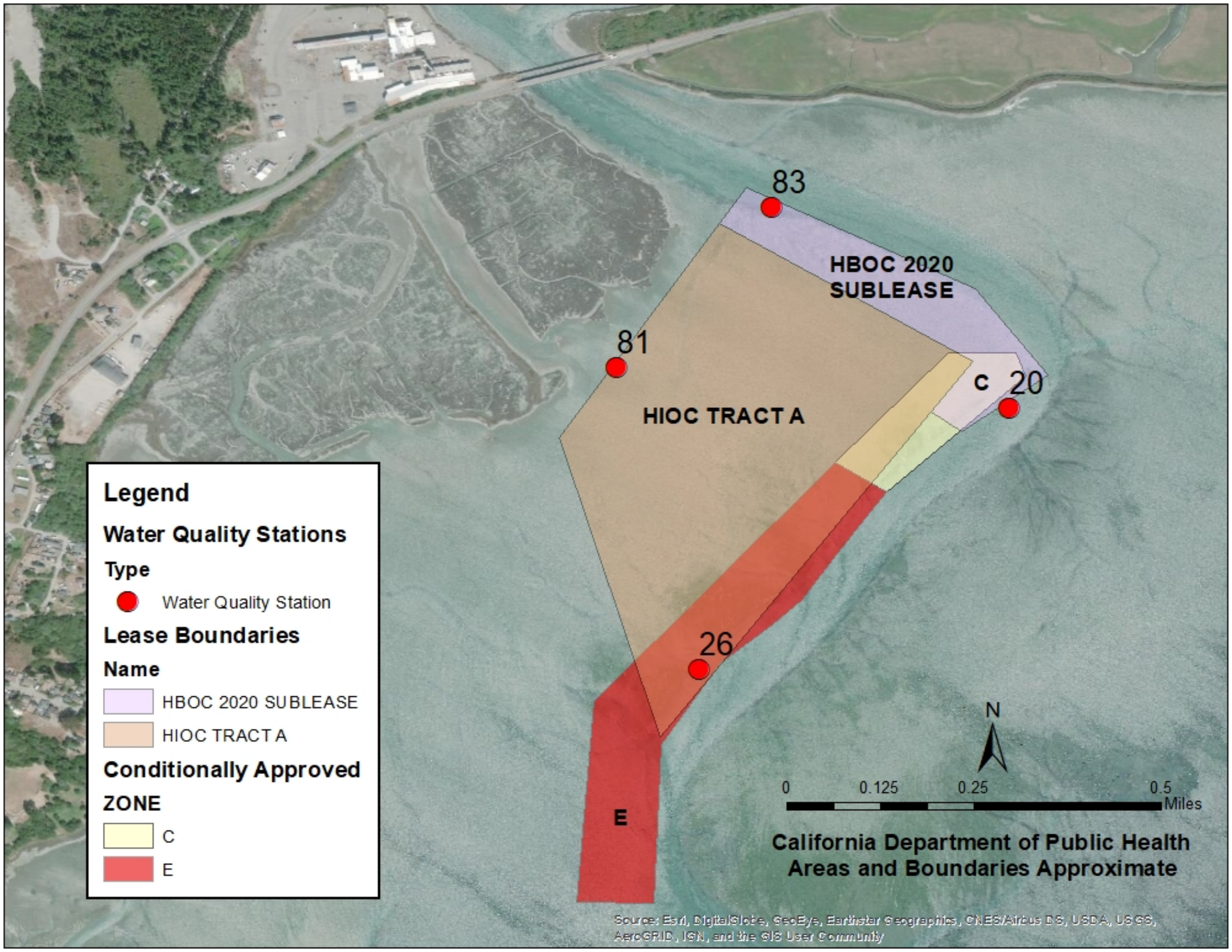
7. Upon completion of the analysis of each set of samples submitted by HIOC, HBOC or CDPH-trained designee, HIOC or HBOC will direct the laboratory to transmit a report of its results by email as soon as possible to shellfishpreharvest@cdph.ca.gov.

8. This plan may be revised by CDPH at any time because of changing conditions or other new information that it shall state in writing to HIOC and HBOC.

IV. REFERENCES

NSSP 2017. Guide for the Control of Molluscan Shellfish: 2017 Revision. National Shellfish Sanitation Program. United States Food and Drug Administration.

Figure 1. Map of the proposed areas overlaid onto the current *Conditionally Approved* area along the Mad River Channel.



APPENDIX A

WATER QUALITY SAMPLING PROTOCOL UNDER ADVERSE POLLUTION CONDITIONS

A. EQUIPMENT AND SUPPLIES NEEDED BY SAMPLER:

1. Sterile water sample bottles (approximately 110 mL or larger size) as provided by an ELAP or FDA certified laboratory, with numbered labels, one per sample plus several extras.
2. Laboratory Submission Form (Figures 2 and 3).
3. Water sampling pole (a broom handle with a radiator hose clamp bolted to one end to hold a sample bottle is sufficient).
4. Water thermometer, Celsius, capable of reading to nearest 1/2 degree.
5. Water bucket (optional).
6. Cooler or insulated shipping container with frozen gel packs.
7. Clipboard or other writing surface.
8. Pen or pencil.
9. Watch.
10. Sample station map.
11. Vessel in safe operating condition with required safety and personal flotation equipment.

NOTE: Appropriate sample bottles and lab slips may be obtained from the certified shellfish laboratory at which grower has established an account.

B. WATER SAMPLING PROCEDURES (INSTRUCTIONS TO SAMPLER)

1. General Requirements

   a. Collect samples at Water Quality Stations 81, 83, 20 and 26 under conditions according to Section II of this Sampling Plan.

   b. All samples should be collected on an Ebb (outgoing) tide. An ebb tide is defined as any period between one hour after the high tide point and up until the low tide point.

   c. Provide ample notification to selected laboratory to ensure that the scheduled sample(s) will be analyzed. Provide the following information: type (e.g. shellfish growing water) and number of samples you will send, date and approximate time of delivery to lab.

   d. Ensure that enough sterile sample bottles and Laboratory Submission Forms are on hand. Any sample bottles on hand must be stored in a clean, dry place free of vermin or other possible source of contamination.

e. If weather or other conditions are hazardous, postpone sampling until the next safe opportunity (appropriate tide when growing area is open). If a sampling is postponed, notify the laboratory as soon as possible by telephone.

2. Sample Collection Procedures

a. Carefully remove cap and hold in one hand so inside surfaces of cap and bottle are not touched or otherwise contaminated.

b. Avoiding visible debris or floating material, dip bottle underwater, mouth down, and with a slow sweeping motion to one side, turn bottle right side up to fill. Take sample beneath the surface about six inches and no deeper than one foot.

c. Bring bottle to surface and tip out a little water to produce a small, about one-quarter inch, amount of air space.

d. Carefully replace cap, without contaminating the sample, and screw on tight. If a sample bottle accidentally becomes contaminated, do not use; sample with another bottle and discard contaminated bottle.

e. Record on the Laboratory Submission Form the station number, sampling time and bottle cap number.

f. Place sample bottle in cooler. Use frozen gel packs in cooler, not wet ice, to avoid possible contamination of sample from contact with melt water.

g. Collect an additional sample at the first station and label it “Temperature Blank”. This sample should be handled identically to all other samples. Upon receipt of the samples, the laboratory will check the temperature of the Temperature Blank to ensure it is within the proper temperature range.

h. Record water temperature at each station, to the nearest 1/2 degree Celsius, and salinity, if applicable. Take temperature of water collected in a bucket or alongside boat; do not insert thermometer or anything else into sterile sample bottle.

i. Complete the Laboratory Submission Form for each group of samples.

j. Transport or ship samples so they are delivered to the laboratory as soon as possible, and no more than 24 hours after first sample was collected (maximum holding time is 30 hours for lab processing). Samples should be kept in a cooler with frozen gel packs or placed in a refrigerator adjusted to a temperature of 4° Celsius (39° F). Samples must be held in a container capable of maintaining a temperature of 1° - 10° C (Do not use wet or dry ice). The sample must arrive at the laboratory at or below the water temperature of the sample’s collection site (measured in step 2.h.).

Any questions regarding this sampling plan should be directed to Steve Etter at (510) 412-4631 or Steve.Etter@cdph.ca.gov or mailed to: Environmental Management Branch, California Department of Public Health, 850 Marina Bay Parkway, MS G165, Richmond, CA 94804.

Figure 2. Example of HBOC Humboldt County PHL laboratory submission form.

HUMBOLDT COUNTY PUBLIC HEALTH LABORATORY

ELAP CERTIFICATION # 2033
JEREMY CORRIGAN, LABORATORY MANAGER
529 I Street Eureka, CA 95501, Phone:(707) 268-2179, Fax: (707) 445-7640
Email: HCPHL@co.humboldt.ca.us

Water Chain of Custody for **Humboldt Bay Oyster Company** **Client# 97**

Collected By:	**FOR LAB USE ONLY**
Date/ Time Delivered:	Received By:
Delivered By:	Date/ Time Received:
Phone:(707) 442-2727 Primary Contact Todd Van Herpe Cell: (707) 499-2388	Scan & email a copy of results to: terry@hogislandoysters.com, lucas@hogislandoysters.com, hboc@suddenlink.net, and the CDPH Group

Lab Test #	Lab Sample Location #	BOTTLE # No Neutralizer	Date/Time Collected	Site# Sampled	Site Salinity g/100g	Site Temp ◦C	Sample Type/ Test
	23338			20			Sea Water/ A-1 15 tube MTF
	23339			26			Sea Water/ A-1 15 tube MTF
	23340			81			Sea Water/ A-1 15 tube MTF
	23627			83			Sea Water/ A-1 15 tube MTF

Comments/ other:

☐Check here if samples received on ice	Temp Blank Bottle #	Date/Time Collected	Initials: Temp (1˚C-10˚C):	**Temperature Control** **☐SN:112008318 LAB** **☐SN:112008370 Rm 135**

Figure 3. Example of HIOC Humboldt County PHL laboratory submission form.

HUMBOLDT COUNTY PUBLIC HEALTH LABORATORY
ELAP CERTIFICATION # 2033
JEREMY CORRIGAN, LABORATORY MANAGER
529 I Street Eureka, CA 95501, Phone:(707) 268-2179, Fax: (707) 445-7640
Email: HCPHL@co.humboldt.ca.us

Water Chain of Custody for **Terry Sawyer, Hog Island Oyster Company Client# 338**

Collected By:	**FOR LAB USE ONLY**
Date/ Time Delivered:	Received By:
Delivered By:	Date/ Time Received:
Phone:(415)669-1149 Phone: (415) 609-6514 Primary Contact Lucas Sawyer Cell: (415) 250-0217	Scan & email a copy of results to: terry@hogislandoysters.com, lucas@hogislandoysters.com, hboc@suddenlink.net, and the CDPH Group

Lab Test #	Lab Sample Location #	BOTTLE # No Neutralizer	Date/Time Collected	Site# Sampled	Site Salinity g/100g	Site Temp °C	Sample Type/ Test
	23338			20			Sea Water/ A-1 15 tube MTF
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	23340			81			Sea Water/ A-1 15 tube MTF
	23627			83			Sea Water/ A-1 15 tube MTF

Comments/ other:

☐Check here if samples received on ice	Temp Blank Bottle #	Date/Time Collected	Initials: Temp (1°C-10°C):	**Temperature Control** ☐**SN:112008318 LAB** ☐**SN:112008370 Rm 135**

Appendix D
Cumulative Impacts Analysis

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Appendix D: Cumulative Impacts Analysis

Section 15130 of the California Environmental Quality Act (CEQA) Guidelines states that cumulative impacts shall be discussed where they are significant. This analysis will cover the following topics where there was more than "no impact" identified in the Hog Island Oyster Company (HIOC) Project Initial Study (IS):

- aesthetics
- air quality
- biological resources
- cultural resources
- geology and soils
- greenhouse gas emissions
- hazards and hazardous materials
- hydrology and water quality
- noise
- transportation
- tribal cultural resources

CEQA Guidelines further state that the cumulative impacts analysis shall reflect the level and severity of the impact and the likelihood of occurrence, but not in as great a level of detail as that necessary for the project alone. Section 15355 of the Guidelines defines cumulative impacts to be "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." Cumulative impacts represent the change caused by the incremental impact of a project when added to other proposed or committed projects in the vicinity.

The CEQA Guidelines (Section 15130[b][1]) state that the information utilized in an analysis of cumulative impacts should come from one of two sources:

1) A list of past, present, and probable future projects producing related cumulative impacts, including, if necessary, those projects outside the control of the agency; or

2) A summary of projections contained in an adopted general plan or related planning document designed to evaluate regional or area-wide conditions.

D.1 Overview of Shellfish Aquaculture in Arcata Bay

Potential cumulative impacts for the 30-acre HIOC Project are limited to Arcata Bay. In Arcata Bay, currently, there are five other companies that farm approximately 287 acres of intertidal shellfish and 90 raft structures, or approximately 2 acres, of subtidal shellfish areas (Figure D-1; Table D-1). Note that there are additional proposed shellfish aquaculture projects and recently approved projects included in this cumulative impacts analysis, as described in detail below. These additional projects are also identified on Figure D-1 and Table D-1.

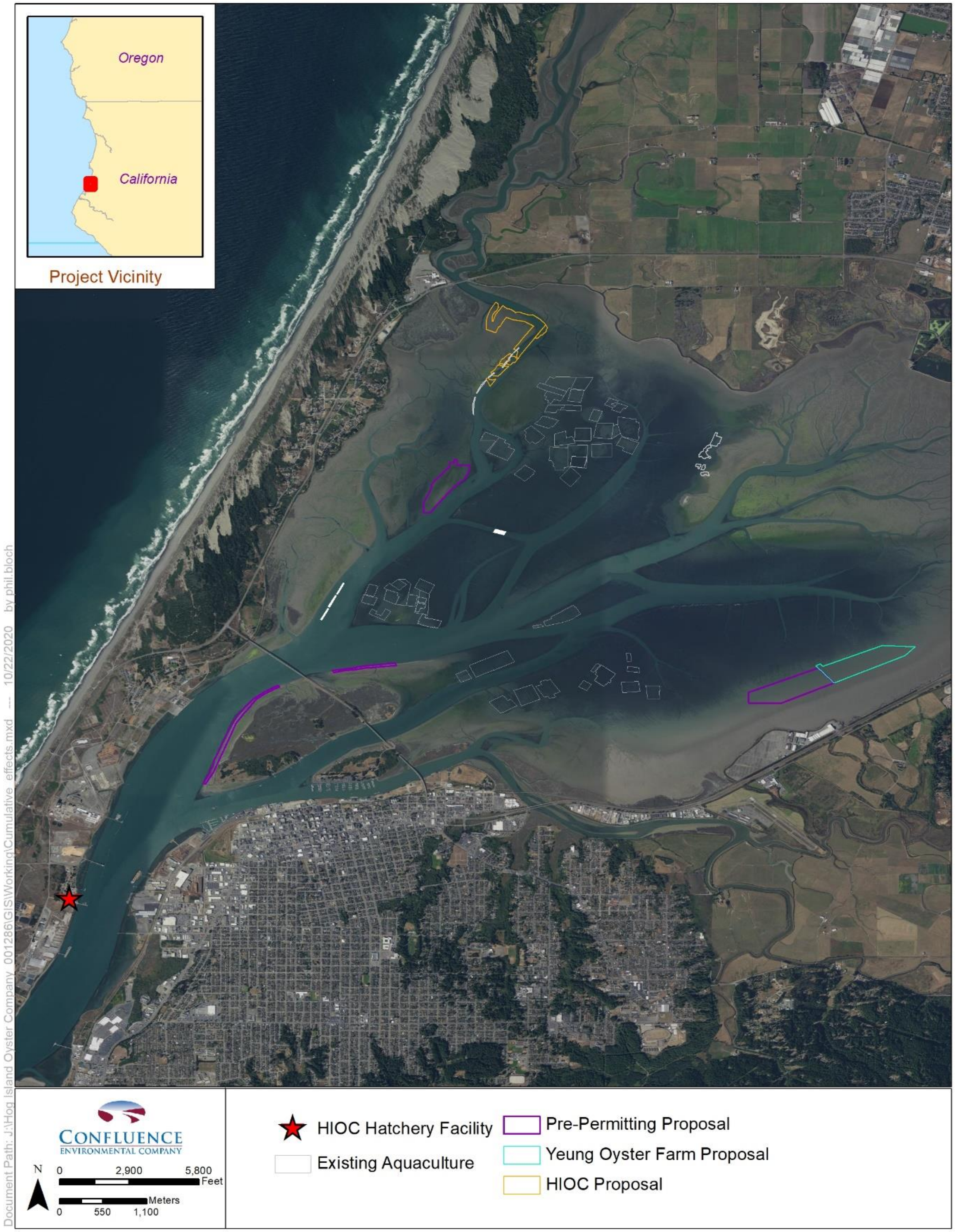

Figure D-1: Existing and Proposed Shellfish Aquaculture in Humboldt Bay.

Table D-1. Existing and Proposed Shellfish Aquaculture Activities in Arcata Bay

Project	Status	Intertidal Area	Subtidal Rafts
Pacific Project*	Existing	279 acres**	35 rafts (~0.8 acres)
Other Companies	Existing	8 acres	55 rafts (~1.2 acres)
HIOC Project	Proposed	30 acres	0 rafts
Yeung Oyster Farm	Proposed	46 acres	0 rafts
Pre-Permitting Project	Proposed	90 acres	20 acres***
Total Existing & Proposed		**453 acres**	**90 rafts (~2 acres) and 20 acres of additional subtidal culture**

* Pacific (or Pacific Seafood Company – previously known as Coast Seafoods Company)
** Pacific is currently reducing its intertidal area from 293 acres to 279 acres.
*** There are 20 acres available for culture but only 3.1 acres of maximum allowable surface area for subtidal rafts identified in District (2015).

In addition to the HIOC Project, there are 2 other proposals to expand intertidal and subtidal shellfish culture operations in Arcata Bay: (1) the Yeung Oyster Farm, and (2) the Humboldt Bay Harbor, Recreation and Conservation District's (District's) Mariculture Intertidal Pre-Permitting Project (Pre-Permitting Project). Both the Pre-Permitting Project and Yeung Oyster Farm are being analyzed in the same Draft Environmental Impact Report (DEIR) under SCH #2017032068. According to District (2020), the Pre-Permitting Project and Yeung Oyster Farm would increase production of Kumamoto oysters (*Crassostrea sikimea*) and Pacific oysters (*Crassostrea gigas*) by up to 136 acres in Arcata Bay. Finally, the Humboldt Bay Harbor, Recreation and Conservation District (the District) has approved 20 acres of subtidal culture for shellfish nurseries and native macroalgae in Arcata Bay (District 2015; SCH #2013062068), which includes a maximum of 3.1 acres of allowable surface area for subtidal rafts.

Culture methods used by HIOC and other companies are similar, and include a variety of intertidal longline systems and rack and bag culture. Longline culture is the dominant form both currently used and proposed in Arcata Bay, using a combination of cultch-on-longline, SEAPA baskets, and tipping bags. While tipping bags are not currently used in the bay, they are considered similar to SEAPA baskets in terms of potential interactions with the environment. There are also several areas that use rack and bag culture as an alternative to intertidal longline systems, although this represents a smaller portion (approximately 2.3% of acreage proposed or approved for aquaculture) of the culture methods used. Finally, subtidal culture (raft culture) or oyster wet storage on pallets in intertidal areas are used for either a nursery area to boost the size of oysters prior to planting or for maturing Manila clam seed. Manila clam seed is only allowed in subtidal culture areas of Humboldt Bay. Note that this cumulative impacts analysis focuses on the intertidal areas of Arcata Bay rather than the subtidal culture areas in both Arcata and Entrance bays. There is no subtidal culture proposed by HIOC.

The cumulative amount of potential human presence would also increase with the various shellfish aquaculture activities. The HIOC Project would result in approximately 2 to 4 additional roundtrip vessel trips per week to maintain the proposed oyster beds. On a very broad scale, over a 15- to 20-acre area, shellfish aquaculture operations include approximately 1 hour per week for operation, maintenance, planting, and harvesting. This activity is concentrated primarily during the low tidal cycle, so there would be 4 to 6 hours of activity a day during a typical weeklong tide run in multiple locations of Arcata Bay. Comparatively, there can be some activity when oyster plots are inundated at shallow depths (e.g., harvesting), but it is more limited compared to when the plots are exposed and "dry."

The general timelines provided in the District Humboldt Bay Mariculture Pre-Permitting Project Draft Environmental Impact Report (District 2020), as modified, can be applied to all shellfish aquaculture projects in Arcata Bay (Table D-2). Note that the information was simplified to encompass the variety of methods used in the bay. While these timelines provide some basic estimates that can be used in the cumulative impacts analysis, it is also important to understand that activities are spread throughout the bay and at varying times of the year. This provides natural staggering of activities and spatial variation for short-term impacts to the surrounding environment. Similarly, farms are not installed all at the same time. For example, the HIOC Project would be installed over a 5-year period. Similar timeframes would be expected for the Yeung Oyster Farm and Pre-Permitting Project.

Table D-2. Frequency of Activity by Intertidal Culture Method

Method	Type of Visit	Area (acre)	# of Visits per Year	Frequency
Longlines	Install Lines	443	0.2	Once every 5 years
	Inspections/ Grade Oysters		12	Once per month
	Plant and Harvest		0.5	Plant and harvest once per 2 years
Rack and Bag	Place Racks	10	0.2	Once every 5 years
	Inspections		12	Once per month
	Plant and Harvest		0.5	Plant and harvest once per 2 years
Source: modified from District 2020				

D.2 Shellfish Aquaculture and Aquatic Habitats in Humboldt Bay

The cumulative amount of potential spatial overlap with habitat in Arcata Bay from existing culture, the HIOC Project, Yeung Oyster Farm, and Pre-Permitting Project is equivalent to approximately 7.2% of the existing eelgrass cover (out of 3,983 acres) and 6.2% of the intertidal habitat (out of 7,354 acres) overall (Table D-3). Note that in the table below, the habitat categories add up to 6,789 acres, which does not include saltmarsh habitat for the intertidal areas overall because there is no overlap between saltmarsh and shellfish aquaculture It is important to understand that overlap with habitat is not a quantification of impact because impacts occur in discrete areas of each culture area.

Table D-3. Overlap of Existing and Proposed Shellfish Aquaculture with Habitats in Arcata Bay

Area	Habitat	
	Mudflats	Eelgrass
Arcata Bay (including Mad River and portions of Central Humboldt Bay) (acre)	2,802.4	3,984.0
Culture Area (acre)	165.8	286.5
Percentage with Shellfish Culture (%)	5.9%	7.2%
Source: NOAA 2012, District 2016, District 2020		

D.3 Cumulative Impacts: Aesthetics

Existing and proposed shellfish aquaculture in Arcata Bay will have similar impacts on aesthetics compared to the HIOC Project considered individually. Aquaculture gear is low profile, produces minimal glare, is often submerged, and the use is consistent with the character of Arcata Bay. Because shellfish aquaculture has to occur at a specific depth in the bay (typically between -2 feet and +4.6 feet mean lower low water [MLLW]), there are often operations next to each other. That is the case with the HIOC Project, the Yeung Oyster Farm, and many areas proposed for the Pre-Permitting Project, in that new areas used for shellfish aquaculture operations would be adjacent to another operation. Another important consideration for aesthetics is that the Pacific Project is currently reducing from 293 acres down to 279 acres used for shellfish aquaculture. While there are some areas that are being proposed to increase in use for shellfish aquaculture within Arcata Bay, there are other areas (especially within eelgrass cover) that have reduced in terms of aquaculture gear and human presence. In general, shellfish aquaculture gear has limited visibility from most public vantage points, even when culture is adjacent to roadways and bridges, as is the case for the HIOC Project. Therefore, under cumulative conditions, this impact is expected to be less than significant.

D.4 Cumulative Impacts: Air Quality

Existing and proposed shellfish aquaculture in Arcata Bay will have similar air quality impacts as the HIOC Project. All aquaculture activities are expected to comply with adopted air quality plans and North Coast Unified Air Quality Management District (NCUAQMD) regulations with respect to particulate matter. The same best management practices (BMPs) proposed for the HIOC Project would be expected for other shellfish companies.

BMP-1 Vessel Maintenance and Fueling: HIOC will maintain all vessels used in culture activities to limit the likelihood of release of fuels, lubricants, or other potentially toxic materials associated with vessels due to accident, upset, or other unplanned events.

HIOC will use marine grade fuel cans that are refilled on land, and HIOC carries oil spill absorption pads and seals wash decks or isolates fuel areas prior to fueling to prevent contaminants from entering the water.

> **BMP-2 Vessel Motors:** HIOC will use highly efficient 4-stroke outboard motors. All motors will be muffled to reduce noise.

Overall, vessel use at the level expected for all existing and proposed shellfish aquaculture activities would still contribute only minor amounts of particulate matter. Therefore, under cumulative conditions, this impact is expected to be less than significant.

D.5 Cumulative Impacts: Biological Resources

This section considers the following cumulative impacts: (1) habitats, (2) benthic communities, (3) carrying capacity, (4) structures and fish, (5) green sturgeon, (6) salmonids, (7) Pacific herring, (8) black brant, (9) roosting birds, (10) nesting birds, (11) wigeon and other waterfowl, (12) migratory birds, and (13) marine mammals.

D.5.1 Habitats

The intertidal footprint of existing and proposed shellfish aquaculture in Arcata Bay is provided in Table D-3. The HIOC Project will avoid adding gear to eelgrass cover, including use of a 5-meter buffer, but will be located on mudflats near the Mad River Slough. The Pacific Project (i.e., the largest area of shellfish aquaculture in Arcata Bay) is located primarily in eelgrass cover. Other shellfish farms, both existing and proposed, are primarily located outside of areas with eelgrass, although there are smaller existing farms that occur in eelgrass cover. The addition of shellfish aquaculture gear can have implications for changes to both mudflat and eelgrass habitats, as discussed below.

The cumulative amount of shellfish aquaculture activities in unstructured (mudflat) habitat would be approximately 165.8 acres or 5.9% of the available habitat (refer to Table D-3). While tidal currents are one of the forces that contribute to sediment transport and sediment distribution, studies have shown that sediment transport within channels and adjacent to channels is more active than over mudflats (Banas and Hickey 2005, Forrest et al. 2009). Oyster longline plots, and other types of intertidal culture methods (e.g., rack and bag systems), are sited away from channels and high enough in tidal elevation on the mudflats that they will not interact significantly with sediment being transported in the channels. In addition, mudflat sediments are relatively cohesive and are not readily eroded by tidal currents.

Erosion and deposition near shellfish aquaculture gear is possible, but these small-scale processes are difficult to quantify. Rumrill and Poulton (2004) found that sediment deposition occurred in the vicinity of oyster cultch-on-longlines, while no deposition occurred in control plots. Sediment build-up was evident around PVC stakes, with soft, flocculant material deposited. These disruptions are expected to be highly localized and consistent with the existing range of normal storm/wave activity. Similarly, microtopographic changes in intertidal beds may occur in areas used for frequent access by workers walking across the tideflats. These changes may result in ponded areas near near-bottom aquaculture, but are insignificant on a landscape scale compared to sediment distribution from storm events (Figure D-2).

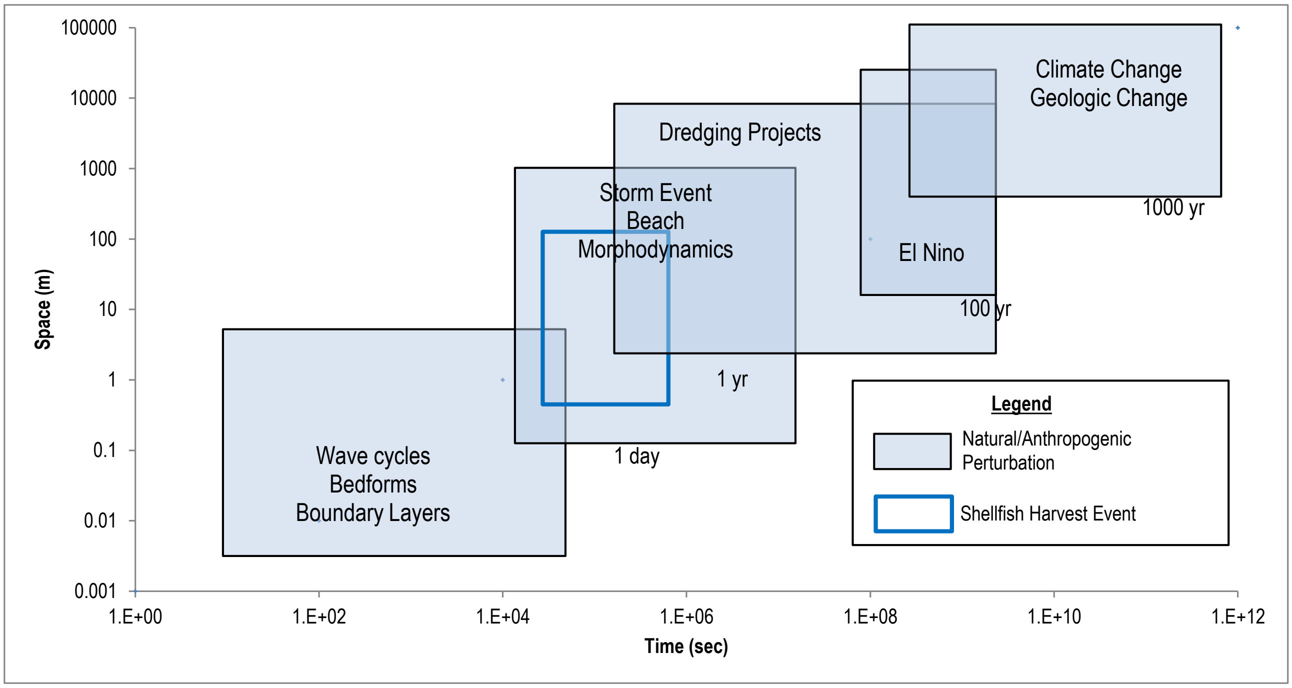

Figure D-2: Scale and Frequency of Factors that Influence Sediment Distribution
Source: de Vriend 1991

Dumbauld et al. (2015) suggested that shellfish aquaculture creates short-term 'pulse' disturbances that may alter the benthic substrate in intertidal areas in a manner consistent with storm events. Figure D-2 is a representation modified from de Vriend (1991) of this type of sediment disturbance compared to the scale and frequency of natural events or another anthropogenic disturbance like a dredging project. Dumbauld et al. (2015) reported that the magnitude of temporary effects from shellfish aquaculture is within a range where natural recovery is anticipated to occur relatively quickly, especially because it is within a type of environment that is dynamic in nature (e.g., intertidal areas that are constantly affected by waves, wind, and tidal energy). While sediment dynamics respond to a variety of influences over time, existing data suggests that sediment changes due to shellfish aquaculture are likely minor in relation to natural sediment dynamics that drive the geophysical structure and functions of nearshore habitats (Forrest and Creese 2006, Forrest et al. 2009).

The cumulative amount of shellfish aquaculture activities in eelgrass cover would be approximately 286.5 acres or 7.2% of available habitat (refer to Table D-3). There are 2 studies that have been conducted on a large scale that have looked at the relationship between eelgrass and shellfish aquaculture: (1) Dumbauld and McCoy (2015) in Willapa Bay, and (2) Merkel and Associates (2020) in Humboldt Bay. Willapa Bay is similar to Humboldt Bay in many respects.

For example, it has a large tidal exchange, well-mixed water column, is relatively shallow (62% is intertidal), and has nine small rivers contributing to the total watershed. Most importantly, there is significant overlap between shellfish aquaculture and eelgrass beds in Willapa Bay. Continuous eelgrass beds cover up to 38% of the bay, and shellfish aquaculture overlaps with up to 22% of the bay (Dumbauld and McCoy 2015).

Dumbauld and McCoy (2015) modeled eelgrass density in Willapa Bay, Washington. A number of parameters were modeled, including: (1) distance to mouth, (2) distance to channel, (3) salinity, (4) elevation, (5) cumulative wave stress, and (6) shellfish aquaculture. The model results indicated that eelgrass density was lower in oyster aquaculture beds, but the impact directly associated with aquaculture represented less than 1.5% of the total predicted eelgrass cover in Willapa Bay. This is related to variable timing and spatial extent of activities in Willapa Bay, where there is recovery in areas that experience impacts before additional impacts occur, and impacts occur in small portions of the bay that allow for recovery of the eelgrass cover overall. Further, this minor change may be offset by other important ecological functions provided. This has been raised through several studies and reviews that recognize there are tradeoffs associated with shellfish aquaculture, but the benefits to species that use the habitat predominantly outweigh the minor impacts and recovery cycle (Forrest et al. 2009, NMFS 2016, Ferriss et al. 2019, Corps 2020).

Preliminary observations from monitoring being carried out for the Pacific Project indicate that eelgrass cover increased at all sites throughout the bay from 2018 to 2020, including both culture and reference sites (Merkel and Associates 2020, 2021). There was no detectable effect of the introduction of culture in areas with eelgrass on eelgrass cover. Preliminary evaluation of the effect of longlines with SEAPA baskets and cultch-on-longlines on eelgrass density (turions per square meter) indicate that there may be reduced eelgrass densities in areas where longlines are installed in eelgrass, although this effect may be related to natural fluctuation of eelgrass within Humboldt Bay. Eelgrass distribution in Humboldt Bay is partially controlled by tideflat elevation, and several sites being monitored as part of the Pacific Project are at or near the maximum elevation for eelgrass in Humboldt Bay. The expansion or contraction of eelgrass at this upper margin may be controlled by weather and tide conditions throughout the year.

There are short-term habitat changes associated with shellfish aquaculture both in mudflats and eelgrass cover, but these changes do not significantly alter the function of that habitat. This is what Dumbauld et al. (2015) described as "pulse impacts." In other words, there are short-term impacts associated with shellfish aquaculture in eelgrass cover, such as disturbance during a harvest event, but it does not result in a permanent change to the system compared to adding a dike or levee (termed by Dumbauld et al. 2015 as a "press impact"). Eelgrass grows in and around shellfish aquaculture gear and mudflats function in a similar manner but with added structure to the system. Notably, unlike the shellfish farms evaluated in the Dumbauld et al. (2015) and Merkel and Associates (2020) studies, the HIOC Project does not propose to cultivate shellfish in eelgrass cover. Additional changes associated with adding gear to Arcata Bay is provided below in relation to benthic communities, fish, birds, and marine mammals.

In addition to the research that indicates these impacts would be minimal on a landscape scale, there are also avoidance measures and BMPs that would be used by HIOC to mitigate for potential impacts to mudflats and eelgrass habitat. These include:

Mit-1 Marine Debris: HIOC will implement a marine debris management plan (Appendix A). At the time of harvest of each cultivation area, HIOC will carry out a thorough inspection to locate and remove any loose, abandoned or out of use equipment and tools. All floating bags and baskets will be marked or branded with the HIOC's name and phone number.

Mit-2 Eelgrass Protection: HIOC will install racks, intertidal longline systems, and other aquaculture gear at least 5 horizontal meters from native eelgrass (*Zostera marina*) cover. This will not prevent continued cultivation in areas where eelgrass moves into the project site.

HIOC is expected to install gear incrementally. Before gear is installed in new areas, eelgrass will be mapped in culture areas using unmanned aerial vehicles (UAV) and/or verified using ground surveys to identify eelgrass cover and establish 5 meter horizontal buffers. Eelgrass surveys will be conducted annually during the eelgrass growing season (May to September) prior to gear installation until gear is fully installed at the site.

Mit-3 Vessel Anchors: HIOC will anchor vessels away from eelgrass.

Mit-4 Vessel Routes: HIOC will establish a vessel route to access its leases that avoids known native eelgrass (*Z. marina*) cover, and maintain a no wake zone within a 1,000-foot buffer north of Tuluwat Island to avoid black brant (*Branta bernicla*) gritting sites in the winter (December 15-April 30).

Mit-5 Channels: HIOC will establish a 10-foot buffer from the top of bank of channels. Culture equipment will not be installed in the buffer areas.

BMP-7 Bed Access: Vessels may cross areas with eelgrass when the predicted tidal height is +4 feet MLLW or greater by putting the engine in neutral and drifting across areas where eelgrass is present. This type of approach will be used when weather and tidal elevations permit

Upon incorporation of these mitigation measures and BMPs, the HIOC Project is not expected to contribute to cumulative eelgrass impacts in Arcata Bay.

Buffers from existing native eelgrass cover have been developed as a protective measure based on the potential for eelgrass seed dispersal, observed eelgrass cover annual expansion, and the distance at which plants are genetically different (Ruckelshaus 1994, Ruckelshaus 1996, and Washington DNR 2013). These metrics suggest that eelgrass cover is expected to expand a maximum of 4 to 5 meters per year. Therefore, the expectation is that activities that are more than 4 or 5 meters away from eelgrass cover are beyond the annual colonization potential of eelgrass cover, thereby protecting the bed from direct impacts and providing a buffer for potential expansion of eelgrass cover. In evaluating shellfish aquaculture in Washington State, NMFS determined that shellfish aquaculture incorporating the proposed buffer "is not expected to diminish eelgrass density or function of existing eelgrass" (NMFS 2016).

Shellfish companies also avoid eelgrass or minimize impacts in eelgrass cover by rotating their farmed footprint. For areas where cultivation occurs directly in eelgrass, there are measures used to minimize impacts to eelgrass cover. These include:

- Financial contributions to regional restoration efforts
- Contribute to improving water quality by requiring regional wastewater treatment to meet regulatory requirements
- Relocation of existing/ongoing aquaculture away from high value fish, bird or eelgrass use areas in Humboldt Bay
- Increased longline spacing (i.e., 10 feet) in existing or new aquaculture areas

Based on the above analysis, under cumulative conditions, impacts to habitat are expected to be less than significant with mitigation.

D.5.2 Benthic Communities

Adding structure to mudflat and eelgrass habitats can change the composition of benthic communities. The majority of studies related to changes from increased biodeposition and the resulting changes to community structure are related to rack and bag culture in France, which consists of culture at densities that far exceed what is proposed on a cumulative basis in Arcata Bay. For example, the areal extent of culture in Pertuis Charentais (SW France), which includes Marennes-Oléron Bay, extends over 9,884 acres (Bouchet and Sauriau 2008), which is orders of magnitude greater than what is proposed for the cumulative amount of intertidal aquaculture in Arcata Bay (~452 acres). Even in these estuaries where oyster culture encompasses a large portion of the estuary, there is not a clear indication that effects are negatively affecting the stability of the benthic communities (Leguerrier et al. 2004).

Rumrill and Poulton (2004) investigated differences in the benthic invertebrate community between near-bottom oyster cultch-on-longline plots, eelgrass control plots, and eelgrass reference sites in Arcata Bay. Results of the study showed that invertebrate biomass was highest in the near-bottom oyster longline plots and lowest in some of the eelgrass reference sites. It was also noted that invertebrate biomass was lowest in on-bottom oyster sites that had been suction dredge harvested. Note that this was a historical method used in Humboldt Bay before culture transitions to near-bottom methods using longlines and rack and bag systems.

In addition to biomass, Rumrill and Poulton (2004) reported that the composition of the invertebrate communities was not significantly different between the near-bottom cultch-on-longline plots and eelgrass control plots. This study provides evidence that oyster longline aquaculture in eelgrass cover does not significantly change the species composition compared to areas without aquaculture gear. This same conclusion was also noted in Dumbauld et al. (2009), indicating that the similarity of benthic infaunal abundance in the culture plots compared to eelgrass plots in Willapa Bay, Washington: "may have arisen not simply due to flow dispersing biodeposits, but because both aquaculture and control areas included eelgrass, which has characteristic effects on sediment." In other words, the presence of eelgrass was the primary determinant in benthic invertebrate abundance and not the added structure related to the longline gear.

In a more recent study of the benthic invertebrate community in Arcata Bay, Confluence et al. (2019) reported that invertebrate communities are not significantly affected by the presence of aquaculture gear. Taxa abundance was analyzed by habitat pair and season. The results suggested that there were not significant differences in mean number of taxa, with and without aquaculture for eelgrass habitat (Figure D-3). In the winter, there was slightly higher total taxa in areas without aquaculture, but this relationship was not significant. Compared to eelgrass habitat, there were larger differences in mean number of taxa within habitat pairs for mudflat habitat, with higher numbers of taxa sampled from areas with aquaculture compared to areas without aquaculture. This information suggests that near-bottom aquaculture potentially has positive changes associated with the addition of shellfish aquaculture gear in mudflat habitat and limited changes for eelgrass habitat, although overall the functions of habitat with and without gear area maintained for the benthic invertebrate communities.

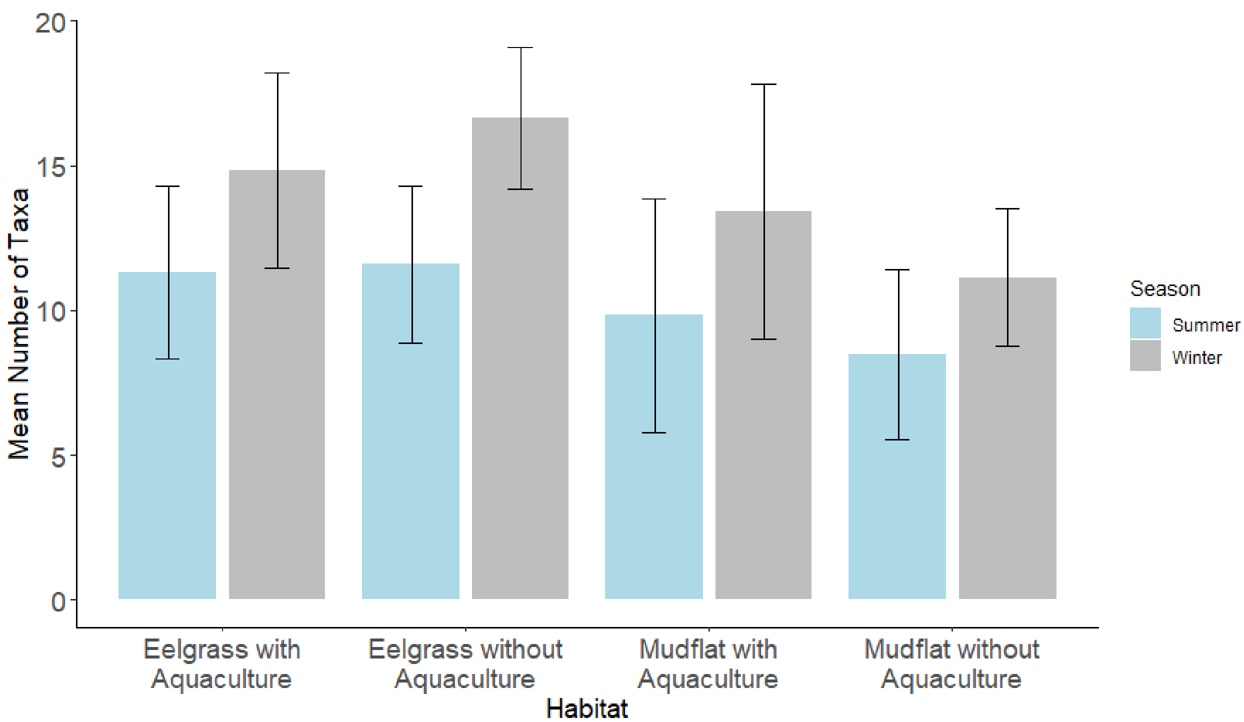

Figure D-3: Invertebrate Taxa Encountered with Each Habitat Pair by Season

Source: Confluence et al. 2019

Note: error bars represent standard deviation in mean number of taxa

Several studies agree with these conclusions, including a study in Chesapeake Bay, Virginia, which looked at benthic invertebrates as an indication of ecological health associated with over 15 acres of floating and on-bottom culture gear (Kellogg et al. 2018). The study found no significant negative impacts on the benthic invertebrate community structure from the presence of gear or oysters, and number of invertebrates inside the farm sites were higher compared to outside.

Invertebrate communities are used as a measure of ecological health within the system. Shellfish aquaculture operations affect invertebrate communities in both negative and positive ways. Most of the literature indicates that, while there are changes to communities, these changes are considered temporary negative changes (i.e., pulse disturbance with a short-term recovery) and longer positive changes in terms of the functions that are provided to higher organisms (e.g., prey for fish and wildlife). These positive changes may also include increased species diversity and species abundance as compared with similar habitats without shellfish aquaculture. The existing literature for Humboldt Bay and other studies associated with shellfish aquaculture support the conclusion that cumulative impacts to benthic communities are expected to be less than significant.

D.5.3 Carrying Capacity

Carrying capacity, also termed "ecological carrying capacity," is defined by Ocean Studies Board and NRC (2010) as:

> *The stocking or farm density above which 'unacceptable ecological impacts' begin to manifest. From a practical standpoint, this process begins with the level of culture that can be supported without leading to significant changes to ecological processes, species, populations or communities in the growing environment.*

There are examples where estuaries have been overstocked on occasion (e.g., Marennes-Oléron Basin), which resulted in poor growth and high mortality of the oysters (Bouchet and Sauriau 2008). The stocking densities in the Marennes-Oléron Basin were orders of magnitude higher than what is proposed in Humboldt Bay, even on a cumulative scale. It is in the oyster farmer's (and regulatory body's) interest to ensure that stocking densities within Arcata Bay do not exceed ecological carrying capacity or production carrying capacity.

Carry capacity is analyzed both through modeling studies and growth studies. The most robust carrying capacity analysis conducted in Humboldt Bay was created for the Pre-Permitting Project (District and SHN 2015); which at the time combined the Intertidal Pre-Permitting Project, Subtidal Pre-Permitting Project, Yeung Oyster Farm, and Pacific Project. The analysis included up to 1,202 acres of shellfish aquaculture operations in Arcata Bay (or 55.02 metric tons dry tissue weight), which were all modeled as adults to maximize potential filtration pressure. According to the analysis, filtration pressure was shown to range between 5% and 9%, which indicates that the "vast majority of carbon fixed by phytoplankton remains available to non-cultured species." In addition, the phytoplankton turnover rate was calculated to replace itself several times per day. The analysis concluded that the existing and proposed culture would have some cumulative effect on Humboldt Bay food resources, but there is an abundance of food available and cultured species will not significantly affect the food resources in the bay. This was considered a conservative result, given that the analysis only calculated change to phytoplankton and did not account for other sources of carbon productivity (e.g., detritus, benthic microalgae, biodeposits). The cumulative impacts of the HIOC Project, when combined with other existing and proposed shellfish farms in Arcata Bay, would result in significantly less potential filtration pressure compared to what was originally analyzed, as the amount of farmed acreage would only be 38% of that evaluated in the Pre-Permitting Project study.

Other indicators of ecological carrying capacity include poor growth and high mortality of shellfish in culture plots or within the natural community. Although no studies have been conducted in Humboldt Bay, there have been growth studies that can be compared to carrying capacity models in 2 separate locations of Washington State: (1) Totten Inlet and (2) Willapa Bay.

NewFields (2009) developed a carrying capacity model for Totten Inlet associated with the North Totten Inlet Mussel Farm. Totten Inlet has the highest concentration of shellfish aquaculture in South Puget Sound (22% of the intertidal area is used by shellfish aquaculture) and has relatively confined circulation. There was public concern for an additional 1.4 acres of shellfish aquaculture in the system. The model indicated that, despite the amount of culture operations in Totten Inlet, the percentage of phytoplankton consumption by filter feeders is approximately 1.5% of the spring/summer production (NewFields 2009). A growth study by Ruesink et al. (2013) also reported that growth is uninhibited by dense culture operations in Totten Inlet. Shellfish aquaculture in Humboldt Bay is cultivated on a smaller portion of the intertidal area (6.2% of the intertidal portion of bay) as compared to Totten Inlet (22% or 1,335 acres of active culture within the intertidal portion of the inlet).

In Willapa Bay, concerns were raised that the conversion from on-bottom to near-bottom culture methods using an intertidal longline system with tipping bags was impacting the growth of an adjacent on-bottom farm (Confluence 2017). A study was conducted to measure chlorophyll concentrations and oyster growth, and then provide an understanding of available food resources. The ultimate conclusion was that food resources are abundant in the northern portion of Willapa Bay, and growth measurements were consistent both inside and outside of the flip-container culture area. This was consistent with a growth study by Ruesink et al. (2003) in the bay. The authors reported that, due to the longer residence times at the southern end of Willapa Bay and other potential contributing factors (e.g., riverine input, eelgrass detritus), growth was slower compared to the northern end where there was a consistent supply of food from the ocean. An update on the growth study provided through the Ruesink Lab (2013), indicated that growth in the southern portion of Willapa Bay in 2003 showed no difference from south to north even though food concentrations were lower in the south. Hypotheses for these differences in results included changes in weather and nearshore oceanic properties, but food limitation was not a problem. Shellfish aquaculture in Humboldt Bay is also cultivated on a smaller portion of the intertidal area (6.2% of the intertidal portion of the bay) compared to Willapa Bay (22% of the intertidal portion of the bay). Therefore, impacts associated with carrying capacity are expected to be the same or less than those in Willapa Bay and Totten Inlet.

There have been no reports of poor growing conditions for the existing cultured oysters in Arcata Bay. In fact, since the carrying capacity analysis was conducted by District and SHN (2015), there has been an overall reduction of shellfish aquaculture activities in Arcata Bay (from approximately 301 acres to 287 acres). The HIOC Project would add up to 30 acres over the next 5 years. Other proposed projects would add up to 136 acres, although it is not clear how long it would take to develop these areas because growers have not been identified yet for these culture areas. More importantly, as noted above, the cumulative total is well below the values studied by District and SHN (2015), and the carrying capacity analysis indicated that cultured shellfish were only using a fraction of the phytoplankton resources in Humboldt Bay.

Both the literature and the carrying capacity analysis for Humboldt Bay support the conclusion that cumulative impacts to carrying capacity are expected to be less than significant.

D.5.4 Structures and Fish

As described above, the cumulative amount of shellfish aquaculture activities in unstructured habitat would be approximately 167 acres or 6.0% of the available habitat (refer to Table D-3). There are certain species (e.g., California halibut) that tend to avoid structure and prefer open sand- or mudflat habitat and others that are structure-oriented (e.g., fish in the families Cottidae and Embiotocidae). However, the majority of species that use the shallow intertidal areas of Arcata Bay are small fish that are using the area as nursery habitat (Pinnix et al. 2005, Schlosser and Eicher 2012). Increased structured habitat, especially adjacent to main channels, can improve conditions for smaller fish. This is discussed below in terms of the potential to increase forage areas for small fish.

On a scale more representative of potential cumulative impacts, there is literature that has looked at food-web implications, especially in areas where shellfish aquaculture is a dominant portion of the estuary (e.g., France). For example, Leguerrier et al. (2004) reported that near-bottom culture in an intertidal mudflat in Marennes-Oléron Bay covering 4,448 acres (or 16% of the bay), and at densities of 200 oysters/m^2, could benefit fish and crabs due to an enhanced food supply. Similarly, Castel et al. (1989) indicated that the presence of oysters on rack-and-bag structures covering 2,471 acres of intertidal habitat augmented meiofauna biomass in the Bay of Arcachon (France). Castel et al. (1989) also reported a reduction in macrofaunal abundance associated with the racks, but indicated that this may have been a product of increased predation, which benefited the slightly larger organisms (e.g., fish and birds) rather than the benthic invertebrates present in the sediment. According to a literature review of near-bottom aquaculture by Forrest et al. (2009), changes to fish are often viewed as neutral or positive.

Increased diversity and nursery habitat provided by oyster aquaculture is considered by many researchers to be an improved ecological function compared to sand or mudflat habitat. The increase in ecological function provided by the placement of oysters in areas of mud or sandy habitat is also considered an improved condition or passive mitigation, similar to how the transplant or expansion of eelgrass into mud or sandy habitats would be considered an improved condition or serve as mitigation. There are a number of examples in the literature – as described above – where oyster culture in estuaries, at much higher proportions than is being cumulatively proposed in Arcata Bay, supports the food-web within that system (e.g., Leguerrier et al. 2004, Dubois et al. 2007, Lin et al. 2009, Preikshot et al. 2015). The amount of unstructured habitat altered is a relatively minor portion of the overall intertidal habitat in Arcata Bay (~6.0% of mudflat habitats) and the scale of shellfish aquaculture proposed supports a conclusion that positive changes would occur from the increase in benthic invertebrates present. Overall, cumulative impacts to fish are expected to be less than significant.

D.5.5 Green Sturgeon

Sturgeon are a relatively large species (4.5 to 7 feet in length) that likely use Humboldt Bay during non-spawning migrations. Sturgeon move into estuaries up and down the West Coast taking advantage of foraging opportunities in bays and estuaries along the way. During the summer and early fall months, sturgeon will remain in bays for weeks to months at a time. Based on acoustic receiver data, the primary habitats where sturgeon would be located in Humboldt Bay include the main channels and near channel habitats (Figure D-4). Sturgeon are more likely to use unstructured near-channel habitat, of which proposed culture would overlap with approximately 4.1% of habitats within 75 meters of main channels in Arcata Bay. Please refer to the IS document for additional details.

In terms of the likely interaction between sturgeon and shellfish aquaculture culture, the areas adjacent to tidal channels and subtidal channels are likely to be more frequently used by green sturgeon compared to the higher elevation shallow intertidal habitat. For example, Kelly et al. (2007) reported that sturgeon in San Francisco Bay were most common at a mean depth of 17 feet during directional movement and between 26 feet and 39 feet during non-directional movement. It is notable that mudflats in Humboldt Bay are typically shallower than the study in San Francisco Bay, which includes oyster culture locations in Arcata Bay. Observations from Humboldt Bay also indicate that sturgeon may reach seasonally high abundances and actively forage in portions of Arcata Channel. During mobile tracking of green sturgeon, NMFS staff postulated that several individuals were feeding either within or immediately adjacent to existing aquaculture beds near Arcata Channel (Goldsworthy et al. 2016). Therefore, by avoiding cultivation within channel areas, use of key foraging habitat potentially used by green sturgeon for shellfish aquaculture is minimized.

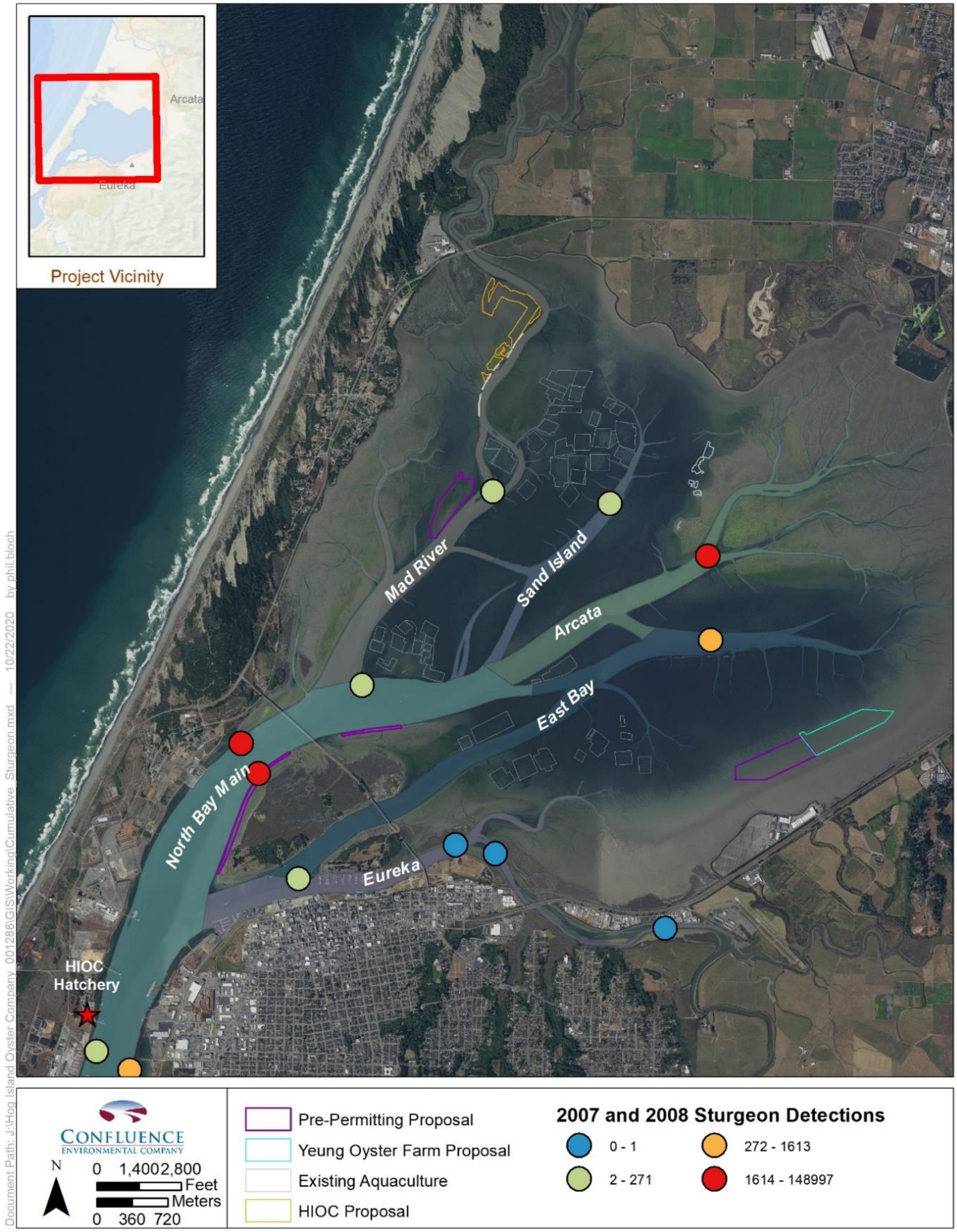

Figure D-4: Shellfish Aquaculture in Humboldt Bay in Relation to Sturgeon Movement
Source: USFWS unpublished data

While the HIOC Project and other proposed shellfish farms may increase vessel traffic within Arcata Bay and activity on cultivated mudflats, sturgeon would be easy to avoid. They occur primarily in the main channels, and would access near-channel habitat when it is inundated. The increase in vessel traffic is expected to be minimal within Humboldt Bay overall compared to existing use of the area by work vessels or other recreational boats. Proposed intertidal aquaculture structures would be inundated for an average of approximately 68% to 89% of the year (District 2020). Sturgeon forage primarily in mudflat habitat and on fish in the channels. Adding structure to mudflat habitat represents a change, but does not mean that sturgeon would be restricted from these areas.

Because sturgeon primarily use the channels, HIOC will avoid impacts related to green sturgeon through incorporation of the following mitigation measure:

Mit-5 Channels: HIOC will establish a 10-foot buffer from the top of bank of channels. Culture equipment will not be installed in the buffer areas.

Overall, spatial overlap of proposed culture does not represent a significant portion of the habitat that sturgeon are likely using, there would be a low frequency of activity within the majority of proposed culture areas, and aquaculture gear is not expected to represent a problem for migration and access. Avoidance of channels, including a 10-foot buffer, will provide additional avoidance of areas where sturgeon are likely using. This is a similar mitigation measure used by other shellfish growers (e.g., Pacific Seafood). Therefore, with the incorporation of this mitigation measure, cumulative impacts to sturgeon are expected to be less than significant.

D.5.6 Salmonids

Salmonids in Humboldt Bay primarily use either the main channels during their outmigration or the tidal portions of Humboldt Bay tributaries (Wallace 2006, Wallace and Allen 2007, Pinnix et al. 2013, Wallace and Allen 2015). This pattern is similar for other salmonids along the West Coast. Simenstad et al. (1982) indicated that most anadromous salmonids that rear for an extended time in freshwater (e.g., coho salmon, Chinook salmon, steelhead, cutthroat cutthroat) will be oriented toward deeper water when they are present in estuaries. However, the early migrant juveniles use the shallower margins of estuaries for a few weeks in the spring before moving into deeper water as they grow larger (Simenstad and Eggars 1981, Simenstad et al. 1982). Information developed by these researchers suggests that adult salmonids are not substantially using the locations where intertidal shellfish aquaculture is currently sited or being proposed, but there may be more overlap with early migrant juveniles. Most shellfish aquaculture operations are located in shallow intertidal habitat. For example, the cumulative amount of habitat overlap within main channels (i.e., subtidal areas) represents approximately 0.2% of subtidal habitat in Arcata and Central Bays that could be used by salmonids.

There is no indication from the existing data that salmonids will be significantly affected by this amount of shellfish aquaculture gear even if they encounter it during outmigration or rearing.

Much of the research suggests that estuaries with aquaculture may enhance habitat for salmonids, or at least represent a neutral effect. For example, Magnusson and Hilborn (2003) assessed the survival of coho salmon and Chinook salmon released from West Coast hatcheries with respect to three characteristics: (1) size of the estuary, (2) percentage of the estuary that is in natural condition, and (3) presence of oyster culture in the estuary. While Humboldt Bay was not one of the estuaries assessed, the results suggested that oyster culture was not having an adverse impact on salmon survival in estuaries where there were substantial runs. Willapa Bay, which has a 150+ year history of extensive oyster culture, including areas in dense eelgrass cover, had the highest coho salmon survival. Grays Harbor, also an important oyster farming estuary, had the third highest coho survival of the twenty estuaries included in the study.

Dumbauld et al. (2015) analyzed whether intertidal oyster aquaculture in Willapa Bay effects the distribution and feeding ecology of juvenile salmonids. The study identified no significant differences in the density of juvenile salmonids caught in the four habitat types analyzed (undisturbed open mudflat, seagrass, channel habitats, and oyster aquaculture), and few significant associations with the prey items that the fish consumed. In other words, the majority of salmon that were found over low intertidal habitats were not dependent on structured habitat (e.g., eelgrass or oyster aquaculture) for prey items. Chum salmon, a typically smaller fish during estuarine residency, was the possible exception. This species doesn't occur in Humboldt Bay. The final conclusion by Dumbauld et al. (2015) was that:

> Permanent or 'press' disturbances like diking marshes, dredging and filling shallower estuarine habitats and even hardening shorelines would be expected to have significant impacts for other stocks and life history variants with smaller juveniles that utilize upper intertidal areas (Fresh 2006, Bottom et al. 2009), but our research suggests that short term 'pulse' disturbances like aquaculture which alter the benthic substrate in lower intertidal areas used primarily by larger juvenile salmon outmigrants may pose a less significant threat to maintaining resilience of these fish populations.

Based on the literature discussed above from estuaries that have a much higher amount of oyster aquaculture, and a variety of culture methods, throughout the estuaries, the amount of culture proposed in Humboldt Bay are expected to result in less than significant cumulative impacts to salmonids.

D.5.7 Pacific Herring

Forage fish (e.g., fish in the families Osmeridae and Clupeidae) are an important dietary resource for higher trophic-level fish and marine mammals. Four species of Osmeridae (or the smelt family) were collected by Pinnix et al. (2005) in both eelgrass habitat and oyster growing areas, including longfin smelt. Larval smelt was one of the dominant species in the otter trawl sampling in January 2003 to 2006 in a small eelgrass bed near the entrance to Humboldt Bay (Garwood et al. 2013). No eulachon were collected in either survey, and they are not common south of the Mad River, although they are considered infrequent visitors to Humboldt Bay (Gustafson et al. 2010).

Pinnix et al. (2005) also collected three species of Clupeidae (or the herring family) from oyster growing areas and eelgrass, including Pacific herring. A recent study looking at the changes in fish communities inside and outside of shellfish aquaculture gear in Humboldt Bay also collected fish in the Osmeridae and Clupeidae families (Confluence et al. 2019).

Forage fish are common in the shallow intertidal habitat of Humboldt Bay, especially Pacific herring. There are approximately 166 acres of intertidal shellfish aquaculture proposed in Humboldt Bay and 287 acres of existing intertidal culture, which represents 6.2% of intertidal habitat (total of 7,354 acres) in Arcata Bay overall. This represents a small amount of the available habitat where forage fish may be found, and given the low intensity and frequency of access to individual areas, even areas occupied by aquaculture gear are unlikely to disturb forage fish populations. Similarly, potential impacts to prey resources are considered less than significant, based on the less than significant changes expected to benthic communities.

The only potentially significant overlap with forage fish habitat is Pacific herring spawning habitat. Rooper and Haldorson (2000) noted that desiccation potential and predation pressure are the main trade-offs for Pacific herring spawning locations. Experimental evidence along British Columbia's Central Coast suggests that the majority of herring eggs are being consumed on the seabed compared to the water column (Keeling 2013). Keeling (2013) concluded that increasing the available spawning habitat (i.e., surface area for egg deposition) may allow herring eggs to be deposited at lower densities and increase egg viability through enhanced water movement and respiratory exchange. In this way, the presence of shellfish aquaculture gear can be a potential benefit by providing more surface area to eggs that remain in the water column and away from benthic predators. The addition of alternate spawning substrate in the form of shellfish and aquaculture gear may provide additional "bet hedging tactics," as described by Lambert and Ware (1984), allowing increased survival from multiple waves of egg and larval cohorts to enhance the probability of good recruitment.

Studies have shown no significant difference in hatching success of herring eggs from artificial substrates, natural substrates, and a variety of macroalgae (Hourston et al. 1984, Palsson 1984, Shelton et al. 2014, Hessing-Lewis et al. 2016). The key to successful herring egg deposition is enough surface area to provide an even coverage of eggs to provide enough exchange of oxygen. Shellfish aquaculture gear may detain or promote colonization of aquatic vegetation. Aquatic vegetation at appropriate tidal elevations may improve the viability of deposited herring eggs.

Overall, the main protection for Pacific herring for shellfish aquaculture in Humboldt Bay is avoidance. The same mitigation measure (Mit-6) proposed for the HIOC Project would be expected for other shellfish companies.

Mit-6 Pacific Herring (*Clupea pallasii*) Avoidance: In any cultivation beds within or adjacent to eelgrass cover (in the event that eelgrass moves into the project site), HIOC will conduct visual surveys for Pacific herring spawn prior to conducting activities during the herring spawning season (October to April). If herring spawn is present, HIOC will suspend activities in the areas where spawning has occurred until the eggs have hatched and spawn is no longer present (typically 2 weeks).

The HIOC Project would add up to 30 acres over the next 5 years in areas that currently do not include eelgrass cover. Other proposed projects would add up to 136 acres. Herring spawn in Humboldt Bay primarily on eelgrass south of the HIOC Project (Mello and Ramsay 2004). Only a small portion of these areas proposed for shellfish farms are in areas that have documented spawning for Pacific herring, and there is a mitigation measure to avoid the spawn when it is observed. Therefore, cumulative impacts to forage fish are expected to be less than significant with mitigation.

D.5.8 Black Brant

The HIOC Project's potential impacts on black brant associated with reduction in foraging opportunity is assessed in the IS document. Primarily, there is avoidance of brant foraging habitat by avoiding eelgrass cover (i.e., Mit-2). Other existing and proposed culture also has the potential to result in impacts to black brant, although the monitoring associated with the Pacific Project indicates that this potential impact is minor (HTH 2015, 2018, 2021). Please refer to the IS document for additional details.

The Pacific Project (formally Coast Seafoods Company) Humboldt Bay Shellfish Aquaculture Environmental Impact Report, which evaluated a project that proposed to cultivate shellfish in approximately 407 acres of continuous eelgrass, estimated that the bay-wide eelgrass biomass reduction (i.e., the impact to brant foraging) from the project would be approximately 3% (District 2016). The EIR evaluated 15 times as much shellfish cultivation in continuous eelgrass as compared to the cultivation evaluated in this analysis, and still concluded that the functional loss of eelgrass to black brant is not expected to result in a significant energetic constraint. The other proposed projects in Arcata Bay (e.g., the HIOC Project, Yeung Oyster Farm, and Pre-Permitting Project) either avoid eelgrass or are located in patchy eelgrass. Patchy eelgrass is not considered in the biomass estimates used by black brant (District 2016). Therefore, the additional proposed shellfish aquaculture is not estimated to put a strain on bay-wide resources important for black brant foraging.

Impacts on black brant associated with human disturbance as a result in increased boat traffic and human presence is estimated to be minor. Because the proposed HIOC Project, Yeung Oyster Farm, and Pre-Permitting Project will primarily avoid continuous eelgrass, there is less potential for brant to be disturbed by workers at these higher-elevation intertidal areas. However, all projects will result in an increase in boat traffic in the main channels of Humboldt Bay that could result in cumulative effects on black brant. The estimate of increased vessel use by HIOC Project above existing conditions is 2 to 4 round trips weekly. Based on the frequency identified in District (2020), the other proposed farms in Arcata Bay would add a similar amount of vessel use per year, although that would depend on how many companies lease through the Pre-Permitting

Project. The only potential gritting site that could be affected from shellfish aquaculture is the Pre-Permitting Project. As a result, black brant may show some short-term shifting of their distribution within Arcata Bay to avoid disturbance and some portion of individuals may respond by shifting to South Bay, where the majority of the brant distribution formerly occurred.

The ability for black brant and other waterbirds to acclimate to some level of disturbance should not be discounted. Based on an analysis performed by H.T. Harvey & Associates (HTH) for the Pacific Project (District 2016; SCH #2015082051), and incorporating data from Stillman et al. (2015), brant are distributed roughly equally between South Bay and Arcata Bay (and eelgrass biomass is also similar in the 2 basins), despite the current level of aquaculture and other recreational and commercial boating occurring in Arcata Bay. This suggests that black brant have adjusted their behavior (i.e., become acclimated to some levels of disturbance) to exploit areas of eelgrass abundance, and it is unlikely that brant would completely abandon most foraging sites, especially considering the amount of area available and the fact that activities do not occur at all shellfish beds during the foraging timing of brant. A shift in brant distribution could result in higher levels of grazing in less disturbed areas. However, the results of eelgrass biomass modelling efforts by HTH indicated the reduction in available biomass under cumulative conditions does not approach significance thresholds, and impacts were estimated at <3% to the available foraging habitat (District 2016). Because the HIOC Project, Pre-Permitting Project, and Yeung Project area all avoiding placement of shellfish aquaculture gear in eelgrass cover, this would avoid major black brant foraging areas.

Finally, the same BMPs proposed for the HIOC Project identified in the IS document would be expected for other shellfish companies. Note that this is a BMP that would be used by all boaters because there are federal laws (e.g., Endangered Species Act, Marine Mammals Protection Act, Migratory Bird Treaty Act) that protect fish and wildlife. While there is no potential impact from the HIOC Project that would need to be mitigated regarding potential interactions with black brant, it is still a common BMP that provides consistency with federal laws.

BMP-3 Fish and Wildlife: During vessel transit, harvest, maintenance, inspection, and planting operations, HIOC will avoid approaching, chasing, flushing, or directly disturbing shorebirds, waterfowl, seabirds, or marine mammals.

Based on the above analysis, it is unlikely that brant will experience a significant reduction in foraging opportunity bay-wide such that their ability to emigrate and breed is threatened. Therefore, cumulative impacts to black brant are expected to be less than significant.

D.5.9 Roosting Birds

Many birds roost on structures within Humboldt Bay, including double-crested cormorants, California brown pelicans, Caspian terns, Forster’s terns, elegant terns, and several gull species. These birds roost on rafts or other structures, as well as on Sand Island. Noise and other sources of human disturbance can cause them to flush from the area. These disturbances have energetic costs associated with flight while birds search for alternative roost sites. The movement of boats and workers associated with all shellfish aquaculture projects may result in cumulative effects to roosting birds. However, activities that would disturb birds primarily occur in the main channels to access intertidal sites. Birds are unlikely to flush from roosts when boats move through the channels, as roosting birds would be acclimated to regular boat traffic in those areas. It is expected that roosting birds in the bay are generally habituated to human disturbance, given that birds often roost on sites that are near human activity (e.g., docks, piers, etc.), and that individuals that are not habituated to regular human disturbance will roost in more remote areas of the bay. Roost sites in the bay are not a limited resource, as there are numerous unoccupied roost sites in the bay year-round. Therefore, cumulative impacts to roosting birds are expected to be less than significant.

D.5.10 Nesting Birds

Sand Island occurs in the north-central portion of Arcata Bay. Double-crested cormorants and Caspian terns nest on Sand Island and human disturbance associated with all shellfish aquaculture operations in the vicinity of the island has the potential to flush nesting birds. Disturbances could result in the loss of eggs and/or chicks, and potentially nest or colony abandonment. The Pacific Project is reducing shellfish gear and culture operations in the vicinity of Sand Island by 14 acres. The HIOC Project is located approximately 1.5 miles from Sand Island. The Pre-Permitting Project has some proposed culture areas near the area, but are also located over a mile from nesting areas. Based on a literature review on human-caused disturbances that elicited a flushing response or nest failure, Borgmann (2010) recommended strategies for avoiding disturbance to nesting birds that included a 330-foot buffer from nesting activities.

Shellfish aquaculture operations are cyclical activities with short periods of work, rather than an ongoing daily operation. Noise-generating activities would occur at discrete points in time during the culture cycle. More importantly, the proposed farm sites provide a larger buffer from nesting activities of double-crested cormorants and Caspian terns than the 330-foot recommended buffer. Therefore, cumulative impacts to nesting birds are expected to be less than significant.

D.5.11 Waterfowl

Boat traffic and the presence of workers associated with the HIOC Project and other shellfish activities in Arcata Bay could disturb waterfowl, causing birds to flush from foraging areas and reducing temporal and/or spatial access to food. Human disturbance can result in increased energetic costs as well as a reduction in foraging opportunity (Borgmann 2010). The waterfowl species most likely affected is American wigeon, which occur in low densities on the bay in winter when they feed on both emergent and floating eelgrass. Similar to the discussion above for black brant, cumulative impacts are not expected to result in significant adverse effects to foraging opportunities or behavioral disturbances such that waterfowl are energetically constrained in regard to emigration or breeding. This is primarily because existing and proposed projects mostly avoid continuous eelgrass cover, overlapping with only 1.5% of the continuous eelgrass cover in

Arcata Bay (refer to Table D-3). Impacts associated with the Pacific Project, which involved the greatest amount of overlap with continuous eelgrass cover, were appropriately mitigated (District 2016). Results of eelgrass monitoring by Merkel and Associates (2020, 2021) indicate that eelgrass cover is not reduced in existing culture areas, including areas with oyster longlines or SEAPA baskets. There may be some reduction of eelgrass density, although these results are confounded with natural changes due to elevation.

While there is potential for shellfish aquaculture operations to result in cumulative effects on waterfowl through increased disturbance, this impact is not expected to be significant given that waterfowl in the bay are already somewhat habituated to the current level of human disturbance from boat traffic and other activities. Moreover, the highest densities of American wigeon in Humboldt Bay coincide with winter waterfowl hunting, indicating that winter habitat use is not strongly influenced by human disturbance. Therefore, cumulative foraging and disturbance-related impacts to American wigeon and other waterfowl are expected to be less than significant.

D.5.12 Migratory Shorebirds

Humboldt Bay is an important estuary for migrating and wintering shorebirds in the Pacific Flyway (Pacific Flyway Council 2018). Impacts to shorebirds were discussed in the IS document, including the results of the Connolly and Colwell (2015) study and observations from the HTH (2015, 2018) studies. Although short-term cumulative impacts to shorebird foraging may occur, the effects are expected to be less than significant based on existing evidence of shorebird use of aquaculture sites. Specifically, intertidal culture areas generally do not support substantial shorebird use at lower elevations (i.e., the Pacific Project). Proposed projects that would be located at higher elevations (e.g., HIOC Project, Yeung Oyster Farm, and Pre-Permitting Project) have a greater potential to affect shorebirds since they occur in mudflat areas that are considered typical foraging habitat. However, foraging-related impacts to shorebirds are expected to be less than significant because shorebird foraging has been observed to occur irrespective of the presence of longlines or other near-bottom shellfish aquaculture gear (HTH 2015, 2018, 2021). Further, the variety of elevations for the various shellfish aquaculture operations and variety of cultivation schedules (i.e., planting and harvesting) for the projects will further reduce potential impacts.

Shorebirds are unlikely to be flushed by boats moving through channels to or from shellfish aquaculture sites based on common observations of shorebird presence on exposed flats throughout Humboldt Bay. For example, during reconnaissance site visits associated with black brant surveys by HTH (2015, 2018, 2021) using images recorded using trail cameras that recorded images at fixed intervals throughout tidal cycles, shorebirds were observed foraging under longlines in close proximity to the passing boat and did not typically flush or alter behavior as the boat passed by. As such, the greatest impact to shorebirds related to human disturbance likely occurs when workers directly access the plots. However, birds will generally experience infrequent levels of disturbance (i.e., once/month for inspections, other than harvest and planting). Shorebirds may exhibit short-term avoidance of these areas when workers are present, but they are unlikely to be regularly disturbed given the infrequent access to farmed plots.

In addition, HIOC would comply with the following BMPs:

BMP-3 Fish and Wildlife: During vessel transit, harvest, maintenance, inspection, and planting operations, HIOC will avoid approaching, chasing, flushing, or directly disturbing shorebirds, waterfowl, seabirds, or marine mammals.

BMP-6 Wetland Buffer: HIOC has adopted a minimum of a 200-foot buffer between the wetlands associated with the Mad River Slough Wildlife Area and the proposed culture area. Culture equipment will not be installed in the buffer areas.

Overall, cumulative foraging and disturbance-related impacts to migratory shorebirds are expected to be less than significant.

D.5.13 Marine Mammals

Marine mammals, especially harbor seals, are primarily located in the main channels and in haul-out areas. The closest haul-out area to shellfish aquaculture sites in Arcata Bay is towards the southern end of the Mad River channel (Ougzin 2013). Otherwise, haul-out sites are located in South Bay or along the coast (Archibald 2015). Some marine mammals produce and use sound for various biological functions, including social interactions, foraging, orientation, and predator detection. Interference with producing or receiving sounds could have adverse consequences to individuals or populations, including impaired foraging efficiency from masking, altered movement of prey, increased energetic expenditures, and temporary or permanent hearing threshold shifts due to chronic stress from noise (Southall et al. 2007). Boat trips associated with all current and proposed shellfish aquaculture in Arcata Bay is expected to be minimal, and increases in boat activity from the HIOC Project, Yeung Oyster Farm, and Pre-Permitting Project will be small compared to existing boat use of the available channels. Human disturbance is, therefore, considered similar to existing conditions and within the range that marine mammals are accustomed to in Humboldt Bay.

The primary impact mechanism identified by the Corps (85 FR 57332) of existing shellfish aquaculture activities or future like actions on marine mammals is entanglement. A recent review of entanglements within aquaculture gear (specifically gear for mussel culture on rafts in deeper coastal waters) found just 19 occurrences globally since 1982 (Price et al. 2016). It is notable that these examples were associated with off-shore shellfish aquaculture operations in deepwater habitat. By contrast, global annual entanglements and bycatch of marine mammals within fishery gear (e.g., gill nets, trawl nets) numbers in the hundreds of thousands (Reid et al. 2006). Gear for intertidal longline systems and rack and bag culture is not designed to capture organisms, like fishing gear, and there are no reports of entanglement concerns within Humboldt Bay from at least 25 years of using near-bottom culture methods. Therefore, this potential impact is considered negligible for intertidal culture methods to marine mammals found in Humboldt Bay.

The proposed HIOC Project, Yeung Oyster Farm, and Pre-Permitting Project all avoid established marine mammal haul-out areas. The haul-out location towards the southern end of the Mad River channel is close to an area where oyster aquaculture has occurred for over 60 years, and the amount of existing shellfish aquaculture is decreasing in that area by 14 acres. Based on the above analysis, under cumulative conditions, this impact is expected to be less than significant.

D.6 Cumulative Impacts: Cultural Resources

Existing and other proposed mariculture in the bay (including the Yeung Oyster Farm and Pre-Permitting Project) will have similar potential impacts to cultural resources as the HIOC Project. While there is very little soil disturbance from near-bottom culture methods, there is the potential that placement of gear could disturb cultural or archeological resources. In order to protect potential impacts, HIOC and other shellfish companies comply with the following mitigation measure:

> **Mit-7 Cultural Resources:** HIOC will comply with the Harbor District Protocol agreed upon between the Harbor District and the Blue Lake Rancheria, Bear River Band of Rohnerville Rancheria, and Wiyot Tribes regarding the inadvertent discovery of archaeological resources, cultural resources, or human remains or grave goods (Appendix B).

The measures detailed out in Appendix B, and provided recently in the Pre-Permitting Project and Yeung Oyster Farm (SCH #2017032068), include an inadvertent discovery plan. The protocols of this plan are laid out in the IS document. Given that all activities that could disturb sediments would include an inadvertent discovery plan, potential cumulative impacts to cultural resources are expected to be less than significant with mitigation incorporated.

D.7 Cumulative Impacts: Geology and Soils

There are numerous fault lines throughout Humboldt Bay, and there is also an intersection of three tectonic plates. As such, the area is highly susceptible to seismic activity. However, shellfish aquaculture operations do not add any fixed structures to the landscape that would be susceptible to seismic damage, nor would these operations put existing structures at greater risk. In addition, culture areas in the bay are level and lack structures that could become unstable and injure workers. The sediment could be subject to liquefaction, which would pose a minor risk to workers; however, the risk is considered very low, given that (1) liquefaction of the type that would be a risk to workers is uncommon, and there is no historical evidence of liquefaction in Humboldt Bay; (2) workers would be within culture areas only temporarily, and no people would inhabit the area; and (3) workers would be near vessels and safety equipment, including personal floatation devices. Therefore, cumulative impacts related to seismic risks are expected to be less than significant.

D.8 Cumulative Impacts: Greenhouse Gas Emissions

Existing and other proposed mariculture in the bay (including the Yeung Oyster Farm and Pre-Permitting Project) will have similar greenhouse gas (GHG) emission impacts as the HIOC Project. Even at a cumulative scale, the level of GHG emissions resulting from shellfish culture (i.e., boat use and storage, processing/cleaning, and transportation of shellfish) in Humboldt Bay is considered minor, particularly relative to the amount of food that will be produced and other activities in the region such as traffic on the surrounding roadways (the existing setting). Therefore, this cumulative impact is expected to be less than significant.

D.9 Cumulative Impacts: Hazards and Hazardous Materials

As described in the IS document, historic land uses around Humboldt Bay have contributed to legacy sediment contamination of both polychlorinated biphenyls (PCBs) and dioxins. These contaminants may bind to sediments and can be remobilized by ground disturbing activities; however, the methods used in Arcata Bay are near-bottom methods that do not significantly disturb bottom sediments.

Shellfish aquaculture operations are dependent on high water quality standards, which is influenced by sediment quality. Because oysters require high quality water to grow, farms avoid areas of Arcata Bay that are known to have water quality concerns, such as areas with high runoff from tributaries, known areas with high dioxin levels, etc. Additionally, shellfish companies are required to avoid areas that could be considered “prohibited” due to upland pollution sources, such as non-functioning septic fields or wastewater treatment plants (CADPH 2020). Maintenance of high water quality and reduction of contaminants due to the presence of commercial shellfish harvesting areas benefits public health and improves opportunities for recreation.

Even with shellfish aquaculture operations in close proximity to former lumber mill locations (e.g., the HIOC Project), there does not appear to be concern for resuspension of dioxins from shellfish aquaculture operations. Testing of tissue in 2003 confirmed that dioxin concentrations in shellfish next to the Mad River Slough were at or below levels found in background conditions associated with food resources throughout the U.S. (PSI 2007). Because existing shellfish aquaculture operations in the Mad River Slough area were transitioned to cultch-on-longline and SEAPA basket culture between 1997 to 2006, the sampling in 2003 would have captured conditions that would be consistent with the HIOC Project or other existing culture operations in Arcata Bay.

Existing and other proposed mariculture in the bay (including the Yeung Oyster Farm and Pre-Permitting Project) will have similar effects regarding hazards and hazardous materials as the HIOC Project. Other shellfish aquaculture operations are expected to take similar precautions to minimize the potential for oil or other spills in the bay, including BMP-1 and BMP-2, so as not to cause impacts related to hazards and hazardous materials.

BMP-1 Vessel Maintenance and Fueling: HIOC will maintain all vessels used in culture activities to limit the likelihood of release of fuels, lubricants, or other potentially toxic materials associated with vessels due to accident, upset, or other unplanned events.

HIOC will use marine grade fuel cans that are refilled on land, and HIOC carries oil spill absorption pads and seals wash decks or isolates fuel areas prior to fueling to prevent contaminants from entering the water.

BMP-2 Vessel Motors: HIOC will use highly efficient 4-stroke outboard motors. All motors will be muffled to reduce noise.

Given the reliance on high water quality standards, the presence of shellfish aquaculture operations provides an industry to the bay that results in consistent monitoring and actions to improve water quality. Therefore, this cumulative impact is expected to be less than significant.

D.10 Cumulative Impacts: Hydrology and Water Quality

Existing and other proposed mariculture in the bay (including the Yeung Oyster Farm and Pre-Permitting Project) will have similar effects on hydrology and water quality as the HIOC Project. Other projects are expected to take similar precautions (i.e., BMPs and mitigation measures) not to impact water quality. Additionally, the carrying capacity analysis (District and SHN 2015) on the abundance of suspended organic matter and potential competition for this food source between cultured shellfish and other filter feeders is a cumulative analysis and the impact is found to be less than significant.

Filter feeding shellfish may locally reduce turbidity and represent a net removal of nitrogen from Humboldt Bay, as well as transfer nutrients from the water column to the sediments. This is based on recent studies associated with shellfish aquaculture operations in the U.S. For example, the IS document discussed the Kellogg et al. (2018) study that looked at the quantification of ecological benefits and impacts of oyster aquaculture in Chesapeake Bay. Although culture densities were shown to have little impact or benefit on water quality, the removal of nitrogen from the system was identified as a quantifiable benefit. The study calculated a removal of 21 to 372 pounds (lbs) of nitrogen and 3 to 49 lbs of phosphorus per farm per year. The net removal of nitrogen compensates for anthropogenic additions of nitrogen (e.g., shoreline development and agricultural runoff), and shellfish filtration may become more valuable as nutrient input increases within coastal communities (Shumway et al. 2003, NRC 2010, Burkholder and Shumway 2011, Kellogg et al. 2013, 2018).

Oyster culture has the potential to increase contaminants in the water column associated with the use of work skiffs for accessing culture rafts, oyster beds and associated areas. All companies that would operate in Humboldt Bay would implement similar measures as BMP-1 and BMP-2 above to minimize the potential for spills and to reduce impacts from spills that do occur. For example, boats would be fueled at the local commercial fuel dock and boats would carry oil spill absorption pads. Overall, even with the increased number of operators proposed in Humboldt Bay, this impact is expected to be less than significant.

D.11 Cumulative Impacts: Noise

The primary noise effect caused by shellfish aquaculture operations include the use of small vessels with internal combustion engines. These vessels generate noise similar to that generated by other small vessels on the bay. The HIOC Project vessels would not be heard from sensitive receptors, especially with the implementation of the following BMP:

BMP-2 Vessel Motors. HIOC will use highly efficient 4-stroke outboard motors. All motors are muffled to reduce noise.

This is a similar BMP used by other companies throughout Humboldt Bay. In general, shellfish aquaculture causes temporary noise effects during the installation of aquaculture gear and other regular operations related to culture activities, but the noise generated is similar to ambient noise conditions at shoreline locations (e.g., cars along the road along the shoreline or other boats on the water). In addition, one of the primary (and preferred uses) of the bay is shellfish aquaculture, which is part of the existing noise environment in Humboldt Bay. The HIOC Project and other proposed shellfish aquaculture projects would not contribute a significant amount of noise impacts to the bay. Overall, cumulative noise impacts are expected to be less than significant.

D.12 Cumulative Impacts: Transportation

Potential impacts to transportation, specifically potential hazards, were identified in the IS document as a potential significant effect that required mitigation to reduce the impacts to less than significant. The main concerns include the potential to disrupt in-water navigation and the potential to generate marine debris. The following mitigation measure and BMPs would be used to avoid and minimize these impacts.

Mit-1 Marine Debris: HIOC will implement a marine debris management plan (Appendix A). At the time of harvest of each cultivation area, HIOC will carry out a thorough inspection to locate and remove any loose, abandoned or out of use equipment and tools. All floating bags and baskets will be marked or branded with the HIOC's name and phone number.

BMP-4 Bed Marking. HIOC culture beds will be marked with a long PVC pole to provide information to boaters of the location of shellfish aquaculture gear.

BMP-5 Bed Mapping. HIOC will provide a map of the culture bed locations and post the maps at the closest boat launch and adjacent wildlife area and on the District's website.

BMP-6 Wetland Buffer: HIOC has adopted a minimum of a 200-foot buffer between the wetlands associated with the Mad River Slough Wildlife Area and the proposed culture area. Culture equipment will not be installed in the buffer areas.

The location of the HIOC Project is within 1,500 feet of a public access point and is surrounded by the Ma-le'l Dunes Park, Humboldt Bay National Wildlife Refuge area, and Mad River Slough Wildlife Areas (Figure D-5). Other farms are located in the same area, although they are further from these primary access points in the Mad River Slough area. An additional avoidance measure used by existing shellfish companies, and would also be used by HIOC, is using a different boat access point into Arcata Bay that is not used by the public. In addition, shellfish aquaculture gear is located in shallow, intertidal habitat that is not commonly used by recreational boaters. Boaters typically use the main channels or deeper sloughs. If boats access high intertidal areas, then shellfish beds are marked to help inform the location of gear.

As presented in the District Pre-Permitting Project Draft EIR (District 2020), shellfish gear is inundated for the majority of year (Table D-4). The HIOC Project is located at +1.6 feet to +4.6 feet MLLW, which is at a similar tidal elevation as the Pre-Permitting Project, and would be exposed approximately 30% of the year or less. During times when gear is inundated, kayakers can pass or maneuver over shellfish gear.

Table D-4. Percent of Time Shellfish Culture Gear is Exposed by Low Tides

Project	Percent of Year Out of Water	Percent of Year Inundated
Pre-Permitting Project	32%	68%
Coast Expansion	11%	89%
Coast Existing	16%	84%
Other Existing	26%	74%
Source: District 2020		

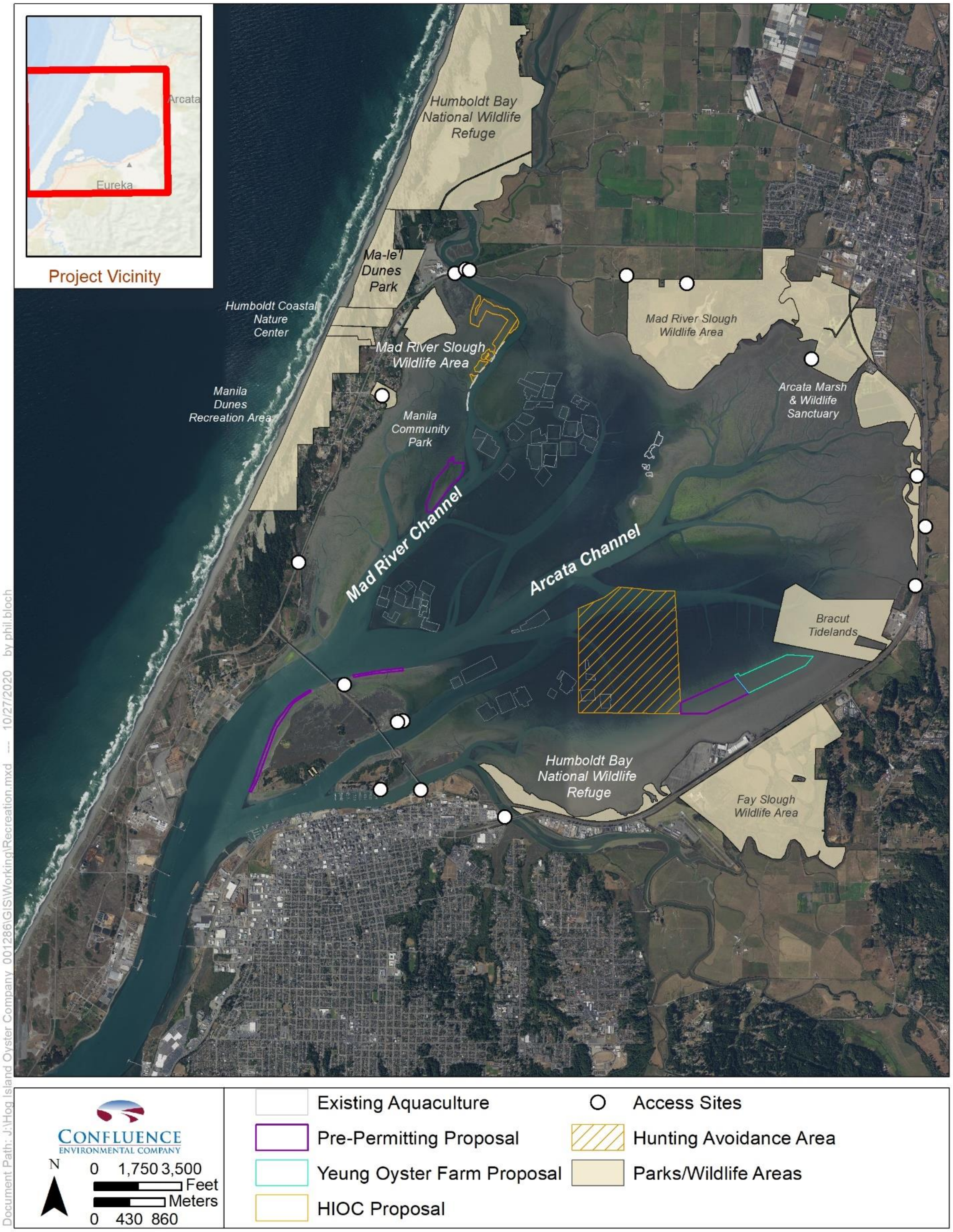

Figure D-5: Existing and Proposed Shellfish Aquaculture in Humboldt Bay in Relation to Recreational Access and Use Areas

While there may be some delays or restricted movement of vessels within specific intertidal areas, there are measures in place to avoid and minimize potential hazards for recreational boaters and kayakers. For example, the mitigation measure (Mit-1) to control escapement of shellfish aquaculture gear also avoid and minimize potential hazards for recreational boaters and kayakers that may encounter the gear. HIOC and other shellfish companies are expected to routinely inspect intertidal longline systems and rack and bag culture during monthly maintenance work and harvest activities. Any pipes or racks disturbed are re-secured or removed if damaged. Any identified loose pipes or other marine debris, even if it is not part of the shellfish operations, are removed from the culture area. It is relevant that shellfish aquaculture has been an industry that is part of Humboldt Bay's history. Shellfish aquaculture started around the 1950s (Barrett 1963). Therefore, shellfish gear and activities are part of the existing conditions that recreationalists have navigated for decades, and shellfish growers understand the importance of good farm maintenance.

Existing and other proposed shellfish aquaculture in Arcata Bay (including the Yeung Oyster Farm and Pre-Permitting Project) will have similar effects to potential transportation hazards in the bay as the HIOC Project. Potential impacts would only occur during certain tide heights and would be limited to areas outside of navigation channels. In addition, the HIOC Project employs mitigation measures to improve communication and the quality of the bay habitat by removing marine debris for both shellfish growers and recreationalists. Therefore, the cumulative impact on recreation is expected to be less than significant with mitigation.

D.13 Cumulative Impacts: Tribal Cultural Resources

Potential cumulative impacts to cultural resources are the same as the potential impacts to tribal cultural resources because the most likely cultural resources in Humboldt Bay are related to the tribes that used the area. The measures detailed out in the mitigation measure above (Mit-7), and the inadvertent discovery plan protocols provided recently in the Pre-Permitting Project and Yeung Oyster Farm (SCH #2017032068), would be used by any shellfish company operating in Humboldt Bay. Given that all activities that could disturb sediments would include an inadvertent discovery plan, potential cumulative impacts to tribal cultural resources are expected to be less than significant with mitigation incorporated.

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Appendix E
Response to Comments on the IS/MND

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Appendix E: Response to Comments on the IS/MND

California Environmental Quality Act (CEQA) Guidelines Section 15072(a) states, "A lead agency shall provide a notice of intent to adopt a negative declaration or mitigated negative declaration to the public, responsible agencies, trustee agencies, and the county clerk of each county within which the proposed project is located, sufficiently prior to adoption by the lead agency of the negative declaration or mitigated negative declaration to allow the public and agencies the review period provided under Section 15105." The Draft Initial Study and Mitigated Negative Declaration (IS/MND) was circulated to the public for 30-days for comment from March 12 to April 12, 2021. In accordance with CEQA, this section of the IS/MND provides written responses to comments received.

Comments are organized by source. Note that the sources listed below are linked to the start of their comments in this document. There are also several comments that have similar concerns. To the extent that a comment is addressed already, that information is linked in the response to the same comment later in the document. For example, "Response to **NMFS Comment 1-1** for additional details on eelgrass distribution in this area" will include a link to the response within the red comment number.

- Federal and State Agencies
    1. National Marine Fisheries Service (NMFS)
    2. California State Lands Commission (CSLC)
    3. California Department of Fish and Wildlife (CDFW)
    4. California Coastal Commission (CCC)
- Non-Profit Organizations
    5. Redwood Region Audubon Society (RRAS)
    6. National Audubon Society, Black Brant Group, and California Waterfowl
- Individuals
    7. Stan Brandenburg
    8. Jeff Black
    9. Terry Cook
    10. Dean Glaser
    11. Steven Grantham(1)
    12. Steven Grantham(2)
    13. Robin Hamlin
    14. Michael McNicholas
    15. Ted Romo

Comment Letter 1: National Marine Fisheries Service

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1655 Heindon Road
Arcata, California 95521-4573

March 5, 2021 Refer to NMFS No: 10012WCR2021AR00040

Dear Mr. Larry Oetker
Executive Director
Humboldt Bay Harbor, Recreation, and Conservation District
P.O. Box 1030
Eureka, California 95502

Dear Mr. Oetker:

This letter constitutes NOAA's National Marine Fisheries Service's (NMFS) comments on the Humboldt Bay Harbor, Recreation, and Conservation District's Initial Study and Mitigated Negative Declaration (IS/MND) for Hog Island Oyster Company's (HIOC) proposed Hog Island Shellfish Farm (Project) in Humboldt County, California. HIOC proposes to install up to 30-acres of aquaculture gear within 110-acres of tideland leases in the northwest portion of Arcata Bay.

The Project is located within the jurisdiction of the NMFS West Coast Region California Coastal Office, and requires a new U.S. Army Corps of Engineers (Corps) permit. As the lead federal action agency, the Corps must conduct an Endangered Species Act (ESA) Section 7 consultation and a Magnuson-Stevens Fishery Conservation and Management Act (MSA) - Essential Fish Habitat (EFH) consultation with NMFS. The IS/MND is one of the sources of information we will consider when completing consultation with the Corps.

NMFS is the lead federal agency responsible for the stewardship of the nation's offshore living marine resources and their habitats, and implements the ESA, the MSA, and the Marine Mammal Protection Act (MMPA) to fulfill its mission of promoting healthy ecosystems. Federally-managed living marine resources provide an important source of food and recreation for the nation, as well as thousands of jobs and a traditional way of life for many coastal communities, healthy ocean populations and ecosystems. NMFS also plays a central role in developing and implementing policies that enable marine aquaculture and works to ensure that aquaculture complies with existing federal laws and regulations that NOAA implements under its marine stewardship mission.

NOAA's aquaculture goals and objectives as outlined in both the Department of Commerce and NOAA's National Marine Aquaculture policies issued in June 2011, encourage and foster development of sustainable marine aquaculture in the context of NOAA's multiple stewardship missions, and social and economic goals. Also in June 2011, NOAA issued a National Shellfish Initiative to further the goal of increasing populations of bivalve shellfish in our nation's coastal waters through sustainable commercial production and native shellfish restoration activities. NOAA recognizes the broad suite of economic, social, and environmental benefits potentially provided by shellfish, including jobs and business opportunities; meeting the growing demand for seafood; habitat for important commercial, recreational, and endangered and threatened species; species recovery; cleaner water and nutrient removal; and shoreline protection.

We appreciate that HIOC has proposed to rely on eelgrass surveys to guide a phased installation of aquaculture gear that avoids the current distribution of eelgrass within the lease area. However, this approach is overly reliant on contemporary eelgrass distribution in this area, given that eelgrass distribution was much more extensive in 2009 (Schlosser and Eicher 2012). HIOC is currently proposing to install gear in areas that were occupied by eelgrass as recently as 2018. Eelgrass in Humboldt Bay is currently in a recession, as wasting disease is causing significant losses around the bay. In 2020, the nearby eelgrass monitoring transect in the Mad River Slough experienced a total loss of eelgrass (pers. com. Joe Tyburczy 2020). In other portions of Humboldt Bay, eelgrass retreat has been documented to be occurring at a rate of 25-feet per year in a linear direction in dendritic subtidal channels (pers. com. Whelan Gilkerson 2020). For these reasons, NMFS strongly recommends that the siting of aquaculture gear avoids all areas that supported eelgrass in 2009 as well as any additional areas found in the more recent surveys. **1-1**

The Southern Distinct Population Segment (SDPS) of North American green sturgeon is a Threatened species with designated critical habitat within the lease area (NMFS 2006). Goldsworthy et al. 2016 describes green sturgeon use of both smaller dendritic subtidal channels and intertidal mudflats in North Bay near Sand Island, adjacent to an area of high use. Pinnix (2008) reported that there were 200 detections of green sturgeon during the 2007 season at the Mad River Slough acoustic receiver array, which is located near the Project. Despite the presence of a high use area near Sand Island, the Mad River Slough is frequently used by (fewer individual) SDPS green sturgeon. Incorporating a buffer on all of the subtidal channels would greatly reduce exposure of SDPS green sturgeon to entanglement; and ameliorate the magnitude of effects to designated critical habitat for SDPS green sturgeon in the lease area. Coincidentally, most of the retreat of eelgrass distribution between 2009 and 2020 has occurred within the dendritic subtidal channels in the lease area and establishing a buffer on these channels would achieve multiple benefits. NMFS strongly recommends that HIOC avoid gear installations in areas documented to support eelgrass from both 2009 and more recent surveys as well as incorporating a small buffer on all subtidal channels. **1-2**

Please direct questions regarding this letter to Matt Goldsworthy, Fisheries Biologist, at Matt.Goldsworthy@noaa.gov or at (707) 357-1338.

Sincerely,

Jeffrey Jahn
South Coast Branch Chief
Northern California Office

cc: Copy to E-File: ARN 10012WCR2021AR00040

3

REFERENCES

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Personal Communications. May 30, 2020. Joe Tyburczy. California SeaGrant. Arcata, California.

Personal Communications. May 30, 2020. Whelan Gilkerson. Merkel and Associates. Arcata, California.

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Response to National Marine Fisheries Service

Comment Number	Response
1-1	It is unclear if the 2009 mapped distribution of eelgrass (NOAA Coastal Services, 2009) was more extensive than mapped in 2020 (Lummis 2020). In 2009, the eelgrass identified in the project vicinity was mapped as "patchy". Patchy refers to areas where the percent cover of eelgrass was between 11-84%. Because of this broad percent cover category, it is difficult to develop a meaningful comparison of the 2009 data with data from other years. Comparison between years to identify long-term trends is also complicated by (1) short term (e.g., monthly) variation in eelgrass distribution; (2) varying mapping methods; and (3) different quality aerial imagery to inform mapping. Confluence Environmental Company (Confluence) re-reviewed the aerial imagery used to classify eelgrass at this area and found that eelgrass is only associated with ponded areas and deeper channels that occur at the project site. Eelgrass does not appear to be present on the higher elevation mudflats in the study; however, many ponded areas and channels appear to have eelgrass. This likely resulted in classifying relatively large areas as having patchy eelgrass, though eelgrass only occurred within as little as 11% of the areas classified as "patchy" (i.e., areas without eelgrass and outside of ponded areas and channels were included in polygons classified with patchy eelgrass.) It would not be practical or beneficial for shellfish culture to avoid areas mapped in 2009 as having 11-84% eelgrass cover because much of those areas did not (and do not) have eelgrass present. Such avoidance is also not required to reduce environmental effects to less than significant. The reference to 2018 data in the comment is related to publicly available imagery viewable in Google Earth and other mapping applications (Goldsworthy, pers. comm., 2021). Interpretation of eelgrass from remote imagery without ground truthing is difficult and can be misleading. There may be some retreat of eelgrass in tidal channels; however, conservation measures to avoid channels and eelgrass areas (Mit-2 [Eelgrass Protection] and Mit-5 [Channel Buffers]) are protective of both existing and potential eelgrass in channels. Eelgrass distribution is dynamic and responds to a wide range of stressors. Additionally, CEQA requires that the initial study "focus on impacts to the existing environment . . . The impacts of a proposed project are ordinarily to be compared to the actual environmental conditions existing at the time of the CEQA analysis." *Center for Biological Diversity v. Dept. of Fish & Wildlife*, 234 Cal.App.4th 214, 248 (2015); *see also CEQA* Guidelines, § 15125, subd. (a). Mitigation Measure 2 and 5 are provided below, including edits (in underline / strikethrough format) to account for annual surveys that were incorporated into the revised IS/MND. **Mit-2 (Eelgrass [*Zostera marina*] Protection):** HIOC will install racks, intertidal longline systems, and other aquaculture gear at least 5 horizontal meters ~~(or 16 feet)~~ from native eelgrass (*Zostera marina*) ~~beds~~cover. This will not prevent continued cultivation in areas where eelgrass moves into the project site. HIOC is expected to install gear incrementally. Before gear is installed in new areas, eelgrass will be mapped in culture areas using unmanned aerial vehicles (UAV) and/or verified using ground surveys to identify eelgrass ~~beds~~cover and establish 5 meter horizontal buffers. Eelgrass surveys will be ~~considered valid pre-installation surveys if performed less than 2 years~~conducted annually during the eelgrass growing season (May to September) prior to gear installation until gear is fully installed at the site. **Mit-5 (Channel Buffers):** HIOC will establish a 10-foot buffer from the top of bank of channels. Culture equipment will not be installed in the buffer areas. The 2020 eelgrass mapping (Lummis 2020) is broadly consistent with the 2009 eelgrass mapping and both show eelgrass present in ponded areas. Applying a buffer of 5 meters around eelgrass mapped in 2020 provides appropriate protection and allowance for expansion of the existing eelgrass resource at this site. Additionally, as further described in Mitigation Measure 2, Hog Island Oyster Company (HIOC) will be conducting annual eelgrass

Comment Number	Response
	surveys and will provide a 5 m buffer from any identified areas of vegetated eelgrass cover prior to installation of aquaculture gear (other than those areas where eelgrass has grown into a cultivated area). Therefore, HIOC will avoid any uncultivated areas where eelgrass expands in the future. This will allow avoidance of any potential impacts to eelgrass at the time aquaculture gear is installed. *Refer* to Response to **CDFW Comment 3-1** for additional details.
1-2	The HIOC Project will incorporate a 10-foot buffer from the top of bank of channels or a 5 meter buffer from eelgrass, whichever is further (Mit-5 [Channel Buffers]). This measure is intended to provide avoidance of channel locations used by the SDPS green sturgeon. *Refer* to Response to **NMFS Comment 1-1** for additional details on eelgrass distribution in this area.

Comment Letter 2: California State Lands Commission

STATE OF CALIFORNIA GAVIN NEWSOM, *Governor*

CALIFORNIA STATE LANDS COMMISSION
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825-8202

JENNIFER LUCCHESI, *Executive Officer*
(916) 574-1800 *Fax* (916) 574-1810
California Relay Service TDD Phone 1-800-735-2929
from Voice Phone 1-800-735-2922

***Contact Phone:* (916) 574-1890**

Established in 1938

March 15, 2021

File Ref: SCH #2021020128

Humboldt Bay Harbor, Recreation, and Conservation District
Adam Wagschal, Deputy Director
601 Startare Drive
Eureka, CA 95502

VIA ELECTRONIC MAIL ONLY (awagschal@humboldtbay.org)

Subject: Initial Study and Draft Mitigated Negative Declaration (Draft MND) for the Hog Island Oyster Company Shellfish Farm in Arcata Bay Project, Humboldt County

Dear Adam Wagschal:

The California State Lands Commission (Commission) staff has reviewed the March 8, 2021, revised Draft MND for the Hog Island Oyster Company Shellfish Farm in Arcata Bay Project (Project), which is being prepared by the Humboldt Bay Harbor, Recreation, and Conservation District (District). The District, as the public agency proposing to carry out the Project, is the lead agency under the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.). The Commission is a trustee agency for projects that could directly or indirectly affect State-owned sovereign land and their accompanying Public Trust resources or uses.

<u>Commission Jurisdiction and Public Trust Lands</u>

The Commission has jurisdiction and management authority over all ungranted tidelands, submerged lands, and the beds of navigable lakes and waterways. The Commission also has certain residual and review authority for tidelands and submerged lands legislatively granted in trust to local jurisdictions (Pub. Resources Code, §§ 6009, subd. (c); 6009.1; 6301; 6306). All tidelands and submerged lands, granted or ungranted, as well as navigable lakes and waterways, are subject to the protections of the common law Public Trust Doctrine. **2-1**

California acquired sovereign ownership of all tidelands and submerged lands and beds of navigable lakes and waterways upon its admission to the United States in 1850. The State holds these lands for the benefit of all people of the State for Public Trust purposes, which include waterborne commerce, navigation, fisheries, water-related recreation, habitat preservation, and open space. On tidal waterways, the State's sovereign fee ownership extends landward to the mean high tide line, except for areas of fill or artificial accretion or where the boundary has been fixed by agreement or a court. On navigable non-tidal waterways, including lakes, the State holds fee ownership of the bed of the waterway landward to the ordinary low water mark and a Public Trust easement landward to the ordinary high water mark, except where the boundary has been fixed by agreement or a court. The boundaries may not be apparent from present day site inspections.

Based upon the information provided and a preliminary review of our records, the proposed Project is located within lands the State patented as Tide Land Location 253 (TLS 122), no minerals reserved. Any remaining State interest at this location has been granted to the District (Humboldt Bay Harbor, Recreation, and Conservation District) pursuant to 1283, Statutes of 1970, as amended. Although the underlying fee has been patented, there is a Public Trust use easement over the Project Area. **2-1 cont.**

Although it does not appear a lease is required from the Commission for the Project, the Commission staff submit the following comments in its role as trustee agency. If you have any questions specific to jurisdiction or lease, please contact Reid Boggiano (contact information provided below).

Project Description

The District proposes to farm oysters in Humboldt Bay, California. Under the Project, approximately 30 acres of culture would be established in intertidal areas using methods that suspend cultured shellfish off the bay bottom to meet the District's objectives and needs as follows:

- Develop a shellfish farm to complement Hog Island Oyster Company (Applicant)'s existing shellfish Hatchery Facility located near Samoa
- Locate oyster beds in areas with optimal growing conditions to maximize efficiency and limit the spatial footprint of the farm
- Produce premium oysters to meet demand from the Applicant's restaurants as well as provide sustainable seafood for local markets
- Create additional job opportunities and sustainable economic development for Humboldt Bay and local jurisdictions

From the Project Description, Commission staff understands that the Project would grow the following three species that could have possible impacts on legislatively granted sovereign land:

- Pacific oysters (*Crassostrea gigas*)- primary focus
- Kumamoto oysters (*Crassostrea sikimea*)
- Native "Olympia" oyster (*Ostrea lurida*)

Adam Wagschal Page 3 March 15, 2021

Environmental Review

Commission staff requests that the District consider the following comments on the Project's Draft MND, to ensure that impacts to the State's legislatively granted sovereign lands are adequately analyzed for the Project.

IV. Biological Resources

Bio-A7: Fouling Organisms and Non-native Species:

- The MND relies upon Boyd et al. (2002) as the source of information on the presence of non-native species in Humboldt Bay. That study is almost 20 years old and may not be reflective of the current diversity and distribution of non-native species in the Bay. A more recent synopsis of the spatial and temporal patterns of non-native species in Humboldt Bay is available in Ruiz and Geller (2018; full reference below). **2-2**
- The MND focuses on whether oyster spat will serve as a source of new non-native species introductions within the Bay but does not adequately address the role of the Project in contributing to the abundance of hard substrate in the Bay for settling and proliferation of non-native species already present or that may enter the Bay via shipping activities. **2-3**
- The MND indicates that the invasive tunicate (*Didemnum* sp.) has been found on shellfish aquaculture gear in Drakes Estero Bay. Based on Ruiz and Geller (2018; full reference below), the species is not yet present in Humboldt Bay. *Didemnum* has documented impacts on native seagrasses, including eelgrass (see Long and Grosholz 2015), hard substrate communities, and can foul infrastructure. *Didemnum* can be spread by aquaculture operation equipment, and there is potential for significant impacts to biological resources in Humboldt Bay if this species becomes established. **2-4** Staff recommends reanalyzing potential impacts from non-native species introductions to Humboldt Bay from the proposed Project, incorporating updated data from Ruiz and Geller (2018), and considering developing an invasive species management mitigation measure to reduce any potential impacts. **2-5**

Bio-A9: Effects to Habitats:

- Vessel Anchors: Staff recommends that **Mit-3 Vessel Anchors** (Applicant will anchor vessels outside of areas containing eelgrass) be augmented to include a specific minimum distance between placed anchors and the edge of eelgrass beds to minimize impacts (turbidity) to eelgrass. Staff recommends that the distance be at least 5 horizontal meters (or 16 feet), similar to the minimum distance required between operation equipment and eelgrass in **Mit-2 Eelgrass Protection**. **2-6**

Adam Wagschal Page 4 March 15, 2021

Bio-E: Local Policies:

- An additional relevant document that should be included on this list (starting on MND page 52) is the Assembly Bill (AB) 691 Sea Level Rise Vulnerability Assessment for the District. This document should be submitted to the Commission (State Lands Commission) as soon as possible to bring the District into compliance with AB 691 (Muratsuchi; Stats. 2013, ch. 592). The document is relevant to this Project because it is meant to assess the vulnerability to sea level rise of the Public Trust lands, resources, assets, and values that the District manages pursuant to its granting statutes, as well as describe potential adaptation strategies to increase coastal resiliency to sea-level rise. There is a Public Trust easement across the water bottom of the Project area, and the District is responsible for the management of the Public Trust in this area. The Commission requests the District include information from their AB 691 assessment in the discussion of local plans, policies, and relevant documents. 2-7

- On page 53 in the second paragraph, it is stated that Humboldt Bay is experiencing the largest annual relative sea-level rise of any location on the California coast, owing to the combination of rising seas and land subsidence. It goes on to discuss the prediction that the habitat range of eelgrass is likely to shift upslope in response, into the Project area, and suggests that the eelgrass and Project activities may be compatible. Staff recommends that the District create a monitoring plan, not only for eelgrass, but for the other biological resources and species of special concern described throughout this section (IV. Biological Resources) in consideration of the likelihood that habitat shifts will occur for all the resources in the Bay due to sea-level rise and other climate change-induced phenomena (increases in water temperatures, changes in water chemistry like ocean acidification and hypoxia, etc.). The monitoring plan should inform an adaptive management plan for this aquaculture operation and others within the District. The purpose of the adaptive management plan should be to establish protocols for how to respond to habitat shifts in a way that protects sensitive habitats like eelgrass beds and the ecological needs and functions of threatened, endangered, and endemic species. The adaptive management plan should include a series of actions to consider taking once events occur like habitat and species migration into the current Project area. Potential actions would include the identification of alternative locations that could host aquaculture operations when current Project locations are encroached on by a significant amount of eelgrass and other species. The adaptive management plan would ensure that the subject aquaculture operations would also be able to thrive in the best conditions suited for the cultivated species, conditions which are also likely to shift due to climate change effects over time. An adaptive management plan for the area would minimize harm to migrating habitats and species and maintain the productivity of the aquaculture operation itself. 2-8

Adam Wagschal Page 5 March 15, 2021

- Staff recommends that the MND replace the projections for sea-level rise found in the second paragraph on page 53 with the most recent, best available science on sea-level rise projections, using the 'Low Risk Aversion; High Emissions' scenario from Table 4 (North Spit Tidal Gauge) in the 2018 State of California Sea-Level Rise Guidance. **2-9**

- In the Humboldt County Humboldt Bay Area Plan Sea Level Rise Vulnerability Assessment, Sections 3.5.1 and 3.5.2 (pages 132-140) discuss potential impacts to the navigational channels and some of the commercial fishing and aquaculture infrastructure in Humboldt Bay, including onshore facilities that will be impacted by sea-level rise. The same areas and resources are a part of this Project. The navigation route identified in Fig. 10 of the MND appears to be through the Samoa Channel and the onshore hatchery facility appears to be on the Samoa Peninsula. Both areas are analyzed for sea-level rise in the Sea Level Rise Vulnerability Assessment mentioned above. Staff recommends including this document in the list of Local Policies (page 52 of MND) and discussing how these impacts will be addressed by the Project since they are physically and functionally connected. **2-10**

XVII. Transportation:

In the MND Discussion, it states that there is a potential for the Project equipment to impact public recreation in Arcata Bay during relatively low tides (page 71):

> "While recreational boaters primarily use the channels and not intertidal habitats, the addition of shellfish aquaculture gear could interfere with the movement of vessels (e.g., boats, kayaks) within those intertidal areas. This interference would occur only when the tides are high enough for vessels to move through the intertidal areas, but so low that that the vessels couldn't move readily over the gear." **2-11**

Commission staff recommends that the Project make efforts beyond **BMP-4 Bed Marking** to inform recreational boaters and water users near the Project area of the Project's location and how to avoid disturbing the equipment and livestock. The more information recreational boaters and water users have about the Project's location and activities, the more user conflicts will be avoided, and the less likely it will be that there will be impacts to the health and safety of both recreationists and livestock. Commission staff recommends the District post notices and maps of the Project location and activities at boat launch sites and public access points around Arcata Bay.

Thank you for the opportunity to comment on the Draft MND for the Project. As a trustee agency, we request that you consider our comments before adopting the MND.

Please send links to or copies of future Project-related documents, including electronic copies of the adopted MND, Mitigation Monitoring and Reporting Program, and Notice of Determination, when they become available. Please refer questions concerning environmental review to Maren Farnum, Senior Environmental Scientist, at (916) 574-0966 or Maren.Farnum@slc.ca.gov. For questions concerning Commission leasing jurisdiction, please contact Reid Boggiano, Public Land Management Specialist, at (916) 574-0450 or Reid.Boggiano@slc.ca.gov.

Sincerely,

Nicole Dobroski

Nicole Dobroski, Chief
Division of Environmental Planning
and Management

cc: Office of Planning and Research
Afifa Awan, Commission
Reid Boggiano, Commission
Maren Farnum, Commission
Jamie, Garrett, Commission
Emma Kennedy, Commission

Literature Cited:

Long, H.A. and E.D. Grosholz. 2015. Overgrowth of eelgrass by the invasive colonial tunicate Didemnum vexillum: Consequences for tunicate and eelgrass growth and epifauna abundance. Journal of Experimental Marine Biology and Ecology, 473: 188-194.

Ruiz, G.M. and J. Geller. 2018. Spatial and temporal analysis of marine invasions in California, Part II: Humboldt Bay, Marina del Rey, Port Hueneme, and San Francisco Bay. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=168904&inline.

Response to California State Lands Commission

Comment Number	Response
2-1	Comment noted.
2-2	Comment noted. Ruiz and Geller (2018) was added to the revised IS/MND. Based on a review of this paper, the conclusions in the IS/MND remain the same. According to Ruiz and Geller (2018), "Our surveys detected surprisingly few new NIS [non-native species] records across the four bays based on morphological analysis." *Refer* to Response to **CSLC Comment 2-3** and the revisions within the IS/MND for a more detailed discussion of the data results reported by Ruiz and Geller (2018) specific to Humboldt Bay.
2-3	The IS/MND notes that "the majority of literature related to organisms that colonize shellfish aquaculture gear are considered to provide additional food resources for fish and larger invertebrates." The more invasive species (e.g., *Didemnum*) have not been found in culture areas, although there are a few examples found in 2015 at marinas in the bay (Ruiz and Geller 2018). The closest location where *Didemnum* was reported was located approximately 3 miles from the HIOC Project. The area surrounding the HIOC Project site already has shellfish aquaculture gear operated by Humboldt Bay Oyster Company, and no invasive species have been observed on their existing gear. There is no other hard substrate near the site that would promote the spread of invasive species. The bags and baskets used by HIOC are removed when harvested and cleaned of any invasive species at their upland facility. Most gear is dried out and pressure washed before the next use. The long-term hard surfaces include the support pipes, which represents a small amount of surface area compared to the rest of the gear. Overall, there does not appear to be a significant spread of invasive species in the bay, and the fouling organisms that do colonize culture gear when it is available are reported in the literature as a benefit to foraging species like salmonids and birds.
2-4	Oysters have been cultivated in Humboldt Bay for over a century using cultivation techniques similar to those employed by HIOC without any documented introduction or spread of *Didemnum* due to shellfish aquaculture operations. HIOC maintains its operations independent from activities in other estuaries. HIOC does not move equipment between sites, and any equipment that is put into use in Humboldt Bay is thoroughly decontaminated and cleaned prior to use in the bay. The lack of hard surfaces left in the water long-term, good control practices for fouling organisms, and lack of reported establishment of *Didemnum* in the area of the HIOC Project minimizes this risk to less than significant.
2-5	*Refer* to Responses to **CSLC Comment 2-2 through 2-4**. Ruiz and Geller (2018) characterized the non-indigenous species present in Humboldt and San Francisco Bays. They identified two "tentative new records for Humboldt Bay" for species of Asian cephalaspidean gastropods (*Philine auriformis* and *P. orientalis*) previously recorded in other West Coast bays (Coos, Bodega, San Francisco, and Tomales Bays). Neither invader is associated with aquaculture and *Philine auriformis* is presumed to be introduced as planktonic larvae through ballast water transfers (Gosliner 1995). HIOC avoids inadvertent introductions and transfers of non-native organisms by limiting movement of gear between coastal bays. Equipment used in Humboldt Bay is dedicated to use in Humboldt Bay. Given that both HIOC's existing operations in Tomales Bay and existing shellfish aquaculture in Humboldt Bay have not been shown to introduce or spread invasive species, this impact is considered less than significant and no management mitigation measure is necessary.
2-6	HIOC does not plan to develop any permanent anchorages as part of this project. Anchors will be used to secure vessels either adjacent to the site in channels of the Mad River Slough, or as they are partially grounded during low tide. The 5 meter buffer discussed in Mitigation Measure 2 (*refer* to Response to **NMFS Comment 1-1**) is to provide a buffer in installing aquaculture gear from existing eelgrass vegetated cover in the event that eelgrass expands beyond the current bed. No such buffer for anchors is required, as the vessel anchors are temporary and Mitigation Measure 3 requires that HIOC not anchor in areas containing eelgrass, including areas where eelgrass expands in the future. The crew will have maps available to avoid eelgrass during anchoring.

Comment Number	Response
	Further, dropping vessel anchors create very little turbidity. The amount is considered nominal compared to the amount of suspended sediment or turbidity generated from a typical storm event that exposes eelgrass to turbidity on a daily basis. There are effects noted from long-term mooring locations (Herbert et al. 2009), but not from short-term access points that are proposed by HIOC. Even long-term mooring locations will quickly recover to baseline conditions after the mooring is removed. In addition, access to the culture beds by HIOC would be infrequent. Boats would need to anchor 2-4 times per week, including access during a high tide when boats would not be anchored. This will allow for recovery of the area between visits. Therefore, Mitigation Measure 3 appropriately protects eelgrass from impacts associated with vessel anchor deployment.
2-7	The comment concerns an issue beyond the scope of the current HIOC Project and IS/MND in requesting that the Harbor District submit a sea level rise vulnerability assessment. While it is anticipated that there will be some sea level rise, it is not anticipated to be so significant or dramatic that it would impact the HIOC Project or create conditions under with the HIOC Project would have a significant impact on the environment. There are additional areas of the site located at higher tidal elevations where HIOC could relocate its shellfish gear in the event that sea levels rose significantly in a manner that impacted its operation. As shown in Figure 3 of the IS/MND, these areas are generally devoid of eelgrass. The Harbor District's Sea Level Rise Adaptation Planning Project does not identify shellfish aquaculture in Humboldt Bay as an area that will likely be significantly affected by sea level rise. *Refer* to Response to **CSLC Comment 2-8** for additional details.
2-8	CEQA requires an evaluation of the project's impacts on the environment, not the environment's impact on a project. *Center for Biological Diversity v. County of Los Angeles*, Cal. Sup. Ct., Case No. 19STCP21000, 4/5/21, at 61 (holding that EIR did not need to evaluate if climate change would increase chance of fire risks); *Cal. Bldg. Indus. Assn. v. Bay Area Air Quality Mgmt. Dist.*, 62 Cal.4th 369, 378 (2015). Therefore, CEQA does not require an evaluation of how climate change may impact bay-wide resources in the future, and how those resources could in turn impact the HIOC Project. Monitoring changes in resources due to sea-level rise and climate change-induced phenomena fall within the purview of groups like the Harbor District, California Sea Grant, universities, and resource management agencies. However, as noted elsewhere, HIOC will commit to annually monitoring eelgrass within the HIOC Project site (Mitigation Measure 2). The comment presumes that, should eelgrass move into HIOC's cultivation areas, that HIOC or the Harbor District should consider adaptive management. However, should eelgrass move into HIOC's cultivation areas, it would provide additional evidence that HIOC's operations can co-exist with eelgrass. *Refer* to Response to **CDFW Comment 3-3** for additional detail regarding the project's impact to eelgrass. Shellfish aquaculture entities in Humboldt Bay have engaged in several targeted studies and monitoring efforts associated with potential effects from aquaculture activities. These studies include eelgrass recovery (Rumrill and Poulton 2004); fish use (Pinnix et al. 2005); invertebrate communities, eelgrass density, and fish use (Hudson et al. 2018 and Confluence et al. 2019); eelgrass monitoring (Merkel and Associates 2020 and 2021); and brant monitoring (HTH 2015, 2018 and 2021). These studies have supported the analysis for this IS/MND. In addition, HIOC has frequently worked in collaboration with researchers, including The Nature Conservancy and UC Santa Cruz, to further academic research regarding intertidal communities and shellfish aquaculture. As noted in Response to **CSLC Comment 2-7**, changes in sea level rise at the HIOC Project site is not likely to be so significant and drastic as to significantly change conditions as compared to the monitoring efforts already performed in Humboldt Bay. In the unlikely event that there was such a drastic shift in tidal elevation, it would likely similarly impact both eelgrass and HIOC's oyster cultivation (given that both require specific tidal elevations to thrive), and HIOC could consider relocation of its gear to another unused portion of the Project site; however, any such significant changes would be entirely speculative at this time. Based on use of the best available science in the IS/MND, including current monitoring studies in Humboldt Bay, there does not appear to be the need for additional monitoring directly associated with the HIOC Project.

Comment Number	Response
	The Harbor District agrees that the proposed adaptive management program would have benefits but does not have adequate resources to design and implement such a program.
2-9	The IS/MND has been revised to incorporate this reference.
2-10	HIOC's existing shellfish processing facility is part of the environmental baseline and would not be impacted by the proposed project; therefore, it is not part of the environmental review subject to CEQA.
2-11	Recreational users will be able to visually identify culture areas by the presence of marker stakes driven into the substrate at the corners of each culture area; these markings are visible at all tidal elevations. Pursuant to BMP-5 (new measure), HIOC will ensure that recreational and other users have up-to -date information to plan and conduct outings on the bay and navigate through or avoid HIOC's planted plots. The new BMP-5 also resulted in edits to BMP-4. The revised language for both measures includes: **BMP-4 (Bed Marking):** HIOC culture beds will be marked with a long PVC pole to provide information to boaters of the location of shellfish aquaculture gear. ~~HIOC will also inform the District of the location of the beds and they will be posted on the District's website.~~ **BMP-5 (Bed Mapping):** HIOC will provide a map of the culture bed locations and post the maps at the closest boat launch and adjacent wildlife area and on the District's website. While hazards to recreational users are already identified as less than significant in the IS/MND, HIOC's practice of marking the corners of each culture area with PVC marker stakes visible at all tidal elevations (BMP-4) and compliance with BMP-5 (bed mapping) further ensures that these impacts are minimized as much as possible.

Comment Letter 3: California Department of Fish and Wildlife

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State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
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GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

April 12, 2021

Adam Wagschal
Deputy Director
Humboldt Bay Harbor, Recreation and Conservation District
P.O. Box 1030, Eureka, CA 95502
awagschal@humboldtbay.org

Subject: Hog Island Oyster Company Shellfish Farm in Arcata Bay Recirculated Initial Study/Mitigated Negative Declaration SCH# 2021020128

Dear Mr. Wagschal,

The California Department of Fish and Wildlife (Department) received the Recirculated Initial Study/Mitigated Negative Declaration (IS/MND) from the Humboldt Bay Harbor, Conservation and Recreation District for the Hog Island Oyster Company Shellfish Farm in Arcata Bay Project (Project) pursuant the California Environmental Quality Act (CEQA) and CEQA Guidelines.[1]

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California fish and wildlife resources. Likewise, we appreciate the opportunity to provide comments regarding those aspects of the Project that the Department, by law, may be required to carry out or approve through the exercise of its own regulatory authority under the Fish and Game Code.

DEPARTMENT ROLE

The Department is California's Trustee Agency for fish and wildlife resources and holds those resources in trust by statute for all the people of the state (Fish & Game Code, Section 711.7, subd. (a) & 1802; Pub. Resources Code, Section 21070; CEQA Guidelines Section 15386, subd. (a)). The Department, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife and habitat necessary for biologically sustainable populations of those species (*Id.*, Section 1802). Similarly, for purposes of CEQA, the Department is charged by law to provide, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources. The Department is also responsible for marine biodiversity protection under the

[1] CEQA is codified in the California Public Resources Code in section 21000 et seq. The "CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

Marine Life Protection Act in coastal marine waters of California and ensuring fisheries are sustainably managed under the Marine Life Management Act.

The Department has the additional role of working toward the objectives of state policy declared in Fish & Game Code Section 1700, which includes, among others, the development of commercial aquaculture.

PROJECT DESCRIPTION SUMMARY

Proponent: Humboldt Bay Harbor, Recreation and Conservation District (Harbor District)
Objective: Hog Island Oyster Company (HIOC) proposes to install 30 acres of shellfish culture operation within 110 acres of leased intertidal mudflat in the northwest portion of Arcata Bay. HIOC proposes to grow three species of oyster: Pacific oysters (*Crassostrea gigas*), Kumamoto oysters (*C. sikamea*), and the native Olympia oyster (*Ostrea lurida*). The primary culture method would be intertidal longlines equipped with either SEAPA-type culture baskets or tipping bags (up to 27 acres), in addition to a small area of raised rack-and-bag culture (up to 3 acres). This new operation would complement HIOC's existing shellfish hatchery facility located near Samoa in Humboldt Bay.
Location: Northwestern tidelands of Arcata Bay adjacent to the Mad River Slough Channel (parcel 506-121-001-000).
Timeline: The proposed Project would be phased in over a five-year period.

BIOLOGICAL SIGNIFICANCE

Humboldt Bay is California's second largest Bay, and the largest estuary on the Pacific coast between San Francisco Bay and Oregon's Coos Bay. The marine and estuarine habitats of Humboldt Bay provide refuge and nursery habitat for more than 300 fish and invertebrate species, many with important commercial and recreational fisheries, and aquaculture value. Humboldt Bay and its wetlands and dunes are habitat for at least 20 State- and federally listed species and numerous California Species of Special Concern.

COMMENTS AND RECOMMENDATIONS

Pursuant to our jurisdiction, the Department offers the following comments and recommendations below to assist the Harbor District and HIOC in adequately identifying and/or mitigating the Project's significant, or potentially significant, direct and indirect impacts on fish and wildlife resources.

I. Special Status Species

Special status species that occur in the Project area and are listed under the California Endangered Species Act (CESA), Federal Endangered Species Act (ESA), or California Species of Special Concern (SSC) include:

- Coho salmon (*Oncorhynchus kisutch*), State and federally threatened (Southern Oregon/Northern California Coast (SONCC) Evolutionarily Significant Unit (ESU));
- Chinook salmon (*Oncorhynchus tshawytscha*), federally threatened (California Coastal ESU);
- Coastal cutthroat trout (*Oncorhynchus clarki clarki*), State SSC;
- Steelhead (*Oncorhynchus mykiss*), federally threatened (Northern California Distinct Population Segment (DPS)), State-endangered candidate (Northern California Summer Steelhead);
- Longfin smelt (*Spirinchus thaleichthys*), State-threatened;
- Green sturgeon (*Acipenser medirostris*), federally threatened (southern DPS), State SCC (northern and southern DPS);
- White sturgeon (*Acipenser transmontanus*), State SSC;
- Pacific lamprey (*Entosphenus tridentatus*), State SSC;
- Western river lamprey (*Lampetra ayresii)*, State SCC; and
- Black brant (*Branta bernicla nigricans*), State SSC.

II. Project Impacts

Eelgrass Habitat

Comments: Native eelgrass beds (*Zostera marina*) are an important part of the Humboldt Bay ecosystem and are recognized by state and federal statutes as both highly valuable and sensitive habitats. Humboldt Bay holds approximately 31% of the known mapped eelgrass in the state (Merkel & Associates 2017). Eelgrass provides primary production and nutrients to the ecosystem along with spawning, foraging, and nursery habitat for fish and other species. Pursuant to the federal Magnuson-Stevens Fishery Conservation and Management Act, eelgrass is designated as Essential Fish Habitat for various federally managed fish species within the Pacific Coast Groundfish and Pacific Coast Salmon Fisheries Management Plans (FMP). Eelgrass is also considered a habitat area of particular concern for various species within the Pacific Coast Groundfish FMP. Eelgrass beds are further protected under state and federal "no-net-loss" policies for wetland habitats and are also listed by the Department as a Sensitive Natural Community with a vulnerable listing status (State Rank S3). Sensitive Natural Communities with rankings of S1-S3 are of limited distribution, often vulnerable to environmental effects of projects, and need to be assessed in the CEQA review process (CDFW 2018). Additionally, the importance of eelgrass protection and restoration, as well as the ecological benefits of eelgrass, is identified in the California Public Resources Code (PRC Section 35630). 3-1

The IS/MND provides maps of previous (2009) and recent (2020) eelgrass distribution in the Project area and states that eelgrass will not be impacted by Project activities. However, the proposed culture area overlaps with former distribution of continuous and patchy eelgrass habitat (based on aerial imagery from 2018 and surveys conducted in 2009). Humboldt Bay has experienced a loss of eelgrass habitat in recent years, with eelgrass receding as much as 25 feet per year near the South Bay State Marine

Recreational Management Area, possibly due to wasting disease and subsequent mudflat erosion (Gilkerson, pers. comm., 2021). Monitoring along the Mad River Slough transect line (north of the Project area) documented a nearly complete loss of eelgrass habitat in 2020 (Tyburczy, pers. comm., 2021). In other areas of the Bay, eelgrass habitat has expanded within the intertidal flats (Gilkerson, pers. comm., 2021). The Department is concerned that only considering existing eelgrass cover during placement of culture gear will fail to capture the spatial and temporal extent of eelgrass in the Project area and will limit eelgrass from returning to its previous distribution. 3-1 cont.

The Project proposes to avoid impacts to eelgrass habitat by incorporating a 5-meter (m) unvegetated perimeter ("buffer") from existing vegetated eelgrass cover. However, the 5-m perimeter recommended in the California Eelgrass Mitigation Policy (CEMP; NOAA, 2014) is considered an extension of potential eelgrass habitat, allowing for natural interannual fluctuations in spatial distribution, and is not considered a "buffer" from eelgrass habitat. The Department recommends that the Project incorporate a buffer between eelgrass habitat and aquaculture gear in addition to the 5-m perimeter to avoid impacts associated with, but not limited to, trampling, vessel operations, shading, and changes in hydrodynamics and sedimentation. Previous aquaculture projects in North Bay have included at least a 10-foot buffer between eelgrass and culture gear. The Intertidal Pre-Permitting Project proposed to include a 30-foot buffer (5-m unvegetated perimeter plus a 15-foot buffer) to avoid impacts to eelgrass habitat and the Coast Seafoods Expansion Project included a 25-foot buffer between rack-and bag culture and eelgrass beds. 3-2 The IS/MND also states that eelgrass surveys shall be valid if performed within two-years of gear installation and does not propose to conduct post-installation eelgrass monitoring or mitigation. Given the recent dieback and high interannual variability in eelgrass distribution in Humboldt Bay, annual surveys are more appropriate. Following the CEMP guidelines, pre-installation eelgrass surveys should be completed within 60 days of gear installation and post-installation surveys should be completed within 30 days of completion. 3-3 Additionally, the IS/MND does not provide any information regarding the proposed methods to conduct eelgrass surveys. 3-4

The Department is also concerned that impacts to eelgrass will occur from vessel operations given the widespread distribution of eelgrass in the subtidal channels adjacent to the culture areas that will likely be used for access. The Project proposes to avoid anchoring and routing vessels in areas containing eelgrass but does not provide a detailed map of proposed anchorage locations or vessel routes. 3-5 In addition, recent modeling efforts in Humboldt Bay predict a substantial shoreward expansion of eelgrass onto intertidal mudflat habitat over the next 100 years in response to sea level rise inundation, particularly in the North Bay (Shaughnessy et al. 2012; Gilkerson 2013; and Stillman et al. 2015). The Department is concerned that aquaculture development and operations in the intertidal zone could limit eelgrass from expanding higher onto intertidal mudflats in response to sea level rise. 3-6

Recommendations: The Department recommends the proposed Project avoid and minimize impacts to eelgrass and fully mitigate for any remaining impacts. The 3-7

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Humboldt Bay Harbor, Conservation and Recreation District
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Department makes the following recommendations for the Final Mitigated Negative Declaration (Final MND):

Analysis of impacts to eelgrass and additional avoidance and minimization measures.

- It is unclear whether alternate locations within the leased area were considered for culture installation to better avoid impacts to eelgrass habitat. The Department recommends HIOC provide information regarding alternative gear placement or describe why it is not feasible. The Department also recommends HIOC disclose whether they or other entities plan to develop additional culture in the leased area in the future. **3-8**
- Avoid areas that supported eelgrass in 2009 as well any additional eelgrass habitat mapped in recent or future years to account for temporal and spatial variability in distribution. This includes placement of aquaculture gear, access routes for vessels and walking, and vessel anchorage locations. **3-9**
- In addition to the 5-m perimeter, include a 10-foot buffer between culture gear and eelgrass habitat. The Department recommends the Final MND include a map that overlays the proposed shellfish culture area, vessel anchorage locations, and vessel routes in relation to previous (2009) and current eelgrass distribution. The map should include both the 5-m perimeter and 10-foot buffer. The map should also include an accurate bathymetric chart. **3-10**
- The Department is concerned culture gear may alter the hydrodynamics of the area such that eelgrass habitat within or in proximity to the action area may be adversely affected and recommends the Final MND include an analysis of how hydrodynamics may be altered. **3-11**
- The Department recommends additional measures be included to avoid impacts from vessel operations, such as minimizing the degree of sediment mobilization from boats, avoiding propeller scarring in areas of eelgrass, and avoiding shading of eelgrass habitat with vessels. **3-12**

A comprehensive eelgrass mitigation and monitoring plan.

- The Department recommends the following for the eelgrass mitigation and monitoring plan: 1) consider pre-installation surveys valid for one year; 2) complete post-installation eelgrass surveys within 30 days of construction completion; 3) conduct surveys during periods of high growth, as described in the CEMP (NMFS, 2014); and 4) provide proposed eelgrass survey methods within the Final MND. If using drone imagery, select a pixel resolution high enough to accurately quantify eelgrass habitat. **3-13**
- Include in the eelgrass mitigation and monitoring plan mitigation for any impacts to eelgrass including, but not limited to, impacts from gear placement, trampling, boat propellers, changes in circulation from gear placement, and sedimentation to ensure no net loss. **3-14**

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- Adaptively manage aquaculture operations with resource and permitting agencies to avoid impacts to any new eelgrass habitat that may recruit to areas within the Project sites not actively used for cultivation. 3-15
- The Department recommends the Harbor District and HIOC consult with the resource and permitting agencies for review of all eelgrass monitoring, mitigation, and adaptive management efforts. 3-16

Non-Native Eelgrass

Comments: The non-native eelgrass (*Zostera japonica*) has been documented in several locations throughout Humboldt Bay (Schlosser et al. 2011). This species is known to grow higher in the intertidal than the native eelgrass (*Z. marina)* and thus may have more opportunities to interact with Project activities. This species has the potential to spread to additional areas due to trampling and boating activities that could break off intact turions for dispersal to new locations. Due to the ability of this species to rapidly colonize areas of unvegetated mudflat, the Department is concerned with the potential spread of this non-native species from Project activities. The IS/MND does not provide any discussion regarding *Z. japonica*. 3-17

Recommendations: The Department recommends the Final MND include a training and monitoring program to educate staff on how to identify, avoid, and monitor the non-native eelgrass species *Z. japonica*. The Department also recommends the Final MND include best management practices that could reduce the potential spreading of this plant to new locations. For instance, avoiding boating and traversing routes to aquaculture gear through areas with *Z. japonica*. If *Z. japonica* is detected within the Project area, HIOC should immediately notify the Department and other resource and permitting agencies. 3-18

Intertidal Mudflats

Comments: Intertidal mudflats provide habitat and foraging opportunities for fish such as longfin smelt, sturgeon, elasmobranchs, leopard sharks, shorebirds and waterfowl. Several species with important commercial and recreational fisheries value also exist within and adjacent to intertidal mudflat habitat that could potentially be impacted by the proposed Project, including Dungeness crab, rockfish, Pacific herring, and California halibut. The discussion in the IS/MND regarding impacts of culture structures on fish species, benthic fauna and habitat is generally limited to cultch-on-longline gear studies. Tipping bags are considerably different structures than cultch-on-longline gear and impacts from this type of gear should be considered. 3-19

Recommendations: The Department recommends the Final MND discuss impacts to mudflat habitat and species specifically from tipping bags. If there is insufficient literature regarding the impacts associated with tipping gear, the Department recommends HIOC develop and implement a monitoring program to assess the impacts of innovative oyster culture gear, such as tipping bags, on fish, bird, and invertebrate assemblages in the 3-20

Project area. The Department recommends the monitoring program be used to evaluate: 1) impacts to mudflat habitat from changes in elevation caused by altered erosion and deposition processes; 2) changes to infauna composition and the subsequent impacts to shorebird and fish food resources; and 3) reduction in foraging areas for shorebirds, waterfowl and fish species, such as black brant, salmonids, bat rays, sturgeon, leopard sharks and longfin smelt. Development of the intertidal mudflat monitoring program should be done in consultation with the Department and other permitting and resource agencies. **3-20 cont.**

Green Sturgeon

Comments: The IS/MND inaccurately states that observations by the National Marine Fisheries Service and U.S. Fish and Wildlife Service during a field visit in 2016 confirmed green sturgeon feeding did not extend into the Mad River Slough area. However, aside from Sand Island, the Mad River Slough area had the most activity on the acoustic receiver during the 2016 field visit, but due to equipment difficulties, this location was not fully surveyed (Goldsworthy, pers. comm., 2021). The 2016 field visit also confirms that green sturgeon frequents the higher elevation areas of the intertidal zone to feed (Goldsworthy et al. 2016). In 2007-2008, approximately 200 sturgeon detections were recorded near the Mad River Slough area and breaching in this area has been repeatedly observed (Goldsworthy, pers. comm, 2021). Previous intertidal longline operations, including the Coast Seafoods Expansion Project, implemented a 10-foot buffer between culture plots and subtidal channels to minimize risks to sturgeon and other species foraging on intertidal mudflats. **3-21**

Recommendations: To reduce impacts to green sturgeon, the Department recommends a buffer distance of at least 10-feet between culture gear and subtidal channels. This buffer would also provide benefits to eelgrass and other fish species foraging along the subtidal and mudflat interface. **3-22**

Naturalization of Non-native Cultured Species

Comments: The Department is concerned with the potential for non-native cultured shellfish to naturalize outside of cultivation areas and impact native marine species. Contrary to what is stated within the IS/MND, there is evidence that feral oysters occur outside of farmed areas. Department staff have observed wild Pacific oysters broadly across the North Bay, including within the Mad River Slough area (Ray, pers. comm., 2021). Over the past two decades, this species has colonized all the San Diego County estuarine systems (Crooks et al. 2015). In Europe, rising temperatures appear to cause an increase in the frequency and fecundity of non-native Pacific oysters, and their potential to displace native species and modify habitat has become a management concern (Herbert et al. 2012; Herbert et al. 2016). **3-23** As sea temperature rises, spawning events in Humboldt Bay may become more frequent and result in further colonization of non-native cultured species. **3-24**

Adam Wagschal, Deputy Director
Humboldt Bay Harbor, Conservation and Recreation District
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Recommendations: The Department recommends the Final MND include updated information regarding detections of cultured species outside of cultured areas, the potential for increased naturalization from this Project, and the ecological impacts naturalization could have on the natural community. The Department also recommends the Final MND include avoidance, minimization, and mitigation measures to reduce the potential for naturalization of cultured species. 3-25

Pacific Herring

Comments: The Department appreciates that the Project proposes measures to protect Pacific herring (*Clupea pallasi*) spawn. The Department has developed a thorough herring egg monitoring and consultation process from previous projects, such as the Coast Seafoods Expansion Project, that provides further protection than the proposed mitigation measure. 3-26

Recommendations: The Department recommends that the following measures are included within the Final MND:

<u>Herring egg monitoring and consultation with the Department.</u>

- The Department recommends all employees who supervise work on the tidelands are trained by a Department biologist to conduct pre-work herring spawn surveys. During the months of December through March, trained employees should perform a pre-work herring spawn survey at each location where work is scheduled to take place to determine whether herring have spawned on eelgrass, culture materials, or substrate. If herring spawn has been recently observed by the employees or Department staff on or in the immediate vicinity of planned planting and/or harvesting activities, shellfish farmers should: (1) postpone planting and/or harvesting activities on any culture beds in those areas for two weeks, or until Department staff confirm herring eggs have hatched; and (2) notify the Department's Eureka Marine Region contact within 24 hours (see contact information below) of the spawn within 24 hours. HIOC should keep records of when the Department was notified of spawning events. 3-27

Black Brant and Shorebirds

Comments: Black brant occur in Humboldt Bay as spring and fall migrant and winter visitors. Humboldt Bay is the most important area in California for this species, due in part to the health and size of eelgrass habitats found in the Bay. Humboldt Bay is also an internationally important site for overwintering and seasonally migrating shorebirds. Recent surveys (2018-2019) estimate that over one million shorebirds from 52 recorded species utilize the Bay throughout the year (Colwell et al., 2020). Many species rely on mudflat habitats for feeding, resting and/or roosting. The Department is concerned that persistent human disturbance, such as increased boat traffic to the Project area from the existing HIOC facility (4 miles away) and human activities associated with shellfish culture, in addition to loss of foraging habitat could impact brant and shorebirds utilizing the Project area. 3-28

The IS/MND does not sufficiently discuss the potentially significant impacts to shorebirds, brant and other waterfowl from increased human disturbance. The Project proposes to implement best management practices to avoid approaching, chasing, flushing, or directly disturbing shorebirds, waterfowl, seabirds, or marine mammals, but does not provide information on how this will be implemented. 3-29

The IS/MND cites that a recent brant monitoring study in Humboldt Bay found no significant difference in brant usage of culture plots versus adjacent reference plots (H.T. Harvey & Associates, 2018). However, the baseline data collected for the referenced study had a 50% camera failure rate and warrants further study. 3-30

Stillman et al. (2015) found that small decreases in eelgrass abundance and small increases in disturbance can have population-level consequences for brant, and that any reduction in eelgrass within Humboldt Bay could adversely affect successful migration. 3-31

Recommendations: The Department recommends the Final MND include a quantitative analysis of both the loss of foraging opportunity and the increase in disturbance along with the cumulative impacts to black brant and shorebirds when both stressors occur simultaneously. 3-32

The Department recommends additional avoidance and minimization measures are included in the Final MND to reduce impacts to brant and shorebirds, such as minimizing the number of boat trips, establishing vessel routes that reduce disturbance and establishing an appropriate buffer between roosting habitat and aquaculture gear. 3-33

Mad River Slough Wildlife Area & Recreational Users

Comments: The Project area is located directly east of the Mad River Slough Wildlife Area, which is owned and managed by the Department, and is heavily used for waterfowl hunting and wildlife observing. The Project is also located near a public access point that is used for recreational fishing, clamming, waterfowl hunting, and boating opportunities. The Department is concerned that the proposed Project may have potentially significant impacts to recreational users and the wildlife on which they depend. The IS/MND does not provide an analysis of potential impacts to recreational users. 3-34

Recommendations: The Department recommends the Final MND includes an analysis of Project impacts to waterfowl hunting, including: 1) decreases in waterfowl available for harvest; 2) the loss of hunting opportunities due to disturbance from boats and aquaculture personnel; 3) the loss of hunting opportunities due to physical obstruction of traditional hunting areas; and 4) increases in hazards to boaters from aquaculture gear. 3-35

To avoid and minimize impacts to waterfowl hunters, the Department recommends the Project limit culture operations that impact bird behavior on hunting days (Wednesday, Saturday, and Sunday) during the waterfowl hunting season. 3-36

The Department also recommends the Final MND include an analysis of Project impacts to recreational fishing, wildlife observing, and boating. 3-37

The Final MND should also provide details on how the lease area will be clearly marked (i.e., number of marker posts, spacing between posts) and how markers will be maintained to ensure the safety of all recreational users. 3-38

Marine Debris

Comments: The Department is concerned that additional aquaculture operations in the Bay could result in an increased presence of marine debris. The Department appreciates that the IS/MND includes a Marine Debris Management Plan (Appendix A). 3-39 The Project proposes to mark or brand HIOC's contact information on floating bags or baskets but does not disclose whether other types of gear (i.e., rack-and-bag) will be marked. 3-40

Recommendations: All culture gear should be marked or branded with HIOC's contact information. The Department requests an annual report from HIOC regarding the volume and type of shellfish gear collected during cleanup events and recommends that it also be sent to appropriate permitting agencies. If consistent discoveries of certain gear types are made during cleanup events by HIOC or the public, HIOC should evaluate (and if feasible, implement use of) alternative gear types or practices that would reduce these consistent sources of debris. 3-41

ENVIRONMENTAL DATA

CEQA requires that information developed in environmental impact reports and negative declarations be incorporated into a database which may be used to make subsequent or supplemental environmental determinations (Pub. Resources Code, § 21003, subd. (e)) Accordingly, please report any special status species and natural communities detected during Project surveys to the California Natural Diversity Database (CNDDB). The CNNDB field survey form can be found at the following link: https://wildlife.ca.gov/Data/CNDDB/Submitting-Data#44524419-online-field-survey-form. The completed form can be submitted electronically or mailed electronically to CNDDB at the following email address: CNDDB@wildlife.ca.gov.The types of information reported to CNDDB can be found at the following link: https://wildlife.ca.gov/Data/CNDDB/Plants-and-Animals. 3-42

FILING FEES

The Project, as proposed, would have an impact on fish and wildlife, and assessment of filing fees is necessary. Fees are payable upon filing of the Notice of Determination by the Lead Agency and serve to help defray the cost of environmental review by the Department. Payment of the fee is required for the underlying project approval to be operative, vested, and final. (Cal. Code Regs, tit. 14, § 753.5; Fish & G. Code, § 711.4; Pub. Resources Code, § 21089) 3-43

CONCLUSION

The Department appreciates the opportunity to comment on the Hog Island Oyster Company Shellfish Farm in Arcata Bay Project IS/MND to assist the Harbor District and HIOC in identifying and mitigating Project impacts on biological resources. Questions regarding this letter or further coordination should be directed to Corianna Flannery, Environmental Scientist at 707-499-0354 or Corianna.Flannery@wildlife.ca.gov.

Sincerely,

DocuSigned by:
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Response to California Department of Fish and Wildlife

Comment Number	Response
3-1	This comment appears to conflate several different causes and trends in eelgrass in Humboldt Bay. 1) The 2009 and 2020 eelgrass maps are broadly consistent with each other and reflect comparable distributions of eelgrass. The 2020 mapping is at a far higher resolution and areas that were mapped as patchy in 2009 are shown as discrete eelgrass patches in 2020. The 2020 mapping suggests neither a large scale expansion nor retreat of eelgrass since the 2009 field mapping effort. Indeed, as Schlosser and Eicher (2012) noted "records suggest that eelgrass distribution in Humboldt Bay has retained the same general footprint over the last 150 years." 2) Eelgrass trends in North Bay and South Bay do not appear to be directly correlated. Recent trends have shown eelgrass in these two regions moving in divergent directions. This is reflected in the commentary from Whelan Gilkerson noted by CDFW that eelgrass habitat has expanded within the intertidal flats in some areas, while disappearing from other areas. 3) As noted by the commenter, the California Department of Fish and Wildlife (CDFW) and National Marine Fisheries Service (NMFS) have enunciated a 5-meter buffer around mapped eelgrass shoots as part of the CEMP's definition of eelgrass habitat to, in part, capture spatial and temporal changes in eelgrass distribution. For example, data from Grette Associates (2005, 2008, 2009) indicated that the shoreline edge of eelgrass can expand or contract laterally by 4-5 m annually. In addition, eelgrass patches that persisted beyond a season were at least 0.3 m^2 in area with minimum shoot density of 3 shoots per 0.25 m^2. 4) Current monitoring efforts on Pacific Seafood (formerly Coast Seafoods) shellfish culture beds in Humboldt Bay using basket methods similar to the proposed culture methods by HIOC suggest that there is no difference in eelgrass cover inside culture areas compared to adjacent reference areas (Merkel and Associates 2021). This suggests that eelgrass will expand if suitable conditions exist, regardless of whether culture gear is present or absent. Ultimately, the HIOC Project will avoid eelgrass using current mapping methods. This is a practice that has been used successfully by HIOC at their Tomales Bay shellfish aquaculture operation, and approved by the California Coastal Commission (Coastal Commission 2019) and U.S. Army Corps of Engineers (Corps 2019). *Refer* to Response to **NMFS Comment 1-1** for additional details.
3-2	The CEMP identifies the basis for the 5-meter distance as "To encompass fluctuating eelgrass distribution and functional influence around eelgrass cover, for the purposes of this policy and guidelines, eelgrass habitat is defined as areas of vegetated eelgrass cover…bounded by a 5 m wide perimeter of unvegetated area." This is the buffer that is referenced in the IS/MND. The intent of characterizing this as a buffer is to differentiate between locations where eelgrass cover (observed eelgrass shoots) occurs and areas characterized as eelgrass habitat under the CEMP. Notably, the CEMP does not require a separate buffer beyond the 5 m wide perimeter. HIOC has a history of successfully growing shellfish in and around eelgrass in California and has developed methods to avoid impacts through trampling and vessel operation. For example, sites will be accessed during a combination of 'wet' and 'dry' conditions. Gear installation will occur during low tides when the sites are dry, which minimizes the potential for turbidity and sediment disruption to affect nearby eelgrass. Once gear is installed, bags or baskets installed on longlines will be maintained during a combination of high and low tide periods. Approximately one-half of site visits are expected to occur during tides exceeding +4 feet MLLW, which will result in complete avoidance of eelgrass. During these tidal conditions, staff can traverse from the channel edges across eelgrass areas without engine operations to avoid impacts to eelgrass. Once within the boat lanes, HIOC staff will either anchor vessels outside of eelgrass areas and maintain lines on foot or use the boat to move between lines. These methods were added as a BMP in the IS/MND: **BMP-7 (Bed Access):** Vessels may cross areas with eelgrass when the predicted tidal height is +4 feet MLLW or greater by putting the engine in neutral and drifting across areas where eelgrass is present. This type of approach will be used when weather and tidal elevations permit.

Comment Number	Response
	Note that HIOC estimates that vessels will only make 2-4 round trips weekly between HIOC's Hatchery Facility and the project site, using low draft, shallow-bottom skiffs that can pass over eelgrass at appropriate tides without grounding. Given that HIOC will not be cultivating within existing eelgrass cover, trampling is not anticipated to be a concern. These practices have been successful in avoiding impacts to eelgrass at HIOC's existing shellfish farm in Tomales Bay, which uses similar cultivation techniques. As noted by the Coastal Commission (2019) in its reauthorization of HIOC's farm: "Because the question of whether or not HIOC's cultivation beds were installed in eelgrass habitat has critical bearing on the consistency of its after-the-fact requests with the Coastal Act's marine resource policies (which require special protection to be provided for areas of special biological significance, such as eelgrass beds), it is one that Commission staff has spent a significant amount of time evaluating. That evaluation has included an extensive review of the available files associated with HIOC's original CDPs, as well as the results of eelgrass mapping of Tomales Bay carried out by CDFW over the past several decades, archives of historic aerial photographs, and relevant historic reports and discussions of eelgrass health and abundance in the bay . . . This information appears to support HIOC's statements and indicates that eelgrass around these leases may have undergone a larger scale expansion that has brought it into portions of those areas in which HIOC had installed cultivation structures and equipment." As noted in the IS/MND, the 5 m buffer proposed by the HIOC Project has been previously approved by the Coastal Commission, Corps, NMFS, and the California Fish and Game Commission, both generally for shellfish aquaculture projects and specifically for HIOC's shellfish farms. Moreover, HIOC proposes to avoid established eelgrass cover. As noted above in the Response to **CDFW Comment 3-1**, recent monitoring of Coast's culture beds in eelgrass, using similar longline culture methods that HIOC has proposed, reported no reduction in eelgrass cover as compared to reference areas. Therefore, HIOC's proposed 5 m buffer should be adequate to account for any potential impacts. Although the HIOC Project will not install gear within existing eelgrass areas, the following information is provided related to the additional topics raised in the comments (e.g., shading and sediment transport). See the Response to **CDFW Comment 3-11** for effects related to hydrodynamics. Presence of oyster longlines has the potential to result in shading effects on the substrate beneath the lines. Given that longlines will be installed 5 m from existing eelgrass and longlines are only a maximum of four feet in height off the substrate, there is no potential for longlines to shade existing eelgrass cover. Eelgrass would only be affected if eelgrass moves into or near cultivated areas. Again, this would be evidence that HIOC's cultivation supports, not hinders, eelgrass habitat, as has been observed on its existing Tomales Bay farm. In this scenario, where eelgrass moved into planted areas, light levels beneath oyster longlines in Humboldt Bay were measured and found to have decreased by as much as 35% compared to reference sites (Rumrill and Poulton 2004). Because the shaded area shifted with the location of the sun, the shading did not limit eelgrass growth. The potential for shading effects from flip bags (similar to tipping bags) within eelgrass beds was evaluated in a study in Washington State in 2016 (Confluence 2016a). Based on field measurements over a 4-week period and physical modeling, it was shown that light levels are slightly reduced under flip bags with PAR levels reduced by 14-23% compared to adjacent reference areas. Overall light levels were substantially higher than eelgrass minimum requirements for growth both under aquaculture gear and in adjacent reference areas. Physical modeling showed that essentially all areas, including areas directly underneath floating gear, receive direct sunlight for at least 50% of the day. Therefore, even if eelgrass moved into areas with longlines, shading does not appear to significantly affect eelgrass beneath the longlines because of the shift in the shaded area throughout the day. Sediment can accumulate within culture beds due to the entrapment of suspended sediments within the culture gear or can erode due to the acceleration of water flow through the structures (Dumbauld et al. 2009; Forrest et al. 2009).

Comment Number	Response
	Studies in Willapa Bay have shown that changes in water circulation are not significant compared to the high variability found in intertidal environments (Banas and Hickey 2005). However, there are some small-scale effects within culture beds that have been observed at various farms, as described more thoroughly in the literature review by Forrest et al. (2009). As noted in the IS/MND, the amount of sediment accumulation within culture gear would be small (<100 mm), and even less sediment would be transported by wind and wave activity to existing eelgrass cover located at least 5 meters from cultivation. This small amount of potential sediment transport would be much lower than existing sediment transport associated with natural causes (i.e. storm activity, etc.). The HIOC Project proposes to avoid eelgrass using standard buffers that are recommended within the existing policy. There does not appear to be the need to provide additional buffers beyond what is proposed.
3-3	Using drone-based aerial eelgrass surveys, HIOC is planning to do at least annual surveys. Mitigation Measure 2 (Mit-2 [Eelgrass Protection]), as reported in the Response to **NMFS Comment 1-1**, was modified to require annual eelgrass surveys. Gear will be installed after the surveys occur and subsequent surveys will be conducted in the next growing season. Note that the proposed survey frequency goes beyond that recommended in the CEMP, which recommends that an eelgrass survey be prepared within 60 days of the *project start date* with post-installation surveys completed within 30 days following completion of project construction or within 30 days of the next active growth period if project construction occurs outside of the eelgrass growth periods identified in the CEMP. HIOC plans to install 5-10 acres per year over a 5-year period. This will allow for multiple surveys to be conducted both before and after gear is installed to ensure that eelgrass is avoided and other potential impacts (e.g., sediment accumulation) can be monitored and adaptively managed. Given that the HIOC Project will be phased over time and the fact that HIOC plans to install gear both within and outside of the eelgrass growth periods identified in the CEMP, conducting an annual survey between May and September will provide sufficient information to evaluate potential project impacts. This is a practice that has been used successfully by HIOC at their Tomales Bay shellfish aquaculture operation, and approved by the Coastal Commission (2019) and Corps (2019).
3-4	Mit-2 (Eelgrass Protection), as provided in the Response to **NMFS Comment 1-1**, indicates that surveys will be conducted using unmanned aerial vehicles (UAV) and/or verified using ground surveys to identify eelgrass cover. HIOC currently uses drone-based (i.e., UAV surveys) aerial eelgrass surveys in Tomales Bay. UAV surveys are performed with high resolution cameras that record the GPS location for each photo. Ground resolution of imagery is approximately 1-inch pixels or higher resolution. Photos are collected along transects with a high degree of spatial overlap so that each point within the survey area is typically recorded on 4 or more photos. These photos are subsequently combined into an image that is geospatially registered for analysis known as an orthomosaic using commercially available software. Imagery is then interpreted using a combination of supervised and unsupervised image classification methods to characterize eelgrass and other habitat features. The accuracy of the classification is assessed using a combination of ground observations and synthetic ground observations (very high resolution ground imagery).
3-5	A vessel route map was provided in the IS/MND (Figure 11). Note that HIOC only estimates a total of 2-4 round-trip vessel routes per week to the project site, resulting in a negligible increase to existing vessel traffic within the channels. Eelgrass will be avoided in the channels, and HIOC uses methods for entering the intertidal areas that also avoids impacts to eelgrass (*refer* to Response to **CDFW Comment 3-2**). These measures will successfully avoid impacts to eelgrass in the HIOC Project site.
3-6	*Refer* to Responses to **CSLC Comment 2-7 and 2-8** for more details.
3-7	HIOC is proposing to avoid all existing eelgrass resources and no significant adverse impacts to eelgrass are anticipated. Therefore, no mitigation is required. *Refer* to Responses to **CSLC Comment 2-6 and 2-8, and CDFW Comment 3-1, 3-2, and 3-3** for more details.
3-8	The area identified for culture includes locations where depth and substrate are suitable for culturing shellfish. HIOC has committed to providing a 5 meter buffer from existing eelgrass cover, and therefore is already avoiding eelgrass habitat. Additional restrictions have been added to the HIOC Project based on the response to comments, including:

<table>
<tr><th>Comment Number</th><th>Response</th></tr>
<tr><td></td><td>
1. Adding a 10-foot buffer from channels (Mit-5 [Channel Buffers]; *refer* to Response to **NMFS Comment 1-2**).
2. Adding an annual drone-based survey (Mit-2 [Eelgrass Protection]; *refer* to Responses to **NMFS Comment 1-1 and CDFW Comment 3-3**).
3. Providing a 1,000 foot protective buffer on the east side of Tuluwat Island during winter months to avoid a documented black brant gritting site (Mit-4 [Vessel Routes]; see below).
4. Adding a 200-foot buffer from wetland areas (BMP-6 [Wetland Buffer]; see below).

Mit-4 (Vessel Routes): HIOC will establish a vessel route to access its leases that avoids known native eelgrass (*Z. marina*) ~~beds~~cover, and maintain a no wake zone within a 1,000-foot buffer north of Tuluwat Island to avoid black brant (*Branta bernicla*) gritting sites in the winter (December 15-April 30).

BMP-6 (Wetland Buffer): HIOC has adopted a minimum of a 200-foot buffer between the wetlands associated with the Mad River Slough Wildlife Area and the proposed culture area. Culture equipment will not be installed in the buffer areas. Refer to **Figure 4** for this buffer area.

These updates further restrict the potential locations where culture will occur and work well with HIOC's standard procedures. It is also notable that HIOC proposes to grow oysters at higher tidal elevations than any existing culture in Humboldt Bay, but have determined the locations that are good to grow oysters based on tidal height and access. Oysters grown at higher tidal elevations have lower growth rates and are more likely to be colonized by barnacles and other fouling organisms which may limit their suitability for the commercial market. Because this location is so high in the intertidal (i.e., +1.6 feet to +4.6 feet MLLW), it will also provide the best avoidance of eelgrass in Humboldt Bay. The elevations that have continuous eelgrass habitat are approximately +1.0 to +1.3 feet MLLW (Merkel and Associates 2017). Eelgrass can occur as high as +4.9 feet MLLW in pooling environments (NOAA 2014), but has not been observed that high in the intertidal in the HIOC Project site (Lummis 2020). Further, areas farther northwest in the Project site that are not proposed for cultivation are very difficult to access from existing channels, creating logistical and operational challenges that limit cultivation in those areas.

HIOC has worked hard to provide adequate restrictions into their operations to fully protect the surrounding environment and species use of the area. There are no future plans to develop additional culture in the leased area.
</td></tr>
<tr><td>3-9</td><td>Refer to Responses to NMFS Comment 1-1, CSLC Comment 2-6 and CDFW Comment 3-1. The HIOC Project will avoid eelgrass mapped in subsequent surveys, excluding eelgrass that moves into areas already under cultivation.</td></tr>
<tr><td>3-10</td><td>Refer to Responses to CSLC Comment 2-6 and CDFW Comment 3-2.</td></tr>
<tr><td>3-11</td><td>
Hydrodynamics can be influenced by shellfish culture gear, but these processes do not significantly extend beyond the culture bed. For example, Forrest and Creese (2006) found seabed elevation was generally lower beneath culture racks, likely due to a local change in the hydrodynamic processes. Where flow is disrupted and currents drop, sediment is likely to be deposited (i.e., directly under baskets). Although the same general areas are used for successive cycles of culture, the majority of gear is often removed during some phases of the culture cycle. For example, HIOC removes baskets and tipping baskets during harvest.

A boat-based Acoustic Doppler Current Profiler survey was conducted in Willapa Bay to measure current speed and direction up-current, down-current, and within oyster longline flip-bag culture beds (Confluence 2016b). The conclusions of the study included:

• Differences in current speeds and current direction within and outside of culture are not significant.
• Differences in current speeds and current direction up-current and down-current of culture are not significant.
• Current speed and direction with depth and at discrete distance intervals along each transect are highly variable.
• Complex circulation patterns exist because of a naturally complex seabed (eelgrass, channels, bed roughness).
</td></tr>
</table>

Comment Number	Response
	Tidal currents are one of the forces contributing to sediment transport and sediment distribution in the area of oyster longline culture gear on the mudflats in Willapa Bay (Confluence 2016b), but they are not the most active means for sediment transport. Studies have shown that sediment transport within channels and adjacent to channels is more active than on mudflats (Banas and Hickey 2005; Forrest et al. 2009). Oyster longline culture beds, and other types of intertidal culture methods (e.g., rack-and-bag, flip-container), are sited away from channels and high enough up (in elevation) on the mudflats that they will not interact significantly with the sediment being transported in the channels. In addition, sediment on the mudflats is relatively cohesive and cannot be readily eroded by tidal currents. Therefore, the culture equipment will not have a significant effect on tidal currents or the sediment transport processes associated with tidal currents.
3-12	HIOC currently uses all of these measures in their typical practices. Refer to the HIOC CDP for Tomales Bay (Coastal Commission 2019). This would be a similar operation, and the following BMP has been added to account for these measures: **BMP-7 (Bed Access):** Vessels may cross areas with eelgrass when the predicted tidal height is +4 feet MLLW or greater by putting the engine in neutral and drifting across areas where eelgrass is present. This type of approach will be used when weather and tidal elevations permit. It is also notable that the HIOC Project site is not a low gradient mudflat. There is a steep channel edge where operators will be crossing to access the site. This makes it feasible to limit engine use when accessing the site by putting the engine in neutral and drifting across areas where eelgrass is present. This type of approach can be used when weather and tidal elevations permit. Refer to Response to **CDFW Comment 3-2** for more details on this method of accessing the site (BMP-7).
3-13	1) A pre-installation survey is part of Mit-2 (Eelgrass Protection), as provided in Response to **NMFS Comment 1-1**, and eelgrass surveys will be conducted annually during periods of high growth, as described in the CEMP. 2) Post-construction eelgrass surveys are not proposed because eelgrass will be avoided. However, an as-built survey can be conducted using aerial imagery to confirm the location of installed aquaculture gear relative to mapped eelgrass. 3) As described in Mit-2 (Eelgrass Protection), proposed eelgrass surveys will occur between May and September as identified as the period of maximum eelgrass growth in northern California in CEMP (NMFS 2014). 4) Proposed eelgrass surveys will use drone-based aerial imagery with a 0.66-inch pixel resolution. Imagery is classified using a combination of computer based and human interpreter reviews to classify eelgrass habitats based on images. Ground observations and/or synthetic ground observations will be used to confirm the accuracy of UAV based surveys. Synthetic ground observations are very high-resolution imagery (ground sampling distance of approximately 0.2 inch/pixel) that provides a comparable view to ground-based observations that are reviewed by an expert human interpreter. The Corps has published guidance for eelgrass delineation reports (Nelson 2018). HIOC plans to use method 5 (Aerial Photography) identified in that guidance for a tier 1 eelgrass delineation. This method is recommended for instances where the project is avoiding eelgrass beds. Refer to Response to **CDFW Comment 3-4** for more details on UAV survey methods.
3-14	HIOC will do annual monitoring using UAV methods. No mitigation is required because the HIOC Project is avoiding eelgrass. Eelgrass may establish within the areas where gear is installed, which occurs in estuaries throughout the West Coast and is one of the reasons why the Corps (2021) concludes that eelgrass and shellfish aquaculture can co-exist.
3-15	HIOC plans to install gear slowly (i.e., 5 to 10 acres/year), and use drone-based imagery to identify eelgrass prior to installation to establish required buffers from eelgrass (Mit-2 [Eelgrass Protection]). This is an adaptive management strategy to avoid impacts to new eelgrass that may recruit to areas within the HIOC Project site not actively used for cultivation.

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3-16	The results of all eelgrass surveys conducted for the HIOC Project will be distributed to CDFW, Coastal Commission, Corps, NMFS, and Harbor District.
3-17	*Z. japonica* is listed as an invasive and noxious weed and is an 'A' rated pest by California Department of Food and Agriculture. Ramey et al. (2011) noted several areas where *Zostera japonica* were detected and treated between 2004 and 2010. The closest area to the HIOC Project site was a patch of high marsh *Z. japonica* near Manila where approximately 30.65 square meters of *Z. japonica* were present in 2010. Management actions were initially effective at reducing the number and size of *Z. japonica* patches. It is notable that HIOC Project activities would not occur as high in the intertidal zone as compared to where *Z. japonica* is typically located. Humboldt Bay eelgrass experts report that *Z. japonica* has not been observed since 2015 and may be extirpated from Humboldt Bay (Shaughnessy, pers. comm., 2021; Tyburczy, pers. comm., 2021; Gilkerson, pers. comm., 2021). The disappearance of *Z. japonica* coincides with a marine heat wave period which affected high intertidal communities and may have created conditions unsuitable for *Z. japonica*. Further, modern aquaculture is not associated with the introduction nor spread of *Z. japonica*. Indeed, several growers have supported *Z. japonica* management efforts and work with resource agencies to help eradicate the noxious weed from Humboldt Bay. HIOC is willing to participate in these types of efforts.
3-18	No *Z. japonica* has been observed within the project site and no vessel activity is expected to occur at the tidal elevations where *Z. japonica* has been historically observed in Humboldt Bay. As described in Mitigation Measure 2, HIOC will survey the proposed aquaculture areas for eelgrass using UAV methods as described in Response to **CDFW Comment 3-13**. This method collects high resolution aerial photos along with ground truthing to identify eelgrass. If patches of *Z. japonica* occur on-site, this method is expected to detect them. These surveys are anticipated to occur on an annual basis for the first 3-6 years of the project until all planned culture gear is installed. HIOC will report *Z. japonica* observations to CDFW and the Harbor District and will engage with CDFW regarding appropriate management approaches if *Z. japonica* is observed within the HIOC Project area.
3-19	There are differences between cultch-on-longline and tipping bags, but these types of culture methods are very comparable to the current SEAPA baskets used in Humboldt Bay and other estuaries along the West Coast. Where appropriate, studies or monitoring related to SEAPA baskets (e.g., Merkel and Associates 2020, 2021) and tipping baskets or flip-bags (e.g., Confluence 2016a, 2016b) were discussed in the IS/MND. Other studies were also discussed related to rack-and-bag and culture methods that involve structures raised above the sediment surface. The IS/MND used the best available science to understand the potential impacts from the proposed HIOC Project. Additional studies were provided, as applicable, to the revised IS/MND.
3-20	The term "tipping bags" may be new, but this culture method has been used for decades along the West Coast, including current use of these methods in Tomales Bay by HIOC. Tipping bags are essentially a generic form of bag/basket hung on longlines. The effects are similar to cultch-on-longline, but using a method that provides a higher quality oyster used in the half-shell market rather than the shucking market. There are several studies reported in the literature that discuss changes to mudflat habitat from the introduction of 3-dimensional structure, many of which were discussed within the IS/MND (throughout Section IV, and additional research as revised). Overall, shellfish gear is considered to have a small-scale effect compared to sediment movement and changes from wind, wave, and tidal action. Dumbauld et al. (2015) suggested that aquaculture creates short-term "pulse" disturbances that may alter the benthic substrate temporarily in a manner consistent with storm events and that the magnitude of these temporary effects is within a range where natural recovery occurs. While sediment dynamics respond to a variety of influences over time, existing data suggests that sediment changes due to aquaculture are likely minor in relationship to natural sediment dynamics that drive the geophysical structure and functions of nearshore habitats (Forrest and Creese 2006; Forrest et al. 2009). Tipping bags have more influence on sediment movement compared to on-bottom oyster culture but less influence compared to rack-and-bag culture. In other words, the range of effects from different types of gear has been

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	studied in the literature and is still considered small compared to wind, wave, and tidal dynamics within intertidal habitats. Studies related to species use of shellfish aquaculture areas also come to similar conclusions. Structured habitat supports smaller organisms (e.g., Pacific herring, anchovies, juvenile rockfish) and a higher abundance of benthic invertebrates that can be used by most fish and birds as foraging habitat. There is a wide range of studies within shellfish culture areas that have looked at changes to the benthic community and fish use. Most recently, two Saltonstall-Kennedy projects conducted research in Humboldt Bay and found that areas with culture gear in mudflats contained a higher abundance of native invertebrates compared to mudflats without culture gear (Hudson et al. 2018; Confluence et al. 2019). As part of its operations in Humboldt Bay, Coast Seafoods/Pacific Seafood has engaged third party consultants to perform brant monitoring in 2018, 2019 and 2020 to evaluate potential effects of culture activities in Humboldt Bay on brant distribution and abundance (HTH 2021). This study's results suggest that "three seasons of sampling [show] that optimal combinations of tide direction and water depth are the primary drivers of brant activity patterns, with newly exposed moderate and low water conditions optimal for foraging. Existing narrow cultch aquaculture plots often appear to attract brant as much or more than similar, nearby plots that lack aquaculture gear, and all three culture plot types [narrow cultch, wide cultch and wide baskets] have attracted more brant than the Control plots at high water depths." The authors suggest that brant use aquaculture areas at similar rates to non-aquaculture areas, and that at high tide aquaculture areas provide dual foraging opportunities where brant may forage on eelgrass wrack or fouling communities associated with culture gear in addition to rooted eelgrass resources. Further, in its review of HIOC's existing tipping bag operations in Tomales Bay, the Coastal Commission (2019) concluded that its operation did not result in significant adverse impacts to benthic habitat, fish, or shorebirds. The literature does not support the indication by CDFW that there would be an impact to species use of these areas because of the use of tipping bags compared to cultch-on-longline, or that there are large differences between these two culture methods. Therefore, a monitoring program is not warranted.
3-21	The IS/MND indicated that green sturgeon did not extend into the shallow areas to the north near the Mad River Slough where the HIOC Project area is located. There was use of the channel, but the intertidal habitat where shellfish culture gear would be located, especially at the higher elevations proposed to be used by HIOC (i.e., +1.6 feet to +4.6 feet MLLW), did not include green sturgeon observations. This shallow habitat is not typically frequented by green sturgeon, which has been reported by several researchers. *Refer* to Response to **NMFS Comment 1-2** for additional details.
3-22	HIOC will provide a 10-foot buffer from the top of bank of channels to limit the potential for interactions between green sturgeon using these channels and aquaculture gear (*refer* to Mit-5 [Channel Buffers] in the revised IS/MND and Response to **NMFS Comment 1-2**).
3-23	Ruesink et al. (2005) notes that spatfall only occurs in "restricted locations that retain larvae and exceed critical temperatures for several weeks." While densities of naturalized oysters appears to be low in Humboldt Bay, and other West Coast bays, there are occasional successful spatfalls and oysters may naturally develop in areas where suitable substrate and conditions exist in Humboldt Bay. Much of the Mad River slough vicinity lacks suitable substrate for development of oysters, which limits the potential for establishment of naturalized oysters. It is unclear whether the areas referenced by James Ray in the comment are within current or historic aquaculture areas where oysters do occasionally fall off of gear and may persist for a period or habitats outside of aquaculture areas. It is largely recognized that these occurrences would not result in long-term populations of naturalized oysters. Despite cultivation of Pacific oysters in Humboldt Bay for 80+ years on as much as 1,000 acres of intertidal habitat, there does not appear to be a widespread, established self-supporting population of Pacific or Kumamoto oysters within the bay. The HIOC Project occurs in the context of approximately 287 acres of existing oyster aquaculture that primarily uses *Crassostrea gigas*. The project adds a negligible increase in the quantity of oysters grown in Humboldt Bay. These existing operations and the current naturalized oyster population is the baseline that this project is contributing to. In this context, the HIOC Project represents a very low risk of additional introductions of naturalized oysters to Humboldt

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	Bay. Where these oysters occur in the future is likely to be places that they would occur whether or not this project occurs. Field observations suggest that where naturalized oysters occur, there are gaps in year classes, which suggests that successful spawning events do not occur on an annual basis in Humboldt Bay. These irregular recruitment events tend to maintain a relatively low density and abundance of naturalized oysters in Humboldt Bay. Further, there is no evidence to suggest that establishment of naturalized *Crassostrea gigas* populations in Humboldt Bay would result in significant adverse impacts. Native oyster species have not been able to establish self-sustaining populations in Humboldt Bay; therefore, there is no risk of displacement or competition with native oyster populations. *Crassostrea gigas* can be a source of food for a number of species in Humboldt Bay (e.g., bat rays, waterfowl, river otters) and organisms can use the oyster shell/organisms as cover (e.g., juvenile Dungeness crab). Given the lack of suitable substrate, any isolated populations of *Crassostrea gigas* are not likely to have a significant impact on the surrounding environment.
3-24	*Refer* to Response to **CDFW Comment 3-23**.
3-25	The information from the Response to **CDFW Comment 3-23** will be added to the IS/MND. As this is not anticipated to result in a significant environmental impact, no avoidance, minimization, or mitigation measures are needed.
3-26	Comment noted. HIOC will use the same approach as the Coast Seafoods Expansion Project.
3-27	Comment noted. HIOC plans to work with CDFW for implementation of its herring spawn survey efforts and looks forward to this collaboration.
3-28	As described in the initial study, HIOC anticipates only 2-4 roundtrip vessel trips per week to the farm site, including trips during high tide where no anchoring or grounding of vessel is necessary. This small addition of boat traffic to Humboldt Bay will be indistinguishable from existing vessel traffic and will not result in significant increases in disturbances to brant or shorebirds as compared to the existing environment. The conclusion that black brant or shorebird foraging would be lost due to the HIOC Project is not consistent with the conclusions from the best available science. For example, Connolly and Colwell (2005) studied shorebird use at oyster longline plots in Humboldt Bay. The authors reported that many shorebirds were found to have higher abundance within culture plots, including willet (*Tringa semipalmata*), marbled godwit (*Limosa* spp.), long-billed curlew (*Numenius americanus*), whimbrel (*Numenius phaeopus*), dowitcher (*Limnodromus griseus*), black turnstone (*Arenaria melanocephala*), sandpipers (*Calidris* spp.), snowy egret (*Egretta thula*), and black-crowned night-heron (*Nycticorax nycticorax*). Black brant are not known to forage in mudflat habitat without the presence of eelgrass or other macroalgae. The vessel route proposed by HIOC includes avoidance of documented black brant gritting sites by more than 1,000 feet. In addition to the information above that concludes that the project will not result in a significant impact to either shorebirds or black brant, HIOC will include Mit-4 (Vessel Routes) and BMP-6 (Wetland Buffer). Refer to Response to **CDFW Comment 3-8**, which discusses avoidance of the Mad River Slough Wildlife Area and black brant gritting sites. *Refer* also to Responses to **CCC Comment 4-12, CCC Comment 4-17, and RRAS Comment 5-3** for more details.
3-29	HIOC would access the Project site 2-4 times per week, which is a nominal increase in vessel traffic in Arcata Bay. BMP-3 (provided below) is a common practice used by many shellfish growers with success where boat speeds are reduced when birds/marine mammals are observed in the water. It is relevant that Humboldt Bay has had a shellfish aquaculture industry for 80+ years and has co-existed with hundreds of fish and wildlife during that time. **BMP-3 (Fish and Wildlife):** During vessel transit, harvest, maintenance, inspection, and planting operations, HIOC will avoid approaching, chasing, flushing, or directly disturbing shorebirds, waterfowl, seabirds, or marine mammals.

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	As discussed in Sections Bio-A5, Bio-D1 and Bio-D4 of the IS/MND, there is no significant interaction anticipated based on historical evidence, existing literature, and use of standard practices that also support fish and wildlife use of the bay. As reported above, HIOC has agreed to use a 200-foot buffer from the adjacent wetland areas. This will also provide a buffer from areas frequented by shorebirds. *Refer* to Responses to **CDFW Comment 3-28, CCC Comment 4-17, and RRAS Comment 5-3** for more details.
3-30	Comparable results occurred in years 1, 2, and 3 of the brant monitoring effort associated with Coast Seafoods (HTH 2021). Camera failures during year 1 were random in their distribution and while they reduced the total number of samples, do not appear to impact the validity of observations. Successive years of similar observations reinforce the reported observations.
3-31	Comment noted. Stillman et al. (2015) describe a process-based model to evaluate the potential effects of a range of scenarios on brant ability to migrate through the Humboldt Bay stopover site. The model includes several necessary simplifications of the brant ecology, and model predictions varied between 17% below and 35% above observed values. Many of the predicted changes are a result of equations incorporated into the model that create deterministic responses that may or may not reflect how the biological system operates and show apparent impacts to brant based on any change in input conditions. Predicted changes in brant fitness and migration characteristics were based on model inputs evaluating changes in the duration of brant disturbance and eelgrass abundance (biomass) at 10% increments. This model is useful for identifying the direction and relative magnitude of likely changes, but is not suitable for evaluating projects at the scale of the HIOC project. The HIOC Project proposes to avoid eelgrass with gear installation and is not projected to cause decreases in eelgrass abundance. The potential for bird disturbance is extremely low based on the ongoing use of the transit route by many recreational and commercial boaters. HIOC has identified that up to approximately 4 round-trips per week may occur. These trips are projected to take a maximum of approximately 4 hours along the entire transit route per week and have the potential for disturbing birds through vessel movement along an established travel corridor used by many recreational and commercial boaters. The total duration of use of the transit corridor by HIOC is expected to average less than 2% of time (based on approximately 4 hours of boat transits per week). Since many of these boat transits are likely to be at the same time as other boaters, and because HIOC staff will take steps to limit disturbance of birds (e.g., BMP-3 [Fish and Wildlife] and Mit-4 [Vessel Routes]), the HIOC Project is not predicted to cause significant increases in bird disturbance.
3-32	The HIOC project is not anticipated to impact brant foraging resources (eelgrass). Because the project avoids eelgrass cover, the quantitative loss of foraging opportunity is zero. The project is including several conservation measures to avoid disturbing brant when present in Humboldt Bay. The project proposes using well-travelled channels and avoiding areas of known aggregations and gritting habitats. While there is no anticipated disturbance to black brant and shorebirds, the maximum amount of disturbance would be two to four weekly vessel trips to the project site and associated activity. This amount of additional activity is inconsequential compared to the existing commercial and recreational traffic in North Bay. No additional evaluation is necessary.
3-33	HIOC proposes a seasonal vessel route to maintain a no wake zone within a 1,000-foot buffer north of Tuluwat Island from the water line, between the SR 255 bridge and the southern edge of Bird Island, to avoid black brant (*Branta bernicla*) gritting sites in the winter (December 15-April 30) (Mit-4 [Vessel Routes] and *refer* to Responses to **CDFW Comment 3-8, CDFW Comment 3-28, and CCC Comment 4-12**). In addition, limiting boat speed and avoiding approaches to flocks of brant will limit or avoid disturbance. HIOC anticipates using vessel transit routes that are similar to those used by other growers in Humboldt Bay. This will limit the potential areas affected by shellfish aquaculture activities. In addition, HIOC minimizes boat trips through workload planning. HIOC has agreed to use a 200-foot buffer from the adjacent wetland areas to avoid interactions with shorebirds. *Refer* to Responses to **CDFW Comment 3-28, CCC Comment 4-17, and RRAS Comment 5-3** for more details.
3-34	"Economic or social effects of a project shall not be treated as significant effects on the environment.... The focus of the analysis shall be on the physical changes." CEQA Guidelines § 15131; *Preserve Poway v. City of Poway*, 245 Cal.App.4th 560, 579 (2016). CEQA does not include a consideration of impacts to hunting. Regardless, HIOC has

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	eliminated proposed cultivation in an area identified as important for hunting in the northeast portion of the project site. BMP-6 (Wetland Buffer) will provide further avoidance of hunting areas in the wetland habitat adjacent to the proposed culture areas. As noted in the IS/MND, the project incorporates 12- to 15-foot rows between blocks of 4 longlines or 2 rows of racks for boats to use (i.e., boat easements), and HIOC will inform the District of the location of beds in Arcata Bay, as per BMP-4 (Bed Marking). Hunters and recreational users can use these boat rows to navigate through the site. The IS/MND does evaluate potential effects to recreational users of the site. Please refer to Section XVII (Transportation).
3-35	*Refer* to Response to **CDFW Comment 3-34**.
3-36	*Refer* to Responses to **CDFW Comment 3-28 and 3-29** regarding shorebird disturbance and Response to **CDFW Comment 3-34** regarding hunting impacts. HIOC only estimates 2-4 roundtrip vessel trips per week to and from the project site. This would result in little or no impact to hunting activity. HIOC has operated a shellfish farm in Tomales Bay for decades without conflicts with hunting. Included in **Attachment 1** are letters from hunters in Tomales Bay, which testify that HIOC's operations do not impact their ability to hunt and that HIOC's operations support local hunters. HIOC will take the additional measures described in Response to **CDFW Comment 3-29** to avoid any disturbance to birds.
3-37	*Refer* to Response to **CDFW Comment 3-34**.
3-38	Updated maps illustrating planned installation of gear identify how lease areas will be marked (*refer* to Figure 10 in the IS/MND). Final gear installation and marking will be based on eelgrass and other conditions, which may affect the final installation and maps will be updated based on as-built conditions (Mit-2 [Eelgrass Protection]). In general, HIOC will mark the perimeters of each group of 4 lines (or each row of racks), with numbered PVC poles/pipes. For the 30- to 40-foot access channels, HIOC will mark with larger PVC pipes, including triangular red or green markings pointing to direction of travel.
3-39	Comment noted.
3-40	All bags or baskets used for growing shellfish would be marked using zip ties that have "Hog Island Oyster Co." and a contact phone number inscribed on them. Gear marking will allow identification of the source of lost gear and a point of contact. HIOC has been leading debris clean-up efforts in Tomales Bay since 2000 and has collected quarterly data since 2016. HIOC has considerable experience performing these operations. Numerically, debris collected is 90% non-aquaculture sourced and 10% shellfish aquaculture sourced with the dominant debris items collected being plastic scraps, cigarettes, food wrappers, plastic bags, plastic bottles, Styrofoam, and aluminum cans. The primary shellfish aquaculture materials recovered include shellfish growing bags, rope, and PVC pipe. Attached as **Attachment 2** is the report submitted by HIOC to the California Coastal Commission regarding its cleanup efforts and debris collected in Tomales Bay.
3-41	All floating bags and baskets will be marked or branded with HIOC's name and phone number (Mit-1 [Marine Debris]). Reporting and process improvement requirements will be added to HIOC's Marine Debris Management Plan. An updated version has been included in the revised IS/MND.
3-42	Comment noted.
3-43	HIOC shall pay applicable fees upon filing of the Notice of Determination.

Comment Letter 4: California Coastal Commission

STATE OF CALIFORNIA—NATURAL RESOURCES AGENCY GAVIN NEWSOM., GOVERNOR

CALIFORNIA COASTAL COMMISSION

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April 12, 2021

Adam Wagschal
Deputy Director
Humboldt Bay Harbor, Recreation and Conservation District
601 Startare Dr.
Eureka, Ca 95501

Re: Notice of Intent to Adopt Mitigated Negative Declaration for Hog Island Oyster Company Shellfish Farm in Arcata Bay

Dear Mr. Wagschal:
Thank you for the opportunity to comment on the Initial Study and Mitigated Negative Declaration for the Hog Island Oyster Company (HIOC) Shellfish Farm, a proposal by HIOC to pursue commercial shellfish aquaculture activities on up to 30 acres of Humboldt Bay. The proposed project will require a coastal development permit from the California Coastal Commission (Commission) and Commission staff anticipates receiving an application shortly. As such, the Commission will use information contained in the IS/MND in its evaluation of the project's conformity with the resource protection and use policies of the Coastal Act. Please accept for consideration our comments on the following sections of the document.

Project Description

1. *Construction*: The IS/MND describes the construction activities of this project as taking place over a period of five years in a lease area adjacent to Mad River Slough in North Humboldt Bay. HIOC would exclusively employ near-bottom culture methods, using bags or baskets on intertidal longlines (up to 27 acres), with a small amount (up to 3 acres) of "raised rack and bag" culture. Installation of this cultivation equipment would necessitate placement of PVC posts and anchors as well as the movement of personnel and equipment within soft substrate mudflat areas. Disturbance of mudflats is known to result in movement of sediment and turbidity into surrounding areas. To help Commission staff understand the scale and duration of construction activities that would occur during the projected five year construction period and the level of mudflat disturbance that may result, please include a description of the anticipated timing and scale of each of the proposed construction events. **4-1** Please also consider additional mitigation measures that may be necessary to help protect nearby eelgrass habitat from adverse impacts of sediment movement and turbidity (e.g.: silt screens, limiting construction to low tides, limitations on the total acreage of construction during a single event) generated during construction. **4-2** Please also describe the types of construction equipment that would be used, the location of **4-3**

proposed staging areas, the time of year installation would occur in, and the proposed number and configuration of the bags or baskets and "raised rack and bags" within the proposed cultivation areas. 4-3 cont.

2. *Surveys:* The applicant proposes to conduct and/or use aerial surveys for eelgrass (*Zostera marina*) no more than two years prior to the start of construction activities for the project. However, eelgrass beds are known to experience significant annual variation. Accordingly, the California Eelgrass Mitigation Policy and Implementing Guidelines (CEMP) developed by the National Marine Fisheries Services calls for eelgrass surveys to be carried out within the same eelgrass growing season as the proposed development or construction activity (or the prior season if the activity would occur between seasons). Because the project will take place over multiple growing seasons, we encourage the Harbor District to consider the addition of eelgrass surveys throughout the 5-year construction period to monitor eelgrass beds within the project area. 4-4

3. *Sediment Accumulation:* The IS/MND notes that any sediment accumulation resulting from the installation of gear will be quickly fixed, as ongoing monitoring would be taking place at the sites. However, the document does not describe the methods by which this monitoring would occur. Please describe how accumulation of sediment would be addressed. 4-5

4. *Representative Photographs:* Please provide representative photographs of each of the proposed cultivation gear types (rack and bag, basket longlines, tipping bag longlines) taken at both high and low tides. 4-6

Biological Resources

1. *Eelgrass Habitat*: Eelgrass is present in several discrete locations within the lease area. The habitat and mapped eelgrass beds primarily occur in channels adjacent to the main channel and Mad River Slough. According to the CEMP (pg. 7-8): 4-7

   "Eelgrass distribution fluctuates and can expand, contract, disappear, and recolonize areas within suitable environments. Vegetated eelgrass areas can expand by as much as 5 meters (m) and contract by as much as 4 m annually (Donoghue 2011). Within eelgrass habitat, eelgrass is expected to fluctuate in density and patch extent based on prevailing environmental factors (e.g., turbidity, freshwater flows, wave and current energy, bioturbation, temperature, etc.). To account for seagrass fluctuation, Fonseca et al. (1998) recommends that seagrass habitat include the vegetated areas as well as presently unvegetated spaces between seagrass patches. In addition, there is an area of functional influence, where the habitat function provided by the vegetated cover extends out into adjacent unvegetated areas. Those functions include detrital enrichment, energy dampening and sediment trapping, primary productivity, alteration of current or wave patterns, and fish

and invertebrate use, among other functions. The influence of eelgrass on the local environment can extend up to 10 m from individual eelgrass patches, with the distance being a function of the extent and density of eelgrass comprising the bed as well as local biologic, hydrographic, and bathymetric conditions (Bostrom and Bonsdorff 2000, Bostrom et al. 2001, Ferrell and Bell 1991, Peterson et al. 2004, Smith et al. 2008, van Houte-Howes et al. 2004, Webster et al. 1998). Detrital enrichment will generally extend laterally as well as down slope from the beds, while fish and invertebrates that utilize eelgrass beds may move away from the 8 eelgrass core to areas around the bed margins for foraging and in response to tides or diurnal cycles (Smith et al. 2008). To encompass fluctuating eelgrass distribution and functional influence around eelgrass cover, for the purposes of this policy and guidelines, eelgrass habitat is defined as areas of vegetated eelgrass cover (any eelgrass within 1 m2 quadrat and within 1 m of another shoot) bounded by a 5 m wide perimeter of unvegetated area (See Attachment 1 for a graphical depiction of this definition). Unvegetated areas may have eelgrass shoots a distance greater than 1 m from another shoot, and may be internal as well as external to areas of vegetated cover. For isolated patches and on a case-by-case basis, it may be acceptable to include an unvegetated area boundary less than or greater than 5 m wide. The definition excludes areas of unsuitable environmental conditions such as hard bottom substrates, shaded locations, or areas that extend to depths below those supporting eelgrass. Suitable depths can vary substantially depending upon site-specific conditions. In general, eelgrass does not extend deeper than 12 feet mean lower low water (MLLW) in most protected bays and harbors in Southern California, and is more limited in Central and Northern California embayments. However, eelgrass can grow much deeper in entrance channels and offshore areas."

4-7 cont.

Please note that the 5m wide perimeter of unvegetated area should be considered part of the eelgrass habitat and not a "buffer" intended to protect that habitat from disturbance. Any such buffer should start at the outer extent of the eelgrass habitat (the outer edge of the 5m wide perimeter of unvegetated area) and extend outwards a distance determined to be appropriate based on the proposed activity and its potential to affect the adjacent eelgrass habitat. As described in the IS/MND, the project would include placement of cultivation gear directly adjacent to eelgrass habitat without an intervening buffer. At lower tides, some of the proposed gear, such as the tipping bag longlines, would resemble four foot high walls or fences of solid material extending up to 300 feet long and four feet high. With changes in tidal elevation and currents, these tipping bags may extend horizontally up to several feet over the adjacent eelgrass habitat. As such, the proposed longlines have the potential to result in significant shading of adjacent eelgrass habitat. **4-8** Please include in the IS/MND a discussion and analysis of this shading effect, its potential to adversely affect eelgrass habitat, and the potential protection and benefit to that habitat that would be provided through implementation of a buffer in which gear would not be installed. **4-9**

In addition, please also evaluate and consider the potential need for a buffer to protect eelgrass habitat against the adverse impacts (such as disturbance, burial and loss) that would result from accessing cultivation areas on foot and the uncontrolled movement of cultivation gear – baskets, bags, lines, posts and/or rack material – into adjacent eelgrass habitat due to accidental loss, collapse or displacement of the cultivation structures. Commission staff's experience with similar types of gear in Tomales Bay, Morro Bay and Humboldt Bay indicates that wind-driven waves and currents can move structures and gear out of cultivation areas and into adjacent habitat areas. Although the lighter floating gear can be moved great distances (sometimes miles away), the areas most likely to be affected by displaced gear and structures are typically within 10 to 20 feet of cultivation areas. 4-10

Finally, please also evaluate and consider the appropriateness of applying the same proposed 30 foot separation between vegetated eelgrass and cultivation structures that was incorporated into the Draft Environmental Impact Report for the Harbor District's Intertidal Pre-Permitting Project and Yeung Oyster Farm through Mitigation Measure Bio-4 (see August 2020 DEIR, page 51). 4-11

2. *Navigation Route:* Currently, the identified vessel navigation route appears to pass directly over known eelgrass habitat and within close proximity to a grit site for black brant. We encourage the Harbor District to provide a more detailed navigation route figure for the cultivation area that shows how eelgrass habitat would be avoided by vessels and a discussion of how disturbance to the brant grit site would be avoided. 4-12 Please also consider including a discussion of alternative routes (potentially including one from the informal boat-ramp located north of the lease area) as well as alternatives configurations of the cultivation area that would allow access from the main Mad River Slough Channel, where eelgrass is not present. 4-13 If feasible, please also discuss the possibility of replacing some motorized access (such as that used for basic maintenance and inspections) with access via non-motorized means that may minimize outboard motor transit over eelgrass habitat. 4-14

3. *Non-native species*: Introduction of non-native species such as Pacific oyster (*Crassostrea gigas*) and Kumamoto oyster (*C. sikamea*) into an ecosystem have the potential to negatively interfere with natural ecological communities. Although there is currently limited available information on the establishment and persistence of non-native oyster species outside of cultivation within Humboldt Bay, feral Pacific oysters have been observed at several locations in the North Bay. We encourage the Harbor District to more directly acknowledge this information and to further investigate it through the conduct of targeted surveys coordinated with aquaculture operators and CDFW staff. 4-15 We also encourage the Harbor District to provide additional information about the conditions that would result in spawning, wild settlement and survival of farmed non-native oysters in Humboldt Bay and the potential for climate change related fluctuations and shifts 4-16

in oceanographic conditions and temperatures to result in more consistent spawning and settlement events. **4-16 cont.**

Recreation

1. *Additional uses:* The proposed project area is directly adjacent to Mad River Slough Wildlife area as well as Manila Community Park and Ma-le'l Dunes, which are known to be popular recreational areas. Please provide an expanded description of the types of recreational activities that occur in and around the lease area, including hunting, sculling, clam harvesting, and recreational boating/kayaking as well as any potential adverse impacts to these activities that may result from the proposed project. **4-17**

Thank you for your consideration of the comments included above. If you have any questions, please do not hesitate to contact me at amanda.cousart@coastal.ca.gov.

Sincerely,

DocuSigned by:
Amanda Cousart
DC21EAAA9F004C8...

Amanda Cousart,
Environmental Scientist
Energy, Ocean Resources and Federal Consistency Division

Response to California Coastal Commission

Comment Number	Response
4-1	HIOC plans to install a target of 5 acres/year with a maximum of up to 10 acres installed per year until gear is fully installed on approximately 30 acres of growing area. Installation activities are planned for low tide when areas are dry or nearly dry. This will minimize turbidity impacts. Disturbances associated with installed gear are expected to be within the range of natural variation from wind-wave events based on the observations by Rumrill and Poulton (2004).
4-2	As requested by the commenter, installation activities are planned for low tide when areas are dry or nearly dry. This will minimize turbidity impacts. Gear will be transported to the site by boat and installed by HIOC staff. Mobilization of sediment from construction activities are expected to be comparable to sediment mobilization during tidal exchanges after people have moved across the mudflat and is not expected to be detectable above Humboldt Bay background levels. Refer to Response to **CDFW Comment 3-2** for additional details.
4-3	As described in the IS/MND, HIOC will use hand posts installed using a gas powered post driver. Helix anchors will be driven into the substrate by hand. Given the limited amount and intensity of construction activity, no staging areas are required. Gear will be transported to site on skiffs or scows and will typically be installed within 1 tide cycle. Installation could occur in any time of the year depending on market need. There would be approximately 960 baskets/acre, 1,960 tipping bags/acre, and 622 racks per acre.
4-4	In response to this comment, HIOC will perform drone-based aerial surveys at least once per year for the purpose of mapping eelgrass until gear is fully installed at the site, expected to be approximately 5 years. HIOC will use the most recent eelgrass survey to inform placement of gear.
4-5	HIOC does not propose monitoring specific to sediment accumulation. As noted in the IS/MND, a number of studies that have evaluated sediment accumulation associated with the types of gear proposed by the project have shown minimal sediment accumulation, primarily located around the gear itself. However, HIOC will collect high resolution aerial imagery on an annual basis during gear installation, which can be used to visually evaluate sediment accumulation or erosion if needed.
4-6	Photos in addition to those included in the IS/MND are included as **Attachment 3**.
4-7	*Refer* to Response to **CDFW Comment 3-2**.
4-8	The information provided by the Commission does not agree with the existing literature on effects of shading from longline culture methods (refer to Rumrill and Poulton 2004). Shading does not affect potential eelgrass habitat. The effects are limited to eelgrass, and the existing literature does not indicate that shading from longline culture results in a reduction of eelgrass. In addition, Merkel and Associates (2021) have reported that eelgrass has established within areas with aquaculture gear, suggesting a positive effect to eelgrass from the presence of aquaculture gear. This is similar to information reported by Tallis et al. (2009). Shellfish culture gear provides a larger boundary layer and slowing water current speed (a small-scale effect within the culture bed), which may increase recruitment of floating seeds as they travel singly or within detached reproductive shoots. Therefore, retention of seedlings could be facilitated by the structure shellfish gear provides. *Refer* to Response to **CDFW Comment 3-2** for additional details.
4-9	*Refer* to Response to **CDFW Comment 3-2**.
4-10	Apart from the limited gear movement on lines, which may allow gear to extend up to 2.5 feet from the line installations, gear is not expected to extend away from the installation areas. Planned operations are expected to limit the potential for gear loss, which typically is limited to extreme events. Extreme events can transport gear vast distances, making buffers an inappropriate tool for managing these unpredictable events.

Comment Number	Response
	While lines can collapse during extreme events, adjacent lines provide some protection from extreme wind-waves, thereby causing lines to collapse away from the edges of cultivated areas towards other culture lines. This means that most line collapses are towards other lines, not away from culture areas. Regular maintenance of the culture areas will control any long-term effects from lines or gear that is displaced by storm events. Any gear that is displaced will be quickly recovered, thereby limiting any impacts to potential expansion or seeding of eelgrass areas. *Refer* to IS/MND Appendix A (Marine Debris Management Plan) and Response to **CDFW Comment 3-2** for additional details.
4-11	Additional separation is not necessary based on analysis of eelgrass interactions with shellfish aquaculture specific to the HIOC Project. No additional buffer is required to minimize effects to eelgrass. The site is primarily comprised of a relatively high tidal mudflat that is at or above approximately +2 feet MLLW. Most, if not all, of the eelgrass documented at the site is below this elevation and associated with either tidal channels or depressions. Therefore, the distances separating eelgrass from shellfish aquaculture at this site provide both 5 meters adjacent to the nearest observed eelgrass shoots and often substantial vertical tidal elevation differences. This is a substantial difference from other tideflat locations in Humboldt Bay. Furthermore, Gilkerson (2008) and Judd (2006) suggest that the tidal range for eelgrass in Humboldt Bay is typically -6.9 feet to 1.3 feet MLLW in Humboldt Bay. The areas proposed for culture by HIOC are likely near or above the upper tidal elevation where native eelgrass can be sustained from year-to-year in Humboldt Bay. Localized pockets at lower elevations or where ponding occurs may support eelgrass at these tidal elevations, and these locations would be avoided using the proposed mitigation measures for the HIOC Project (Mit-2 [Eelgrass Protection], Mit-3 [Vessel Anchors], Mit-4 [Vessel Routes]). *Refer* to Response to **CDFW Comment 3-2** for additional details.
4-12	According to Mitigation Measure 4, as provided in Response to **CDFW Comment 3-8** above, HIOC will establish a vessel route to access its leases that avoids known native eelgrass (*Z. marina*) beds, and maintain a no wake zone within a 1,000-foot buffer north of Tuluwat Island to avoid black brant (*Branta bernicla*) gritting sites in the winter (December 15-April 30). HIOC will be using the standard navigational channel for this route, and will not interact or impact eelgrass in close proximity of this location. *Refer* to the updates of the vessel route in Figure 11 of the IS/MND.
4-13	The public boat launch at Mad River Slough is not a suitable site for supporting commercial aquaculture. Commercial aquaculture requires the safe and regular transport of aquaculture equipment, product and crews. The Samoa Boulevard site lacks parking for crew, storage for equipment and dock facilities for loading and unloading vessels. Growers regularly use forklifts and cranes to manipulate equipment and shellfish product and to move gear between upland facilities and vessels. This site lacks dock facilities that would allow for equipment loading and unloading using cranes or forklifts which would create an increased potential for injuries. In addition, there is no provision at this site for moving or storing commercial shellfish product. These facilities are all provided at the existing HIOC facilities. The boat ramp at this site is also insufficient to support some of the larger vessels that HIOC uses to support its operations. Use of recreational boat ramps by commercial operators creates a potential conflict. Launching a vessel and loading the vessel with commercial aquaculture equipment may take multiple hours and effectively prevent use of the boat ramp by other users to launch or retrieve vessels when HIOC is launching, loading, unloading and retrieving vessels. Mad River Slough has small areas of fringing eelgrass beds along the channel margins in recent and historic mapping. Vessel transits are planned to use existing channels and boats will typically travel mid- channel. Eelgrass along the proposed transit route is along the channel margins and direct effects to this resource would be limited to boat wakes. These waves are similar or smaller than other vessel wakes and wind driven waves. The primary area where there is a potential interaction between vessels and eelgrass is along the channel margins surrounding the project site and these points of access would be used by either boats accessing the site from Mad River Slough or

Comment Number	Response
	HIOC's identified transit route. HIOC has identified drifting across areas that may contain eelgrass (refer Response to **CCC Comment 4-14**) as an additional measure to minimize the potential for eelgrass impacts. *Refer* to Response to **CCC Comment 4-12** for updated information regarding the vessel navigation route.
4-14	Safe and efficient access to the site requires staff to use motorized vessels. However, in the event that vessels need to drift over portions of the site that contain eelgrass, staff will limit engine use by putting the engine in neutral and drifting across eelgrass areas (BMP-7 [Bed Access]). This type of approach can be used when weather and tidal elevations permit. Note that vessel traffic to the project site is limited to only 2-4 trips per week, thereby substantially limiting any impacts associated with vessel use. *Refer* to Response to **CDFW Comment 3-2** for additional details.
4-15	*Refer* to Response to **CDFW Comment 3-23**.
4-16	Ruesink et al (2005) identifies water temperatures exceeding 18°C to 20°C as critical thresholds for spawning and temperatures exceeding 16°C as a critical threshold for larval development of *C. gigas*. Sea temperature in Humboldt Bay is typically 11°C to 14°C (Sea Temperature 2021). At present, natural recruitment is only documented to occur regularly in 3 locations in north America – British Columbia, Canada, Hood Canal, Washington And Willapa Bay, Washington (Ruesink et al. 2005). Shifts in oceanographic and temperatures that increase the frequency and duration above those thresholds will increase the likelihood of successful naturalization events by cultivated oysters. The project uses habitats similar to existing *C. gigas* culture areas in Humboldt Bay and will not cause changes in the environment that affect the potential for natural spawning and settlement events of *C. gigas* in Humboldt Bay. *Refer* to Response to **CDFW Comment 3-23** for additional details regarding the environmental impacts associated with the naturalization of *C. gigas*.
4-17	HIOC has adopted an approximately 200-foot buffer between the wetlands associated with the Mad River Slough Wildlife Area and the proposed culture area, including avoidance of the channel adjacent to this buffer (Mit-5 [Channel Buffers], BMP-6 [Wetland Buffer]). Gear would be installed east of the existing channel. This buffer is anticipated to provide additional area for visual and recreational access between Mad River Slough and the upland wildlife area. By limiting gear installation to the east side of the channel that is adjacent to the wildlife area, boaters will have access through the channel and areas west of the channel. In addition, this buffer is anticipated to avoid disturbance of shorebirds using the wildlife area habitats by staff working on the proposed project. The project will incorporate boat channels within the project site that will be used by HIOC's vessels but can also be used by recreational boaters and kayakers. Recreational users will also be able to fully utilize the channels on the project site, and the additional 10 foot buffer incorporated into the project from channels will provide an additional buffer zone should recreational users stray from channel areas. *Refer* to Response to **CSLC Comment 2-11 and CDFW Comment 3-34** for additional details.

Comment Letter 5: Redwood Region Audubon Society

REDWOOD REGION AUDUBON SOCIETY
P.O. BOX 1054, EUREKA, CALIFORNIA 95502

March 12, 2021

Adam Wagschal, Deputy Director
Humboldt Bay Harbor, Recreation and Conservation District
601 Startare Drive
Eureka, CA 95501

Subject: Comments on proposed Hog Island Oyster Company Shellfish Farm in Arcata Bay

Dear Mr. Wagschal,

Thank you for the opportunity to comment on the proposed Hog Island Oyster Company Shellfish Farm in Arcata Bay (HIOC Project). Redwood Region Audubon Society (RRAS), a member of the National Audubon Society, is a 501(c) (3) public benefit corporation of about 500 members. We promote wise, balanced, responsible and ethical use of natural systems on a local, national and global scale, protecting the biotic and abiotic components of local, national and global natural systems, with an emphasis on birds.

We have reviewed the Initial Study and Draft Mitigated Negative Declaration for the HIOC Project (Initial Study), dated February 6, 2021, and provide the following comments.

Disturbance of Roosting Shorebirds
Shorebirds regularly roost at high tide in the vegetated wetlands adjacent to northwest section of the proposed shellfish longline culture area, as shown in Figure 4 of the Initial Study. This is based on observations by wildlife biologists, including from the 2018-2019 Humboldt Bay Shorebird Survey Project, led by shorebird expert Dr. Mark Colwell of Humboldt State University. In addition, a study of shorebird high-tide roosts in Humboldt Bay documented a number of roosts in the HIOC Project vicinity (Colwell and others, 2003). While the study found many such roosts around Humboldt Bay, we believe it appropriate to include measures to protect high-tide roosts to protect the bay's importance to migratory and wintering shorebirds (see: https://whsrn.org/whsrn_sites/humboldt-bay-complex/), and more so given the potential cumulative impacts of the many existing and proposed projects in and around Humboldt Bay. **5-1**

While the HIOC Project includes a measure—BMP-3—to reduce disturbance, we find that this measure, however well-intentioned, would likely not prevent disturbance to roosting shorebirds near the HIOC project. BMP-3 relies on HIOC personnel to spot and avoid disturbing birds. Shorebirds are often inconspicuous when roosting in wetland vegetation, making it easy for HIOC operators to miss. **5-2**

We recommend, as a more reliable way to avoid and minimize disturbance to roosting shorebirds, that the project provide a 300-foot buffer from the wetland vegetation, where no **5-3**

A MEMBER OF THE NATIONAL AUDUBON SOCIETY longlines or other activities occur. Based on Figure 4 of the Initial Study, this would affect a strip of proposed longline area located just west of a narrow tidal channel in the northwest corner of the proposed lease area, of about 3 to 4 acres. Perhaps an equivalent area of longlines could be added elsewhere within the lease area. The attached figure shows the suggested buffer area. 5-3 cont.

We use 300 feet as a buffer size based on relevant examples we could find. In Maine, 250 ft is the recommended buffer for shorebird roosts (Maine Department of Inland Fisheries and Wildlife, 2010: page 2). Also, a study of 11 shorebird species (Koch and Paton 2014), a 300-ft buffer would exceed the observed flushing distance for all species (for >95% of observations). The Koch and Paton study recommended buffers of up to 185 meters (about 600 ft) for the most sensitive species in their study (Black-bellied Plover—which also winters on Humboldt Bay), but as noted, 300 feet would exceed their observed flushing distances in nearly all cases. 5-4

Disturbance of Brant and Other Waterfowl

The Initial Study does not fully address disturbance to Brant (*Branta bernicula*), other waterfowl, and water birds in general due to increased work-boat traffic to the Project area from an HIOC facility on the western edge of Humboldt Bay near Samoa, a one-way commute distance of about 4 miles across northern Humboldt Bay. Previous analyses may not be applicable, as the distribution of Brant has shifted in recent years from a greater use of southern Humboldt Bay to a greater use of northern Humboldt Bay. According to the U.S. Fish and Wildlife Service, the bay is the most important Brant wintering and migration site in California and Oregon, with an estimated 40 percent or more of the Pacific Flyway's Brant population using Humboldt Bay as a migratory stopover in the spring, primarily to feed on eelgrass (https://www.fws.gov/refuge/Humboldt_Bay/wildlife_and_habitat/PacificBrant.html). 5-5

We recommend, as a way to minimize disturbance of Brant, waterfowl, and other waterbirds, that the project evaluate and implement if feasible accessing the HIOC site from a launch point on Mad River Slough, such as existing one the north side of Samoa Blvd. With a very direct and short commute of about one-third mile, this would likely have much less disturbance impact to Brant and other waterbirds using the north bay. 5-6

Loss and Degradation of Tidal Flat Habitat

While the HIOC Project has a relatively small footprint, the placement of shellfish longlines will reduce the availability of tidal flats within that footprint reduce the availability of tidal flat for shorebirds, waterfowl, wading birds and other wildlife. We are concerned about the cumulative loss and degradation of tidal flat habitats associated with the continued permitting of individual projects. We recommend that the Humboldt Bay Harbor, Recreation and Conservation District carry out a study to determine the cumulative effect of existing, currently planned, and anticipated aquaculture and other projects affecting tidal flats on bird populations and the carrying capacity of Humboldt Bay to support those bird populations. 5-7

Marine Debris Management

We acknowledge the HIOC Project's inclusion of a Marine Debris Management Plan (Appendix A of the Initial Study). While we believe that the intent was (appropriately) to focus this plan on Humboldt Bay, the version in the Initial Study refers to Tomales Bay in the third-from-last bullet. Please correct this in any final documents. 5-8

We thank the Humboldt Bay Harbor, Recreation and Conservation District for the opportunity to review the project and present concerns.

2

Sincerely,

Gail Kenny
President
Redwood Region Audubon Society

REFERENCES CITED (available on request)

Colwell, M.A., T. Danufsky, N.W. Fox-Fernandez, J.E. Roth, and J.R. Conklin. 2003. Variation in shorebird use of diurnal, high-tide roosts: how consistently are roosts used? Waterbirds 26(4):484-493.

Koch, S.L., and P.W.C. Paton. 2014. Assessing anthropogenic disturbances to develop buffer zones for shorebirds using a stopover site. Journal of Wildlife Management 78(1):58–67.

Maine Department of Inland Fisheries and Wildlife. 2010. Recommended land use guidelines in shorebird feeding and roosting areas. 19 pages. Available at: https://atlanticflywayshorebirds.org/outreach/Recommended_Land_Use_Guidelines_Shorebird_Feeding_Roosting_Areas_FINAL_Nov2010.pdf

Attachment: Figure 4 from the HIOC Project's Initial Study, annotated to show location of recommended 300-foot-wide buffer area for vegetated wetland habitat used by roosting shorebirds.

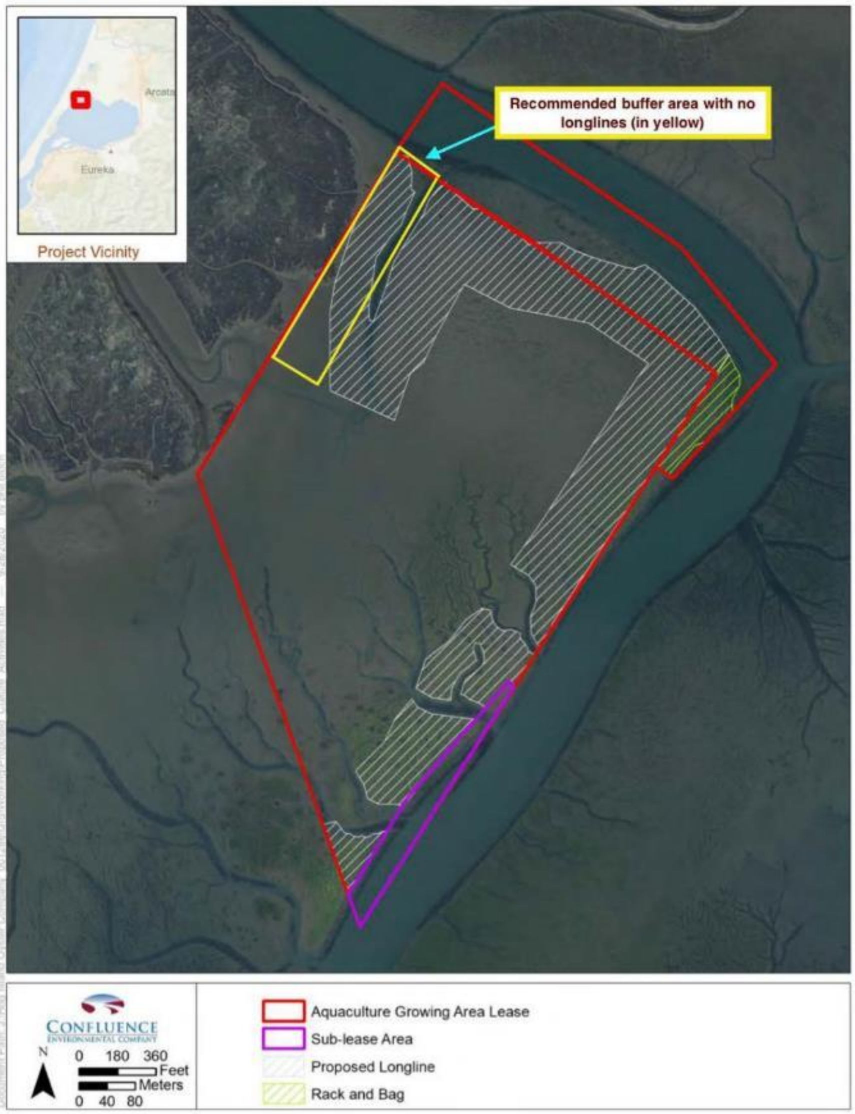

Figure 4: Project Map and Vicinity

HIOC Shellfish Farm in Arcata Bay
Draft Initial Study

13

Humboldt Bay Harbor District
February 2021

4

Response to Redwood Region Audubon Society

Comment Number	Response
5-1	Pursuant to Mitigation Measure 2, HIOC will avoid all existing eelgrass cover on the project site (*Refer* to Response to **NMFS Comment 1-1**). HIOC will also provide a 200-foot buffer from the wetland areas associated with the Mad River Slough Wildlife Area (*see* BMP-6 [Wetland Buffer]), which will further reduce the potential interaction with shorebird roosting areas. *Refer* to Response to **CDFW Comment 3-8.**
5-2	As noted in the IS/MND, studies conducted evaluating the impact of the same aquaculture gear types as those proposed by the project have shown that the project is not likely to result in significant disturbance of shorebirds. This is further addressed through Mit-2 (Eelgrass Protection), where HIOC will avoid eelgrass vegetation on the site and general avoidance of the Mad River Slough Wildlife Area (BMP-6 [Wetland Buffer]). Shellfish aquaculture operations involve activities that are spread apart from each other both spatially and temporally. For example, each longline would be visited, on average, approximately once every 2-3 months. This includes general maintenance where there would be limited activities on-site. Overall, the site will be accessed approximately 2-4 times per week and the work would be spread out over the entire 30 acres throughout the year with access to small portions at a time. The primary noise-generating activities are harvesting and initial gear installation, which would occur on the project site every 1-3 years. Therefore, given the limited nature of these activities, they would not result in a significant impact to shorebirds.
5-3	In response to this comment, HIOC will incorporate a 200-foot buffer from wetland associated with the Mad River Slough Wildlife Area. Please see the revised Figure 4 in the IS/MND that shows this change. Note that parts of this culture area were further reduced beyond the 200-foot buffer to also incorporate avoidance of a subtidal channel. *Refer* to Mit-5 (Channel Buffers) and BMP-6 (Wetland Buffer), as discussed in Responses to **NMFS Comment 1-2** and **CDFW Comment 3-8**.
5-4	*Refer* to Responses to **CDFW Comment 3-28, CCC Comment 4-12, and RRAS Comment 5-3**. Note that this comment also informs the adoption of HIOC's proposed vessel route, which is located a minimum of 1,000 feet away from existing brant gritting sites on Tuluwat (Indian) Island. *See* Figure 11 in the IS/MND for the updated vessel route. Mitigation Measure 4 says: **Mit-4 (Vessel Routes):** HIOC will establish a vessel route to access its leases that avoids known native eelgrass (*Z. marina*) ~~beds~~cover, and maintain a no wake zone within a 1,000-foot buffer north of Tuluwat Island to avoid black brant (*Branta bernicla*) gritting sites in the winter (December 15-April 30).
5-5	*Refer* to Responses to **CDFW Comment 3-28 and CCC Comment 4-12**. Impacts are also discussed in Bio-D4 of the IS/MND.
5-6	*Refer* to Response to **CCC Comment 4-13**.
5-7	A cumulative impact analysis was provided as Appendix D to the IS/MND.
5-8	Comment noted. An updated version has been included in the revised IS/MND.

Comment Letter 6: National Audubon Society, Black Brant Group and California Waterfowl

April 12, 2021

Mr. Adam Wagschal
Humboldt Bay Harbor, Recreation, & Conservation District
601 Startare Drive
Eureka, California 95501-0765

Re: Initial Study and Draft Mitigated Negative Declaration Recirculation for the Hog Island Oyster Company Shellfish Farm in Arcata Bay (SCH#2021020128)

Dear Mr. Wagschal,

On behalf of the undersigned organizations, thank you for considering the following comments on the Recirculated Initial Study/Mitigated Negative Declaration (IS/MND) from the Humboldt Bay Harbor, Conservation and Recreation District for the Hog Island Oyster Company Shellfish Farm (HIOC) in Arcata Bay Project (Project) pursuant the California Environmental Quality Act (CEQA) and CEQA Guidelines.

We disagree with the IS/MND's findings of less than significant impact of the Project after mitigation
for birds and other wildlife, recreation, and vessel safety. In order to comply with the California
Environmental Quality Act, the Harbor District must require the applicant to prepare a draft 6-1
Environmental Impact Report (DEIR). The DEIR should also adhere to the recommendations of the 6-2
California Coastal Commission's in its recent guidance for CDP applicants.[1]

The Project is located in an area of Arcata Bay that holds the potential to be of lower impact to natural
resources than other areas in the bay, due to its location in the west side of the bay where there is
existing aquaculture activity. Additionally, we have appreciated the opportunity to correspond with 6-3
HIOC leadership, and we believe HIOC is committed to mitigate project impacts through further

[1] CCC Coastal Development Permit Application Guidance: Aquaculture and Marine Restoration. 2020. https://documents.coastal.ca.gov/assets/cdp/Draft-CDP-Application-Guidance-Aquaculture-and-Marine-Restoration.pdf July.

refinement to the project description and inclusion of appropriate coastal development permit conditions. Therefore, with proper analysis and mitigation through a DEIR and robust consultation with agencies and the public, a fully mitigated shellfish project is possible at the site. **6-3 cont.**

Unfortunately, the IS/MND falls far short of adequately describing natural resources and recreational attributes of the project site and Arcata Bay, and the potential impacts to these resources from new shellfish operations at the site. It contains numerous unsubstantiated assertions, missing analyses and information, and it fails to use recent readily available published peer reviewed studies on birds, eelgrass and other natural resources. **6-4** The IS/MND asserts less than significant impact to numerous resources and uses; fails to adequately mitigate for expected impacts; and fails to provide an analysis of cumulative impacts from existing as well as other anticipated aquaculture operations in the bay. **6-5**

Project Description

Hog Island Oyster Company (HIOC) proposes to install approximately 30 acres of shellfish culture operation within 110 acres of leased intertidal mudflat in the northwest portion of Arcata Bay adjacent to the Mad River Slough Channel. HIOC proposes to grow three species of oyster: exotic Pacific oysters and Kumamoto oysters, and the native Olympia oyster. The primary culture method would be intertidal basket-on-longline or tipping bags on up to 27 acres, plus raised rack- and-bag culture on up to three acres. The project would be phased in over a five year period.

Bio-D1: Effects to Wintering and Migrating Shorebird Populations

The analysis of impacts to shorebirds is inadequate and the sole mitigation measure (BMP-3) falls short of protecting shorebirds. The IS/MND fails to include readily available updated information on the diversity and abundance of shorebirds in Humboldt Bay or to include readily available and spatially described information on the locations of key shorebird high tide roosts in the project area. It fails to include published information on the impacts of disturbance on shorebirds from aquaculture maintenance operations. It relies on outdated information about shorebird use of the bay and improperly interprets an earlier study[2] to assert a finding of no significant impact on shorebirds. **6-6**

The Bay is a site of Hemispheric importance to shorebirds, supporting well over 850,000 shorebirds of 52 species throughout the year.[3] Many species of shorebirds have dramatically declined throughout the world, U.S., and California. Shorebirds have declined 37% in North America since 1970.[4] Shorebirds face ongoing threats from aquaculture, other coastal development and associated disturbance, as well as new threats from climate change altering and reducing the coastal wetland habitats they rely on. Hence, the intact habitat of Humboldt Bay are of critical importance to shorebirds in the western hemisphere. **6-7**

The DEIR should provide the best available information on shorebirds in the bay and at the project site, analyze the impacts to shorebirds from increased human disturbance, and provide mitigation measures. The DEIR should include a quantitative analysis of the loss of foraging opportunity and the increase in **6-8**

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[2] Connolly, L.M. & M.A. Colwell. 2005. Comparative use of longline oysterbeds and adjacent tidal flats by waterbirds. *Bird Conservation International* 15: 237–255.

[3] Colwell, M.A., C. Polevy & H. LeWinter. 2020. Humboldt Bay, California, USA hosts a globally important shorebird community year-round. *Wader Study* 127(3): 10.18194/ws.00209 December.

[4] Rosenberg, K. V., A. M. Dokter, P. J. Blancher, J. R. Sauer, A. C. Smith, P. A. Smith, J. C. Stanton, A. Panjabi, L. Helft, M. Parr, et al. (2019). Decline of the North American avifauna. Science 366:120–124

disturbance when both stressors occur at the same time. The DEIR should analyze a potential heightened risk of raptor predation to shorebirds due to reduced visibility for the shorebird, disruption of antipredator flocking behavior due to presence of aquaculture equipment, or increased visibility to predators due to use of aquaculture equipment as perches.[5] The IS/MND notes that Dunlin often roost on top of aquaculture equipment, making them more susceptible to predation for the reasons listed above. Across a single winter at Bolinas Lagoon, raptors predated approximately 20.7% of the wintering population of Dunlin.[6] Compounding an increased potential of raptor predation due to increased visibility to predators on top of an already pressured population could have a significant impact to Dunlin, one of the two numerically dominant yet declining shorebirds in California. 6-9

The DEIR must provide improved mitigation measures to protect shorebirds. These include additional avoidance and mitigation measures beyond BMP-3, which is inadequate. This would include a) minimizing boat trips and/or establishing vessel routes that reduce disturbance; and b) adjusting the project boundary to avoid disruption of important shorebird roosts adjacent to the project area. 6-10

As part of minimizing boat trips and establishing vessel routes to reduce disturbance, we agree with the recommendation of numerous commenters including individual hunters, and Redwood Region Audubon: 6-11

> We recommend, as a way to minimize disturbance of Brant, waterfowl, and other waterbirds, that the project evaluate and implement if feasible accessing the HIOC site from a launch point on Mad River Slough, such as existing one the north side of Samoa Blvd. With a very direct and short commute of about one-third mile, this would likely have much less disturbance impact to Brant and other waterbirds using the north bay.

Finally, in its March, 2021 letter to the HBHRD, Redwood Region Audubon notes that shorebirds regularly roost at high tide in the vegetated wetlands adjacent to northwest section of the project area. This was documented recently in the 2018-2019 Humboldt Bay Shorebird Census, led by shorebird expert Dr. Mark Colwell of Humboldt State University as well as in prior literature. We agree with RRAS that the project provide a 300-foot buffer from wetland vegetation, where no structure or maintenance activities occur. Based on Figure 4 of the IS/MND, this would affect a strip of proposed longline area located just west of a narrow tidal channel in the northwest corner of the proposed lease area, of about 3- 4 acres. 6-12

Bio-D4: Effects to Black Brant

The analysis of impacts to Black Brant is inadequate and the sole mitigation measure (BMP-3) falls far short of protecting Black Brant. The IS/MND makes numerous unfounded assertions about the ability of Black Brant to habituate to disturbance, as well as the use of the north and south bays by the species. Black Brant are highly susceptible to disturbance, which is considered by experts to be the most important impact of aquaculture in the bay to the species. The IS/MND makes a false assertion 6-13
suggesting a far lower use of the bay by Brant than is documented in the literature (pg 34). It fails to 6-14

[5] Kelly, J.P, J.G Evens, R.W. Stallcup, and D. Wimpfheimer. 1996. Effects of aquaculture on habitat use by wintering shorebirds in Tomales Bay, California. California Fish and Game 82: 160-174

[6] Page, G. and D.F. Whitacre. 1975. Raptor predation on wintering shorebirds. *Condor* 77: 73-83.

provide a citation for this assertion. In reality, Humboldt Bay is the most important place in California for Brant. Stillman et al. 2015, whose authors include global experts on the species, found

> Approximately 75% of the Pacific Flyway population of brant winters in Mexico, and nearly 60% of those birds rely on Humboldt Bay as a spring staging site. Any factors that reduce the number of birds that can emigrate northwards from the bay, or increase the time taken to do so, will have consequences for survival and reproduction and hence overall population size We identified declines in eelgrass biomass and increases in disturbance as such factors.

6-14 cont.

The foundational importance of Humboldt Bay is a key reason in 2017 the CCC reduced and consolidated the operational footprint of Coast Seafoods, from 300 acres to 273 acres, and directed Coast to remove gear to allow eelgrass beds to recover.[7] **6-15**

The IS/MND mistakenly relies on a recent study in Humboldt Bay which found no significant difference in usage between culture plots vs adjacent reference plots. However, those results are invalid due to a >50% failure rate of the cameras used to establish baseline. [8] The published literature suggests Brant avoid exposed longline gear, which overlaps with the tidal stage that allows them to feed on eelgrass. **6-16** Most important, the IS/MND dismisses without reference the potentially significant impacts to Brant from increased human disturbance. Brant are highly sensitive to disturbance and experts recommend a 1000' buffer to prevent flushing. The Project proposes to implement BMPs to avoid chasing, flushing, or directly disturbing wildlife but does not describe how this will be implemented. **6-17**

The DEIR must include an analysis of impacts to Brant through the loss of foraging opportunity posed by the aquaculture gear and increased disturbance, and provide mitigation for those impacts. As mentioned above, the impacts of disturbance to waterbirds and shorebirds would be greatly reduced by changing the launch site of maintenance vessels to Mad River Slough. **6-18**

Bio-A9: Effects to Habitats

Our comments pertain specifically to eelgrass habitats. The analysis of impacts to eelgrass is inadequate and mitigation measures (Mit-1, Mit-2, Mit-3) fall short of protecting eelgrass. Humboldt Bay holds approximately 37% of the known mapped eelgrass habitat in the state. Eelgrass is of foundational importance as habitat for fish and other species. It provides nutrients to the ecosystem, sequesters carbon, and mitigates the impacts of ocean acidification.[9]

6-19

Due to the importance of eelgrass to the marine ecosystem, in 2020 the California Natural Resources Agency prioritized the protection and restoration of eelgrass. The Ocean Protection Council has committed to

> Work with partners to preserve the existing, known 15,000 acres of seagrass beds and create an additional 1,000 acres by 2025 … [and] Support projects that protect existing and potential

[7] https://documents.coastal.ca.gov/reports/2017/9/w22b/w22b-9-2017-report.pdf
[8] H.T. Harvey & Associates. 2021. Coast Seafoods Company Humboldt Bay Shellfish Aquaculture Operations Black Brant Monitoring Plan: Annual Report 2020.
[9] Coast-wide evidence of low pH amelioration by seagrass ecosystems. 2021. Ricart, Aurora et al. Global Change Biology 31 March 2021https://onlinelibrary.wiley.com/doi/10.1111/gcb.15594

4

> eelgrass habitats as identified in habitat suitability mapping, consistent with the National Marine Fisheries Service's California Eelgrass Mitigation Policy as key policy and technical guidance for protecting and restoring eelgrass.[10]

In keeping with this policy, aquaculture in Humboldt Bay and around must be managed to support the state's goal not only for the protection, but also the restoration of eelgrass. 6-19 cont.

We appreciate HIOCs intention to avoid eelgrass in gear placement and farm operations, pursuant to the recommendations of the California Eelgrass Mitigation Policy (CEMP) as well as state regulations for the avoidance of eelgrass and establishment of buffer areas in aquaculture leases. However, it is important to note that contrary to numerous assertions in the IS/MND, shellfish aquaculture in west coast estuaries negatively impacts eelgrass. NMFS evaluated the response of eelgrass to shellfish aquaculture in seven west coast estuaries[11] and found 6-20

> We found that eelgrass response metrics to shellfish aquaculture were generally negative, particularly metrics associated with abundance (biomass, density and percent cover).

In order for the Project to avoid harm to current and future eelgrass, additional analyses, mitigation measures and planning efforts must be described in the DEIR. 6-21

The IS/MND provides maps of eelgrass habitat generated by surveys conducted in 2009 and 2020. The Project area overlaps with the prior distribution of continuous and patchy eelgrass habitat. 6-22 Also, the IS/MND does not provide any information regarding the proposed methods to conduct eelgrass surveys prior to installing gear. 6-23 We share the concern of permitting and trustee agencies that only considering existing eelgrass cover during placement of culture gear will fail to capture the spatial and temporal extent of eelgrass in the Project area and will limit eelgrass from returning to its previous distribution. 6-24 The DEIR must follow the recommendations of the California Coastal Commission, Department of Fish and Wildlife, and National Marine Fisheries Service in regard to additional analyses and mitigation measures needed to protect eelgrass in the project area. This should take the form of a stand-alone eelgrass mitigation and monitoring plan that should evaluate and address:

- Alternative and/or reduced locations within the lease areas to avoid sites where eelgrass has been previously mapped.
- Establish a 5-meter perimeter and 10-foot buffer between eelgrass and aquaculture gear, and provide maps that also include vessel routes and anchorages to avoid eelgrass.
- Avoid trampling of eelgrass by maintenance workers.
- Per the CEMP, pre-installation eelgrass surveys should be completed within 60 days of gear installation and post-installation surveys should be completed within 30 days of installation.
- A plan to work with agencies to adaptively manage eelgrass should it grow within the operational footprint of the Project.

6-25

[10] California Ocean Protection Council. 2020. Strategic Plan to Protect California's Coast and Ocean 2020–2025. http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20200226/OPC-2020-2025-Strategic-Plan-FINAL-20200228.pdf
[11] Conway-Cranos, Tish et al. 2017. Eelgrass-shellfish aquaculture interactions in west coast estuaries: using meta-analysis to quantify sources of variation in effect size. NMFS report.

Effects to recreation

The IS/MND fails to analyze potential impacts to recreational users, and BMP-4 is wholly inadequate to mitigate these impacts. The Project area is located directly east of the Mad River Slough Wildlife Area, which is owned and managed by the Department of Fish and Wildlife. According to the DFW as well as many local stakeholders, this area is rich in waterfowl and is heavily used for waterfowl hunting. The Project is also located near a public access point in Mad River Slough that is used for recreational fishing, clamming, waterfowl hunting, and boating. This is one of the few remaining public access points in the area to non-boaters, making this a unique public access opportunity. Therefore, the Project is likely to have significant impacts to recreational users and the wildlife on which they depend. 6-26

Therefore, the DEIR must include an analysis of decreases in waterfowl available for harvest; the loss of hunting opportunities due to disturbance from boats and aquaculture personnel; the loss of hunting opportunities due to physical obstruction of traditional hunting areas; and increases in hazards to boaters from aquaculture gear. 6-27

Effects to vessel safety

The IS/MND wholly fails to acknowledge, let alone analyze increases in hazards to boaters, nor how the Project will ensure the safety of boaters who encounter aquaculture gear. Numerous commentors have noted that existing aquaculture in the bay is a major hazard to navigation. One longtime hunter notes that Coast's longline gear is 6-28

> A "deadly forest" at lower tides and in poor visibility and/or windy conditions. The standpipes used to anchor longlines and baskets can puncture boats and entangle mariners. The placement of the gear at the proposed project site would reduce options for boaters when Mad River Slough poses dangers due to currents and winds.

The Project must comply with California's navigable waters rule stating that private entities cannot obstruct or interfere with the public's right of navigation. This includes navigation for purposes of hunting and other boat-dependent recreation.[12] 6-29

To remedy these shortcomings in the IS/MND, the DEIR must analyze increases in hazards to boaters from aquaculture gear, how the lease and operational area will be clearly marked, and how markers will be maintained to ensure the safety of all recreational users. 6-30

Cumulative Impacts Analysis (Appendix D)

This analysis fails to adequately assess cumulative impacts, dismisses these impacts as less than significant, and contains numerous unfounded assertions and outright falsehoods. For example, the analysis asserts 6-31

[12] The rule is derived from Article X, section 4 of the California Constitution, which states: No individual or partnership, or corporation, claiming or possessing the frontage or tidal lands of a harbor, bay, inlet estuary, or other navigable water in this State, shall be permitted to exclude the right of way to such water whenever it is required for any public purpose, nor to destroy or obstruct the free navigation of such water; and the Legislature shall enact such laws as will give the most liberal construction to this provision, so that access to the navigable waters of this State shall always be attainable for the people thereof.

> While there is potential for shellfish aquaculture operations to result in cumulative effects on waterfowl through increased disturbance, this impact is not expected to be significant given that waterfowl in the bay are already somewhat habituated to the current level of human disturbance from boat traffic and other activities.

6-31 cont.

In reality, waterfowl and Brant are highly susceptible to disturbance, and this susceptibility is a key reason the CCC consolidated and reduced Coast's operations in the bay in 2017. Cumulative impacts of the project have not been adequately considered in the context of 325 acres of existing aquaculture, as well as planned expansion on the part of the HBHRCD. The Cumulative Impact Appendix currently provides outdated information regarding black brant distribution across the Humboldt Bay. 6-32

The IS/MND lacks an analysis of impacts to ecosystems. CEQA requires analysis of effects on "ecosystems," the boundaries of which are not defined by state lines.[13] Therefore, the IS must analyze environmental effects occurring both within California and outside of it. Indeed, as CEQA is "to be interpreted in such manner as to afford the fullest possible protection to the environment within the reasonable scope of the statutory language" the Project's impacts must be analyzed in terms not only of their effects around Humboldt Bay, but throughout the Pacific Flyway and California Current Large Marine Ecosystem.[14] This is particularly important for this project given that many of the species it affects are highly migratory and commercially important. 6-33

In sum, the IS/MND fails to adequately describe, analyze and mitigate for impacts to natural resources, recreation and vessel safety. Therefore, the Harbor District must not approve a Mitigated Negative Declaration for the Project. Thank you for your attention to our comments and please let us know if you have questions 6-34

Sincerely,

Anna Weinstein
Director, Marine Conservation
National Audubon Society

Fred Harpster
President
Black Brant Group

Mark Hennelly
Vice President, Legislative Affairs and Public Policy
California Waterfowl

[13] CEQA Guidelines § 15358(a)(2).
[14] Laurel Height Improvement Ass'n v. Regents of University of California, 47 Cal.3d 376, 404 (1988).

Response to National Audubon Society/Black Brant Group/California Waterfowl

Comment Number	Response
6-1	As further discussed elsewhere in the responses to comments, there is no significant unavoidable adverse impact that would warrant preparation of an environmental impact report pursuant to CEQA Guidelines § 15064.
6-2	The Coastal Commission's review of an application for a coastal development permit is separate from the Harbor District's review of a permit and associated CEQA review. Regardless, HIOC will comply with all Coastal Commission requirements associated with submission of its coastal development permit to the Coastal Commission.
6-3	Comment noted.
6-4	If there are additional sources that should be incorporated into the study, we are happy to review those. The comment did not provide any sources to be reviewed or provide examples of how the analysis was unsubstantiated.
6-5	Comment noted. A cumulative impact analysis was provided as Appendix D to the IS/MND.
6-6	The HIOC Project has added BMP-6 [Wetland Buffer], which includes a 200-foot wetland buffer and avoidance of the channel between the wetlands associated with the Mad River Slough Wildlife Area and the proposed culture area. While there is no potentially significant adverse impact from the HIOC Project that would need to be mitigated regarding potential interactions with wintering and migrating shorebird populations, this is still a common BMP that provides consistency with federal laws. Although the commenter notes that the analysis falls short, they do not provide any literature that dispute the conclusions of the IS/MND or the literature used. Direct evidence from studies conducted in Humboldt Bay have come to the same conclusions (Connolly and Colwell 2005, HTH 2015, 2018, 2021), that shellfish aquaculture plots typically have a neutral or even positive effect for most shorebirds and wading birds. This agrees with other literature along the West Coast or in locations with dense shellfish aquaculture operations (e.g., Hilgerloh et al. 2001, Roycroft et al. 2004, Žydelis et al. 2006, Kirk et al. 2007, Caldow et al. 2007, Žydelis et al. 2009). The commenter indicates that the Connolly and Colwell (2005) has been misinterpreted, but the conclusions of this paper by the authors are: "Overall, birds did not appear to avoid longline areas as compared to adjacent tidal flats. Rather, many species were more abundant and diversity was greater on longline plots." While the comment may be correct that shorebird populations are declining, the best available science does not support the contention that the type of shellfish aquaculture cultivation methods proposed by the project are a contributing factor to that decline. Impacts associated with shorebirds may not be "certain," but certainty is not required under CEQA; rather, the best available science supports that the HIOC Project will have a less than significant impact on shorebirds. Refer to Responses to **CDFW Comment 3-20 and CDFW Comment 3-28 to 3-33** for more details.
6-7	The IS/MND analyzes impacts to shorebirds due to disturbances (*see* Section D-1). This comment provides no specific analysis as to how that discussion is deficient.
6-8	*Refer* to Response to **CDFW Comment 3-32**.
6-9	The commenter does not provide information that is related to shellfish aquaculture, other than the mention that aquaculture can provide perches for dunlin. The study cited by the commenter (Page and Whitacre 1975) was related to a study in Bolinas Lagoon, Marin County during the winters of 1971-72 and 1972-73. The paper included general predation observations of merlin and short-eared owl on shorebirds such as dunlin and least sandpiper. Shellfish aquaculture was not part of the study area. In more recent work, van den Hout et al. (2010) conducted a study on predator escape tactics comparing nearshore and farshore foraging species. Nearshore species utilized shoreline habitats that could obscure predator approach (e.g., beach-cast wrack and cover provided by rocks and other habitat structures) and relied on quick escape movements, whereas the farshore species foraged in open mudflats and relied on "many eyes" to detect predators and employed coordinated aerial escape flight maneuvers. The HIOC Project is located in a nearshore environment and can provide similar cover to evade predation. This is further supported by Kelley et al. (1996). While Kelly et al. (1996) suggested that the aquaculture equipment could increase risk of predation by raptors, they also observed that foraging

Comment Number	Response
	least sandpipers remained on the ground beneath oyster racks during attacks by a peregrine falcon, and suggested that the aquaculture areas may have provided increased cover and protected them from predation. Based on both the best available science and avoidance measures of the adjacent mudflat area where shorebirds are likely to congregate, the HIOC Project will not have a significant impact on dunlin or other foraging shorebirds.
6-10	HIOC is establishing avoidance buffers around roosting areas as discussed in Responses to **CDFW Comment 3-28, CCC Comment 4-12, and RRAS Comment 5-3**. The proposed vessel transit route has been further refined to avoid established brant gritting sites as discussed in Response to **CCC Comment 4-12**. As further discussed in Response to **CCC Comment 4-12**, Mad River Slough is not a suitable alternative route and is not necessary to reduce or eliminate significant impacts to shorebirds. In response to this comment, BMP-6 (Wetland Buffer) and BMP-7 (Bed Access) have been added to the updated IS/MND. Refer to Response to **CDFW Comment 3-2 and 3-8**.
6-11	*Refer* to Response to **CCC Comment 4-13**. This would impact recreational use of this boat launch and is not a feasible use for commercial purposes.
6-12	Refer to Responses to **CDFW Comment 3-28, CCC Comment 4-12, and RRAS Comment 5-3**. In response to these comments, HIOC will incorporate a 200-foot buffer from wetland areas.
6-13	The IS/MND notes that habituation occurs to organisms that encounter the same stimulus repeatedly whereby the response tends to decrease with increased encounters of the stimulus. This is a generally recognized concept, as discussed in Rankin et al. (2009). As Nisbet (2000) notes, often research effects on bird disturbance "have been directed primarily towards cataloguing adverse effects of disturbance and…often mis-cited, selectively cited, or overstated such effects." This is not to suggest that disturbance does not occur or that it does not have an adverse effect on brant or other birds when it does occur; the references to habituation provide context about the environment where the interaction is occurring. Brant in Humboldt Bay will be encountering numerous similar stimuli from boats during their wintering periods. Schmidt (1999) found that brant in Humboldt Bay spend less than 2% of time on alert or flying behaviors compared to 36% of time spent feeding. Schmidt (1999) noted that "there were many times when large slow-moving boats elicited no apparent response from brant." Schmidt (1999) also noted that "Habituation was apparent at the mid-channel, where people digging clams often approached to within 20 m while brant continued to feed." These observations clearly suggest that there is a degree of habituation to boat traffic by brant in Humboldt Bay. Given that HIOC will only be adding an additional 2 to 4 roundtrip trips to and from the project site each week, HIOC vessels will provide an extremely small increase in the overall boat traffic in Humboldt Bay. Given that brant are utilizing portions of North Bay near aquaculture gear (for example, an identified roosting site is located in close proximity to Coast Seafood's aquaculture operation) and near channels with significant existing vessel traffic, this provides empirical evidence that they have become habituated to these conditions in a manner where a slight increase in vessel activity is unlikely to result in substantial additional flushing or create additional energetic demands for brant. Indeed, were brant so sensitive to these concerns, disruption caused by hunting activities would be a far greater concern as compared to the proposed project. However, to further address this concern, the project has incorporated, which Mit-4 (Vessel Routes) that vessel speeds be reduced around areas with established brant gritting sites.
6-14	The statements referenced are from the Management Plan for Pacific Population of Brant published by the Pacific Flyway Council in 2018 as cited in the earlier sections of the paragraph on Page 34. Note that the reference in the IS/MND is to wintering activity, while the comment appears to be referring to staging and migration behavior. These are different behaviors with wintering being a longer-term use of sites whereas staging and migration is a shorter, potentially more intensive use. Furthermore, the distribution of wintering brant populations along the West Coast appears to be changing over time, with a shift starting around 2004 toward more wintering brant reported in mid-winter surveys staying in Alaska and a smaller proportion travelling to Mexico. The most recent reported mid-winter survey (2017) shows about 5% of wintering brant (8,765 of 155,720) were observed in California and 52% in Mexico. We have added the reference to Stillman et al. 2015 to the IS/MND for added context to the use of Humboldt Bay by brant during their spring staging and migration behavior. The IS/MND does not dispute that Humboldt Bay is an important site for brant, stating that "Humboldt Bay is an important wintering and spring staging site for brant in the Pacific Flyway." However, as noted elsewhere, the project is

Comment Number	Response
	not anticipated to result in a significant impact to brant that would affect their migratory route or ability to migrate from Mexico to Alaska. There are minimal impacts to eelgrass from the HIOC Project and no reason why foraging in Humboldt Bay or migration would be affected. *Refer* to Response to **CDFW Comment 3-31** for additional discussion of the Stillman et al. paper.
6-15	The Coastal Commission determined that the Coast project would result in significant impacts to brant, primarily associated with a reduction in eelgrass available for brant to consume. A key difference between the Coast Seafoods project and the proposed project is that the Coast Seafoods project included cultivation within eelgrass areas. However, it should be noted that the Coastal Commission still approved continued cultivation in 273 acres of Humboldt Bay, despite receiving many of the same comments as those provided herein. That project was approximately 10 times larger than that proposed by HIOC. Further, the Coastal Commission, supported by comments provided by the commenters at the time, concluded that locating shellfish aquaculture near Mad River Slough and avoiding East Bay adequately protected brant: "Considering that information, the Commission found that the proposed expansion of Coast's operation would result in a loss of forage sites and opportunities for brant as well as an increase in disturbance. The Commission further found that in light of these impacts, brant's protected status, and the importance of Humboldt Bay for its continued survival, a smaller scale and more consolidated project would be needed to provide protection for this species of special biological significance. Coast carefully considered these findings in the development of its revised project and decided not only to no longer propose an expansion of its operations but to reduce and consolidate them around some of the most densely used areas of its existing and historic footprint. *These areas in the Mad River and Bird Island sections of Arcata Bay have been identified by numerous parties (environmental organizations, state and federal agencies, waterfowl experts, local members of the public, etc.) as locations that are likely to support limited brant use, potentially due to the sparser eelgrass habitat they contain and the high levels of ongoing and historic shellfish aquaculture activities concentrated within them.* Accordingly, Coast's proposal to increase use of these areas by relocating approximately 42 acres of cultivation beds into them from the central portion of Arcata Bay is not expected to result in additional adverse impacts to black brant." (emphasis added) (Coastal Commission 2017). As noted in the IS/MND, the monitoring plans required pursuant to the Coast approval have confirmed that its aquaculture operations do not result in significant disturbances to brant, which continue to use the studied aquaculture sites at the same rate as reference sites.
6-16	*Refer* to Response to **CDFW Comment 3-30**. Given that the project avoids areas with eelgrass, it will not affect the ability of brant to feed on eelgrass.
6-17	Regarding the potential disturbance associated with culture activities within the project area, HIOC only proposes to be active within the project site approximately 2 to 4 times per week. Note that Humboldt Bay Oyster Company already operates a shellfish farm within the area, therefore, any brant use of the site is likely already habituated to the aquaculture activities within the area. Individual HIOC lines are anticipated to be revisited approximately once every 2-3 months. The IS/MND discusses potential disturbances to brant associated with the project in Bio-D-4, citing studies conducted in Humboldt Bay on aquaculture gear similar to that proposed, which established no significant difference between brant use of cultured plots and reference plots. These monitoring studies were reviewed by the California Coastal Commission and Harbor District, among others. Refer to Responses to **CDFW Comment 3-28 and CDFW Comment 3-29** for additional discussion of the project's impacts to brant. Rodgers and Schwikert (2002) report average flushing distances for waterbirds from outboard powered boats as being between 23 and 53 meters, with birds flushing at distances ranging between 9 and 140 meters from vessels. The project's proposed vessel route has been revised to include a buffer over 1,000 feet from established brant gritting sites. *Refer* to Response to **NAS Comment 6-13** for additional discussion of potential disturbance to brant associated with increased vessel activity.

Comment Number	Response
6-18	Aquaculture gear for this project is not projected to have any impact to brant foraging resources because eelgrass surveys will guide gear installation to avoid installing gear in areas where eelgrass is observed. Brant feed primarily on eelgrass and this resource is avoided through mitigation actions by the HIOC Project. *Refer* to Response to **CDFW Comment 3-32** for additional details. Regarding consideration of alternative launch sites, *refer* to Response to **CCC Comment 4-13**.
6-19	There is no indication of how the mitigation measures fall short of protecting eelgrass. The IS/MND acknowledges the importance of eelgrass as a protected habitat.
6-20	Conway-Cranos et al. (2017) evaluates reported studies from areas where eelgrass and culture co-occur. The relevant literature for the HIOC Project was discussed in the IS/MND. The Conway-Cranos et al. (2017) technical report has been superseded by Ferriss et al. (2019), which notes that "Shellfish have been farmed in and around eelgrass for over a century and it is clear that shellfish aquaculture does not preclude eelgrass." This study differentiated between responses of eelgrass to on-bottom versus off-bottom culture. Off-bottom culture in eelgrass areas is associated with decreased eelgrass density and cover, but other metrics were not significantly different. Furthermore, this study does not evaluate eelgrass attributes in sites where eelgrass and culture are adjacent to one another, but do not overlap. As noted by NMFS in its assessment of aquaculture in Washington State, a 5 meter buffer from established eelgrass habitat, which is the same buffer proposed for the project, "is not expected to diminish eelgrass density or function of existing eelgrass" (NMFS 2016).
6-21	As noted in the IS/MND, the project is meeting or exceeding conservation measures for the protection of eelgrass on the West Coast previously adopted by the Coastal Commission, California Fish and Game Commission, Corps, and NMFS. The eelgrass mapped at this site is broadly consistent with results from past mapping efforts, suggesting the distribution of eelgrass at this site is stable over time.
6-22	*Refer* to Responses to **NMFS Comment 1-1 and CDFW Comment 3-1**.
6-23	*Refer* to Response to **CDFW Comment 3-13**.
6-24	The avoidance of eelgrass using UAV methods prior to gear installation is an accepted method that is in line with the CEMP, Corps guidance (Nelson 2018), and recent permitting decisions for shellfish aquaculture in California (Coastal Commission 2019, Corps 2019). The 5 meter buffer from eelgrass is also an accepted method established by the CEMP to avoid impacts. As discussed above, the eelgrass mapped in 2009 and 2020 appears to be largely consistent (*refer* to Response to **NMFS Comment 1-1**); according to the CEMP and NMFS, providing for a 5 meter buffer allows for eelgrass to move into the area (*refer* to Response to **CDFW Comment 3-1**); HIOC has observed and confirmed with regulatory agencies that culture areas in Tomales Bay support eelgrass and that HIOC's cultivation methods promote, rather than inhibit, eelgrass expansion (*refer* to Response to **CDFW Comment 3-2**); and the culture areas are located at tidal elevations where it is unlikely eelgrass would grow (*refer* to Response to **CDFW Comment 3-8**). In addition, CEQA requires that the initial study "focus on impacts to the existing environment, not hypothetical situations. The impacts of a proposed project are ordinarily to be compared to the actual environmental conditions existing at the time of the CEQA analysis." *Center for Biological Diversity v. Dept. of Fish & Wildlife*, 234 Cal.App.4th 214, 248 (2015); *see also CEQA* Guidelines, § 15125, subd. (a). The analysis was based on the best available science related to the existing conditions of eelgrass in the culture area (Lummis 2020). *Refer* to Response to **NAS Comment 6-21** regarding compliance with recommendations from other resource agencies concerning eelgrass avoidance and mitigation.
6-25	HIOC is avoiding mapped eelgrass areas. Areas where eelgrass was mapped in 2020 are consistent with 2009 eelgrass mapping. As noted earlier, some large areas noted as 'patchy' in 2009 are mapped as explicit patches within those areas in the 2020 mapping due to higher resolution eelgrass mapping (i.e., the 2009 mapping used a category of 11-84% "patchy" eelgrass cover in this area rather than mapping where eelgrass specifically occurs as was done in 2020).

Comment Number	Response
	No additional eelgrass mitigation is warranted. Regarding the commenter's request for an additional 10-foot. buffer, *refer* to Response to **CDFW Comment 3-2**. If eelgrass establishes within the site, this supports that aquaculture and eelgrass can co-occur. *Refer* to Response to **CDFW Comment 3-3** regarding the timing of eelgrass surveys.
6-26	In response to this comment, HIOC has eliminated proposed cultivation in an area identified as important for hunting in the northeast portion of the project site. See BMP-6 (Wetland Buffer) in the updated IS/MND. *Refer* to Response to **CDFW Comment 3-34** for additional details related to recreational use.
6-27	*Refer* to Response to **CDFW Comment 3-34**.
6-28	The IS/MND does evaluate potential effects to recreational users of the site. Refer to Section XVII (Transportation). As requested by the commenter, HIOC has eliminated proposed cultivation in the northeast portion of the project site to provide greater access to recreational users. The project also incorporates boat lanes that allow for recreational access through cultivated areas. *Refer* to Figure 10 for a conceptual plan showing the proposed boat areas. *Refer* to Response to **CDFW Comment 3-38** for additional details regarding bed marking and mapping.
6-29	The navigable waters rule is not absolute and allows for some impact to navigation (otherwise no in-water or overwater structures would be permitted within the state). The project would promote commerce on the Harbor District's tidelands, which is recognized as a valid and appropriate public trust use. The Harbor District is not required to favor one public use over another, *Marks v. Whitney*, 6 Cal.3d 251, 259 (1971). Promotion and support of a commercial aquaculture industry itself qualifies as a proper public trust use. See *National Audubon Society v. Superior Court*, 33 Cal.3d 419, 435 (1983)(defining promotion of a commercial brine shrimp fishery as a valid public trust use). The Harbor District has the right and authority under the public trust doctrine and its own implementing legislation under the Harbors and Navigation Code to restrict navigability in some areas to advance other public uses as it deems appropriate. *Personal Watercraft Coalition v. Marin County Board of Supervisors*, 100 Cal.App.4th 129, 151-53 (2002); *Graf v. San Diego Unified Port Dist.*, 7 Cal.App.4th 1224, 1231-33 (1992). Further, fee owners of tidal shore lands may maintain lawfully constructed structures on their property in areas where the public trust easement exists (State Lands Commission 2017). Evaluating navigational and recreational impacts under CEQA satisfies the Harbor District's obligation to consider impacts to public trust uses, and the public trust doctrine does not impose any additional procedural requirement independent of CEQA. *Citizens for East Shore Parks v. California State Lands Comm'n*, 202 Cal. App. 4th 549, 577-79 (2011). By mapping and marking aquaculture gear and boat lanes that can be used for passage through the proposed HIOC project, access is provided to navigate through the site thereby satisfying California's navigable waters rule. Further, HIOC's proposed cultivation avoids all subtidal channels, which are the primary means for navigation through the project site. The project also does not impede the main channels in North Bay, which are the primary thoroughfares for navigability in the bay. This appropriately balances the public's rights to navigation and the Harbor District's public use to promote commerce within Humboldt Bay.
6-30	*Refer* to Response to **CDFW Comment 3-38 and NAS Comment 6-28**.
6-31	The cumulative impact analysis included in the IS/MND considers cumulative impacts associated with the project and existing shellfish aquaculture in Humboldt Bay, including Coast Seafoods' shellfish farm, as well as other shellfish aquaculture projects that are currently under consideration by the Harbor District. *Refer* to Responses to **NAS Comment 6-13, NAS Comment 6-15, and NAS Comment 6-17** for additional detail.
6-32	*Refer* to Response to **NAS Comment 6-14**.
6-33	CEQA requires a consideration of direct and "indirect or secondary effects which are caused by the project and are later in time or farther removed in distance, but are still reasonably foreseeable." CEQA Guidelines § 15358(a)(2). The IS/MND describes relevant bird migratory routes and evaluates the project's impacts on birds and their ability to migrate successfully. *See* BIO D-2 and BIO D-4.

Comment Number	Response
	If there are no significant impacts identified to bird foraging habitat and use of Humboldt Bay from the HIOC, then there would be no reason to assume that there would be migration concerns for species that use the bay.
6-34	*Refer* to Response to **NAS Comment 6-1**.

Comment Letter 7: Stan Brandenburg

From: Adam Wagschal
To: Gary Reener (HIOC)
Subject: Fwd: Hog Island Oyster Company Shellfish Farm in Arcata Bay (Application Number 2020-03)
Date: Wednesday, March 3, 2021 5:28:34 PM

From: Stan Brandenburg <stan.brandenburg@gmail.com>
Sent: Wednesday, March 3, 2021 5:11 PM
To: Adam Wagschal
Cc: Steve Rosenberg; Weinstein, Anna; Scott Frazer; Ted Romo
Subject: Hog Island Oyster Company Shellfish Farm in Arcata Bay (Application Number 2020-03)

Hi Adam,

In regards to the proposed Hog Island Oyster Company Shellfish Farm in Arcata Bay (Application Number 2020-03) I have the following comments and concerns.

1. Cumulative impacts to shorebird and waterfowl habitat. Currently, there is no commercial scale aquaculture activity in the HIOC Project area and this project proposes to blanket critical shorebird and waterfowl feeding and loafing habitat with 110 acres of off bottom oyster cultivation in the intertidal zone along the west edge of Mad River Slough channel. **7-1** As I and many others have said before, and the body of scientific evidence supports, off bottom oyster culture excludes shorebirds and waterfowl from their feeding and resting areas. These birds have evolved over eons on tidal flats and they don't like any structure around them because it might harbor predators. Currently, the intertidal zone along the east side of Mad River Slough channel in Northwest corner of Arcata Bay is already full of longline gear from Coast Seafoods aquaculture operations. **7-2** The exclusionary impacts to shorebirds and waterfowl from Coast's operations have already compromised the habitat in this area of Humboldt Bay and cumulative effects from this proposed project will drive a stake through the heart of all that is left. I have observed shorebirds and waterfowl in this area for 45 years and at any given low tide, a plethora of shorebirds, waterfowl and other waterbirds can be observed feeding and loafing in the proposed project area. The cumulative impacts of a project of this size in addition to Coast Seafoods operations will have detrimental effects on both migratory and resident bird populations. They are being crowded out. **7-3**

In addition to excluding shorebirds and waterfowl from their feeding and loafing areas, disturbance from the increase in boat traffic stresses these birds out. They can't sleep or eat and they only have so much time to access their food during the low water periods. Again, the body of scientific evidence supports this fact. Disturbance harms birds. Ask yourself if you would like to try and sleep next to a busy highway. **7-4**

2. Public Safety- From a boating standpoint, off bottom aquaculture is a ***major*** man-made hazard to navigation. The 2" standpipes used to anchor longlines and baskets will easily put a hole through the bottom of a small boat. Recently this last fall while waterfowl hunting I found myself in the middle of Coast's longline gear because a thick fog obscured my vision. I couldn't see 50', which is a common occurrence in North Bay. I looked down and saw the **7-5**

deadly forest of Coast's longline gear less than an inch under the water's surface. I still have gouges in the bottom of my boat from disentangling myself from this man made hazard to navigation. Luckily the water wasn't rough or I most likely would have holed my boat and sunk. I was lucky I didn't punch a hole through the bottom anyway. I couldn't get out of it because the strong currents that are typical in Mad River Slough channel pushed me into it and held me there. This off bottom culture is ***dangerous***, especially the larger diameter pipe (2") sticking up 2'. When they used the smaller diameter pipe, it was bad, but it was a little more forgiving. The larger pipes that are used now are boat skewers. In addition to blanketing the **7-5 cont.**
bottom with boat skewers, this proposed project will create a fence and preclude small boats (kayaks etc.) from using the safety of the shallows over the mudflats and force them to stay in the Mad River Slough channel which is ***extremely*** dangerous at times because of the effects of wind beating against the strong current. In its proposed configuration, this aquaculture project is eventually going to kill someone, most likely an inexperienced boater, or boaters. This proposed project will place an extreme hazard to navigation where none existed before and preclude public use from several small but important reaches of the navigable waters of Arcata Bay.

Please incorporate my comments into the public comment portion of this proposed project.

Sincerely,

Stanley B. Brandenburg

Stan Brandenburg

PO Box 322,

Cutten, CA 95534

Response to Stan Brandenburg

Comment Number	Response
7-1	Humboldt Bay Oyster Company currently operates an approximately 5 acre shellfish farm in close proximity to the project site. The project proposes 30 acres of cultivation, leaving the remaining 80 acres of the HIOC Project site undeveloped and available for shorebird and waterfowl feeding. This includes a 200-foot buffer from wetland areas and culture beds (BMP-6 [Wetland Buffer]). *Refer* to Responses to **CDFW Comment 3-28 and 3-29** for additional details.
7-2	*Refer* to Responses to **CDFW Comment 3-28 and 3-29**, **RRAS Comment 5-2 and 5-3**.
7-3	*Refer* to Response to **NAS Comment 6-31**.
7-4	*Refer* to Response to **CDFW Comment 3-28**.
7-5	HIOC will mark bed boundaries and provide maps showing the locations of gear associated with its farm to help educate boaters through the Humboldt Bay Harbor District's website about areas where gear may be present. *Refer* to Response to **NAS Comment 6-28** for additional details.

Comment Letter 8: Jeff Black

From: Jeffrey M Black
To: Adam Wagschal
Subject: Proposed expansion Hog Island Oyster Company
Date: Tuesday, March 9, 2021 8:46:13 AM

Adam Wagschal
Deputy Director Humboldt Bay Harbor, Recreation and Conservation District
601 Startare Drive
Eureka, CA 95501

Hog Island Oyster Company, Proposed Arcata Bay Shellfish Farm (Application Number 2020-03) PROJECT LOCATION: Tidelands in Arcata Bay, California (parcel 506-121-001-000)

Dear Mr. Wagschal:

I have the following comments and concerns regarding the proposed Hog Island Oyster Company Shellfish Farm in Arcata Bay (Application Number 2020-03):

The Initial Study is "inadequate" because it fails to address a new disturbance from shellfish farming due to the increased boat traffic and harvesting disturbances that Hog Island Oyster Company will generate if they leave their facility, located at the southwest side of Woodley Island Marina, and travel north to this new oyster culture site in North Bay by the mouth of the Mad River Slough. 8-1

Pacific black brant, all other waterfowl, and shorebirds that are congregating on Humboldt Bay will be impacted by these new activities on their loafing and feeding sites. 8-2 Access to the Hog Island proposed site from the public launch point on the north side of Samoa Boulevard would have less impacts to Pacific black brant and other avian species. 8-3

Please incorporate my comments into the public comment portion of this proposed project.

Thank you

Jeff Black, HSU Wildlife Professor

Response to Jeff Black

Comment Number	Response
8-1	The vessel use and transit route is discussed in the IS/MND in Section 3.4.4, which includes a depiction of the proposed transit route (Figure 11). The effects from vessel transit are also discussed in BMP-3 (Fish and Wildlife), which will limit the potential impact to birds along the transit route. *Refer* to Responses to **CDFW Comment 3-28, CDFW Comment 3-29, and CCC Comment 4-12**.
8-2	*Refer* to Responses to **CDFW Comment 3-28 and 3-29**.
8-3	*Refer* to Response to **CCC Comment 4-13**.

Comment Letter 9: Terry Cook

From: Terry Cook
To: Adam Wagschal
Subject: Oyster beds
Date: Tuesday, March 9, 2021 7:44:33 AM

Hog Island Oyster Company, Proposed Arcata Bay Shellfish Farm (Application Number 2020-03) PROJECT LOCATION: Tidelands in Arcata Bay, California (parcel 506-121-001-000)

Dear Mr. Wagschal:

I have the following comments and concerns regarding the proposed Hog Island Oyster Company Shellfish Farm in Arcata Bay (Application Number 2020-03).

The Initial Study is "inadequate" because it fails to address a new disturbance from shellfish farming due to the increased boat traffic and harvesting disturbances that Hog Island Oyster Company will generate if they leave their facility, located at the southwest side of Woodley Island Marina, and travel north to this new oyster culture site in North Bay by the mouth of the Mad River Slough. 9-1

Pacific black brant, all other waterfowl, and shorebirds that are congregating on Humboldt Bay will be impacted by these new activities on their loafing and feeding sites. 9-2 Access to the Hog Island proposed site from the public launch point on the north side of Samoa Boulevard would have less impacts to Pacific black brant and other avian species. 9-3

Please incorporate my comments into the public comment portion of this proposed project.

Thank you

Sincerely,

Terry cook

3511 18th street

Eureka, ca 95501

707-845-1835

Response to Terry Cook

Comment Number	Response
9-1	*Refer* to Response to **Black Comment 8-1**.
9-2	*Refer* to Responses to **CDFW Comment 3-28 and 3-29**.
9-3	*Refer* to Response to **CCC Comment 4-13**.

Comment Letter 10: Dean Glaser

From: camelg@aol.com
To: Adam Wagschal
Subject: Hog Island Oyster Company, Proposed Arcata Bay Shellfish Farm (Application Number 2020-03) PROJECT LOCATION: Tidelands in Arcata Bay, California (parcel 506-121-001-000)
Date: Wednesday, March 10, 2021 1:50:20 PM

Adam Wagschal
Deputy Director Humboldt Bay Harbor, Recreation and Conservation District
601 Startare Drive
Eureka, CA 95501

P.O. Box 1030
Eureka, CA 95502-1030

Fax: (707) 443-0800
Email: awagschal@humboldtbay.org

Hog Island Oyster Company, Proposed Arcata Bay Shellfish Farm (Application Number 2020-03) PROJECT LOCATION: Tidelands in Arcata Bay, California (parcel 506-121-001-000)

Dear Mr. Wagschal:

I have the following comments and concerns regarding the proposed Hog Island Oyster Company Shellfish Farm in Arcata Bay (Application Number 2020-03).

The Initial Study is "inadequate" because it fails to address a new disturbance from shellfish farming due to the increased boat traffic and harvesting disturbances that Hog Island Oyster Company will generate if they leave their facility, located at the southwest side of Woodley Island Marina, and travel north to this new oyster culture site in North Bay by the mouth of the Mad River Slough. 10-1

Pacific black brant, all other waterfowl, and shorebirds that are congregating on Humboldt Bay will be impacted by these new activities on their loafing and feeding sites. 10-2 Access to the Hog Island proposed site from the public launch point on the north side of Samoa Boulevard would have less impacts to Pacific black brant and other avian species. 10-3

Please incorporate my comments into the public comment portion of this proposed project.

Thank you

Sincerely,

Dean Glaser

1546 Ronald Ave.

Fortuna, Ca. 95540

7077253880

Response to Dean Glaser

Comment Number	Response
10-1	*Refer* to Response to **Black Comment 8-1**.
10-2	*Refer* to Responses to **CDFW Comment 3-28 and 3-29**.
10-3	*Refer* to Response to **CCC Comment 4-13**.

Comment Letter 11: Steven Grantham (1)

RECEIVED

MAR 16 2021

H.B.H.R. & C.D.

Adam Wagschal
Deputy Director Humboldt Bay Harbor, Recreation and Conservation District
601 Startare Drive
Eureka, CA 95501

P.O. Box 1030
Eureka, CA 95502-1030
Fax: (707) 443-0800
Email: awagschal@humboldtbay.org

RECEIVED

M 16

H.B.H.R. & C.D.

Hog Island Oyster Company, Proposed Arcata Bay Shellfish Farm (Application Number 2020-03) PROJECT LOCATION: Tidelands in Arcata Bay, California (parcel 506-121-001-000)

Dear Mr. Wagschal:

The following are my comments and concerns regarding the proposed Hog Island Oyster Company Shellfish Farm in Arcata Bay (Application Number 2020-03).

The Initial Study is "inadequate" because it fails to address a new disturbance from shellfish farming due to the increased boat traffic and harvesting disturbances that Hog Island Oyster Company will generate if they leave their facility, located at the southwest side of Woodley Island Marina, and travel north to this new oyster culture site in North Bay by the mouth of the Mad River Slough. 11-1

Pacific black brant, all other waterfowl, and shorebirds that are congregating on Humboldt Bay will be impacted by these new activities on their loafing and feeding sites. 11-2
Access to the Hog Island proposed site from the public launch point on the north side of Samoa Boulevard would have less impacts to Pacific black brant and other avian species. Please incorporate my comments into the public comment portion of this proposed project. 11-3

Thank you

Sincerely,

Steven Grantham
1696 Old Arcata Road
Bayside CA 95524
707-845-4058
tulecruncher@yahoo.com

Response to Steve Grantham

Comment Number	Response
11-1	*Refer* to Responses to **CSLC Comment 2-11 and CDFW Comment 3-34**.
11-2	*Refer* to Responses to **CDFW Comment 3-28 and 3-29**.
11-3	*Refer* to Response to **CCC Comment 4-13**.

Comment Letter 12: Steve Grantham (2)

Adam Wagschal
Deputy Director Humboldt Bay Harbor, Recreation and Conservation District
601 Startare Drive
Eureka, CA 95501

P.O. Box 1030
Eureka, CA 95502-1030
Fax: (707) 443-0800
Email: awagschal@humboldtbay.org

April 12, 2021

Hog Island Oyster Company, Proposed Arcata Bay Shellfish Farm (Application Number 2020-03) PROJECT LOCATION: Tidelands in Arcata Bay, California (parcel 506-121-001-000)

Dear Mr. Wagschal:

I previously commented on the subject project. Following are additional comments and concerns of mine regarding negative effects to recreation and coastal access that seem could result from the proposed Hog Island Oyster Company Shellfish Farm in Arcata Bay (Application Number 2020-03).

Considering the project more, and with personal knowledge of the project's environment, I found that the environmental document did not consider the project's potential for social effects on recreation use and access, of local project area, by actual user groups. What appears to be an apparent omission of pertinent information, in the context of recreation and coastal access at the project site, I feel should be elevated and looked at with more attention in finished documents.

As a user of the area it seems obvious that potential negative social effects would be put on potentially multiple user groups. End users: kayakers, canoers, sailors, paddlers, and the scull boat hunter, and types of small craft use, seems likely to be hampered or actually denied reasonable access to the built-out project area. The project area is a place that is used by people, in varying frequency, albeit seasonal and for sure intermittently. It's an inclusive group nonetheless. The potential for social effect across that group would be a logical result of the oyster farming described. The gear involved, and the location's topography/geography contribute to this. Increased industrial boat traffic, farming, and harvesting methods that Farm would deploy, leave little to the imagination. As presently proposed there are conflict of uses with the cohort of recreational minded; that are, and might otherwise be concerned, and the interests of the Farm. 12-1

With 70+ acres of State of California Mad River Slough State Wildlife Area (APN: 506-112-019-000), the project is reasonably adjacent to the west side of the proposed project area. This location is an obvious recreational draw. The acres are well-used, and it's a popular public hunting/public day use area. It draws folk's attention because it's of high recreational quality, is accessible, and close to home. Locally, the marsh is sometimes referred to as Emerson's. It is accessed by foot, but also by shallow water small craft. Most typically boaters launch at the Mad River Slough boat launch. 12-2 If a small craft user traveled east on the slough, and at the end of the marshes high ground, on the south, it's my understanding; they would encounter the Farm's gear deployments. 12-3

Grantham
2 of 2

April 12, 2021

It's no mystery why this area is popular with waterfowlers, and others. The remnant salt marsh is reasonable size and vitality. It provides public access to coastal wetlands and foreshore. It still attracts birds, birders, hunters, and paddlers alike. It's an interesting area on Arcata Bay. Historically, and in the present, all prior to extensive oyster farming in the Arcata Bay's northwest corner, this area accommodated substantial larger numbers of migratory waterfowl and shorebirds. From what I see, it still does, but to an apparent lesser degree. Birds still congregate on the proposed project area during the migration. It just seems reasonable to imagine that the proposed project would contribute to and unsettle the hold out brant, ducks, eagle, and otters that still use the space. It seems the project imposes a big footprint on an important mud flat.

12-4

Introduction of oyster gear in the proposed locations puts obstacles in line with an often enough-traveled paddle craft route. It degrades a route. Ultimately, it's concerning to me that the degraded route contributes to further erosion to types of recreational access on this part of the Arcata Bay. In my view, the oyster gear seems as obvious an impediment to recreational access as can be for boaters/paddlers, and hunters who use Mad River Slough and Mad River Slough State Wildlife Area. Whether that's important is the Lead Agency determination. It should still be documented in the final document. Regardless the Lead determination, it's my opinion that implementation as proposed, would make the project area less safe, additionally unpredictable, and perhaps impossible to hunt or paddle.

12-5

It seems reasonable to expect that Lead Agency consider importance of, and effects to recreation and coastal access as it occurs in the local context. Base the analyses, on importance of recreation and access, on actual project effects, and the final environmental document would likely find that there's appearance of social impact on an important resource. This effect on recreational coastal access it seems might have social consequences, which, in all fairness, should be determined by Lead Agency. If there is an important resource, and the project's effects are harmful to resources there's an expectation they be mitigated in the final documents.

12-6

In my opinion the more industrial traffic, and gear added to the Arcata Bay, as proposed by this project further devalues a one of a kind recreational resource, and a State of California Wildlife Area. Over many hours of personal time spent at Emerson's, I'm convinced that more commercial traffic in this remnant wild area will result in less wildlife. Less wildlife perhaps could lead to less interest in the project's surroundings by the recreational public.

12-7

Obviously, I am concerned about degrading this travel route, and the access it affords to a wild location. For me this project brings attention to the appearance of an incessant encroachment on the local natural places that some of us use and care about. Lastly, please consider that the final environmental document elevate its analysis of social effects to actual user groups, i.e. recreational hunters, fishers, paddlers, etc. that have a connection to the project area, and its environs. If this analysis determines there is an effect, that effect should be mitigated.

12-8

Please incorporate these comments into the public comment portion of this proposed project.

Thank you.

Sincerely,

Steve Grantham

Response to Steve Grantham (2)

Comment Number	Response
12-1	*Refer* to Responses to **CSLC Comment 2-11 and CDFW Comment 3-34**.
12-2	*Refer* to Response to **CCC Comment 4-17**. This comment supports HIOC's contention that its use of the Mad River Slough boat launch is incompatible with its existing use by recreational users.
12-3	*Refer* to Responses to **CSLC Comment 2-11 and CDFW Comment 3-34**.
12-4	*Refer* to Responses to **CDFW Comment 3-28 and 3-29**.
12-5	*Refer* to Responses to **CSLC Comment 2-11, CDFW Comment 3-34, and CDFW Comment 3-36**.
12-6	Refer to Response to **CDFW Comment 3-34**.
12-7	The project proposes a negligible increase in vessel traffic in Humboldt Bay, with only 2-4 additional roundtrip vessel trips per week. This small increase in vessel traffic is not anticipated to result in additional disturbance to birds and wildlife as compared to the existing environment. *Refer* to Responses to **CDFW Comment 3-28 and CDFW Comment 3-32** for additional details.
12-8	*Refer* to Responses to **CSLC Comment 2-11and CDFW Comment 3-34**.

Comment Letter 13: Robin Hamlin

From: hamlinra@gmail.com
To: Adam Wagschal
Subject: Hog Island Oyster Company
Date: Sunday, March 21, 2021 6:33:34 PM

The following are my comments on the Initial Study and Draft Mitigated Negative Declaration for the Hog Island Oyster Company Shellfish Farm in Arcata Bay.

The document does not address the potential impacts of the proposed shellfish farm's marine debris (plastics and lost gear) on candidate, sensitive, or special status species found in the bay, ocean, and beaches. This should include a discussion of potential impacts on whales. The document also does not address the cumulative impacts of marine debris from past and present shellfish aquaculture on biological resources in the bay, ocean, and beaches. 13-1 13-2

For the past three years, I have participated in coastal cleanups on Clam Beach. We routinely find debris from Humboldt Bay oyster farms on this beach. This includes short pieces of 1/4 inch diameter 3-strand yellow polypropylene rope, 3/4 inch black ABS pipes, zip-tie tags, vexar bags, and occasionally oyster baskets and trays. It is not unusual to find 20-40 pieces of the yellow rope and occasionally 100's of pieces of it during a single cleanup. This obviously represents only a small portion of the aquaculture debris that is entering our ocean from current and past oyster operations in the bay. Potential impacts from this plastic material needs to be addressed.

The Marine Debris Management Plan should address the following:

1. Aquaculture debris collected during bay and beach cleanups should be documented and quantified. This is absolutely necessary to understand the extent of the problem.
2. There should be a requirement to reduce the amount of plastic materials being used.
3. Photographs should be included of all proposed equipment so that cleanup crews can identify the source of items that are found. 13-3
4. Cleanup of existing marine debris in the bay from past aquaculture operations needs to be addressed prior to increasing the acreage of oyster cultivation. It is likely that the 3/4 inch black ABS pipe we regularly find on Clam Beach is from these past operations.

Thank you
Robin Hamlin
2330 Mather Road
McKinleyville CA

Response to Robin Hamlin

Comment Number	Response
13-1	Marine debris are discussed in the IS/MND (*see* Section TRANS-C). Effects to sensitive species from the project are also discussed in the IS/MND in Section BIO-A. HIOC has a strong record of retaining and picking up aquaculture gear and most displaced gear remains within the vicinity of the project site, which is not at a tidal elevation where whales would be present, where it can be retrieved during routine gear maintenance checks by HIOC. Research by the Ocean Conservancy (2007) revealed that approximately 12% of debris items collected are from ocean sources with the remaining 88% from land-based sources. HIOC collects a large amount of marine debris from non-aquaculture sources during its regular debris collection efforts; removal of this debris is effectively mitigating the potential for these items to create microplastics (Andrady 2011; Heatherington et al. 2005). Furthermore, the aquaculture gear does not break down easily to form microplastics. Andrady et al (2003) report that degradation of plastic materials like those used in aquaculture is extremely slow, primarily because they are in the water column where lower temperatures, light levels and oxygen concentrations retard degradation. Fouling communities on aquaculture gear deflect UV-B radiation, reducing photodegradation processes (Andrady 2011). For these reasons, aquaculture is not a significant source of marine plastics or debris. While plastics are seen as a potential threat to marine mammals and whales consumption of plastics by marine organisms is associated most with floating and brightly colored materials which mimic prey items (Derraik 2002). With the exception of floats, aquaculture gear sinks and is neutral or dark colors. Furthermore, it is highly unlikely that plastics would be transported outside the vicinity of the project site to locations where whales would be present. Mit-1 (Marine Debris) will minimize potential effects to candidate sensitive or special status species in Humboldt Bay. Refer to Response to **CDFW Comment 3-40** for more details on the amount of debris that HIOC regularly removes from intertidal areas in Tomales Bay, most of which (90%) is generated from adjacent shorelines by the public or local landowners. A similar program will be implemented in Humboldt Bay.
13-2	Effects are expected to improve marine debris in Humboldt Bay based on HIOC implementation of a Marine Debris Management Plan similar to what they have implemented in Tomales Bay. *Refer* to Response to **CDFW Comment 3-40** for additional details. Because HIOC picks up marine debris throughout Humboldt Bay pursuant to its proposed Marine Debris Management Plan, regardless of the source of the debris, the project will reduce cumulative impacts associated with marine debris.
13-3	The HIOC Marine Debris Management Plan (Mit-1) includes all of these BMPs. *Refer* to Appendix A of the IS/MND.

Comment Letter 14: Michael McNicholas

Adam Wagschal
Deputy Director Humboldt Bay Harbor, Recreation and Conservation District
601 Startare Drive
Eureka, CA 95501

P.O. Box 1030
Eureka, CA 95502-1030

Fax: (707) 443-0800
Email: awagschal@humboldtbay.org

Hog Island Oyster Company, Proposed Arcata Bay Shellfish Farm (Application Number 2020-03) PROJECT LOCATION: Tidelands in Arcata Bay, California (parcel 506-121-001-000)

Dear Mr. Wagschal:

I have the following comments and concerns regarding the proposed Hog Island Oyster Company Shellfish Farm in Arcata Bay (Application Number 2020-03).

The Initial Study is "inadequate" because it fails to address a new disturbance from shellfish farming due to the increased boat traffic and harvesting disturbances that Hog Island Oyster Company will generate if they leave their facility, located at the southwest side of Woodley Island Marina, and travel north to this new oyster culture site in North Bay by the mouth of the Mad River Slough. **14-1**

Pacific black brant, all other waterfowl, and shorebirds that are congregating on Humboldt Bay will be impacted by these new activities on their loafing and feeding sites. Access to the Hog Island proposed site from the public launch point on the north side of Samoa Boulevard would have less impacts to Pacific black brant and other avian species. **14-2**

The 75 acres of Mad River Slough State Wildlife Area (APN: 506-112-019-000) which is directly adjacent to the west side of the proposed project area is a public hunting/public use area.

Proposed oyster farming techniques are extremely hazardous and impede access for recreational boaters/paddlers, and hunters utilizing Mad River Slough State Wildlife Area. The mapped culture areas in the project are directly adjacent to locations historically used for hunting, and retrieval areas for hunting dogs. Hunters will be unable to use dogs to retrieve waterfowl from areas where the proposed oyster farming techniques are implemented, and using a dog in these areas is imperative to retrieving downed waterfowl. Therefore, making these areas difficult if not impossible to hunt. **14-3**

Proposed culture areas and techniques will entirely block recreational boat traffic from accessing the marsh using historic routes as shown on page 13 and 14 of the INITIAL STUDY and DRAFT MITIGATED NEGATIVE DECLARATION. This will make the Mad River Slough Wildlife Area (APN: 506-112-019-000) inaccessible to boat traffic and therefore limiting access for hunting, fishing, and other recreation. **14-4**

Historically a raft of 100,000 + migratory waterfowl congregate on the proposed project area annually. The proposed project will likely force these birds to change their habits, undoubtedly negatively impacting the hunting Mad River Slough Wildlife Area. 14-5

The project as proposed is an unmitigable direct negative impact to recreation and access to public land used for recreation; restricting specifically hunting, fishing, and boat access to Mad River Slough Wildlife Area (APN: 506-112-019-000). 14-6

Both State and Federal Navigable Water Acts allow for, and encourage recreation on our waters. The proposed project will impede my ability to use this part of the bay as I once did, limiting the timing, and types of recreational activities that may take place. 14-7

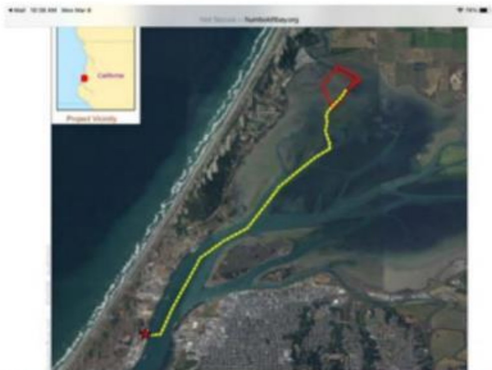
Adding more industrial traffic and gear to the bay as proposed in this project is devaluing a one of a kind recreational resource and a state wildlife area. I have been hunting this area for 15 years and this is an unacceptable outrage. 14-8

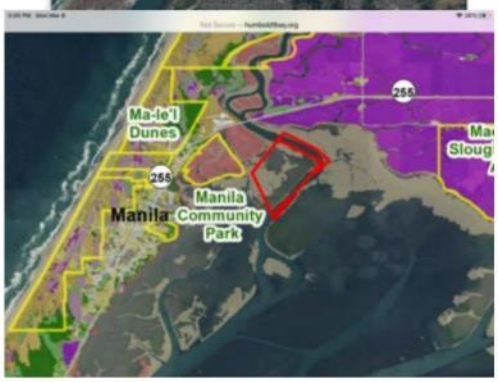
Please incorporate my comments into the public comment portion of this proposed project.

Thank you

Sincerely,

Michael McNicholas
Registered Professional Forester #3029
1656 Dean Street
Eureka CA, 95501

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Response to Michael McNicholas

Comment Number	Response
14-1	*Refer* to Response to **Black Comment 8-1**.
14-2	*Refer* to Response to **CCC Comment 4-13**.
14-3	*Refer* to Responses to **CSLC Comment 2-11, CDFW Comment 3-34, and CDFW Comment 3-36**.
14-4	*Refer* to Response to **CDFW Comment 3-34**.
14-5	*Refer* to Responses to **CDFW Comment 3-28 and 3-29**.
14-6	*Refer* to Response to **CDFW Comment 3-34**.
14-7	*Refer* to Response to **NAS Comment 6-29**.
14-8	The acreage of aquaculture activity in Humboldt Bay has declined from a peak of approximately 1,000 acres to the current level of approximately 330 acres. The HIOC Project adds approximately 30 acres of aquaculture activity which means that the total area approved for cultivation after the HIOC project would be similar to the amount of authorized aquaculture activity occurring in Humboldt Bay prior to the reconfiguration and reduction of Coast Seafoods activity approved in 2018. *Refer* to Responses to **CSLC Comment 2-11 and CDFW Comment 3-28** for additional details.

Comment Letter 15: Ted Romo

From: Ted Romo <blackbrantsky@yahoo.com>
Sent: Monday, April 12, 2021 3:37 PM
To: Adam Wagschal <awagschal@humboldtbay.org>
Subject: Hog Island Oyster Company, Proposed Arcata Bay Shellfish Farm (Application Number 2020-03) PROJECT LOCATION: Tidelands in Arcata Bay, California (parcel 506-121-001-000)

April 12, 2021

Adam Wagschal
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Hog Island Oyster Company, Proposed Arcata Bay Shellfish Farm (Application Number 2020-03) PROJECT LOCATION: Tidelands in Arcata Bay, California (parcel 506-121-001-000)

Dear Mr. Wagschal,

I oppose this project because the Initial Study is inadequate and an EIR is needed! 15-1

Migratory bird habitats, public recreational uses, and waterfowl hunting traditions have not been given full or reasonable consideration in the Initial Study or the proposed mitigation declaration of environmental impact for Hogg Island's permitting process of the acquisition of potential oyster expansion in the Mad River Slough Wildlife Area in North Bay. 15-2

Humboldt Bay is a multi-faceted, dynamic prolific habitat that has evolved over the ages to provide food and shelter for generations of marine, mammal, and avian wildlife.

This project will cause various degrees of permanent changes to the habitat for migratory birds and the serene visual comfort and recreational tranquility for the public.

Let's look at the effect on wildlife as this area lies adjacent to the Mad River Slough Wildlife Area. This area is a haven for both shore birds and waterfowl; this is a concern that does not show adequate discussion and needs to be evaluated within a DEIR not just a Mitigated Negative Declaration.

One very important part for the survival of all migrating birds is the accumulation of fat that will be used for providing the stored energy that will be needed when they arrive at the nesting sites, so they can use their body fat for egg formation which commences along the Flyway before arriving on the nesting grounds. Because time constraints do not always allow for the birds to acquire enough body fat once they have arrived at the nesting sites, it is critical for the survival of the species that they have had access to undisturbed loafing, feeding, and gritting sites along the Pacific Flyway. Therefore, the maximum quality of conditions necessary for

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completing this pre-egg laying process is critical for the survival of the species. The timing of the spring migration and spring food intake is what makes waterfowl and other avians vulnerable to the impact from the habitat that the population migrates through and precedes the arrival on the nesting grounds.

"Surveys in Humboldt Bay conducted by H.T. Harvey and Associates (2016) noted that brant no longer feed in areas with longline culture once the tides were low enough for the structures to be an impediment. Given the height of eelgrass in north Humboldt Bay, the height of the gear deployed, and the effective feeding depth of brant - many gear types render areas amongst cultivated beds unavailable for most or all available tidal feeding windows (H.T. Harvey and Associates 2016)." (2018 Pacific Flyway Management Plan pg 19 <pacificflyway.gov>)

Within this study there has been a gross omission of the effects on other waterfowl other than brant. Ducks are a valuable resource and A DETAILED ANALYSIS IS NEEDED in this study. Therefore, this project has not been adequately evaluated, and it can and will have very detrimental impacts that are not addressed in the Initial Study or Mitigated Negative Declaration. **15-3**

Disturbance has not been addressed. The work boat traffic will create a serious adverse impact on migratory birds and public users on the CA DFW Mad River Slough Wildlife Area. **15-4**

Overall, this project will be a tremendous disturbance to the area regarding waterfowl and shorebirds by watercraft, acquiring access to the area by coming from the South portions of Humboldt Bay and the movement of watercraft returning from the North back to their original origin of starting point. All of the area in between will have a disturbance factor that will flush the birds off their loafing areas and disrupt their feeding opportunities; this will negatively impact their attainment of the bodily energy needed to obtain optimal energy to migrate, successfully breed, and have strong clutches that will enhance the population for years to come. **15-5**

Regular boating access by Hogg Island Oyster Company will disturb waterfowl and other Avian species all year round.

My calculation on a yearly disturbance factor is ONE boat traveling 12 miles per round trip will be traveling 1,248 miles per year of cumulative Disturbance!!!! To reduce this potential disturbance, the departure for the transit route should be changed to occur from the northern area of Mad River Slough, so the point of departure is as close to the project site as possible. **15-6**

MIT-2. Eel Grass Protection

The Special Conditions from the 2018 California Coastal Commission Staff Report states the following:

"Pre-installation Eelgrass Survey. No shellfish cultivation equipment, anchors, or other structures, gear or equipment shall be installed or placed on, in, over, or directly adjacent to areas in which eelgrass is growing. Prior to placing or installing structures or equipment on any shellfish cultivation area not shown on Exhibit 2 ("existing cultivation areas") HIOC shall submit, for Executive Director review and approval, information collected within the most recent eelgrass growing season **(May through September)** demonstrating that no eelgrass is present within the area in which installation or placement is proposed. If eelgrass is present or the Executive Director does not approve the information (for example, because it is inconclusive, out of date, of inadequate resolution, or improperly collected), HIOC shall retain the services of a qualified, independent third party to carry out an eelgrass survey of that area. The survey shall be carried out consistent with the methodology and protocols established in the National Marine Fisheries Service's California Eelgrass Mitigation Policy and shall be carried out during the eelgrass growing season in which installation activities will occur (or the previous growing season if installation will occur after the completion of one growing season and prior to the start of the next). The results of the eelgrass survey shall be provided to the Executive Director for review and approval along with a map or diagram showing the footprint and location of proposed cultivation structures and equipment relative to nearby eelgrass beds and demonstrating that installation within or adjacent to eelgrass will not occur. While installation of shellfish cultivation structures and equipment shall be prohibited within eelgrass, if eelgrass beds move or expand into areas with existing cultivation structures and/or equipment, HIOC may continue to maintain and use these areas for shellfish cultivation." (CCC 2018) **15-7**

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Regular boating access by Hogg Island Oyster Company will disturb waterfowl and other avian species all year round.

The migratory bird habitat and public recreational use have not been fully considered adequately addressed. The idea that this project will have minimal impact on the habitat has not been adequately studied, but is only a reference to the statement that adding gear will not change habitat or change how species will interact with additional gear. The IS generalization that 100 years of history justifies such use throughout the entire bay gives a false narrative to the complexity of each individual project. CEQA stipulates, "Ensure that mitigation measures are site appropriate, accurate, and sufficiently detailed to be effective at the time they are applied to the project." (CEQA Guidlines 15230) 15-7 (cont.)

Special Condition # 9 included in the 2018 permit for HIOC states, "Cultivation Site Access and Vessel Use" During vessel transit, harvest, maintenance, 2-81-40-A1; 2-84-2-A1; 2-84-10-A1 and 1-94-55-A1 (Hog Island Oyster Company, Inc.) inspection, and planting operations, HIOC **SHALL** avoid approaching, chasing, flushing, or directly disturbing shorebirds, waterfowl, seabirds, or marine mammals. In addition, typical in-water operations involving boat use **shall** be carried out consistent with the vessel routes and vessel management measures included in Exhibit 4." (CCC 2018 pg 9-10)

THE WORDING IN BMP-3 strays from the original wording found in the CCC approval of the permit for HIOC. 15-8

On page 11 of the DIS, TABLE 1. BMP-3 Fish and Wildlife states that "During Vessel Transit, Harvest, Maintenance inspection, and planting operations HIOC "WILL AVOID" approaching, chasing, flushing or directly disturbing shore birds, waterfowl, seabirds, or marine mammals."
In order to stay consistent with the special conditions # 9, the BMP-3 needs to strike the word "WILL" AND REPLACE IT WITH "**SHALL**" because the **current wording** is **inaccurate** and **needs to be changed!!!**

BMP-4 Galvanized Steel Pipes

The anchor posts are proposed to be galvanized steel pipe T-stakes, 16 per Acre x 27 acres = 432 total steel pipes or other suitable materials and are used to maintain line tension. My computations indicate that 432 pieces of Galvanized Steel Pipe will be added to the substrate. The problem with "galvanized pipes, there is a high risk of lead contamination as well as corrosion leaking into your drinking water." "When these pipes are dipped in hot zinc for galvanizing, it should be noted that naturally occurring zinc is not pure. This means that the pipe is susceptible to added impurities like lead." (WebSite: Earth and Human) 15-9

Galvanized pipes seem to have an 8-to-12 year life span when in salt water. One solution would be to use stainless steel to mitigate any problems, but we still have 432 pieces of Steel posts in the project that in themselves present a Hazard to Recreation users that travel in that part of the bay with shallow water craft. 15-10

Safety

This subject is brought up in the comment on page 23 under **Aes-D: Light or Glare**. It clearly states that lights are being used at night time. "This lighting could be viewed by people on the shoreline, but because the lights would typically be distant from these viewers (by 0.25 mile or more), the effect would be negligible. People on the bay (i.e., boaters) would be exposed to the lights at a closer distance, but the increased lighting would generally improve boating safety, and views would not be adversely affected. Therefore, this potential impact is expected to be less than significant." (pg 23)

This comment divulges a truthful discourse. "People on the bay (i.e., boaters) would be exposed to the lights at a closer distance, but the increased lighting would generally improve boating safety, and views would not be adversely affected." This description basically is saying that boating safety will be compromised by this project during less than bright shiny days which can exist any time here on the North Coast. Fog, rain, overcast days, and diminished visibility are real-life scenarios that can present themselves daily. This is an area of concern that needs to be developed further within a DEIR and not glossed over! General public safety should be paramount in any forthcoming project!! 15-11

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However, the specifications call for providing 12-foot markers, so the boaters can hopefully identify the location of the beds. However, the specifications come up very short on details as to how many poles will be needed to be effective for inclement conditions? Are we to assume that the very, very minimum will meet the criteria without real-life testing of how recreational users will find that the markings, as currently described, do or do not meet everyday needs? We have never had an aquaculture project just 1500 feet away from a recreational boat launch. The potential for recreational users to encounter complications will increase exponentially as the years pass. **15-12**

The term "CLEARLY" needs to be defined and put in writing. Again a DEIR needs to take precedence over this subject. "(BMP-4 Bed Marking) HIOC culture beds will be marked with a long PVC pole to provide information to boaters of the location of shellfish aquaculture gear. HIOC will also inform the District of the location of the beds, and they will be posted on the District's website. To minimize potential hazards, beds will be marked with long PVC poles. There are 12- to 15-foot rows between blocks of 4 longlines or 2 rows of racks for boats to use (i.e., boat easements), and HIOC will inform the District of the location of beds in Arcata Bay, as per BMP-4. While there may be some delays (i.e., boaters) would be exposed to the lights at a closer distance, but the increased lighting would generally improve boating safety, and views would not be adversely affected. Therefore, this potential impact is expected to be less than significant.or restricted movement of vessels within specific intertidal areas, these measures are in place to avoid conflicts with recreational boaters." **15-13**

Again safety takes a back seat!!! They might have insurance, but how does that play out over real up front safety concerns?

CEQA stipulates "when a proposed project risks exacerbating those environmental hazards or conditions that already exist, an agency must analyze the potential impact of such hazards on future residents or users "CEQA's enactment—that public health and safety are of great importance in the statutory scheme. (E.g., §§ 21000, subds. (b), (c), (d), (g), 21001, subds. (b), (d) emphasizing the need to provide for the public's welfare, health, safety, enjoyment, and living environment"

AESTHETICS

AES- Visual character

Another area is Aesthetics. This subject is glossed over by inferring that because there is currently an existing aquaculture rack-and-bag farm in close proximity, the potential impact of this project would be less than significant. **15-14**

"The visual character would become less 'natural' under the proposed project, but would be consistent aesthetically with current activities on the bay. For example, there is an existing rack-and-bag culture operation adjacent to the HIOC Project area."

This comment is erroneous due to the fact that the described existing rack and back as a visual comparison is a false narrative. The existing aquaculture operation consists of 5 acres of rack and bag but has NO LONG LINE or TIPPING BAG AQUACULTURE. The description seems to be comparing only the 3 acres of HIOC's rack and bag but gives minimum information regarding the 27 acres of Long Line and Tipping Bag which are VERY OBTRUSIVE and will be visible most of the time!! HIOC's project is six times the size of the existing rack and bag oyster farm and has very visible Long Line and Tipping Bag apparatus.

The proposed project stipulates that it will take place over a five year period of time culminating with the 30 acres being developed. This gradual development will have a cumulative visual and esthetic effect that will be significant and will be obvious from State Hwy 255 and will stand out due to the fact that the oyster tipping bags will oscillate and rotate like a floating curtain by a large buoy over a range of 2' or 3' high, but the bags are 2' x 3' in measurement, so they can float up and down with the tide. HIOC has a starting point of 1.5' above 0'. The overall depth of the tide can be an average of 6', so if the project starts out at 3', the floating bags or "tipping bags" can float upwards to a height of a 5' at a high tide and a low to 1' above the substrate mud. So the percentage of visibility will be higher than 30% of the time over 365 days, but on a daily tidal influence, it will still be visible most of the day. **15-15**

4

Tipping Bag aquaculture is mentioned in the mitigated study, but there are no descriptions or pictures of how they work or look, so I have included a picture for you!

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6. SLAVE TO THE TIDES: SPATIOTEMPORAL FORAGING DYNAMICS OF SPRING STAGING BLACK BRANT

JEFFREY E. MOORE1,2 AND JEFFREY M. BLACK. Waterfowl Ecology Research Group, Department of Wildlife, Humboldt State University, Arcata, CA 95521.

Sincerely,

Ted Romo
blackbrantsky@yahoo.com
707-496-0525

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Response to Ted Romo

Comment Number	Response
15-1	*Refer* to Response to **Comment NAS Comment 6-1**.
15-2	*Refer* to Responses to **CSLC Comment 2-11, CDFW Comment 3-28, CDFW Comment 3-29, CDFW Comment 3-34, and CDFW Comment 3-36**.
15-3	The IS/MND includes an evaluation of the project's impacts on waterfowl and shorebirds. *See* Section D-1. *Refer* to Response to **CDFW Comment 3-28** for additional details.
15-4	*Refer* to Responses to **CDFW Comment 3-28, CDFW Comment 3-34, and CDFW Comment 3-36**.
15-5	*Refer* to Responses to **CDFW Comment 3-28, CDFW Comment 3-29, and NAS Comment 6-17**.
15-6	*Refer* to Responses to **CCC Comment 4-13 and NAS Comment 6-10**.
15-7	The IS/MND evaluates the impacts of the individual HIOC project and incorporates mitigation measures as needed.
15-8	Note that the referenced permit is for a different geographic area and that no permit has yet been issued by California Coastal Commission for this project. HIOC will follow its California Coastal Commission permit requirements when a permit is issued for this project. Note that the effect of the words 'shall' and 'will' are identical for implementation of BMP-3 (Fish and Wildlife).
15-9	Galvanized steel pipes are the most accepted material for marine construction, and are used in common applications such as docks, pilings, and other infrastructure. There is no information to suggest that use of galvanized steel pipes is leading to lead contamination or corrosion that is then affecting drinking water (coming from freshwater sources).
15-10	*Refer* to Responses to **CSLC Comment 2-11 and CDFW Comment 3-34**.
15-11	*Refer* to Responses to **CSLC Comment 2-11 and CDFW Comment 3-34**.
15-12	The location of the boat launch was addressed under TRANS-C: Hazards in relation to the HIOC Project site. The potential impact is minimized because shellfish aquaculture gear is placed higher in the intertidal than where recreational boats typically occur (+1.6 feet to +4.6 feet MLLW); recreational boaters primarily use the channels and not intertidal habitats; and there are boat rows provided between culture beds to aid in navigation. While hazards to recreational users were considered less than significant in the IS/MND, other measures used by HIOC to further reduce impacts to recreational boaters include BMP-4 (Bed marking), BMP-5 (Bed Mapping), and BMP-6 (Wetland Buffer). These are standard operating procedures for HIOC. *Refer* to Responses to **CSLC Comment 2-11 and CDFW Comment 3-38** for additional details.
15-13	The IS/MND evaluates potential hazards to recreational users in Section TRANS-C.
15-14	Aesthetic impacts are evaluated as compared to the existing visual character and quality of public views. The fact that this area already includes aquaculture uses as part of the existing visual character means that the visual impact of the project is less. Moreover, the project would only be visible approximately 30% of the year.
15-15	While the tipping bags are able to float, that does not mean that they will be visible from State Hwy 255 up to a tidal elevation of 6 feet MLLW. Tipping bags are black in coloration, and not discernible when they are immersed compared to the surrounding water unless you are located right on top of the culture bed. The closest viewing location from the highway is located approximately 0.25 miles from the culture beds. Something that is immersed in water would not be seen from that distance. In addition, there is existing culture adjacent to the proposed HIOC Project, which means that it is in line with the character of the existing conditions. Overall, views of shellfish aquaculture operations are common in Arcata Bay and consistent with the current aesthetic character of the area. Therefore, this potential impact is expected to be less than significant.

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Attachment 1
Tomales Bay Letters from Hunters

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Nathan Dorris

23 Sunnyhill Road

Novato, CA 94945

I have been hunting black brant on Tomales Bay for 15 years. During this time I have seen many changes in the migratory habits of these waterfowl as it relates to their time on the bay. As nature may dictate, some years the birds come early and stay late, and sometimes they come late and stay late. I have seen brant in the bay in good numbers all the way into March, and as early as late November. The main area I personally hunt is close to many aquaculture leases and growing areas. I have never seen a change in brant behavior as a direct result of aquaculture practices. Growing areas are clearly marked, and actively worked. I have often shot the 2 brant limit while hunting 300 to 400 yards from a lease being actively worked by growing crews. The oyster boats, beds, crews and the grow fields themselves have never, in my personal experience, been a detriment to the brant hunting in Tomales Bay.

As eel grass is the main food for brant, many individuals I have talked to are of the opinion that aquaculture is destructive to eel grass. I have seen personal evidence to the contrary over the years. I have seen eel grass beds expanded near leases, and entire new growths prospering in these same areas. I am of the opinion that aquaculture, when farmed correctly, is a benefit to existing and future eel grass growth. I have seen areas barren of eel grass been leased and oysters cultivated. The very next brant season I have seen new growths appear that were not existent before the oyster farming began. I might add that at least in Tomales, one of the biggest threats to eel grass is human use by recreational boaters, many of whom will often anchor in these beds, thereby pulling up live grass with the anchor, and pull live grass to camouflage their boat to make them look more natural. In Tomales Bay eel grass beds are no-anchor zones. I would like to state that hunting IN eel grass is not great for brant hunting. Hunting the edges of grass beds, thereby not anchoring on eel grass, has proved much better for me hunt-wise and is a far greater practice.

Lastly I would like to note that brant season in Tomales Bay is right in the heart of recreational Dungeness crab season, and on any given day there can be dozens of boats crossing near the hunting grounds working crab gear. I have had kayaks paddle right through my decoys. I do not consider an oyster lease, even a large lease, to be responsible for "scaring away the brant". As a hunter, you want the birds flying, not rafted up 600 yards from where you have your decoys. Brant will often take to the air, circle the area where they were feeding and loafing a few times, and settle right back down in the same place. To speak plainly, there is one action that runs the brant out of the bay, and makes them extremely wary when they return, and that is them being shot at. Personally I want my brant in the air flying around as much as possible, not gathered on the water content to stay in one place all morning. To be clear: nothing will make waterfowl get out of town like being repeatedly shot at. The boats, the oyster crews, the fishermen, the brant are used to seeing on a daily basis and do not seem the least bit bothered by those human activities. Oyster farming, when done correctly and in partnership with all concerned, has been very good for brant hunting where I hunt them.

Sincerely,

Nathan A. [signature]

May 14, 2021

John Finger
Founder, CEO
Hog Island Oyster Company
PO Box 829
Marshall, CA 94940

Dear Mr. Finger

My name is Robert A. Arndt I have lived in Point Reyes my entire life I started Hunting brant on Tomales Bay in the 1970's. There has been oyster companies in Tomales Bay Ever since I started hunting brant. We haven't to had any negative effects from the oyster companies in the bay. They do not scare the flocks of brant on the bay. When the oyster companies see our set ups for hunting they keep their distance to not interfere with our hunting. The flocks of brant when they come in the bay tend to feed in and around the oyster racks. Eating eel grass that is drifting in the bay. In fact, one time the oyster company has been a help when I was out sculling the bay got a little too rough and one of the workers for Hog Island Oyster Company actually came out and picked me up and took me to shore. So I do not see any negative effect for the oyster companies being on the bay in the last 40 years of hunting on Tomales Bay.

Robert A. Arndt

Attachment 2

Tomales Bay Cleanup Report Submitted to the California Coastal Commission

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Hog Island Oyster Co. Marine Debris Reduction and Management Report 2020

Results of cleanup events are summarized below (pages 2-23). Location of each effort is not marked on a map but described with a start and end point. Everything between Tom's Point and Tomasini Point on the east shore and everything between Brazil Beach and Shell Beach on the west shore was surveyed at some point in the year. Roadside cleanups in Marshall were just as frequent.

Training on the topic of Marine Debris took place on March 7^{th} for farm crew. Training materials and crew attendance sheet on pages 24-28, and 29.

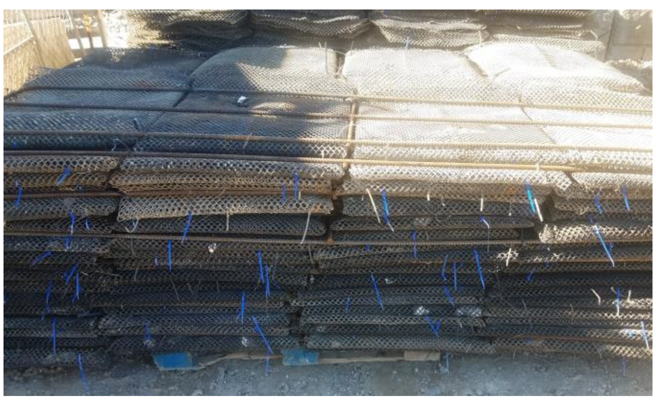
Recovery of HIOC cultivation gear is estimated below:

Lost: to our knowledge no gear was lost from any of our growing areas.

Recovered: 4 clam rolls, 4 bottom bags, 9 floating bags, and 2 SEAPA baskets.

Changes to cultivation gear in 2020 included an increase in the use of SEAPA baskets in our intertidal longlines and the continuing removal of clam roll culture (ongoing) in lease M-430-15.

Zipties with "HOG ISLAND OYSTER CO. 415-663-9218" inscribed in them continue to be applied to all new and repaired gear. Tagging of all HIOC gear is expected by 2021.



Hog Island Oyster Co. Bay Clean-ups January 2020

Bay Clean December 13th, Monday – Jodi – 5 minutes

Collected a large piece of Styrofoam at Marconi landing.

Bay Clean December 13th, Monday – Victoria and Molly – 1.5 hours

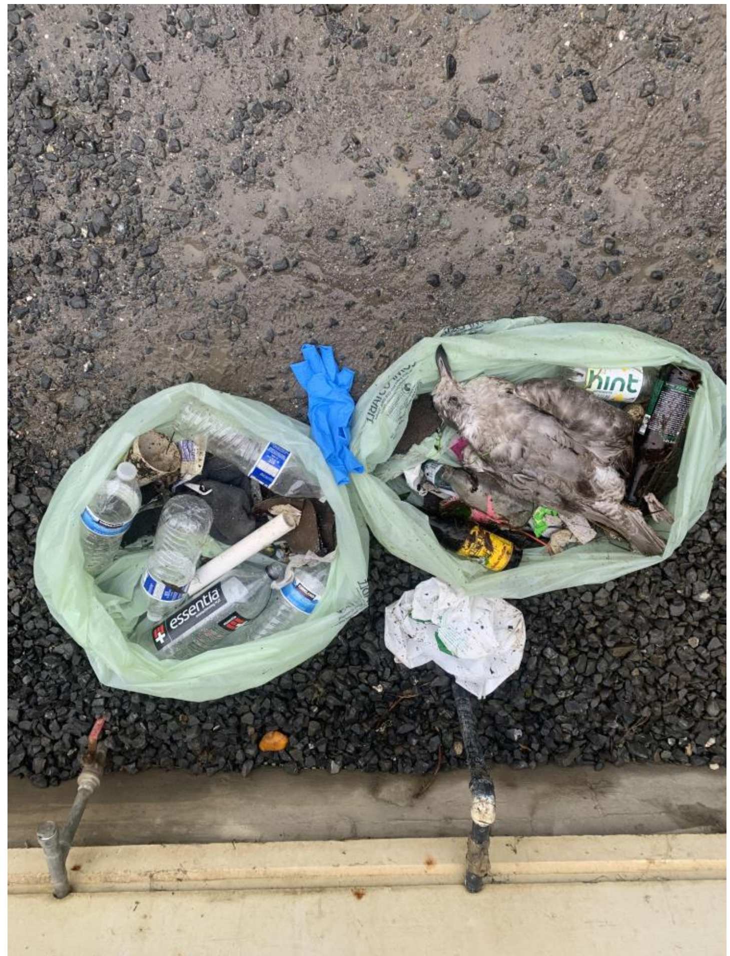
Walked on Petaluma-Marshall Rd, form HWY 1 to church. Found:

- 10 lbs of plastic debris
- 78 lbs of glass bottles
- 3 lbs of metal scraps
- 1 car part

Bay Clean January 16th, Thursday – Nick and Dre – 1 h

Walked on Petaluma-Marshall Rd and HWY 1, from H2 Ranch to Marshall Tavern. Found:

- 17 plastic scraps
- 10 food wrappers
- 7 plastic bottles
- 6 paper scraps
- 5 cardboard scraps
- 4 cigarette butts
- 3 plastic bags
- 3 styrofoam pieces
- 3 glass bottles
- 1 PVC pipe
- 1 aluminum can
- 1 hat
- 1 piece of lumber



Bay Clean January 22nd, Wednesday – Daniel – 2 h

Surveyed the shore of lease 430-15. Found.

- 6 HIOC floating shellfish growing bags
- 2 PVC pipes
- 8 Styrofoam pieces
- 5 plastic scraps
- 2 plastic lids
- 2 plastic bottles
- 1 plastic bag
- 1 buoy
- 2 aluminum cans
- 1 ball

Hog Island Oyster Co. Bay Clean-ups February 2020

Bay Clean February 17th, Monday – Daniel – 2 hours

Walked along shore from HIOC farm, past Cypress Grove preserve, and up to lease 430-14. Found:

- 1 shellfish growing bag
- 1 floating shellfish growing bag
- 9 plastic scraps
- 9 pieces of styrofoam
- 6 plastic bags
- 5 plastic lids
- 4 plastic bottles
- 3 aluminum cans
- 3 balls
- 2 clothing items
- 2 food wrappers
- 2 shotgun shells
- 1 fishing gear wrapper
- 1 paddle
- 1 flexible pipe

Hog Island Oyster Co. Bay Clean-ups March 2020

Bay Clean March 6th, Friday – Daniel – 1 hour

Walked along shore of leases 430-12 and 430-13. Found:

- 1 HIOC bottom shellfish growing bag (cut open)
- 1 piece of rope
- 8 plastic scraps
- 4 fishing gear wrappers
- 4 paper scraps
- 3 pieces of Styrofoam
- 3 plastic lids
- 2 shotgun shells

Bay Clean March 11th, Wednesday – Matt – 1 hour

Walked along HWY 1 from HIOC south parking lot up Marshall-Petaluma Rd. Found:

- 5 Zipties
- 3 plastic bottles
- 4 plastic bags
- 3 plastic cups
- 6 food wrappers
- 1 piece of Styrofoam
- 1 glass bottle
- 2 paper cups
- 5 aluminum cans
- 25 cigarette butts

Bay Clean March 19th, Thursday – Brad – 1 hour

Walked along shore of lease 430-12. Found:

- 3 floating shellfish growing bags
- 1 SEAPA lid
- 3 food wrappers
- 2 plastic scraps
- 2 plastic bags
- 1 plastic cup
- 1 piece of wire

Hog Island Oyster Co. Bay Clean-ups April 2020

Bay Clean April 9th, Thursday – Daniel – 1.5 hour

Walked along shore from lease 430-13 to Tomasini Point. Found:

- 7 floating shellfish growing bags
- 1 shellfish market bag
- 1 piece of rope
- 6 plastic scraps
- 2 clothing items
- 1 glove
- 1 ball
- 2 aluminum cans
- 1 glass bottle
- 1 plastic lid
- 1 shotgun shell
- 1 piece of lumber
- 1 piece of Styrofoam
- 1 plastic bag
- 1 balloon

Hog Island Oyster Co. Bay Clean-ups May 2020

Bay Clean May 29th, Friday – Daniel – 1.5 hour

Walked along shore from HIOC farm to lease 430-14. Found:

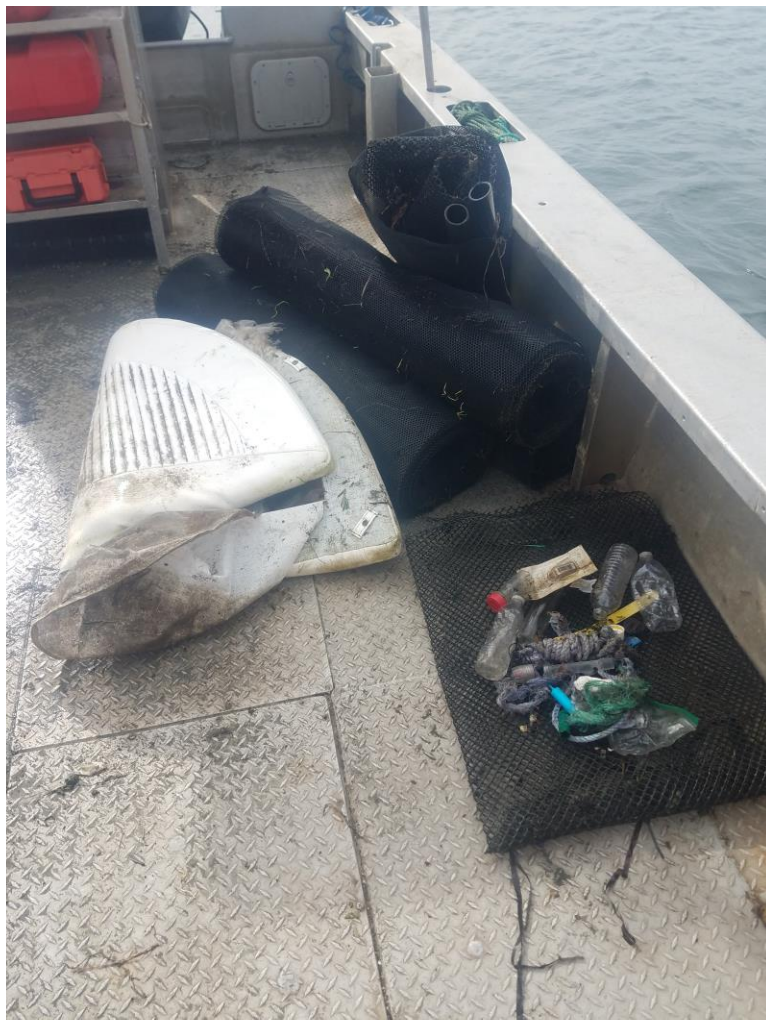
- 9 plastic scraps
- 4 plastic bags
- 3 pieces of Styrofoam
- 3 plastic lids
- 2 balls
- 2 cardboard scraps
- 2 pieces of rope
- 1 zip tie
- 1 shellfish tag
- 1 piece of wire

Hog Island Oyster Co. Bay Clean-ups June 2020

Bay Clean June 12th, Friday – Daniel – 2 hour

Walked along shore of lease 430-15. Found:

- 2 HIOC shellfish growing bags
- 3 shellfish growing bags
- 3 HIOC clam rolls
- 2 PVC pipes
- 4 plastic bottles
- 3 plastic bags
- 3 plastic lids
- 2 shotgun shells
- 2 plastic scraps
- 1 piece of rope
- 1 emergency light
- 1 glass bottle
- 1 piece of styrofoam
- 1 boat seat



Hog Island Oyster Co. Bay Clean-ups July 2020

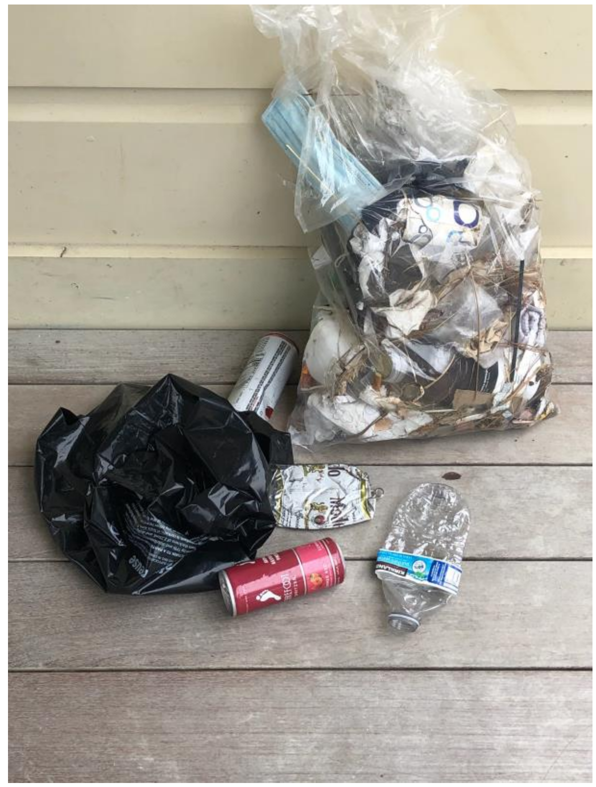
Bay Clean July 7th, Tuesday – Cat and Madeline – 1 hour

Walked on roadside from Marshall Tavern to H2 ranch. Found:

- 2 shellfish growing bags
- 1 shellfish market bag
- 20 plastic scraps
- 10 food wrappers
- 3 plastic bottles
- 3 glass bottle
- 1 piece of styrofoam
- 5 cardboard scraps
- 5 paper scraps
- 2 paperboard scraps
- 3 aluminum cans
- 1 metal scrap
- 1 glove
- 2 clothing items
- 15 cigarette butts
- 1 hypodermic needle

Bay Clean July 17th, Friday – Cat and Anna – 0.5 hour

Walked along HWY 1 from HIOC farm. Found:



- 1 shellfish market bag
- 2 plastic bottles
- 2 zipties
- 1 plastic bag
- 18 plastic scraps
- 2 plastic cups
- 20 food wrappers
- 10 cardboard scraps
- 30 paper scraps
- 2 paper cups
- 4 aluminum cans
- 2 metal scraps
- 2 wire pieces
- 1 clothing item
- 3 face masks
- 1 car part
- 30 cigarette butts

Bay Clean July 21st, Tuesday – Matt – 1 hour

Walked along Callbox beach across from Strauss farm. Found:

- 4 plastic bottles
- 5 plastic bags
- 18 plastic scraps
- 5 food wrappers
- 1 Styrofoam piece
- 6 glass bottles
- 30 cardboard scraps
- 23 paper scraps
- 3 aluminum cans
- 5 fishing gear packages
- 2 balls
- 37 cigarette butts

Bay Clean July 21st, Tuesday – Matt – 0.75 hour

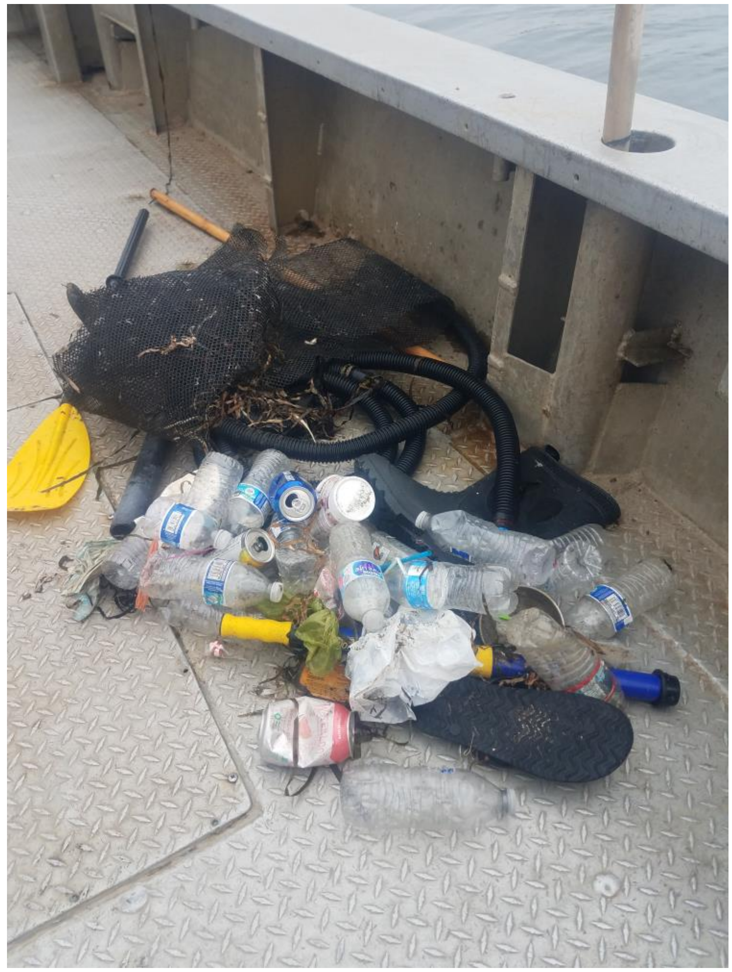
Walked along the Marshall Tavern parking lot. Found:

- 4 plastic bottles
- 6 zipties
- 3 plastic bags
- 10 plastic scraps
- 5 food wrappers
- 3 glass bottles
- 20 cardboard scraps
- 4 aluminum cans
- 1 piece of rope
- pliers
- 1 clothing item
- 2 face masks
- 37 cigarette butts
- 1 yoga mat

Bay Clean July 29th, Wednesday – Daniel – 1 hour

Walked along lease 430-15 and beyond Tom's Point. Found:

- 1 PVC pipe
- 1 piece of a HIOC clam roll
- 19 plastic bottles
- 4 aluminum cans
- 4 masks
- 4 plastic scraps
- 3 plastic bags
- 3 sandals
- 3 food wrappers
- 2 food containers
- 1 boot
- 1 paddle
- 1 piece of tubing
- 1 doggie bag
- 1 kids plastic toy
- 1 piece of lumber



Bay Clean July 29th, Wednesday – Cat and Anna – 0.5 hour

Walked along HWY 1 from HIOC farm. Found:

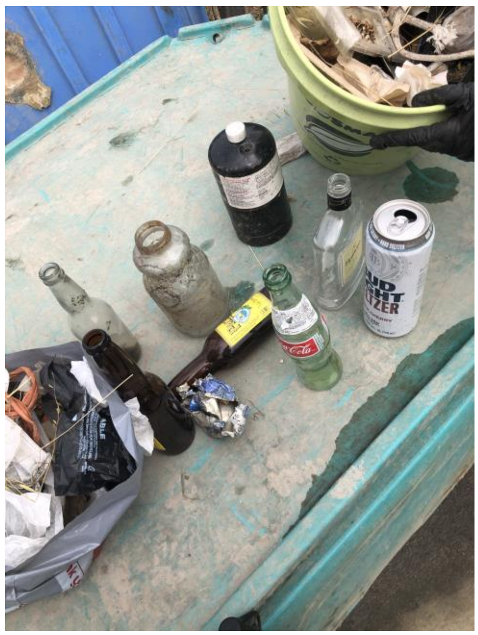
- 1 Ziptie
- 1 plastic bag
- 23 plastic scraps
- 3 food wrappers
- 10 cardboard scraps
- 20 paper scraps
- 2 aluminum cans
- 2 metal scraps
- 2 fishing gear
- 1 fishing debris
- 56 cigarette butts

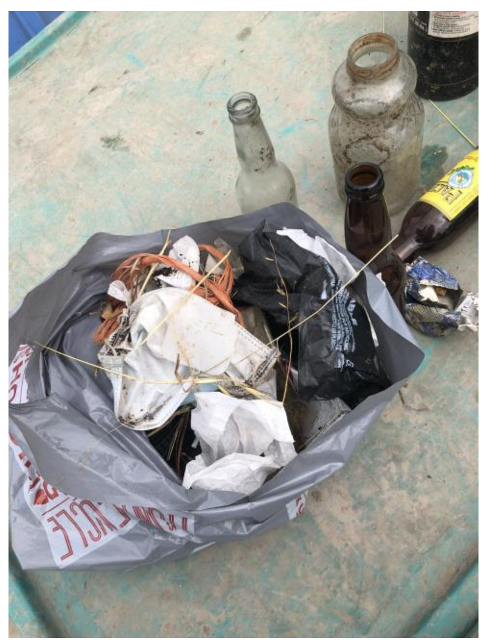
Hog Island Oyster Co. Bay Clean-ups September 2020

Bay Clean September 16th, Wednesday – Cat, Anna, and Madeline – 1 hour

Walked on roadside from Marshall Tavern to H2 ranch. Found:

- 1 PVC pipe
- 2 Zip ties
- 2 plastic bags
- 255 plastic scraps
- 2 plastic cups
- 10 food wrappers
- 2 pieces of styrofoam
- 10 glass bottles
- 52 paper scraps
- 7 aluminum cans
- 15 metal scrap
- 5 wire pieces
- 2 pieces of rope
- 1 fishing gear wrapper
- 12 fishing gear
- 1 mask
- 2 clothing items
- 178 cigarette butts
- 1 car part
- 2 plastic toys
- 31 personal hygiene items





Bay Clean September 21st, Monday – Wilber, Brian, Edgar – 1 hour

Walked around Miller Boat Launch. Found:

- 6 plastic bottles
- 8 plastic scraps
- 3 paper scraps
- 1 piece of paperboard
- 1 aluminum can
- 2 wire pieces
- 3 pieces of rope
- 1 sandal
- 1 clothing item
- 2 balls
- 2 cigarette butts

Hog Island Oyster Co. Bay Clean-ups October 2020

Bay Clean October 19th, Monday – Daniel – 2 hour

Boated along shore from Marshall Beach to Shell Beach, and from Tomasini Point to Marconi Landing. All items were found on the east shore:

- 19 floating shellfish growing bags
- 5 shellfish growing bags
- 2 HIOC shellfish growing bags
- 6 food wrappers
- 3 plastic scraps
- 1 shotgun shell
- 1 plastic food container
- 1 paddle

Bay Clean October 20th, Tuesday – Joe – 0.25 hour

While launching farm boat at Marconi Boat Launch found an abandoned deep cycle marine / boat battery, 2 food wrappers, and a piece of lumber.

Hog Island Oyster Co. Bay Clean-ups November 2020

Bay Clean November 5th, Thursday – Daniel – 2 hours

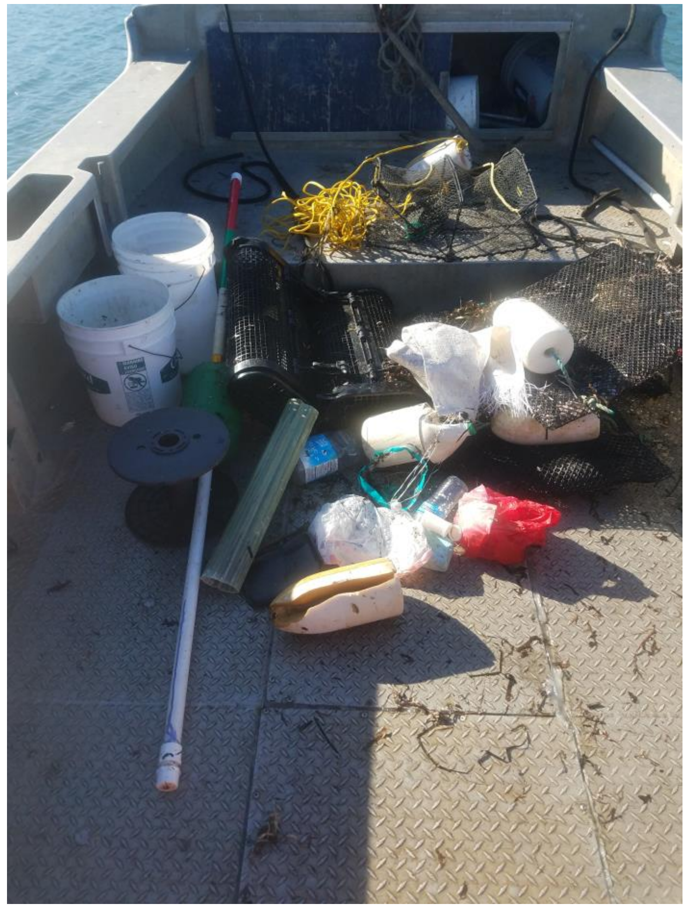
Paddled along shoreline from HIOC farm to lease 430-14. Found:

- 1 shellfish growing bag
- 19 plastic scraps
- 12 plastic bags
- 4 food wrappers
- 3 plastic bottles
- 3 fishing gear wrappers
- 3 latex gloves
- 2 fishing gear
- 2 glass bottles
- 2 aluminum cans
- 2 hats
- 3 plastic kids' toys
- 1 ball
- 1 piece of tubing

Bay Clean November 30th, Monday – Daniel – 2.5 hours

Boated along shoreline from Preston Pt. through lease 430-15. Found:

- 3 HIOC floating shellfish growing bags
- 2 HIOC SEAPA baskets
- 2 buoys
- 4 plastic bottles
- 3 plastic bags
- 2 plastic buckets
- 2 plastic scraps
- 1 Styrofoam piece
- 1 crab trap



Hog Island Oyster Co. Bay Clean-ups December 2020

Bay Clean December 6th, Sunday – Daniel – 0.5 hours

Walked along shore from HIOC farm north. Found:

- 1 shellfish growing tray
- 2 pieces of rope
- 8 plastic scraps
- 6 plastic bags
- 5 food wrappers
- 3 fishing gear wrappers
- 2 socks
- 1 plastic bottle
- 1 paper cup
- 1 ball
- 1 kid's plastic toy
- 1 shotgun shell

HOG ISLAND OYSTER COMPANY MARINE DEBRIS MANAGEMENT PLAN

Hog Island Oyster Company (HIOC) works closely with local citizens, companies, and organizations to address marine debris management. HIOC does a minimum of four bay clean-ups a year, with emphasis on the four HIOC leases (M-430-10, M-430-11, M-430-12, and M-430-15). The goal is also to conduct monthly bay and/or roadside clean-ups on different sections of the bay and along HWY 1. HIOC also helps organize a yearly bay clean-up event on California Coastal Clean Up Day with the Environmental Action Committee and the Marconi Conference Center. In addition to aquaculture debris, materials from other sources are also collected. During the 2016 to 2020 clean-up effort, waste associated with recreation (e.g., hats, cigarettes, Styrofoam) and food (e.g., food wrappers, bottles) comprised the largest amount of debris collected.

The specific action items that are part of the marine debris management plan include:

1. Regularly educate staff on the issues of marine debris. Ensure that all staff do not litter.

2. Growers must strive to continually improve gear, so that breakage and scattering of debris is minimized.

3. Avoid the use of any single-use materials. Minimize waste generation, practicing the principals of reduction, re-use, recycling and recovery. Purchase materials with a long a life span, preferably reusable but at least recyclable.

4. Secure all buoys/floats properly to minimize loss.

5. When tossing out loose bags or bundles of lightweight seed bags ensure that all bags are either heavy enough not to drift away or secured/anchored to prevent drifting or movement. All loose bags shall be secured within two weeks of being tossed out if not sooner.

6. Avoid leaving tools, loose gear and construction materials on leases and surrounding area for longer than one week. All materials staged on leases shall be secured to prevent movement and or burial.

7. If a culture method is unsuccessful, or is not in use for over a period of one year, all materials will be promptly removed.

8. At a minimum, leases and surrounding areas shall be patrolled for lost and broken gear monthly. Patrols should occur as soon as possible or at least within two-weeks of any high wind or storm event.

9. Growers will participate in quarterly bay clean-ups, which include walking the bay, shoreline and wetlands, to get to hard to reach areas. An itemized list of any, and all debris (including shellfish gear), collected will be recorded and communicated to other growers. The goal is to reduce the total volume of debris that is accumulating in Tomales Bay.

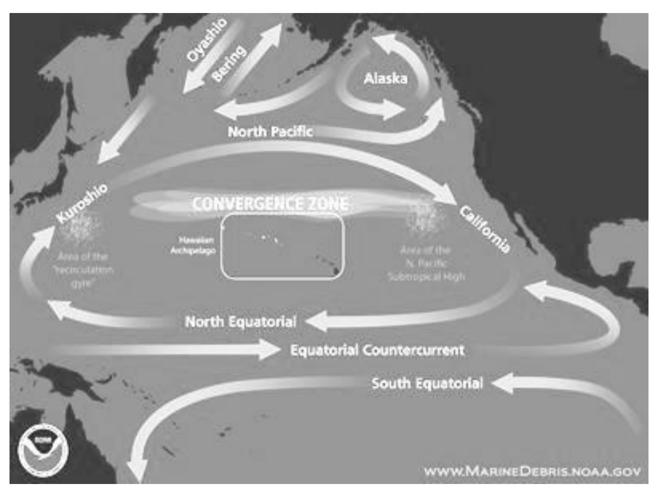
10. Growers will work with and collaborate with local community and other coastal cleanup people/organizations to coordinate bay wide clean-up efforts. All trash will be collected (including non-shellfish items) at all times.

11. A review of lease escrow accounts shall occur on a regular basis to ensure that adequate funds are available to clean up abandoned leases. Growers shall retain the right to perform the clean-up of any abandoned leases themselves, so as to not decrease the balance in the escrow account.

Marine Debris and Tomales Bay

Any unattended human-made object that finds its way to the coastal or marine environment is considered marine debris. Marine debris has become one of the most pervasive pollution problems facing the world's oceans and waterways and poses threats to ecosystems, economies, and communities. Marine debris smothers and shades coral reefs and salt marshes, disrupting growth and surface cover. Seals, sea birds, sea turtles, whales, and dolphins, are entangled in debris, resulting in hindered movement, decreased feeding ability, injury, and death. Fish, crustaceans, shellfish, and zooplankton ingest microplastics, and can consume less food and have decreased energy for growth as a result. Plastics have recently been found in the digestive tracts of fish and shellfish and the soft tissues of shellfish sold at markets for human consumption. A serving of six oysters grown off the coast of France could contain as many as 50 plastic particles. It is a global problem with impacts from fishing and navigation to human health and safety. The issue of marine debris in Tomales Bay has gotten significant attention from regulators and the public in recent years, especially in connection to oyster farming operations. We have taken action to correct some of these issues yet our systems are not flawless and solutions require constant attention.

The majority of marine debris comes from land-based sources, though ocean-based debris can be significant in some areas. Globally, it is estimated that between 4.8 and 12.7 million metric tons of plastic enter the ocean from land every year. The increased use of synthetic products over the past 40 years, along with increasing human population has exponentially increased the volume of trash in our oceans. Plastics can be carried for miles through streams, sewer systems and wind to coastal areas. When these durable and highly buoyant synthetic products enter the ocean they can travel for thousands of miles on oceanic currents. The debris carried from the coastlines by currents can become caught in oceanic circulation patterns, concentrating in particular regions of the ocean - commonly referred to as "Garbage Patches". These are not blankets of trash that can be seen with satellite or aerial photographs. Much of the debris found in these areas of concentration consist of small bits of plastic, floating at or under the surface of the water.



Marine debris comes in many forms, from tiny plastic nurdles (left) to 4,000-pound derelict fishing nets. Some of the most common marine debris items include cigarette filters, food wrappers, beverage bottles and cans, grocery and trash bags, fishing lines, nets and other gear. Here at HIOC our shellfish production relies almost entirely on synthetic materials: the plastic bags we keep our oysters in, the nylon zip ties and PVC coated wire we close our bags with, the PVC pipes our racks rest on and that mark our growing areas, the rope we use to secure our gear (polypropylene, nylon, and polyester), PVC floats used on our tipping bags, the mesh bags we sell our product in, and the tags we sell it with. All our gear in the bay is constantly subject to wind and wave action, deterioration from sunlight, and storms, as well as the eventual encounter with a propeller or raccoon. Thus we need to keep constant and broad vigilance over our leases and shores.

Summary of itemized bay and roadside cleanups in Tomales Bay from January 2016 to December 2020:

Plastic scraps	2960	PVC	171
Cigarette butts	2075	Fishing gear	151
Food wrapper	1413	Food container	135
Plastic bags	864	Buoys	123
Plastic bottles	829	Clothing item	120
Styrofoam	691	Plastic cups	105
Metal scraps	575	Balls	100
Aluminum cans	534	Lumber	94
Paper scraps	516	Fishing gear wrapper	82
Shellfish growing bags	493	Shellfish growing trays/crate	78
Glass pieces	492	Shotgun shell	53
Glass bottles	471	Bags full of trash	50
Lids/tops/caps	446	Personal hygiene	49
Rope	320	Wire pieces	48
Shellfish floating growing bags	243	Zipties	45
Cardboard scraps	208	Paper cups	44
Packaging material	186	Kid's beach toys	40
Car parts	185	Other debris	272

Of a total of 15,250 marine debris items collected between 2016 and 2020, 1,559 items (~10%) are possibly related to shellfish culture (highlighted in grey). In some cases these items can also be related to recreational uses or ocean input (e.g. rope, Zipties, PVC pipe, and buoys). This percentage of shellfish culture related items has decreased from 35% of total items collected in 2016, to 11% in 2017, 5% in 2018, back up to 13% in 2019 and down again to 7% in 2020.

At the HIOC Farm we have been very proactive in organizing regular bay and road cleaning events for farm crew and all staff as well as recycling and finding ways to re-use materials. All of these efforts reduce our consumption of synthetic materials and lessens their contribution to the global waste problem. However, sometimes trash accidentally falls overboard, flies in the wind, or gets mixed into drain water and flows into the bay. Preventing marine debris and keeping trash off the ground here at the farm helps protect the bay and ocean ecosystems, and makes our commitment to the health of the bay obvious to neighbors and customers. Reducing and minimizing our contribution to the marine debris problem in the bay exemplifies our commitment, yet we need to go a step further. Shellfish farms in Tomales Bay don't only share the responsibility for keeping the bay clean but also the blame when we don't. Therefore we need to keep vigilant of not only what we leave behind but what others leave behind. Though we are and should be proud of what we do, there is always room for improvement.

What do you think?

What items do we currently re-use and recycle?

What are the most common items of trash we produce that could accidentally enter the marine environment?

Retail mesh bags and small pieces of them – Sometimes partial pieces or bags that are too short are left on the ground.

PVC - shavings, cuttings, pipe sections - Do you always sweep into trash can or vacuum? Especially when working outdoors (upper/lower decks, ranch). Do we always double check we are not leaving pipes behind when we do lease work? Are mallets better than pole pounders (less shaving)?

Copper wire, zip ties, and clips- small pieces are easy to leave behind. Do not leave zip ties on bags when you cut them, put them in the trash or in your pocket. Keep an eye out for them at all times and everywhere.

Gear production/maintenance – Are we conscious of how resistant our gear is when we do work on it?

Tags - How often do you think tags are lost and get carried by drain/wind into bay?

Eating utensils, cups, cans, bottles - Sometimes found around lower/upper deck.

***Cigarette butts* -** Do you always throw butts into the proper receptacle?

Although marine debris is found worldwide, we can all help with the smallest actions:

**Reduce, reuse, and recycle. Look for ways to expand our efforts.*

** Work towards minimizing or eliminating the use of single use synthetic items.*

**Clean up any trash you see on the ground or in the water, whether or not you left it there.*

**Bay cleaning events and collaboration with other growers – quarterly.*

**Dispose of cigarette butts in appropriate container – do not leave butts smashed on the ground.*

**Keep trash/recycling receptacles nearby at all work stations for easy access (including on each boat and lower deck) and dispose of contents regularly.*
**Whenever and wherever you can, collect and dispose of small pieces of cut zip ties, tags, wire, PVC shavings, clam bags, and oyster bags.*
**If we are all consistent we can make a big improvement.*

More discussion…
What situations and work conditions make it hard for you to clean up and reduce the quantity of trash entering the bay and ocean?
When are you more likely to forget trash pick-up and proper disposal? What would help you remember?
Are there more ways in which we can recycle and re-use materials? Share your ideas.

Hog Island Oyster Co.

Educational Unit Attendance Sheet

On 12 / 9 / 20 I attended a lesson on Marine Debris and BMPs.

Department	Print name	Signature
FARMS.	VICTOR H. Rodriguez	[signature]
FARMS	Evert Gonzula	[signature]
FARMS.	JOAQUIN GUEVARA	J.G.B
FARM	Wilber Mejia	Wilber M.
FARM	12HUIV	12HUL VC
FARM	Hector MOLINERO	[signature]
FARM	Raul Valenzuela JK	[signature]
FARM	BRIAN MITTONE	[signature]

Attachment 3
Photos of Shellfish Aquaculture Gear

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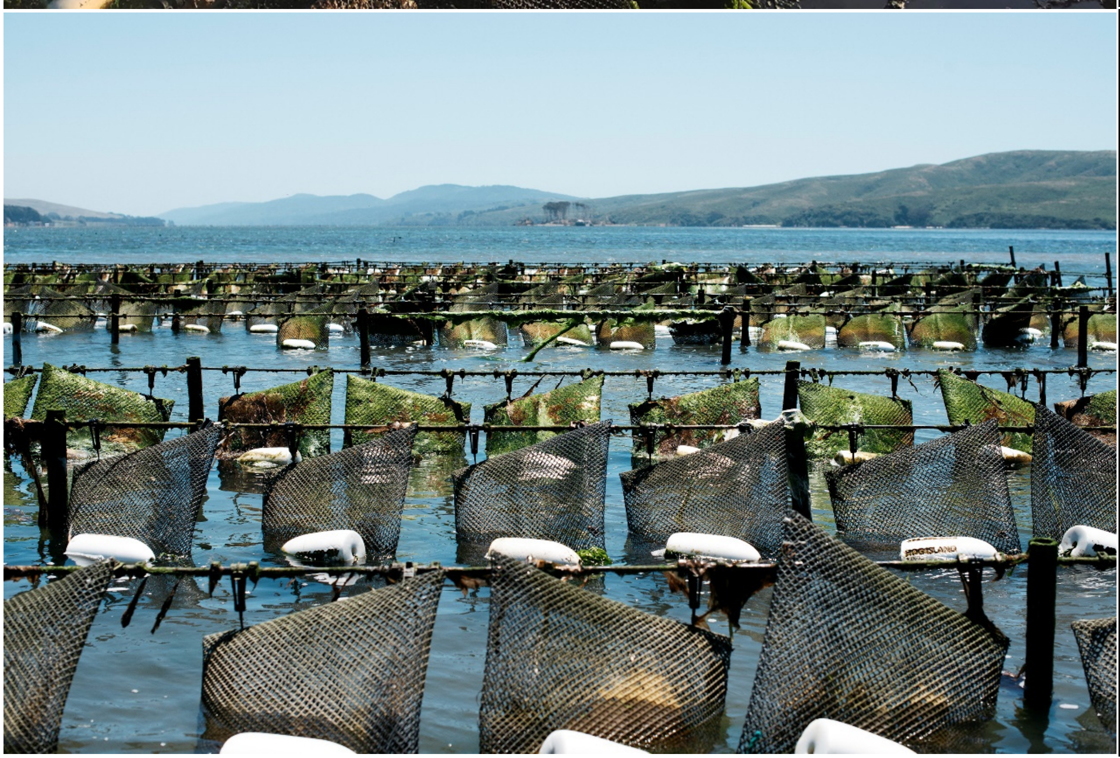
Rack and Bag Culture at Low Tide

Bags from Rack and Bag Culture

Intertidal Longline Systems with SEAPA-style Baskets at Low Tide

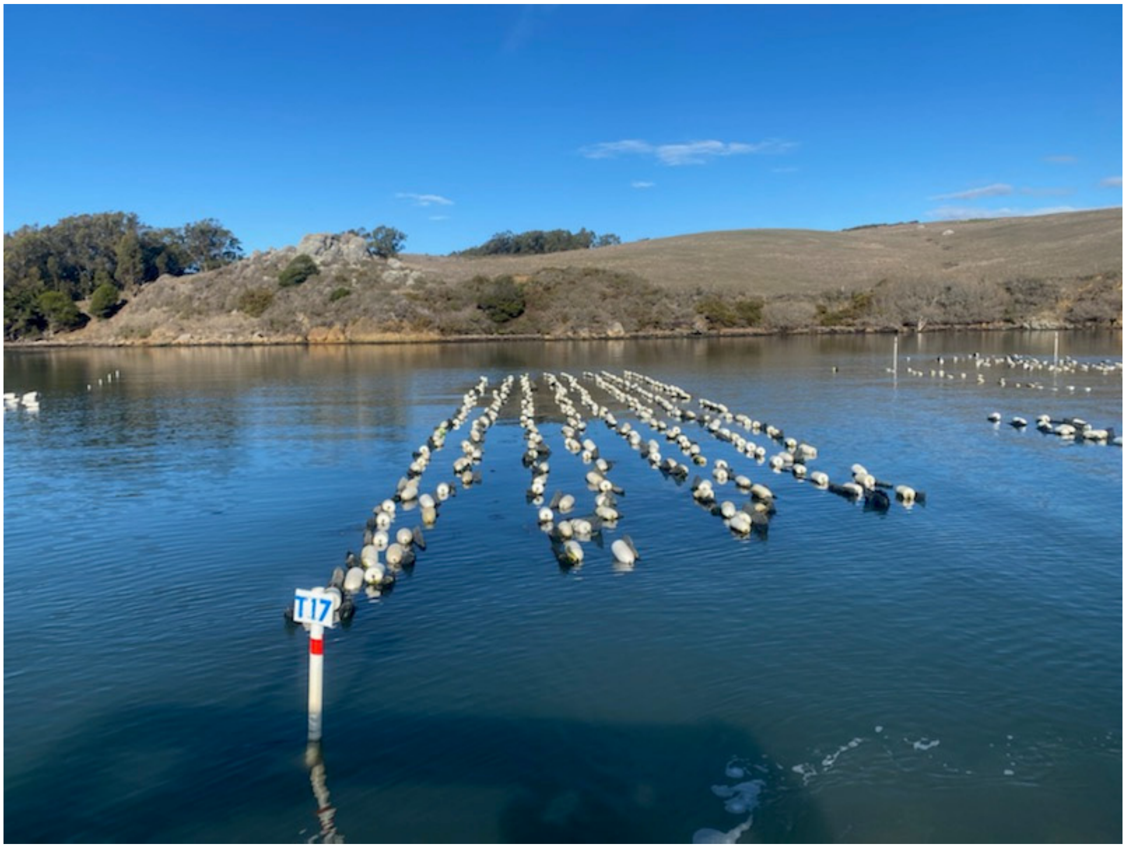
Intertidal Longline Systems with SEAPA-style Baskets at Low Tide

Tipping Bags with Floats at Low Tide



Tipping Bags with Floats at Low Tide

Tipping Bags with Floats at Low Tide



Tipping Bags with Floats at High Tide