United States Environmental Protection Agency

Region 4
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Atlanta, GA 30303

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Final
Environmental Assessment

National Pollutant Discharge Elimination System Permit for Ocean Era, Inc – Velella Epsilon Offshore Aquaculture Project – Gulf of Mexico

Abbreviations Used in this Document

Abbreviation	**Definition**
ACL	Annual Catch Limit
APHIS	Animal and Plant Health Inspection Service
ATON	Aids to Navigation
BACT	Best Available Control Technology
BES	Baseline Environmental survey
BOEM	Bureau of Ocean Energy Management
BPJ	Best Professional Judgement
BSEE	Bureau of Safety and Environmental Enforcement
ºC	Degree Celsius
CAA	Clean Air Act
CAAP	Concentrated Aquatic Animal Production
CASS	Coastal Aquaculture Siting and Sustainability
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Chl-a	Chlorophyll a
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DA	Department of Army
DO	Dissolved Oxygen
DOC	Department of Commerce
DOD	Department of Defense
DOI	Department of Interior
DPS	Distinct Population Segment
DWH	Deepwater Horizon Event
EA	Environmental Assessment

EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EFP	Exempted Fishing Permit
EIS	Environmental Impact Statement
ELG	Effluent Limitations Guidelines
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FMP	Fishery Management Plan
FR	Federal Register
ft	Feet
FWS	U.S. Fish and Wildlife Service
GAP	Gulf Aquaculture Permit
GOMESA	Gulf of Mexico Energy Security Act
GPS	Global Positioning System
Gulf	Gulf of Mexico
HAB	Harmful Algal Blooms
HAPCs	Habitats of Particular Concern
kg/day	Kilograms per Day
km	Kilometer
lbs. gw	Pounds Gross Weight
LOA	Letter of Authorization
LOP	Letter of Permission
m	Meters
MAS	Multi-Anchor System
MBTA	Migratory Bird Treaty Act
mg/l	Milligram per Liter

MMAP	Marine Mammal Authorization Program
MMPA	Marine Mammal Protection Act
MOU	Memorandum of Understanding
MPAs	Marine Protected Areas
MSA	Marine Sanctuary Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
nmi	Nautical Mile
NMSA	National Marine Sanctuaries Act
NMSP	National Marine Sanctuary Program
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
ODC	Ocean Discharge Criteria
ODMDS	Ocean Dredged Material Disposal Site
PAHs	Polyaromatic Hydrocarbons
PATON	Private Aids to Navigation
PCBs	Polychlorinated Biphenyls
PDARP	Final Programmatic Damage Assessment and Restoration Plan
PEIS	Programmatic Environmental Impact Statement
PFEIS	Programmatic Final Environmental Impact Statement
PM	Particulate Matter
ppt	Parts per Thousand
PSD	Prevention of Significant Deterioration

PSMP	Protected Species Management Plan
RAS	recirculating aquaculture system
RUE	Right of Use and Easement
SEFSC	Southeast Fisheries Science Center
SLA	Submerged Lands Act
SPCC	Spill Prevention, Containment, and Countermeasure
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TP	Total Phosphorous
ug/L	Microgram per Liter
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
WTCW	Well Treatment, Completion, and Workover (fluids)

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Table 1 - Errata Table – Substantive Changes from draft to final EA

Page Number / Section	Change from draft to final EA
Global	Added Ocean Era, Inc. as applicant
Global	Clarification that permit will be limited to “one production cycle”
Introduction	Text revised
Table 3	Revised ESA and MMPA text
Section 3.2.3 – Air Quality	Text revised and updated
Section 4.2.1 – Water Quality	Text Revised
Section 4.2.1.1 – Pharmaceuticals	Text revised
Section 4.2.2 – Sediment Quality	Text revised
Section 4.2.3 Air Quality	Text revised
Section 4.3.1 – Fish	Text revised
Section 4.3.3 – Marine Mammals	Text revised
Section 4.3.4 – Sea Turtles	Text revised
Section 4.3.6 – Essential Fish Habitat	Concurrence correspondence text added
Section 4.4.3 – Recreational Fishing	Text revised
Section 4.4.4 – Commercial Fishing	Text revised
Section 4.4.5 – Environmental Justice	Text revised
Section 5.0 – Cumulative Impacts	Text revised
Section 5.3 Future Aquaculture Operations	Text revised
Section 5.4 – Physical Resources	Text revised

Section 5.4.1 – Water Quality	Text revised
Section 5.4.1.1 – Pharmaceuticals	Text revised
Section 5.4.2 – Sediment Quality	Text revised
Section 5.4.3 – Air Quality	Section has been revised to reflect updated information
Section 5.5 – Biological Resources	Text revised
Section 5.5.4 – Sea Turtles	Text revised
Section 5.5.6 – Essential Fish Habitat	Text revised and concurrence correspondence text added
Section 6.0- Alternatives	Text revised
Section 6.7 – Preliminary FONSI	Text revised
Section 7.5 – Section 7 ESA Coordination	Text revised
Section 7.6 – Essential Fish Habitat Consultation	Text revised
Section 9.0 – Public Notice	Section has been revised to reflect public comment period, public hearing, and agency responses.

List of Appendices

1.0 Introduction

Ocean Era, Inc. (formerly Kampachi Farms, LLC) (applicant) is proposing to install and operate a pilot-scale marine aquaculture facility in federal waters of the Gulf of Mexico (Gulf) and has applied for permits from multiple federal agencies (See Table 2). This EA was prepared by the U.S. Environmental Protection Agency (EPA) as the lead federal agency with assistance from the National Marine Fisheries Service (NMFS) and U.S. Army Corps of Engineers (USACE) as cooperating agencies under the National Environmental Policy Act (NEPA). This EA evaluates the potential environmental impacts from the construction and operation of the proposed project, named Velella Epsilon (VE). Cooperating agencies have jurisdiction by law or special expertise with respect to the potential environmental impacts resulting from the VE project.

A NEPA review is required when the EPA issues a National Pollutant Discharge Elimination System (NPDES) permit for a "new source" under the Clean Water Act (CWA). At this time, the proposed facility does not meet the definition of "new source," which includes facilities subject to and commencing construction after the promulgation of national standards of performance under Section 306 of the CWA (40 CFR Section 122.2). The proposed facility will commence construction after promulgation of national standards of performance for Concentrated Aquatic Animal Production (CAAP) facilities set forth at 40 CFR Part 451; however, those standards do not apply to facilities producing less than 100,000 pounds of aquatic animals annually (the proposed facility will produce a maximum of 80,000 pounds of aquatic animals per year). Thus, the obligation to conduct NEPA review for issuance of "new source" permits does not directly apply to the proposed permit.

While the NEPA regulations are not automatically applicable to the proposed facility, the EPA finds that a NEPA analysis will be beneficial. It is appropriate to perform a NEPA review in accordance with EPA's *Policy for Voluntary Preparation of NEPA Documents* (63 FR 58045; October 29, 1998) based on the facility-specific circumstances surrounding the issuance of the NPDES permit. First, preparing a NEPA evaluation will enhance and facilitate an analysis of environmental impacts that are not well known because the proposed facility would be the first aquaculture facility to operate and discharge in federal waters of the eastern Gulf. Second, the EPA's decision to prepare an Environmental Assessment (EA) is also supported by 40 CFR Section 6.205(a), which provides for preparation of an EA when a proposed action is expected to result in environmental impacts and the significance of the impacts are not known. Third, improved coordination and efficiencies with other federal agencies will occur. Finally, the proposed facility's maximum annual production of 80,000 lbs. is relatively close to the threshold for meeting the new source definition for which EPA's NEPA requirements under 40 CFR Part 6 are automatically applicable. While the EPA voluntarily used NEPA review procedures in conducting the analysis for the NPDES permit issuance, the EPA also has explained that "[t]he voluntary preparation of these documents in no way legally subjects the Agency to NEPA's requirements" (63 FR 58046).

1.1 Environmental Review Process and Coordination

This will be the first offshore aquaculture project in the Gulf to be issued under the new interagency process for coordinating aquaculture permitting.[1] Because a particular agency may have more extensive authority and expertise concerning the activities that are subject to these regulations, that agency (or agencies) will generally take the lead on required evaluations or consultations in order to minimize delays and reduce potential duplication and effort (NMFS, 2016). In addition to the cooperating agencies, the EPA requested that the Bureau of Ocean Energy Management (BOEM), the U.S. Fish and Wildlife Service (FWS), Bureau of Safety and Environmental Enforcement (BSEE), and the U.S. Coast Guard (USCG) contribute in this process as participating agencies.

1.2 Regulatory Background

The operator of an offshore aquaculture facility must obtain required federal permits and authorizations prior to beginning operations (*e.g.*, USACE Section 10 permit needed before anchoring any structures into federal waters of the Gulf and EPA's NPDES permit needed before discharging pollutants from those structures). Table 1 summarizes the permits that are needed to conduct aquaculture in federal waters of the Gulf.

Table 2: Federal Permits needed for offshore aquaculture projects.

Agency	Statutes/Authorities	Purpose	Permit
U.S. Army Corps of Engineers	Section 10 of the Rivers and Harbors Act	Required in navigable waters of the U.S. to protect navigation for commerce	Section 10 Permit or Letter of Permission
U.S. Environmental Protection Agency	Sections 402 and 403 of the Clean Water Act	Required for the discharge of pollutants into waters of the U.S.	NPDES Permit

Additional details regarding the statutory/regulatory framework that supports offshore aquaculture permitting are provided in the following sections.

1.2.1 EPA--Clean Water Act

In accordance with the CWA, all pollutant discharges must comply with specific legal requirements. The CWA defines pollutant as dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. The CWA established the NPDES program to protect and improve water quality by regulating point-source discharges into waters of the United States. Pursuant to its CWA authority, the EPA developed the NPDES Permit Program to permit pollutant discharges.

[1] On February 6, 2017, the Memorandum of Understanding (MOU) for Permitting Offshore Aquaculture Activities in federal waters of the Gulf of Mexico became effective for seven federal agencies with permitting or authorization responsibilities.

Discharges from aquaculture operations are primarily governed by the implementing regulations of CWA Sections 402 and 403. The CWA Section 402 authorizes the EPA to issue NPDES permits for the discharge of pollutants from point sources into waters of the United States. The CWA Section 402 requires that a NPDES permit for a discharge into federal waters of the ocean be issued in compliance with EPA's ocean discharge criteria within CWA Section 403 for preventing unreasonable degradation of the receiving waters (i.e., 40 CFR Section 125.121). Potential pollutant discharges from aquaculture operations include solids, nutrients, ammonia, fish waste, feed waste, pharmaceuticals, chemicals, and other industrial animal-processing byproducts. The proposed facility will require a NPDES permit because it proposes to discharge pollutants from a point source to waters of the United States and, therefore, is subject to the general CWA Section 301 prohibition against discharges unless authorized by a NPDES permit.

Relevant to the proposed action is the CWA implementing NPDES regulation relating to CAAP facilities under 40 CFR Section 122.24, which requires technology-based effluent limitations for certain discharges of pollutants from CAAP facilities. The discharges from the proposed facility are not regulated as a CAAP because the facility does not meet the fish production thresholds for the warm water category. Therefore, the discharge of pollutants from the facility will be regulated as an aquatic animal production facility and the NPDES permit for the proposed facility will include the CAAP effluent limitations based on best professional judgement as allowed by 40 CFR Section 125.3(c).

Effective in 2004, the CAAP performance standards and effluent-limit guidelines (ELGs) are set forth in 40 CFR Part 451 and consist of a series of management practices designed to control pollutant discharges. These standards and guidelines were developed for CAAP facilities producing over 100,000 pounds annually in net pens or submerged cage systems. Based on maximum production levels provided by the applicant, the proposed action will not meet that production threshold. However, while the Part 451 effluent guideline limitations are not directly applicable, the NPDES permit for the facility will adopt those same requirements in the permit based on the best professional judgment (BPJ) of the permit writer and based on the factors set forth in 40 CFR Part 125, Subpart A. An individual permit is required because no general permit is available for off-shore aquatic animal production or CAAP operations within federal waters of the Gulf. NPDES permits usually are issued for 5-year terms and reissued every 5 years.

The CWA's jurisdiction extends over navigable waters, territorial seas, the waters of the contiguous zone, and the oceans. The CWA defines navigable waters to include the territorial seas, which are defined as the belt of seas measured from the ordinary, low-water line in direct contact with the open sea and the line marking the seaward limit of inland waters and extending seaward 3 miles. The contiguous zone is the entire zone established under Article 24 of the Convention of the Territorial Sea and the Contiguous Zone, and any portion of the high seas beyond this zone is defined as the ocean. In most places, federal waters extend from where state waters end out to about 200 nautical miles (nmi) also known as the U.S. Exclusive Economic Zone (EEZ).[2]

[2] EPA has delegated the NPDES program to the State of Florida for projects in state waters. The State of Florida's NPDES jurisdiction extends three miles offshore. The CWA requires the EPA to issue NPDES permits for pollutant discharges beyond three miles seaward offshore Florida.

The CWA Section 403 requires all offshore pollutant discharges to have permit limits consistent with EPA's ocean discharge criteria, which are the EPA's regulations to prevent unreasonable degradation of the marine environment in connection with discharges to the territorial seas, the contiguous zone, and the oceans. Consequently, all CWA Section 402 permitted discharges into the territorial sea, the waters of the contiguous zone, or the oceans must be consistent with CWA Section 403 criteria.

Additionally, depending upon the proposed design and operations, aquaculture facilities may also be subject to federal requirements under the Animal and Plant Health Inspection Service (APHIS) which is administered by the U.S. Department of Agriculture, the Spill Prevention, Containment, and Countermeasure (SPCC) regulations, or the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and NEPA (EPA, 2006).

1.2.2 USACE--Section 10

The proposed action requires the issuance of a Department of the Army (DA) permit pursuant to Section 10 of the Rivers and Harbors Act (RHA) approved March 3, 1899, (33 U.S.C. 403) (hereinafter referred to as Section 10) only. Pursuant to 33 CFR 320.2(b), Section 10 prohibits the unauthorized obstruction or alteration of any navigable water of the United States (U.S.). The construction of any structure in or over any navigable water of the United States, the excavating from or depositing of material in such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. The instrument of authorization is designated a permit. The authority of the Secretary of the Army to prevent obstructions to navigation in navigable waters of the United States was extended to construction of artificial islands, installations, and other devices located on the seabed, to the seaward limit of the outer continental shelf, by section 4(f) of the Outer Continental Shelf Lands Act of 1953 as amended (43 U.S.C. 1333(e)). (See 33 CFR part 322.3(b)).

1.3 Primary Federal Authorizations needed for Proposed Aquaculture Projects

In addition to required federal permits, other federal authorizations may be needed to support commencement of offshore aquaculture projects in federal waters. For example, if an aquaculture facility is co-located within the outer continental shelf (OCS) oil and gas facilities (this is not the case with the VE project), the BOEM and the BSEE must review and provide certain approvals which would be incorporated into the federal permitting processes (i.e., no separate authorizations would be issued). Once all federal permits have been obtained, applicants must apply to the USCG to receive an authorization to deploy Private Aids to Navigation (PATON), (*e.g.*, markers, buoys, at their approved aquaculture operation site). Table 3 provides a summary of the federal authorizations that may be needed for offshore marine aquaculture projects in federal waters.

For purposes of this EA, nautical mile is used interchangeably with geographic miles (i.e., CWA) to be distinguished from statutory miles. For example, 9 nmi equals 8.99 geographic miles versus 10.36 statute miles.

Table 3: Federal authorizations required for Offshore Aquaculture Projects.

Agency	Statutes/Authorities	Purpose	Application Form(s)/Process4	Who initiates this action and how?	Form of authorization
Authorizations					
U.S. Coast Guard (USCG)	33 U.S.C. 1221 *et seq* 33 CFR Section 66	Ensure safe navigation Authorize Private Aids To Navigation	Private Aids to Navigation Application Form (CG-2554)	Applicant seeking to establish a private aid to navigation	Formal authorization from appropriate USCG District
Authorizations for Aquaculture Operations Co-Located with OCS Oil and Gas Facilities					
Bureau of Ocean Energy Management (BOEM)	Outer Continental Shelf Lands Act; Energy Policy Act of 2005; 30 CFR Section 500-599	Required for any offshore aquaculture operations that utilize or tether to existing oil and gas facilities	Right of Use and Easement (RUE) for Energy and Marine- Related Activities Using Existing OCS Facilities	Operator of the OCS aquaculture facility proposing to initiate offshore aquaculture activities submits request for an Alternate Use RUE after contacting and receiving approval from the OCS Oil and Gas Facility Owner	A formal RUE is established using the facility for the purpose of aquaculture
Bureau of Safety and Environmental Enforcement (BSEE)	Outer Continental Shelf Lands Act			Permitting agencies request BSEE consultation on proposed aquaculture activities	

1.4 Required Federal Consultations, Reviews, and Other Applicable Laws

The EPA and the USACE must coordinate with other agencies when making permitting decisions for offshore aquaculture operations. Table 4 provides a summary of these applicable laws and coordination efforts. Additional information about the coordination and consultation efforts to comply with other applicable federal laws is provided in Chapter 7 and in the Appendices of this EA.

Table 4. Other Applicable Federal Laws

Federal Law	Description of the Requirement
Endangered Species Act	Section 7 of the Endangered Species Act (ESA) requires any federal agency that issues a permit to consult with NOAA's National Marine Fisheries Service (NMFS) and/or the U.S. Fish and Wildlife Service (USFWS), if issuance of the permit may affect ESA- listed species and/or the designated critical habitat for ESA-listed species. The Section 7 consultation process requires an analysis of the effects of the proposed action on ESA-listed species and designated critical habitat based on the best available science. The analysis must determine if the proposed action is likely to adversely affect an ESA-listed species and/or designated critical habitat. If the analysis determines the issuance of a proposed permit may adversely affect an ESA-listed species, but will not jeopardize its continued existence, then reasonable and prudent measures and implementing terms and conditions that minimize the adverse impacts must be developed.
Essential Fish Habitat	The essential fish habitat (EFH) provisions of the Magnuson-Stevens Act require federal agencies to consult with NMFS when activities they undertake or permit may adversely affect EFH.
National Historic Preservation Act	Section 106 of the National Historic Preservation Act (36 CFR Part 800) requires any federal agency issuing a permit to account for potential effects of the proposed aquaculture activity on historic properties, e.g., shipwrecks, prehistoric sites, cultural resources. If a proposed aquaculture activity has the potential to affect historic properties, these details must be provided by the applicant as part of the application packages.
Fish and Wildlife Coordination Act	The Fish and Wildlife Coordination Act requires any federal agency issuing permits to consult with USFWS and NMFS if the proposed aquaculture activities could potentially harm fish and/or wildlife resources. These consultations may result in project modification and/or the incorporation of measures to reduce these effects.
National Marine Sanctuary Resources Act	Section 304(d) of the National Marine Sanctuaries Act (NMSA) requires that any federal agency issuing permits to consult with NOAA's National Marine Sanctuary Program (NMSP) if the proposed aquaculture activity is likely to destroy or injure sanctuary resources. As part of the consultation process, the NMSP can recommend reasonable and prudent alternatives. While such recommendations may be voluntary, if they are not followed and sanctuary resources are destroyed or injured in the course of the action, the NMSA requires the federal action agency(ies) issuing the permit(s) to restore or replace the damaged resources.
Marine Mammal Protection Act	The Marine Mammal Protection Act (MMPA) prohibits the harassment, hunting, capturing or killing of marine mammals without a permit from either the Secretary of the Interior or the Secretary of Commerce. There are some exemptions to marine mammal take which are specified in sections 101 and 118 of the Marine Mammal Protection Act.
National Environmental Policy Act	NEPA requires federal agencies to prepare either an Environmental Impact Statement (EIS) or Environmental Assessment (EA) for any federal action affecting the quality of the human environment; unless it is determined the activity is categorically excluded from NEPA. NOAA has completed a Programmatic EIS (PEIS), which broadly considers a range of similar aquaculture projects in the Gulf. Federal agencies, in particular EPA and USACE, will ensure that any additional site-specific assessments deemed necessary are conducted. Permit applicants may be required to provide support for the project-specific evaluation of alternatives and their environmental effects, such as providing estimates of nutrient loadings, an assessment of the potential for benthic impacts, or effects on native species.
Coastal Zone Management Act	The Coastal Zone Management Act of 1972 (CZMA) encourages coastal states to develop and implement coastal zone management plans as a basis for protecting, restoring, and establishing a responsibility in preserving and developing the nation's coastal communities and resources. Coastal states with an approved coastal zone management program are authorized to review certain federal actions affecting the land or water uses or natural resources of its coastal zone for consistency with its program. Under the CZMA, a state may review: activities conducted by, or on behalf of, a federal government agency within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone; an application for a federal license or permit; and any plan for the exploration or development or, or production from, any area that has been leased under the Outer Continental Shelf Lands Act for offshore minerals exploration or development. The CZMA requires federal agency activities to be consistent to the maximum extent practicable with the enforceable policies of a state's approved coastal zone management program.

1.5 Proposed Action

The applicant is proposing a pilot-scale project where up to 20,000 almaco jack (*Seriola rivoliana*, i.e., Kampachi) fingerlings will be reared in a single net pen aquaculture system in federal waters approximately 45 miles west, southwest of Longboat Pass-Sarasota Bay, Florida. Project details are provided in *Section 1.7.3 Summary of Proposed Project Activities*.

The proposed action is the issuance of a permit under the respective authorities of the EPA as required to operate the facility. The EPA's proposed action is the issuance of a NPDES permit that authorizes the discharge of pollutants from an aquatic animal production facility that is considered a point source into federal waters of the United States. In addition, the USACE proposed action is the issuance of a Letter of Permission (LOP) pursuant to Section 10 that authorizes anchorage to the sea floor, and structures affecting navigable waters.

1.6 Purpose and Need for the Proposed Action

The applicant seeks permits and authorizations for the VE project which is a single net pen demonstration project for open ocean aquaculture of marine finfish in federal waters of the Gulf. The EPA and the USACE are the two federal agencies that are statutorily required to issue permits and authorizations for this type of operation. The EPA and USACE agency specific purpose and need for the proposed project are as follows:

EPA

On November 9, 2018, the EPA Region 4 received a complete application for a NPDES permit from the applicant (Ocean Era) for the discharge from a marine aquaculture facility into federal waters of the Gulf. The proposed action is the issuance of a new NPDES individual permit for discharges from a new aquaculture facility into federal waters of the Gulf. The proposed facility would be the first aquaculture facility to operate and discharge in federal waters of the eastern Gulf and, thus, the significance of any impacts to the environment from such a facility are not fully known. Consistent with 40 CFR Section 6.205(a), the EA was prepared for the proposed action under EPA's *Voluntary Policy for the Preparation of NEPA Documents*. The applicant needs an NPDES permit in order to operate and discharge from its proposed aquaculture facility in compliance with the CWA.

USACE

Operators must obtain a Section 10 permit prior to installing any offshore aquaculture infrastructure, such as net pens and lines, provided that it is an "installation or other device" and is attached to the seabed. The applicant needs a DA authorization in order to operate its proposed aquaculture facility in compliance with Section 10.

On November 10, 2018, the USACE Jacksonville District received a complete application for a DA permit pursuant to Section 10 for structures and work affecting navigable waters from Ocean Era. The USACE evaluated this project pursuant to a LOP pursuant to 33 CFR 325.2(b)(2) and (e)(1). Pursuant to 325, Appendix B (6) Categorical Exclusions, all applications which qualify as letters of permission (as described at 33 CFR 325.2(b)(2) are categorically excluded from NEPA as they are not considered to be major Federal actions significantly affecting the quality of the human environment.

For the purposes of this EA, the Section 10 Permit and LOP will be used interchangeably. The LOP will be valid for five years. However, the applicant proposes a pilot-scale aquaculture system that will raise approximately 20,000 almaco jack over an 18-month project period. An LOP was determined appropriate for this action due to the small scale and temporary nature of the proposed pilot project.

1.7 Site Selection

Two potential site locations, approximately five nautical miles apart, were identified along the 40-meter (m) isobath after an extensive preliminary siting analysis conducted with NOAA's National Ocean Service National Centers for Coastal Ocean Science (NOS NCCOS) staff. Preliminary analysis used a number of site criteria including: proximity to a commercial port, adequate water depths (at least 130 ft) to allow net pen submersion and maximize mooring scope, avoidance of hardbottom habitats, artificial reefs and submerged cultural resources (e.g., shipwrecks), areas consisting of unconsolidated sediments for positioning the anchors, avoidance of marine protected areas (MPAs), marine reserves, and Habitats of Particular Concern (HAPCs). Selection criteria also considered the presence of navigational fairways, vessel traffic routes, anchoring areas, lightering zones, deepwater ports, platform safety zones, military zones, fisheries and tourism areas, dredging sites, mineral extraction areas, designated dredge material dumping sites, rights of way for energy transmission lines and communications cables, and scientific reference sites and fishery conflicts.

A baseline environmental survey (BES) (Appendix A) of both sites was commissioned by the applicant to determine if the sites were clear of sensitive live bottom habitat, potential hazards, and potential archeological and historic features not present in the data sets used in the preliminary site analysis. The BES was also used for engineering analysis by determining whether selected sites contained sufficiently deep layers of unconsolidated sediments suitable for cage anchors. Benthic surveys using sidescan sonar, sub-bottom profiling, and towed magnetometer data determined that the seafloor at both locations were free of any exposed pipelines, marine debris, underwater wrecks and cultural resources. This site screening process informed federal agencies of viable action alternatives and non-viable alternatives as part of the NEPA process.

1.7.1 Description and Location

The proposed facility will be located within the boundary of the coordinates shown in Table 5. The boundary of the facility is ~45 miles southwest of Sarasota, Florida and consists of water depths of ~130 feet which is conducive for placement of the single cage and multi-anchor system (MAS).

The applicant will select a specific location within that area based on diver-assisted assessments of the sea floor when the cage and MAS are deployed. See *Appendix A* for additional information on the project boundary.

Table 5. Velella Epsilon Boundary Coordinates

Location	Latitude	Longitude
Upper Left Corner	27° 7.70607' N	83° 12.27012' W
Upper Right Corner	27° 7.61022' N	83° 11.65678' W
Lower Right Corner	27° 6.77773' N	83° 11.75379' W
Lower Left Corner	27° 6.87631' N	83° 12.42032' W

1.7.2 Surrounding Location Uses

The proposed area is located on a portion of the west Florida Shelf that is heavily trawled by the shrimp fishing industry. Additionally, large portions of the west Florida Shelf are designated as military special use airspace. To avoid user conflicts in this area, the applicant coordinated closely with the military and the shrimping industry during the site selection process.

1.7.3 Summary of Proposed Project Activities

The proposed project activities include operation of a pilot-scale marine aquaculture facility with up to 20,000 almaco jack (*Seriola rivoliana*; i.e., Kampachi) being reared in federal waters for a period of approximately 12 months (total deployment of the cage system is 18 months), which will represent one production cycle. Based on an estimated 85% (percent) survival rate, the operation is expected to yield approximately 17,000 fish. Final fish size is estimated to be approximately 4.4 lbs./fish, resulting in an estimated final maximum harvest weight of 80,000 lbs. (considering a 90% survival rate). The fingerlings will be sourced from brood stock that are located at Mote Aquaculture Research Park and were caught in the Gulf near Madeira Beach, Florida. As such, only F1 progeny will be stocked into the proposed project. Following harvest, cultured fish would be landed in Florida and sold to federally-licensed dealers in accordance with state and federal laws.

A single offshore strength (PolarCirkel-style) submersible fish pen will be deployed on an engineered MAS mooring system. The design provided by the applicant for the engineered MAS will use embedment anchors for the mooring system. The cage material for the proposed project is constructed with rigid and durable materials (copper mesh net with a diameter of 4 millimeter (mm) wire and 40mm x 40 mm mesh square). The mooring lines for the proposed project will be constructed of steel chain (50mm thick) and thick rope (36mm) that are attached to a floating cage that will rotate in the prevailing current direction; the floating cage position that is influenced by the ocean currents will maintain the mooring rope and chain under tension during most times of operation. The bridle line that connects from the swivel to the cage will be encased in a rigid pipe. Structural information showing the MAS and pen array, along with the tethered tender vessel, is provided in *Appendix B*.

The cage design is flexible and self-adjusts to suit the constantly changing wave and current conditions. As a result, the system can operate floating on the ocean surface or submerged within the water column of the ocean. When a storm approaches the area, the operating team uses a valve to flood the floatation system with water, causing the entire cage array to submerge. A buoy remains on the surface, marking the net pen's position and supporting the air hose. When the pen approaches the bottom, the system will maintain the cage several meters above the sea floor. Submerged and protected from the storm above, the system is still able to rotate around the MAS and adjust to the currents. After storm events, facility staff makes the cage system buoyant, causing the system to rise back to the surface or near surface position to resume normal operational conditions. The proposed project cage will have at least one properly functioning global positioning system device to assist in locating the system in the event it is damaged or disconnected from the mooring system.

At the conclusion of the 18-month demonstration trial period, the net pen and all mooring equipment would be removed from the site and hauled to shore for proper cleaning and storage. For a detailed schematic of the pen design see *Appendix B*.

1.8 Documents incorporated by reference

The NEPA implementing regulations direct agencies to develop succinct NEPA documents and incorporate material by reference when appropriate without impeding agency and public review of the action (see 40 CFR Section 1502.21). Therefore, the EPA is incorporating the following documents and references for this EA:

- NMFS' 2008 Programmatic Environmental Impact Statement (PEIS), NMFS proposed regional regulations: *Fishery Management Plan to Promote and Manage Marine Aquaculture within the Gulf of Mexico Exclusive Economic Zone*.

- USEPA Region 4's 2016 Environmental Assessment (EA) for *National Pollutant Discharge Elimination System (NPDES) Permit for Eastern Gulf of Mexico Offshore Oil and Gas Exploration, Development, and Production*

- NOAA Fisheries' 2016 final rule: *the FMP for Regulating Offshore Aquaculture in the Gulf of Mexico*

- 40 CFR Part 6 – *Procedures for Implementing the National Environmental Policy Act and Assessing the Environmental Effects Abroad of EPA Actions.*

- 2016 Interagency Memorandum of Understanding for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf of Mexico.

2.0 Alternatives

The EPA considered two alternatives for the proposed VE project in this EA. Alternatives considered include a No Action Alternative (Alternative 1) and issuance of a NPDES permit for the facility (Alternative 2).

2.1 Alternative 1--No Action

Under the no-action alternative, the EPA would not issue a NPDES permit for the proposed VE project. The effects of the no action alternative are described in Chapter 3, Affected Environment, in which no structures or pens would exist at the site location.

2.2 Alternative 2 --Issuance of NPDES Permit and Section 10 Authorization

Under Alternative 2, the EPA would issue a NPDES permit for the proposed VE project. This Alternative complies with the statutory requirements of the CWA.

2.3 Alternatives Considered but Eliminated from Detailed Study

As discussed in *Section 1.7 Site Selection*, multiple sites were considered for the proposed project site. An extensive screening process was undertaken by the applicant to evaluate these alternative sites. Sites originally considered but identified in the BES (Appendix A) as non-viable were eliminated from further consideration for not meeting the necessary criteria. For the purposes of NEPA, these alternative sites have been eliminated for consideration by the EPA and USACE and are not carried forward for analysis in this EA.

2.4 Factors Used to Develop and Screen Alternatives

As required by 40 CFR Section 1502.14, the EPA is required to rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for elimination. The EPA is also required to devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits. In addition, the EPA must include reasonable alternatives not within the jurisdiction of the lead agency and include the alternative of no action.

As part of the NEPA process, the EPA must identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference. The EPA must also include appropriate mitigation measures not already included in the proposed action or alternatives.

The EPA has included both action and no action alternatives in this EA. Rationale for alternatives eliminated for additional study is provided in Chapter 1. We provide a detailed discussion on the proposed action and the levels of impacts compared to the no action alternative in Chapters 4. Chapter 5 describes cumulative impacts in the context of the proposed action. Chapter 6 provides the agency preference and rationale for the preferred alternative. Protective measures and mitigation measures for the proposed action are described throughout this EA and all supporting documents.

3.0 Affected Environment

3.1 Introduction

This chapter describes the existing environment potentially affected by the proposed action through issuance of required federal permits and authorizations. The current status of each potentially affected resource is discussed below, including physical resources (Section 3.2), biological resources (Section 3.3), and social and economic environment (Section 3.4). This chapter describes the potentially affected resources prior to the proposed action as a point of comparison for evaluating the consequences or impacts resulting from the proposed action. Resources that are not expected to be impacted (e.g. wetlands) by the proposed action are not discussed in this chapter and therefore are not carried forward for analysis.

The discussion in this section is primarily focused on the proposed location for the VE project, which is in the eastern Gulf (west Florida Shelf) approximately 45 miles southwest of Sarasota, Florida. The applicant will utilize existing land-side facilities such as boat docks and hatcheries for all other aspects that are not analyzed in this section.

The EPA used several sources of information to develop this chapter including but not limited to the *Final Environmental Assessment, National Pollutant Discharge Elimination System (NPDES) Permit for Eastern Gulf of Mexico Offshore Oil and Gas Exploration, Development, and Production, 2016*. The *ODC Evaluation* in *Appendix C, Ocean Era – Velella Epsilon Net Pen Fish Culture Facility and the NPDES Permit [FL0A00001] Outer Continental Shelf, Gulf of Mexico*, and *Draft Biological Evaluation – Ocean Era, LLC – Velella Epsilon, Marine Aquaculture Facility, Outer Continental Shelf Federal Waters of the Gulf of Mexico, March 15, 2019 in Appendix D* provide expanded discussions on the physical and biological environments in the eastern Gulf and the general area of the proposed VE project.

3.2 Physical Resources

Ocean currents on the west coast of Florida were studied for 308 days at the Tampa Ocean Dredged Material Disposal Site (ODMDS), located approximately 18 miles west of Tampa Bay, approximately 27-meters (m) deep, during the 2008-2009 time period (EPA, 2012). Measured currents in this study are consistent with previous studies at the Tampa ODMDS in the 1980s revealing that currents flowed predominately to the south and southeast with mean near bottom current velocities between 5 and 8 cm/sec. Ocean currents were also measured at a NOAA buoy (Station 42022) located along the 50-meter isobath approximately 45 miles north-east of the project location from 2015 to 2018. Currents at this location average 3-5 centimeters per second (cm/sec) higher than at the Tampa ODMDS. Currents at both locations were shown to have a dominant southerly direction in the winter and northerly direction in the summer consistent with circulatory current patterns of the eastern Gulf. Tides can dominate the currents at the Tampa ODMDS, but most often they are dominated by other forces (e.g. surface winds and the Gulf Loop Current). Tidal influence should be less pronounced further offshore.

Offshore habitats in the proposed project area include the water column and the sea floor. The west Florida Shelf extends seaward of Sarasota Bay approximately 200 kilometer (km) to a depth of 200 m and consists mainly of unconsolidated sediments punctuated by low-relief rock outcroppings and several series of high relief ridges. The seafloor on the west Florida Shelf in the proposed project area consists mainly of coarse to fine grain sands with scattered limestone outcroppings making up about 18 percent of the seafloor habitat. These limestone outcroppings provide substrata for the attachment of macroalgae, stony corals, octocorals, sponges and associated hard-bottom invertebrate and reef fish communities (EPA, 1994). Unconsolidated (soft) sediments provide habitat for benthic macroinvertebrate communities, consisting of several hundred species and provide an important source of forage for benthic and demersal fishes and shellfish.

3.2.1 Water Quality

Water quality studies have been conducted at the Tampa ODMDS, located approximately 18 miles west of Tampa Bay. During a 2013 EPA Status and Trends study of the Tampa ODMDS the following water quality parameters in the water column were evaluated: conductivity, dissolved oxygen (DO), salinity, temperature, density, and turbidity and conducted laboratory analysis for nutrients, metals, polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides and butyltins. Temperatures recorded ranged from 29.77 to 29.98 degrees Centigrade (^{o}C), while salinity ranged from 35.47 to 35.88 parts per thousand (ppt), DO ranged from 5.99 to 6.19 mg/L, and density ranged from 22.14 to 22.99 sigma-T.

The results from chemical analyses of the water samples collected during that study revealed, with the exception of six metals, all other analytes were either not detected at or above the reporting limit or the reported values were flagged as estimates. The six detected metals and their range of values (in micrograms per liter or ug/L) are arsenic (1.0 – 1.09), chromium (0.21 -0.49), copper (0.119 -0.139), lead (0.025), nickel (0.21 – 1.74), and zinc (0.53 – 1.47). All of these values are below levels of concern.

3.2.1.1 Deepwater Horizon Spill

On April 20, 2010, the Deepwater Horizon (DWH) oil drilling rig operating 47 miles southeast of Louisiana in the Mississippi Canyon Block 252 of the Gulf, exploded and sank killing 11 workers and releasing the largest marine oil spill disaster in the U.S. history of marine oil drilling operations. Four million barrels of oil flowed over an 87-day period from the damaged Macondo oil well, before the well was finally capped on July 15, 2010 (EPA, 2017). The oil spill's surface extent exceeded 19,305 square miles and ranged from central Louisiana to the Florida Panhandle (EPA, 2017). The Macondo well is located more than 300 miles North/Northwest of the proposed location of the VE project. The Final Programmatic Damage Assessment and Restoration Plan (PDARP) and Final Programmatic Environmental Impact Statement (PEIS) describes the impacts of DWH.[3] a

[3] The PEIS can be found at: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan/.

3.2.1.2 Red Tide Outbreaks

During the month of October 2017, a bloom of the Florida red tide organism, *Karenia brevis*, broke out in Southwest Florida and extended from Pinellas to northern Collier counties, along approximately 145 miles of coastline at its height. The bloom persisted for over a year and resulted in large scale fish kills, as well as sea turtle and manatee mortality. A state of emergency was declared for seven Florida counties, including Lee, Collier and Charlotte, due to the impact of red tide. *Karenia brevis* is still occurring in several locations along the coast. Updates on red tide occurrence off the west coast of Florida can be found online.[4]

Nutrient addition to the Gulf is of concern because they can contribute to harmful algal blooms (HABs); however, quantitative direct links to marine aquaculture are lacking in the scientific literature. HABs are on the rise in frequency, duration, and intensity in the Gulf, largely because of human-induced activities (Corcoran, Dornback, Kirkpatrick, & Jochens, 2013). Of the more than 70 HAB species occurring in the Gulf, the best-known is the red tide organism, *Karenia brevis*, which blooms frequently along the west coast of Florida. Macronutrients, micronutrients and vitamins characteristic of fish farms can be growth-promoting factors for phytoplankton. However, a NPDES permit is being issued with conditions to monitor the discharge and protect water quality. The overall pollutant loading of the project should be minimal given the small production levels. Additionally, it is not expected that aquaculture-related pollutants will be measured in the water within 5-10meters from the project.

The primary nutrients of interest in relation to open ocean aquaculture are nitrogen and phosphorus; both may cause excess growth of phytoplankton and lead to aesthetic and water quality problems. Generally, in marine waters, phytoplankton growth is either light or nitrogen limited, and phosphorus is not as critical a nutrient as it is in fresh water (Ryther, 1971; Welch, 1980). However, it has been shown that because nutrient fluctuations in the Gulf can be significant due to the large inputs from river systems, both nitrogen limitation and phosphorus limitation can happen concurrently in different locations (Turner & Rabalais, 2013).

3.2.1.3 Pharmaceuticals

Diseases may occur in net-pen systems because water moves freely between net-pens and the open marine environment, allowing the transmission of pathogens between wild and farmed fish (Rust, et al., 2014). Fish diseases occur naturally in the wild, but their effects often go unnoticed because moribund or dead animals quickly become prey for other aquatic animals. Clinical disease occurs only when sufficient numbers of pathogens encounter susceptible fish under environmental conditions that are conducive to disease (Rose, Ellis, & Munro, 1989). Fisheries managers are concerned about the risk of pathogen amplification on farms followed by transmission of pathogens from farmed to wild fish, as well as the introduction of nonnative pathogens and parasites when live fish are moved from region to region. Aquaculture facilities may use a number of measures, including vaccines, probiotics, limiting culture density, high-quality diets, and use of antibiotics, which are effective at preventing and controlling bacterial

[4] http://www.myfwc.com/RedTideStatus.

diseases. Antibiotics are considered a method of last resort and are being replaced by other sound management approaches.

3.2.2 Sediment Quality

The EPA (EPA, 2014) analyzed sediments at the Tampa ODMDS for the following parameters: particle size, total organic carbon, heavy metals, nutrients including total phosphorous (TP), NO_2+NO_3 (Nitrites and nitrates), NH_3 (Ammonia), and Total Kjeldahl Nitrogen (TKN), and extractable organic compounds (e.g., Polyaromatic hydrocarbons or PAHs), pesticides, and Polychlorinated biphenyls or PCBs.

All stations were shown to be predominantly sand, ranging from a low of 73.4 % sand to a high of 97.3 % sand. Silt/clay fractions ranged from 0.3 to 26.7 %. Total organic carbon (TOC) results ranged from 0.18 – 0.38 %. The amount of percent solids found for the Tampa ODMDS samples ranged from 68.3 – 82.4 %. The sediment chemistry showed all contaminants, except for metals, to be at or below detection limits. For the thirteen metals analyzed, nine were found to be detectable at one or more sample locations. However, the very low concentration results were not of a significant concern. This sediment data represents the best available information for sediment quality in the region of the proposed action.

3.2.3 Air Quality

In the vicinity of the proposed action, Section 328 of the Clean Air Act Amendments of 1990 (CAA) authorized EPA to establish air-emission control requirements for Outer Continental Shelf (OCS) sources located off Florida's Gulf coast eastward of the 87°30' W longitude. The purpose of these air-control requirements is the attainment and maintenance of federal and state ambient air quality standards and the compliance with the CAA's provisions to prevent significant deterioration of air quality. The EPA Region 4 currently administers the air quality program in the eastern Gulf and the Department of Interior (DOI) is authorized to regulate air emissions in the western Gulf west of 87°30' W longitude (EPA, 2016).

The CAA requires the EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants (criteria air pollutants) to protect human health and welfare (EPA, 2018a). NAAQS have been designated for these six criteria pollutants: carbon monoxide, ozone, sulfur dioxide, nitrogen dixoide, Particulate Matter, particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM10), and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and lead (EPA, 2018b). The EPA is required to designate areas that meet (attainment) or do not meet (nonattainment) these 6 NAAQS to ensure compliance with air quality standards. Additionally, the CAA requires states to develop a general plan (State Implementation Plans) to attain and maintain the NAAQS. For those areas in nonattainment with NAAQS, the states are required to develop a specific plan to achieve attainment for all standards responsible for an area's nonattainment status (EPA, 2018c).

The Gulf has no fixed air quality monitoring stations. Beyond the states' seaward boundaries, the Gulf is listed as unclassified with respect to NAAQS attainment. Consequently, the only available air quality data relevant to the Gulf is that data collected by the states of Mississippi, Alabama, and Florida's Gulf coastal counties. The comparison of year 2014 to 2005 air quality data for the coastal counties for these three states indicate that the overall air quality has improved. There are no non-attainment areas along the Gulf's central and eastern coast as of 2020. The greater Tampa/St Petersburg area within Hillsborough County, Florida is a maintenance area that has been redesignated from nonattainment (EPA, 2016).

When any new source of air-pollutant emissions meeting a major status is proposed, the CAA's Prevention of Significant Deterioration (PSD) provisions are triggered. These provisions include: the installation of the "Best Available Control Technology" (BACT); an air quality analysis; an additional impacts analysis; and public involvement (EPA, 2018d).

The purpose of the PSD provisions is to assure that any decision to permit increased air pollution in certain areas is made only after careful evaluation of all the consequences of such a decision and after adequate procedural opportunities for informed public participation in the decision making process. The focus is to protect the public health and welfare; preserve, protect, and enhance the air quality in Class I areas, such as areas of special national or regional natural, recreational, scenic, or historic value, including national parks, national wilderness areas, national monuments, and national seashores; and insure that economic growth will occur in a manner consistent with the preservation of existing clean air resources. The closest Class I area to the vicinity of the proposed action is the Breton National Wildlife Refuge (NWR) and Wilderness area offshore southeastern Louisiana near the seaward boundaries of Mississippi and Alabama (EPA, 2016). The Refuge is comprised of a series of barrier islands including Breton Island and the Chandeleur Islands in the Gulf.

3.2.4 Coastal Barrier Beaches

The Gulf is characterized by a broad spectrum of sediments, sediment transport processes, and environments that vary along the spectrum from coastal shores to deep water. Waves, tides, currents, and gravity are the primary transporters of sediments. The coastal sedimentary environments include: beaches, tidal inlets, tidal flats, wetlands, and estuaries that are dominated by sediments originating from land (terrigenous sediments) (Ward, 2017). The proposed action is to be located in approximately 40 m water depth off southwest Florida, generally located approximately 45 miles west, southwest of Longboat Pass-Sarasota Bay, Florida. There are several coastal barrier islands 1-2 miles off shore and in the vicinity of Sarasota to include Siesta Key, Lido Key, Long Boat key, Manasota Key, etc. The islands are highly developed with residential and businesses catering to tourism and recreation.

3.2.5 Noise Environment

The proposed project is located on the west Florida Shelf, approximately 45 miles southwest of Sarasota, Florida in federal waters. Ambient noise from wind, waves, and periodic noise from occasional boat and vessel traffic are expected. The facility is not expected to make a significant contribution to ambient noise and to current open operation noise.

3.2.6 Climate

The effect of ongoing human-caused climate change makes the Gulf environment vulnerable to rising ocean temperatures, sea level rise, storm surge, ocean acidification, and significant habitat loss. Cores from corals, ocean sediments, ice records, and other indirect temperature measurements indicate the recent rapid increase of ocean temperature is the greatest that has occurred in at least the past millennium and can only be reproduced by climate models with the inclusion of human-caused sources of heat-trapping gas emissions. While the long-term global sea surface temperature pattern is clear, there is considerable variability in the effects of climate change regionally and locally because oceanographic conditions are not uniform and are strongly influenced by natural climate fluctuations (Doney, et al., 2014).

Certain areas along the Atlantic and Gulf coasts are undergoing relatively rapid sea water inundation and associated landscape changes because of the prevalence of low-lying coastal lands in combination with altered hydrology and land subsidence. The combination of sea level rise and land subsidence is forecast to result in various changes in the distribution and abundance of coastal wetlands and mangroves, which could damage habitat functions for many important fish and shellfish populations (BOEM, 2016). Shellfish populations also are at risk from ocean acidification. Increases in water temperatures will alter the seasonal growth and geographic range of harmful algae and certain bacteria, such as *Vibrio parahaemolyticus,* which was responsible for human illnesses associated with oysters harvested from the Gulf and northern Europe (Doney, et al., 2014).

3.3 Biological Resources

Biological resources refer to plant and animal communities and associated habitat that they comprise or, that provides important support to critical life stages. This section focuses primarily on the biological resources occurring in the eastern Gulf and in the area of the proposed VE project. The following sub-sections provide a discussion on the biological setting of the eastern Gulf and resources such as birds, reptiles, fish, marine mammals, marine invertebrates, plants, and fish species that may occur in the project area.

The west Florida Shelf extends seaward of Sarasota Bay approximately 200 km to a depth of 200 m and consists mainly of unconsolidated sediments punctuated by low-relief rock outcroppings and several series of high relief ridges. The seafloor on the west Florida Shelf in the immediate vicinity of the proposed project area consists mainly of coarse to fine grain sands with scattered limestone outcroppings making up about 18% of the seafloor habitat. These limestone outcroppings provide substrata for the attachment of macroalgae, stony corals, octocorals, sponges and associated hard-bottom invertebrate and fish communities (EPA, 1994).

A 2010 survey of the Tampa ODMDS site 18 miles west of Tampa Bay, (70 miles northeast of the proposed VE site) showed that the dominant substrata at the natural bottom sites in the area consisted of sand, live coral, coralline algae, sponge, hydroid, octocorals, rubble, macro algae rock, and turf algae. Macro invertebrate counts at the natural bottom sites were dominated by gastropods, crabs, sea urchins, bivalves and several scelacterian corals including, blushing star coral (*Stephanocoenia intersepta*), tube coral (*Cladocora arbuscular*), smooth star coral

(*Solenastrea bournoni*), thin finger coral (*Porites divaricate*), solitary disc corals such as *Scolymias,* and the sinuous cactus coral (*Isophyllia sinuosa*).

3.3.1 Fish

The Gulf has a diverse ichthyofaunal community consisting of more than 1400 finfish species, over 51 shark species, and at least 49 species of rays and skates. About 900 marine fishes occur off the west Florida coast, occupying all benthic and pelagic habitats, including many managed fish stocks of great commercial and recreational importance. There are also a number of fish species that are protected under the ESA.

Of the ESA-listed fish species, only the smalltooth sawfish (*Pristis pectinate*), giant manta ray (*Manta birostris*), and oceanic whitetip shark (*Carcharhinus longimanus*), may occur in the vicinity of the VE project and the presence of even these species is likely rare. The aquaculture facility proposed sites are more than 250 miles south of the Suwannee River, the southernmost river with a reproducing population of gulf sturgeon (*Acipenser oxyrinchus desotoi*). There are rare captures of Gulf sturgeon in the bays, estuaries, and nearshore Gulf off Tampa Bay and Charlotte Harbor during the cool winter months, but no reported captures in offshore waters. nassau grouper (*Epinephelus striatus*), also listed under ESA, are generally absent from the Gulf north and outside of the Florida Keys; this is well documented by the lack of records in Florida Fish and Wildlife Conservation Commission's, Fisheries Independent Monitoring data as well as various surveys conducted by NOAA Fisheries Southeast Fisheries Science Center (SEFSC). Based on this information, we believe both Gulf sturgeon and nassau grouper will not be present.

The smalltooth sawfish is a tropical marine and estuarine elasmobranch. Smalltooth sawfish primarily occur in the Gulf off peninsular Florida and are most common off Southwest Florida and the Florida Keys. There are distinct differences in habitat use based on life history stage as the species shifts use through ontogeny. Juvenile smalltooth sawfish less than 220 cm, inhabit the shallow euryhaline waters (i.e., variable salinity) of estuaries and can be found in sheltered bays, dredged canals, along banks and sandbars, and in rivers (NMFS, 2000). As juveniles increase in size, they begin to expand their home ranges (Simpfendorfer, Wiley, & Yeiser, 2010; Simpfendorfer, et al., 2011), eventually moving to more offshore habitats where they likely feed on larger prey as they continue to mature. While adult smalltooth sawfish may also use the estuarine habitats used by juveniles, they are commonly observed in deeper waters along the coasts. Poulakis and Seitz (2004) noted that nearly half of the encounters with adult-sized smalltooth sawfish in Florida Bay and the Florida Keys occurred in depths from 200-400 ft (70-122 m) of water. Similarly, Simpfendorfer and Wiley (2005) reported encounters in deeper waters off the Florida Keys, and observations from both commercial longline fishing vessels and fishery-independent sampling in the Florida Straits report large smalltooth sawfish in depths up to 130 ft (~40 m) (International Sawfish Encounter Database, 2014). Even so, NMFS believes adult smalltooth sawfish use shallow estuarine habitats during parturition (when adult females return to shallow estuaries to pup) because very young juveniles still containing rostral sheaths are captured in these areas. Since very young juveniles have high site fidelities, they are likely birthed nearby or in their nursery habitats. Smalltooth sawfish feed primarily on teleost and elasmobranch fishes at all lifestages even though sawfish move from estuarine to coastal habitats during their ontogeny (Poulakis, et al., 2017).

The oceanic whitetip shark is a large open ocean highly migratory apex predatory shark found in subtropical waters around the globe. It is usually found offshore in the open ocean, on the OCS or around oceanic islands in deep water greater than 184 m, occurring from the surface to at least 152 m depth. Occasionally, it is found close to land, in waters as shallow as 37 m (~120 ft.), mainly around mid-ocean islands, or in areas where the continental shelf is narrow with access to nearby deep water. Oceanic whitetip sharks feed mainly on teleosts and cephalopods (Backus, Springer, & Arnold, 1956; Bonfil, Clarke, & Nakano, 2008), but studies have also reported that they consume sea birds, marine mammals, other sharks and rays, mollusks, crustaceans, and even garbage (Compagno, 1984; Cortes, 1999). Backus, Springer, and Arnold (1956) recorded various fish species in the stomachs of oceanic whitetip sharks, including blackfin tuna, barracuda, and white marlin. The available evidence also suggests that oceanic whitetip sharks are opportunistic feeders.

On January 22, 2018, NOAA Fisheries published a final rule listing the giant manta ray (*Manta birostris*) as threatened under the ESA effective February 21, 2018 (83 FR 2916). The giant manta ray is the largest living ray, with a wingspan reaching a width of up to 9 m (29.5 ft), and an average size between 4-5 m (15-16.5 ft). The giant manta ray is found worldwide in tropical subtropical, and temperate seas. These slow-growing, migratory animals are circumglobal with fragmented populations. Giant manta rays make seasonal long-distance migrations, aggregate in certain areas and remain resident, or aggregate seasonally (Dewar, et al., 2008; Graham, et al., 2012; Girondot, et al., 2015; Stewart, Hoyos-Padilla, Kumli, & Rubin, 2016). Giant manta rays are seasonal visitors along productive coastlines with regular upwelling, in oceanic island groups, and near offshore pinnacles and seamounts. The timing of these visits varies by region and seems to correspond with the movement of zooplankton, current circulation and tidal patterns, seasonal upwelling, seawater temperature, and possibly mating behavior. They have also been observed in estuarine waters near oceanic inlets, with use of these waters as potential nursery grounds (Adams & Amesbury, 1998; Milessi & Oddone, 2003; Medeiros, Luiz, & Domit, 2015; Pate). Giant manta rays primarily feed on planktonic organisms such as euphausiids, copepods, mysids, decapod larvae and shrimp, but some studies have noted their consumption of small and moderately sized fishes (Miller & Klimovich, 2017). When feeding, giant manta rays hold their cephalic lobes in an “O” shape and open their mouth wide, which creates a funnel that pushes water and prey through their mouth and over their gill rakers. They use many different types of feeding strategies, such as barrel rolling (doing somersaults repeatedly) and creating feeding chains with other mantas to maximize prey intake.

3.3.2 Invertebrates

Of the more than 15,000 species of animals in the Gulf, more than 13,000 are invertebrates. Like fishes, marine invertebrates are distributed throughout the Gulf and they occupy all marine habitats. Some species of crabs, shrimps and lobster, etc., make up important managed fishery stocks and several invertebrate species are protected under ESA.

Marine invertebrates currently protected under ESA include a number of species of stony coral (i.e., elkhorn (*Acropora palmata*), staghorn (*Acropora cervicornis*), pillar (*Dendrogyra cylindrus*), rough cactus coral (*Mycetophyllia ferox*), lobed star (*Orbicella annularis*), mountainous star (*Orbicella faveolata*), and boulder star (*Montastrea annularis*). The listed coral species do not occur in or near the VE project. Of the seven ESA-listed coral species in the Gulf, four (elkhorn, lobed star, mountainous star, and boulder star) are known to occur in the Flower Banks National Marine Sanctuary, located 70 to 115 miles off the coast of Texas and Louisiana and all seven are known to occur near the Dry Tortugas, a small group of islands located in the Gulf approximately 67 miles west of Key West, Florida.

3.3.3 Marine Mammals

There are 22 marine mammal species protected by the MMPA occurring in the Gulf, a manatee (under Fish and Wildlife Service jurisdiction) and 21 cetacean species (dolphins and whales; all under NOAA Fisheries' jurisdiction). Two of the marine mammals, sperm whales (*Physeter macrocephalus*) and manatees (genus *Trichechus*), have been protected under the ESA for many years and an unnamed subspecies, the Gulf bryde's whale (*Balaenoptera edeni*), was just listed as endangered under the ESA (81 FR 88639).

The manatee species in the Gulf, western indian manatee (*Trichechus manatus*) does not travel into offshore waters of the VE project area. In contrast, most of the Gulf cetacean species reside in the oceanic habitat (greater than or equal to 200 m). However, the atlantic spotted dolphin (*Stenella frontalis*) is found in waters over the continental shelf (10 m-200 m), and the common bottlenose dolphin (*Tursiops truncatus truncatus*) (hereafter referred to as bottlenose dolphin) is found throughout the Gulf, including within bays, sounds, and estuaries; coastal waters over the continental shelf; and in deeper oceanic waters. Consequently, bottlenose dolphins and atlantic spotted dolphins are the most likely marine mammal species that overlap with the facility's proposed sites. There are other marine mammal species that may overlap with the facility's proposed site, but these marine mammals are not known to use this habitat regularly or are likely extralimital or occasional migrants.

Bottlenose dolphins in the Gulf can be separated into demographically independent populations called stocks. Bottlenose dolphins are currently managed by NOAA Fisheries as 36 distinct stocks within the Gulf. These include 31 bay, sound and estuary stocks, three coastal stocks, one continental shelf stock, and one oceanic stock (Hayes, Josephson, Maze-Foley, & Rosel, 2017). Marine Mammal Stock Assessment Reports and additional information on these species in the Gulf are available on from the NOAA Fisheries Office of Protected Species.[5]

The bottlenose dolphin stock that overlaps with this action is the Northern Gulf continental shelf stock. The best abundance estimate for this stock is 51,192 with a resulting potential biological removal[6] of 469 (Waring, Josephson, Maze-Foley, & Rosel, 2016). This stock of dolphins inhabits waters from 20 m to 200 m deep from U.S.-Mexican border to the Florida Keys

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[5] http://www.nmfs.noaa.gov/pr/sspecies/.

[6] The potential biological removal (PBR) level is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. The PBR level is the product of the following factors— 1) The minimum population estimate of the stock; 2) One-half the maximum theoretical or estimated net productivity rate of the stock at a small population size; and3) A recovery factor of between 0.1 and 1.0.

(Waring, Josephson, Maze-Foley, & Rosel, 2016). Threats to this stock include fisheries entanglements (e.g., shark bottom hook and line and bottom longline, snapper-grouper and other reef fish bottom longline and hook and line, and trawl fisheries for butterfish (*Peprilus triacanthus*) and shrimp) that can result in serious injury or death (Waring, Josephson, Maze-Foley, & Rosel, 2016).

The atlantic spotted dolphin occurs primarily from continental shelf waters 10 m to 200 m deep to slope waters (Fulling et al., 2003; Mullin and Fulling, 2004; Maze-Foley and Mullin, 2006). The most recent best abundance estimate for this stock is 37,611. However, the potential biological removal is currently unknown given the lack of more current population surveys (Waring, Josephson, Maze-Foley, & Rosel, 2016). There tends to be a concentration of these animals over the Florida Shelf in the eastern Gulf and stretched westward to the Florida panhandle (Waring, Josephson, Maze-Foley, & Rosel, 2016). It has been suggested that this species may move inshore seasonally during the spring, but data supporting this proposition are limited (Caldwell & Caldwell, 1966; Fritts, et al., 1983). Threats to this stock include fisheries entanglements (e.g., pelagic longline and shrimp trawl gear) that can result in serious injury or death (Waring, Josephson, Maze-Foley, & Rosel, 2016).

3.3.4 Sea Turtles

Green sea turtles (*Chelonia mydas*) North Atlantic and South Atlantic district population segments (DPSs), hawksbill (*Eretmochelys imbricate*), kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and loggerhead (*Caretta Caretta*-Northwest Atlantic DPS) sea turtles are all highly migratory and travel widely throughout the Gulf. Several volumes exist that cover the biology and ecology of these species (Lutz & Musick, 1997; Lutz, Musick, & Wyneken, 2003; Wyneken, Lohmann, & Musick, 2013). Sea turtles are primarily diurnal and feed and rest intermittently during a typical day. Sea turtles can spend their nights sleeping at the surface while in deep water or on the bottom wedged under rocks in nearshore waters. Many divers have seen green turtles sleeping under ledges in reefs and rocks. Hatchlings typically sleep floating on the surface, and they usually have their front flippers folded back over the top of their backs.

Green sea turtle hatchlings occupy pelagic areas of the open ocean and are often associated with *Sargassum* rafts (Carr A. 1987; Walker, 1994). Pelagic stage Green sea turtles are thought to be carnivorous. Stomach samples of these animals found ctenophores and pelagic snails (Frick, 1976; Hughes, 1974). At approximately 20 cm to 25 cm carapace length, juveniles migrate from pelagic habitats to benthic foraging areas (Bjorndal, 1997). As juveniles move into benthic foraging areas a diet shift towards herbivory occurs. They consume primarily seagrasses and algae, but are also known to consume jellyfish, Sea salps, and sponges (Bjorndal, 1980; Bjorndal, 1997; Paredes, 1969; Mortimer, 1981; Mortimer, 1982). During the day, green turtles occupy shallow flats and seagrass meadows. In the evening, they return to their sleeping quarters of rock ledges, oyster bars and coral reefs. The diving abilities of all sea turtle species vary by their life stages. The maximum diving range of green sea turtles is estimated at 110m (360 ft.) (Frick, 1976), but they are most frequently making dives of less than 20 m (65 ft.) (Walker, 1994). The time of these dives also varies by life stage. The maximum dive length is estimated at 66 minutes, with most dives lasting from nine to 23 minutes (Walker, 1994). NOAA Fisheries and FWS removed the range-wide and breeding population ESA listings of the Green sea turtle and listed eight DPSs as threatened and three DPSs as endangered, effective May 6, 2016. Two of the Green sea turtle DPSs, the North Atlantic DPS and the South Atlantic DPS, occur in the Gulf and are listed as threatened.

The hawksbill sea turtle's pelagic stage lasts from the time they leave the nesting beach as hatchlings until they are approximately 22-25 cm in straight carapace length (Meylan A., 1988; Meylan & Donnelly, 1999). The pelagic stage is followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Little is known about the diet of pelagic stage hawksbills. Adult foraging typically occurs over coral reefs, although other hard-bottom communities and mangrove-fringed areas are occupied occasionally. Hawksbills show fidelity to their foraging areas over several years (van Dam & Diez, 1998). The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan A., 1988). Gravid (pregnant) females have been noted ingesting coralline substrate (Meylan A., 1984) and calcareous algae (Anderes Alvarez & Uchida, 1994), which are believed to be possible sources of calcium to aid in eggshell production. The maximum diving depths of these animals are unknown, but the maximum length of dives is estimated at 73.5 minutes, more routinely dives last about 56 minutes (Hughes, 1974).

Kemp's ridley sea turtle hatchlings are also pelagic during the early stages of life and feed in surface waters (Carr A., 1987; Ogren, 1989). After the juveniles reach approximately 20 cm carapace length they move to relatively shallow (less than 50m) benthic foraging habitat over unconsolidated substrates (Marquez, 1994). They have also been observed transiting long distances between foraging habitats (Ogren, 1989). Adult and sub-adult kemp's ridleys primarily occupy nearshore habitats that contain muddy or sandy bottoms where prey can be found. Kemp's ridleys feeding in these nearshore areas primarily prey on crabs, though they are also known to ingest mollusks, fish, marine vegetation, and shrimp (Shaver, 1991). The fish and shrimp kemp's ridleys ingest are not thought to be a primary prey item but instead may be scavenged opportunistically from bycatch discards or discarded bait (Shaver, 1991). Given their predilection for shallower water, kemp's ridleys most routinely make dives of 50 m or less (Soma, 1985; Byles, 1988). Their maximum diving range is unknown. Depending on the life stage, a kemp's ridley may be able to stay submerged anywhere from 167 minutes to 300 minutes, though dives of 12.7 minutes to 16.7 minutes are much more common (Soma, 1985; Mendonca & Pritchard, 1986; Byles, 1988). kemp's ridleys may also spend as much as 96% of their time underwater (Soma, 1985; Byles, 1988).

Leatherback sea turtles are the most pelagic of all ESA-listed sea turtles and spend most of their time in the open ocean. They will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these species regardless of life stage (Bjorndal, 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that these species can dive in excess of 1,000 m (Eckert, Eckert, Ponganis, & Kooyman, 1989) but more frequently dive to depths of 50 m to 84 m (Eckert, Nellis, Eckert, & Kooyman, 1986). Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Standora, Spotila, Keinath, & Shoop, 1984; Eckert, Nellis, Eckert, & Kooyman, 1986; Eckert, Eckert, Ponganis, & Kooyman, 1989; Keinath & Musick, 1993). Leatherbacks may spend 74% to 91% of their time submerged (Standora, Spotila, Keinath, & Shoop, 1984).

Loggerhead sea turtle hatchlings forage in the open ocean and are often associated with *Sargassum* rafts (Hughes, 1974; Carr A., 1987; Walker, 1994; Bolten & Balazs, 1995). The pelagic stage of these sea turtles is known to eat a wide range of things including sea salps, jellyfish, amphipods, crabs, syngnathid fish, squid, and pelagic snails (Brongersma, 1972). Stranding records indicate that when pelagic immature loggerheads reach 40 cm to 60 cm straight-line carapace length, they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic (Witzell W., 2002). Here they forage over hard- and soft-bottom habitats (Carr A., 1986). Benthic foraging loggerheads eat a variety of invertebrates with crabs and mollusks being an important prey source (Burke, Morreale, & Rhodin, 1993). Estimates of the maximum diving depths of loggerheads range from 211 m to 233 m (692-764 ft.) (Limpus & Nichols, 1988; Thayer, Bjorndal, Ogden, Williams, & Zieman, 1984). The lengths of loggerhead dives are frequently between 17 and 30 minutes (Thayer, Bjorndal, Ogden, Williams, & Zieman, 1984; Limpus & Nichols, 1988; Limpus & Nichols, 1994; Lanyon, Limpus, & Marsh, 1989) and they may spend anywhere from 80% to 94% of their time submerged (Limpus & Nichols, 1994; Lanyon, Limpus, & Marsh, 1989).

Of the five sea turtles species, loggerheads are the most abundant on the west Florida shelf. The west Florida shelf hard-bottom and live-bottom habitats provide long-term residence and foraging habitats for juvenile and adult loggerheads. The West Florida Shelf provides residence areas for post-nesting loggerheads from four of the five loggerhead recovery units identified by the NOAA Fisheries and the USFWS in their recovery plan for the northwest Atlantic loggerhead population (NOAA and FWS, 2008). Those four recovery units are peninsular Florida (Girard, Tucker, & Calmettes, 2009; Phillips, 2011; Ceriani, Roth, Evans, Weishampel, & Ehrhart, 2012; Foley, et al., 2013), the Dry Tortugas (Hart, et al., 2012), the northern Gulf of Mexico (Hart, et al., 2012; Foley, et al., 2013), and the northern Atlantic (Mansfield, 2006; Griffin, et al., 2013).

3.3.5 Birds

The marine and coastal birds that occur in the Gulf region for at least some portion of their life cycle are generally classified as seabirds, shorebirds, wetland birds, waterfowl, passerines, and raptors (EPA, 2016).

Seabirds include gulls, terns, loons, frigate birds, pelicans, tropicbirds, cormorants, gannets, boobies, storm-petrels, and shearwaters. They spend a large portion of their lives on or over seawater and may be found both in offshore and coastal waters of the Gulf. They feed on fish and invertebrates; their temporal occurrence varies greatly. Some seabirds, e.g., boobies, petrels, and shearwaters, only occur in open ocean habitats, including deeper waters of the continental slope and basin. Most seabird species of the Gulf are found in the continental shelf and adjacent coastal and inshore habitats.

Shorebirds include plovers, oystercatchers, stilts, avocets, and sandpiper. Shorebirds typically are small wading birds that feed on invertebrates in shallow waters and along beaches, mudflats, and sand bars. Shorebirds are generally restricted to coastline margins except when migrating. Shorebirds are generally solitary or occur in small- to moderate-sized flocks, although large aggregations of several species can occur during migration.

There are 14 federally-listed avian species identified as threatened or endangered, previously delisted, or as candidate species in the eastern Gulf of Mexico. Three species are listed as threatened; eight species are listed as endangered; and three species are delisted. Of those species, only two listed species are considered in this EA because their behavior and range could expose them to activities covered under the proposed action: piping plover (*Charadrius melodus*) and red knot (*Calidris canutus*). See the *Biological Evaluation - Appendix D* for more information. There are several other listed species whose range includes inshore and coastal margin waters that are very unlikely to be exposed to the activities covered under the proposed VE permit.

The piping plover is a shorebird that inhabits coastal sandy beaches and mudflats. Critical habitat rules have been published for piping plover, including designations for coastal wintering areas in Florida. The piping plover is considered a state species of conservation concern in all Gulf coast states (BOEM, 2012a).

The red knot, listed as threatened in 2014, is a highly migratory species travels between nesting habitats in mid- and high-Arctic latitudes and southern non-breeding habitats in South America and the U.S. Atlantic and Gulf of Mexico coasts (BOEM, 2012b). Red knots forage along sandy beaches, tidal mudflats, salt marshes, and peat banks for bivalves, gastropods, and crustaceans (FWS, 2013). Wintering red knots are found primarily in Florida and is designated a State Species of Conservation Concern.

3.3.6 Essential Fish Habitat

There are seven Gulf Fishery Management Plans (FMPs), covering a number of representative finfish and shellfish species, which result in most of the landings from the Gulf. The FMPs or amendments to the plans, provide the basis for management of fishery resources in the Gulf of Mexico by regulating the amount of fish that are harvested and are enforced by the U.S. Coast Guard, enforcement agents from the NMFS, and the Gulf states.

Representative fish species from all FMPs occur in the area around the proposed VE site. In general, reef fish are widely distributed in the Gulf, occupying both pelagic and benthic habitats during their life cycle. Habitat types and life history stages can be found in more detail in (Gulf of Mexico Fishery Management Council, 2004). Generally, both eggs and larval stages are planktonic with larvae feeding on zooplankton and phytoplankton. Exceptions to these generalizations include the gray triggerfish (*Balistes capriscus*) that lay their eggs in depressions in the sandy bottom, and gray snapper (*Lutjanus griseus*) whose larvae are found around submerged aquatic vegetation. Juvenile and adult reef fish are typically demersal and are usually associated with benthic features which offer some relief (i.e., coral reefs, artificial reefs, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings).

The 2010 EPA Tampa ODMDS survey identified 29 species of demersal fishes associated with the high relief habitat created by the dredged material spoil mound, with 14 species on nearby natural low-relief hard bottom habitat. Abundances of fishes on natural low-relief hard bottom in the area were also significantly smaller than on the spoil mound (EPA, 2011). Coastal pelagic fishes that are common to the area include some commercially important groups of fishes including sharks, anchovies, herring, mackerel, tuna, mullet, bluefish and cobia. Oceanic pelagic species occur at or seaward of the shelf edge include many larger species such as sharks, tuna, bill fishes, dolphin and wahoo.

More extensive descriptions of fish communities in the eastern Gulf, and their associated habitat, can be found in the *ODC Evaluation, Appendix C*, the *Final Environmental Assessment, National Pollutant Discharge Elimination System (NPDES) Permit for Eastern Gulf of Mexico Offshore Oil and Gas Exploration, Development, and Production, 2016*, and the NOAA Fisheries' 2008 Programmatic Environmental Impact Statement (PEIS), NMFS proposed regional regulations: *Fishery Management Plan to Promote and Manage Marine Aquaculture within the Gulf of Mexico Exclusive Economic Zone*.

3.3.7 Deepwater Benthic Communities

Depending on the criteria used, deepwater and related deepwater biological communities in the Gulf are generally defined as occurring in a range of depths from 200-500 m (i.e., 656-1500 ft.). The proposed VE site is located along the 40-45 m (120-135 ft.) depth range. Because depths equal to 200 m occur approximately 130 miles off Sarasota, Florida, deepwater benthic communities are not found near the proposed site.

3.3.8 Live Bottoms

The seafloor on the west Florida shelf in the immediate vicinity of the proposed project area consists mainly of coarse to fine grain sands with scattered limestone outcroppings making up about 18% of the seafloor habitat. These limestone outcroppings provide substrata for the attachment of macroalgae, stony corals, octocorals, sponges and associated hard-bottom invertebrate and fish communities (EPA, 1994). A 2010 survey of the Tampa ODMDS site 18 miles west of Tampa Bay, (70 miles northeast of the proposed VE site) showed that the dominant substrata at the natural bottom sites in the area consisted of sand, live coral, coralline algae, sponge, hydroid, octocorals, rubble, macro algae rock, and turf algae. Macro invertebrate counts at the natural bottom sites were dominated by gastropods, crabs, sea urchins, bivalves and several scleractinian corals identified in *Section 3.3 Biological Resources*.

3.3.9 Seagrasses

The west Florida coast, in both Florida state waters and adjacent federal waters, include the two largest contiguous seagrass beds in the continental United States: the Florida Keys and the Florida Big Bend regions. Florida seagrasses include turtle grass (*Thalassia testudinum*), shoal grass (*Halodule wrightii*), and manatee grass (*Syringodium filiforme*), the most abundant species in estuarine and nearshore waters. Star grass (*Halophila engelmanii*) is locally abundant in turbid estuarine environments, and paddle grass (*Halophila decipiens*), covers large areas of the west Florida shelf at depths from 9 m to more than 30 m (30 to over 100 ft.). Wigeon grass (*Ruppia maritima*) is also widely distributed in Florida estuaries.

Sargent, Leary, Crewz, and Kruer (1995) estimated that Florida state waters contained approximately 2,660,000 acres of seagrass, of which 55% (1,451,900 acres) occur in the Florida Keys and Florida Bay. An additional 826,800 acres (31% of statewide total seagrass area) occurred in the Big Bend region. The remaining seagrass area, 381,200 acres, was distributed in estuaries and lagoons throughout the state. If seagrasses in adjacent federal waters, including deepwater *Halophila* beds, are included, seagrass area in state and federal waters totals more than 3 million acres.

Seagrasses are very sensitive to water column transparency, their depth, distribution, and survival are primarily determined by water clarity. In areas with extremely clear water (the offshore areas of Big Bend and the Florida Keys, seagrasses grow to depths greater than 20 m (65 ft.). The only seagrass species that may be found on the shelf offshore Sarasota Bay is paddle grass (*Halophila decipiens*), which can occur at depths over 30m (90 ft.) in very clear water (Handley, Altsman, & DeMay, 2007).

3.4 Social and Economic Environment

The following sections provide discussion on the status of U.S. seafood production and consumption, commercial aquaculture, commercial landings of almaco jack, and environmental justice.

3.4.1 U.S. Seafood Consumption and Production

The U.S. is a net importer of seafood. In 2017, the U.S. imported edible seafood products valued at $21.5 billion and exported $5.7 billion (NMFS, 2018a). That is a seafood trade deficit of $15.8 billion. U.S. commercial landings (wild-catch) cannot increase to eliminate that deficit without becoming unsustainable. However, aquaculture production can increase and become a potentially sustainable resource.

3.4.2 Commercial Marine Aquaculture Production

The U.S. ranks sixteenth in world aquaculture production (NMFS, 2018a). That production rank includes both freshwater and marine aquaculture. Within the U.S, the Gulf is a major aquaculture producer (NMFS, 2015a), and marine aquaculture production has been increasing.[7] However, current freshwater aquaculture production far exceeds marine aquaculture.

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[7] More information about Gulf aquaculture at the regional and state levels can be found in the USDA Census of Aquaculture and is incorporated by reference (https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Census_of_Aquaculture/).

Gulf marine aquaculture primarily produces oysters, hard clams, and live rock species. Florida ranks toward the top in the U.S. for hard clam production and most of its production occurs in Cedar Key. Florida is also the largest live rock[8] producer that occurs in Monroe County. Economic and demographic characteristics of these and other Gulf areas can be found in NOAA Fisheries community profiles. The full-length community profiles, last updated in 2002 to 2005, have in-depth information regarding the historic, demographic, cultural, and economic context for understanding a community's involvement in fishing.[9]

3.4.3 Commercial Landings of Almaco Jack

Almaco jack is part of the Gulf Reef Fish Fishery and it along with banded rudderfish (*Seriola zonata*) and lesser amberjack (*Seriola fasciata*) make up the 'Jacks Complex'. The Jacks Complex has a combined commercial and recreational annual catch limit (ACL), and with the exception of 2013, annual landings have been less than the ACL. Commercial landings of the complex are considerably lower than recreational landings. More information about the Jacks Complex and the Reef Fish Fishery can be found on the NMFS Southeast Regional Office's Gulf of Mexico Reef Fish webpage and is incorporated by reference.

Dockside (ex-vessel) revenue from almaco jack landings accounted for an average of 0.3% of the total dockside revenue for commercial fishing vessels that harvested the species from 2012 to 2016. The very low percentage is expected because almaco jack is not a commercially targeted species. Instead, it is incidentally harvested by commercial vessels that target pelagic species. Almaco jack has a relatively low dockside price because it is commonly characterized as a 'trash fish'. For example, when compared with other species (e.g., banded rudderfish, vermilion snapper (*Rhomboplites aurorubens*) and hogfish (*Lachnolaimus maximus*) and excluding king mackerel, (*Scomberomorus cavalla*) the reef fish fishery, the dockside price of almaco jack ranks towards the bottom. Nonetheless, commercial landings of wild-caught almaco jack generate economic benefits to the nation in the form of jobs and income, sales, and value-added impacts. Average annual landings (59,633 lbs. gw with a value of $85,658 in 2016) generates 11 full- and part-time jobs, $312 thousand in income impacts and other benefits (estimates produced by NMFS SERO using model produced and applied in Fisheries Economics of the United States, 2016).[10] For more information about commercial landings within the Gulf, see reference at NMFS, 2018a. There is presently no commercial aquaculture of almaco jack in the Gulf. Nevertheless, it is traditionally harvested.

3.4.4 Commercial Fishing

Commercially important species groups in the GOM include oceanic pelagic (epipelagic) fishes, reef (hard bottom) fishes, coastal pelagic species, and estuarine-dependent species. Invertebrates such as shrimp, blue crab, spiny lobster, and stone crab also contributed

[8] Live rock is fragmented pieces of old coral reefs. These pieces are colonized by marine life such as invertebrates, corals, sponges, and millions of beneficial nitrifying bacteria.

[9] Community profiles for fishing communities in the Gulf can be found at http://sero.nmfs.noaa.gov/sustainable_fisheries/social/community_snapshot/ and is incorporated by reference.

[10] More information about the dealers and commercial fishing in Florida at the community level can be found within the community profiles and is incorporated by reference (http://sero.nmfs.noaa.gov/sustainable_fisheries/social/community_snapshot/)

significantly to the value of commercial landings. Other finfish species that contributed substantially to the overall commercial value of the GOM fisheries included red grouper, red snapper, and yellowfin tuna.

The commercial fishing industry is an important component of the economy of the Gulf coast of Florida. Table 6 shows commercial landings and ex-vessel values for finfish and shellfish landing for west Florida that are compiled annually by NMFS. In 2014 and 2015, commercial landings of all fisheries in west Florida totaled in excess of 63 million and 71 million pounds, respectively and was valued at $171 million and $190 million (NMFS Office of Science and Technology, 2016). The Gulf shellfishery dominated, with only 22% of the total landings, but accounting for 78% of the value; shrimp represented nearly 70% of the shellfish catch and value.

Important commercial finfish and shellfish include red grouper, Atlantic herring, king mackerel, striped mullet, red snapper, yellowtail snapper, blue crab, stone crab (claws), spiny lobster, oysters, and brown and pink shrimp.

Table 6. Annual Commercial Landings for West Florida, 2014 and 2015

Metrics	2014	2015
Thousand Pounds	63,657	71,633
Metric Tons	28,875	32,493
Thousand Dollars	171,565	190,586

Source: NMFS, 2016

3.4.5 Recreational Marine Fishing

In 2017, the U.S. recreational marine fishers took an estimated 202 million fishing trips and harvested an estimated 397 million fish weighing 447 million pounds. Approximately 36% of those trips were made in the Gulf (NMFS, 2018a). Recreational fishing activity can affect a regional economy in a number of ways. When anglers participate in fishing activities, they support sales and employment in recreational fishing and other types of businesses. Anglers buy fishing equipment from bait and tackle shops, rent or buy boats, or pay to have others take them on charter boats to fish. They may also pay for food and drink at local restaurants, purchase gas for their boat, and stay in hotels for overnight fishing trips (NMFS, 2018b).

The majority of Gulf trips are in West Florida. In 2015, for example, approximately 64% of the Gulf's recreational fishing trips were in West Florida (NMFS Office of Science and Technology, 2016). The 13,219 angler trips in West Florida generated 60,179 jobs, approximately $2.6 billion in income and other beneficial impacts (NMFS, 2018b).

The most commonly caught non-bait species (numbers of fish) in the eastern Gulf in 2015 were spotted seatrout (*Cynoscion nebulosus*), gray snapper, red drum (*Sciaenops ocellatus*), blue runner or bluestripe jack (*Caranx crysos*), and sand seatrout (*Cynoscion arenarius*). The largest harvests by weight were for Spotted seatrout, red drum, red snapper (*Lutjanus campechanus*), king mackerel, sheepshead (*Archosargus probatocephalus*), and dolphinfish (*Coryphaena* *hippurus*) (NMFS Office of Science and Technology, 2016). The species most commonly caught on Gulf trips that fished primarily in federally-managed waters were red snapper, red grouper (*Epinephelus morio*), white grunt (*Haemulon plumierii*), dolphinfish, and yellowtail snapper (Ocyurus chrysurus). About 33 % of the total Gulf catch came on trips that fished primarily in the state territorial seas.

3.4.6 Human Health/Public Health

Aquaculture's contribution to global seafood production continues to rise. With this rise in aquaculture production, human health/public health issues associated with aquaculture should be considered. Human health/public health concerns that can arise from aquaculture production include the increase in use of formulated food, use of antibiotics, use of antifungals, and use of agrochemicals. These aquaculture practices can potentially lead to elevated levels of antibiotic residuals, antibiotic-resistant bacteria, persistent organic pollutants, metals, parasites, and viruses in aquaculture finfish. People working in and around aquaculture facilities, populations living near these operations, and consumers may be at potential risk of exposure to these containments (Sapkota, et al., 2008).

3.4.7 Environmental Justice

On February 11, 1994, the President issued Executive Order 12898 (E.O. 12898), "*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*." E.O. 12898 provides that "*each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations*." E.O. 12898 also provides for agencies to collect, maintain, and analyze information on patterns of subsistence consumption of fish, vegetation, or wildlife.

Where an agency action may affect fish, vegetation, or wildlife, the agency should consider the potential adverse effects on subsistence patterns of consumption and indicate the potential for disproportionately high and adverse human health or environmental effects on low-income populations, and minority populations. The proposed project is physically located on the west Florida shelf, approximately 45 miles west, southwest of Longboat Pass-Sarasota Bay, Florida in federal waters, which is not near any minorities or low-income populations. However, harvested farmed fish would be brought to port where wild fish are landed by potentially subsistence fishermen.

4.0 Environmental Consequences

4.1 Introduction

This chapter describes the potential environmental impacts associated with the proposed actions as well as the issuance of required federal authorizations necessary to operate the VE project. The anticipated impacts on resources as a result of the VE project are discussed in the following sections.

Concerns related to the environment regarding aquaculture operations include water quality (waste and pharmaceutical applications), genetic impacts to wild fish from cultured fish escapes (e.g., loss of fitness to wild populations if wild and cultured fish interbreed), spread of disease from cultured to wild fish, entanglement of protected species in aquaculture gear, use of bait fish as a feed source, risk of loss of equipment and damage to the marine environment during severe storm events (e.g., tropical storms, hurricanes), privatization of a public resource (federal waters) for profit, loss of ocean space where aquaculture operations are sited, and socio-economic impacts on commercial or recreational fisheries.

Generally, open ocean aquaculture may have effects on water and sediment quality and the plant and animal communities living in the water column and those in close association with, on, or in the sediments. The two major factors which determine the geographic distribution and severity of impacts of open ocean aquaculture on the water column, seafloor sediments and benthic communities are farm operations management, and farm siting. Sound farm operating practices tend to reduce waste loading by employing efficient feeding methods and by use of dry, slow sinking, more easily digested feed types. Good management practices can also limit impacts due to escapes, spread of diseases, and entanglements etc. Proper farm siting can minimize water column and benthic impacts by maximizing over bottom depths and current flow through cages, and through avoidance of more sensitive biological communities. Optimal siting can also reduce potential marine resource use conflicts.

A more extensive discussion of the potential impacts on physical and biological resources associated with the proposed action are provided in *Appendix C*, *ODC Evaluation and the NPDES Permit [FL0A00001] Outer Continental Shelf, Gulf of Mexico* and *Appendix D*, *Draft Biological Evaluation – Ocean Era, LLC - Velella Epsilon, Marine Aquaculture Facility, Outer Continental Shelf Federal Waters of the Gulf of Mexico, March 15, 2019*.

4.2 Physical Resources

Offshore aquaculture operations can affect physical resources in several ways. Particulates from fish cages add to water column turbidity and reduced clarity. Solid wastes can alter the physical environment and chemistry of benthic sediments. In cases of extreme loading, solid wastes can result in burial of benthic habitats beneath cages. The placement of physical structures on the seafloor, i.e., anchors and anchor lines, and in the water column, cages, may result in damage to seafloor habitat and entanglement and collision impacts to motile marine animals.

Alternative 1 - No Action. The No Action alternative would result in no effect on physical resources (water column and seafloor) because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed action alternative, the issuance of an NPDES permit, will likely have minimal impacts to physical resources in the vicinity of the proposed facility. The siting analysis conducted during the site selection process chose an area consisting of unconsolidated sediments coupled with sufficient depth and current flow parameters that should result in broad dispersion of solid wastes. Positioning away from potential live bottom habitat will mitigate physical benthic impacts from anchors and mooring lines. The cage is designed to swivel around the center of a suspended 3-point mooring, further reducing anchor chain sweep. The relatively small fish biomass to be reared in the single cage (80,000 lbs. at harvest – one production cycle) demonstration is expected to result in small daily loading rates per meter squared (m^2) downstream of the cage. Solid wastes settling on the seafloor will likely undergo resuspension and transport and additional dispersion from the area resulting in minimal solids accumulation.

4.2.1 Water Quality

The water quality around offshore aquaculture operations is mainly affected by the release of dissolved and particulate inorganic and organic nutrients. Water column effects around offshore aquaculture operations include a decrease in dissolved oxygen and increases in biochemical oxygen demand, and nutrients (phosphorus, total carbon and organic and inorganic nitrogen), increased turbidity and potential for ammonia toxicity. Degradation of water quality parameters is greatest within the fish culture structures and improves rapidly with increasing distance from cages. Recent studies have documented only limited water column impacts due to rapid dispersal (Holmer, 2010). The health of the fish stocks is a self-limiting control on water column pollution. A more extensive discussion of water quality impacts from offshore aquaculture operations can be found in the *ODC Evaluation*, *Appendix C*.

Alternative 1 - No Action. The No Action alternative would result in no change to the quality of the water column because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed action alternative, issuance of an NPDES permit will likely have minimal impacts to water quality in the vicinity of the proposed facility due to the small fish biomass, 80,000 lbs produced during a 280-day fish production cycle in the single cage facility and current flows measured in the vicinity of the selected site. It is estimated (CASS Tech Reports, Appendix F) that a total of 2,743 kg of ammonia nitrogen would be produced during the production cycle. The EPA's calculations provided in the ODC Evaluation for this project, *Appendix C*, estimated that the flow-averaged ammonia concentration at an ammonia production of 9.8 kilograms per day (kg/day) loading rate is approximately = 0.0072 milligrams per liter (mg/l), significantly below the USEPA's published ammonia aquatic life criteria values for saltwater organisms.[11]

4.2.1.1 Pharmaceuticals

There is some concern that use of antibiotics in offshore aquaculture operations could lead to an increase in antibiotic resistance among bacteria in the facility effluent. An extensive discussion of impacts resulting from pharmaceutical application at offshore aquaculture operations can be found in the ODC Evaluation for this project, *Appendix C*.

Alternative 1 - No Action. The No Action alternative would result in no use of pharmaceutical agents because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed action alternative, issuance of NPDES permit will likely result in minimal use of pharmaceutical agents only in the event of disease, and, therefore, have minimal impacts to sediment quality in the vicinity of the proposed facility. Also, due to the small fish biomass, 80,000 lbs. produced during a 280-day fish production cycle in the single cage facility, the amounts of pharmaceutical agents needed will be small, and current flows measured in the vicinity of the selected site should result in broad dispersal of any pharmaceutical agents onto the seafloor.

The applicant has indicated that FDA-approved antibiotics will not likely be used during the proposed project due to the strong currents expected at the proposed action area and the low fish culture density. In the unlikely event that therapeutants are used, administration of drugs will be performed under the control of a licensed veterinarian. In addition, the NPDES permit will require that the use of any medicinal products including therapeutics, antibiotics, and other treatments are to be reported to the EPA. The report will include types and amounts of medicinal product used and the period of time it was used.[12] In accordance with the NPDES permit, all drugs, pesticides and other chemicals must be applied in accordance with label directions.

4.2.2 Sediment Quality

The two most significant sources of impacts to sediment quality from offshore aquaculture operations are total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. Numerous studies have shown that organic enrichment of the seabed is the most widely encountered environmental effect of culturing fish in cages (Karakassis,

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[11] EPAS recommended saltwater aquatic life criteria is available at: www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table.

[12] The applicant noted in the NPDES permit application that only FDA-approved therapeutants for aquaculture would be used. The applicant is not expected to use any drugs; however, in the unlikely circumstance that therapeutant treatment is needed, three drugs were provided to the EPA as potential candidates (hydrogen peroxide, oxytetracycline dihydrate, and florfenicol).

Tsapakis, Hatziyanni, Papadopoulou, & Plaiti, 2000; Price & Morris Jr., 2013; Karakassis, Tsapakis, Smith, & Rumohr, 2002). The spatial patterns of organic enrichment from offshore aquaculture operations varies with physical conditions at the sites and farm specifics and has been detected at distances from meters to several hundred meters from the perimeter of the cage array (Mangion, Borg, & Schembri, 2014). Studies of offshore aquaculture operations in the Mediterranean showed that the severe effects of organic inputs from fish farming on benthic macrofauna are limited to up to 25 m from the edge of the cages (Lampadariou, Karakassis, & Pearson, 2005) although the influence of carbon and nitrogen from farm effluents in sea floor can be detected in a wide area about 1,000 m from the cages (Sara, Scilipoti, Mazzola, & Modica, 2004). The impacts on the seabed beneath the cages were found to range from very significant to relatively negligible depending on sediment type and the local water currents, with silty sediments having a higher potential for degradation. Model results for this project predict that there are minimal to no risks to water quality or benthic ecology functions within the area of operation, *CASS Technical Reports Appendix F*. A more in-depth discussion of potential impacts to sediment quality can be found in the *ODC Evaluation*, *Appendix C*.

Alternative 1 - No Action. The No Action alternative would result in no effect on sediment quality around the site because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed action alternative, issuance of NPDES permit will likely have minimal impacts to sediment quality in the vicinity of the proposed facility. The siting analysis conducted during the site selection process chose an area with sufficient depth and current flow parameters that should result in broad dispersion of solid wastes. The relatively small fish biomass to be reared in the single cage (80,000 lbs. at harvest – one production cycle) is expected to result in small daily loading rates per meter squared downstream of the cage. Solid wastes settling on the seafloor will likely undergo resuspension and transport and additional dispersion from the area resulting in minimal solids accumulation. The results of a depositional model (CASS Tech Reports, Appendix F) show that for the estimated production values, net organic carbon accumulation would be at 5.0 grams per meter squared per year ($g/m^2/yr.$) or less for 99.0 % of the test grid. A portion of the organic wastes are expected to be assimilated by the macroinvertebrate community inhabiting the soft sediments in the surrounding area. A more extensive discussion of the potential for impacts to physical resources can be found in the ODC Evaluation, Appendix C. The results of deposition modeling, even when doubling fish production amounts, conclude that net accumulation of wastes following a 1-year production cycle would likely not be distinguishable from background levels of organic carbon. Even when the period of discharge is increased to the full 5-year permit term, the modeling report indicated that the proposed project "will not likely have a discernable impact on benthic communities around the project location" and that the project "will present challenges for monitoring and detecting environmental impacts on sediment chemistry or benthic communities because of the circulation around the project location and the small mass flows of materials from the net pen installation."

4.2.3 Air Quality

There are no large sources of anthropogenic (man-made) emissions expected to be released into the atmosphere from the project area under the proposed alternative. A tender vessel, which will be moored to the net pen array, may be a small source of emissions in offshore waters. The tender vessel is an 80-foot ocean going Staysail Schooner, the SV Machias, a U.S. Coast Guard inspected and documented (Document No. 289053) sailing vessel with a commercial fishing endorsement, outfitted and approved for open ocean, blue water cruising that includes space for 24 passengers. The vessel is equipped with modern communications and navigation technology, e.g., two-way radio, GPS, radar, high frequency transceivers, etc. It can use both sail power and diesel power and in the event of problems, can communicate with the Coast Guard for assistance. At least two scientific field technicians from Ocean Era, LLC, will be stationed on the tender vessel at all times for the duration of the project. Staff will be rotated, so that each individual is at sea for four weeks, then off for two weeks. The vessel will maintain position at the site via mooring to the array. All marine engines on the vessel meet IMO/EPA air quality standards. Hoteling emissions are expected while the vessel is moored at the project site. The vessel is equipped with two generators on-board (25KW and 15KW) units. Moreover, trade wind conditions around Florida are likely to quickly disperse these emissions. The EPA has reviewed detailed information regarding the support vessel and confirmed that the emission associated with the tender vessel will not be a significant source of air emissions.

4.2.4 Coastal Barrier Beaches

The proposed action is to be located in approximately 130 m water depth off southwest Florida, approximately 45 miles southwest of Sarasota, Florida. The proposed action will be offshore from any coastal barrier beaches. In accordance with the CZMA, the applicant obtained concurrence from the Florida Department of Environmental Protection for the proposed project, *Appendix H*. It is possible that miscellaneous debris from the aquaculture operation could impact coastal beaches, but it is anticipated that impacts to coastal barrier beaches will be negligible.

4.2.5 Noise Environment

The proposed project's location, approximately 45 miles offshore off the western coast of Florida, is an area with ambient noise from wind, waves, and periodic noise from occasional boat and vessel traffic. The proposed facility is not expected to make a significant contribution to ambient noise and to current open ocean noise.

4.2.6 Climate

As discussed in *Section 3.2.6 Climate*, the effect of ongoing human-caused climate change makes the Gulf environment vulnerable to rising ocean temperatures, sea level rise, storm surge, ocean acidification, and significant habitat loss. The climate in the project area would be as described in *Section 3.2.6 Climate*.

Alternative 1 - No Action. The No Action alternative would result in no effect on the climate because an aquaculture facility would not be built without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The Proposed Action alternative, issuance of NPDES permit, will likely result in negligible emissions of Green House Gasses (GHGs) resulting from operation of support vessels. The cages could be vulnerable to storm events in the Gulf, however, mitigation measures proposed in the NPDES permit will minimize the potential for damage to the environment from such an event.

4.3 Biological Resources

The biological resources likely to occur in the immediate vicinity of the proposed VE project are described in *Section 3.3 Biological Resources*. The factors with potential to impact biological resources around coastal fish farms are disturbance, entanglement, vessel strikes, and the discharges of dissolved and particulate inorganic and organic nutrients into the water column and discharges of total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. The latter can potentially impact biological communities through the degradation of water quality, affecting pelagic plants and animals, and organic enrichment of benthic sediments, thereby, affecting benthic biota.

A more extensive discussion of the potential impacts on physical and biological resources associated with the proposed action are provided in the *Appendix C*, *ODC Evaluation* and *Appendix D*, *Draft Biological Evaluation – Ocean Era, LLC - Velella Epsilon, Marine Aquaculture Facility, Outer Continental Shelf Federal Waters of the Gulf of Mexico, March 15, 2019*.

4.3.1 Fish

Fish species that can occur in the vicinity of the proposed VE project area are discussed in *Section 3.3.1 Fish*. The factors that may impact fish near coastal offshore aquaculture operations are disturbance, and water and sediment quality degradation as a result of waste discharges. Potential water quality impacts are associated with discharges of dissolved and particulate inorganic and organic nutrients into the water column and discharges of total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. These discharges can potentially impact fish through the degradation of water quality, affecting pelagic plants and animals, and organic enrichment of benthic sediments, affecting benthic habitat.

Alternative 1 - No Action. The No Action alternative would result in no effect on water column biota or benthic communities around the site, including fish, because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed action alternative, issuance of NPDES permit, will likely have only very minimal impacts to the fish species expected to occur near the proposed facility. The siting analysis conducted during the site selection process chose an area with sufficient depth and current flow parameters that should result in rapid dilution of dissolved wastes and broad dispersion of solid wastes discharged from the facility. The relatively small fish biomass to be reared in the single cage (80,000 lbs. at harvest – one production cycle) demonstration is also expected to result in small daily loading rates of discharged pollutants downstream of the cage. In addition, it is expected that fish that may occur at the proposed VE project site would only encounter the facility temporarily since they are motile animals. Exposure to any discharged pollutants will be minimal.

One concern with marine cage culture and fish tends to be the threat of entanglement with nets, lines or other floating equipment. The large diameter of the anchor line as well as the stiffness of it and other lines make it extremely unlikely that a fish would be entangled. Additionally, the pen will use a rigid copper alloy mesh, which presents no entanglement hazard.

Another concern is related to the potential for fish escapes and genetic impact they may have on native fish. The farmed species, almaco jack, is native and common to the Gulf. The fingerlings will be sourced from brood stock that are located at Mote Marine Aquaculture Research Park and were caught in the Gulf near Madeira Beach, Florida. As such, only F1 (first filial generation) progeny from those wild caught brood stock will be stocked into the net-pen for the proposed project. Neither the brood stock, as they are native and wild caught, or the first-generation fingerlings from that brood stock, have undergone any genetic modification or selective breeding, and would not likely pose a competitive risk to wild stock. It’s also not likely that there would be any genetic contamination or weakening if any fugitive fish spawned with wild individuals. Therefore, there is limited to no risk for non-indigenous stock establishment. Furthermore, the risks that escaped farm fish pose to wild populations are a function of the probability of escape, and the magnitude of the event that could cause an escape event. The copper mesh cage to be used is impact resistant and designed to survive storm events while being completely submerged. The EPA believes that the cage design will result in a low probability of escape.

An additional concern is related to the potential for pathogens and parasites to be released from the pen impacting wild fish. Pathogen and parasite transfer is considered in the NPDES permit through the following conditions:

1) The permittee will be required to create and implement health management strategies for marine aquaculture organisms in the BMP plan. Effective disease prevention programs may include routine health exams and inspections, accurate record-keeping by the permittee, biosecurity measures, preventative actions like vaccines.
2) The permittee will be required to certify that the fish were examined prior to going offshore to ensure they are healthy, so any pathogens that affect them would come from the surrounding environment.
3) The NPDES permit includes fish health and disease control conditions that are comparable to the Gulf Aquaculture FMP requirements referenced below.

> “Marine aquaculture activities should: (1) Minimize impacts of disease outbreaks if they occur; (2) Create and implement health evaluation programs and policies that prevent the importation or release of disease pathogens or parasites of

> regulatory concern. These policies should support development and utilization of technologies to identify and control disease organisms; (3) Develop effective disease control, quarantine, and inventory destruction procedures to prevent the spread of disease to public waterways, native species, and other marine aquaculture facilities; (4) Create and implement health management strategies for marine aquaculture organisms in cooperation with states, federal agencies, industry, veterinarians, and scientists; and (5) Use only FDA approved therapeutic and chemical treatments as part of best management practices."

Regarding potential impacts from water and sediment quality, fish species are not expected to be impacted given their unique habitat preferences and known proximity to the proposed action area. The oceanic whitetip shark is not likely to occur near the proposed project given its preference for deeper waters. The action agencies believe that the nassau grouper will not be present given that it is absent from the Gulf outside of the Florida Keys. Interactions with smalltooth sawfish with the proposed project is extremely unlikely because they primarily occur in the Gulf off peninsular Florida and are most common off Southwest Florida. The giant manta ray may encounter the facility given its migratory patterns. However, long term impacts are not expected because the facility is relatively small and is expected to have a short deployment period of approximately 18 months.

The NPDES permit provisions will contain environmental monitoring (water quality, sediment, and benthic infauna) and other conditions that minimize potential adverse impacts to fish from the discharge of effluent from the proposed facility, and prohibit the discharge of certain pollutants (e.g., oil, foam, floating solids, trash, debris, and toxic pollutants). Due to the pilot-scale size of the facility and low density of cultured fish, water quality and benthic effects are not expected to occur outside of 30 m. The discharges authorized by the proposed NPDES permit represent a small incremental contribution of pollutants that are not expected to affect fish species in the project area.

4.3.2 Invertebrates

Marine invertebrates occurring in the Gulf are discussed in *Section 3.3.2 Invertebrates*. The factors that may impact marine invertebrate communities near coastal offshore aquaculture operations are impacts to water and sediment quality. Anchor placement and mooring line sweep may impact sessile benthic invertebrates. Expected discharges from aquaculture operations include dissolved and particulate inorganic and organic nutrients into the water column, total solids deposition, and organic enrichments to seafloor sediments from uneaten feed and fish feces These discharges can potentially impact protected corals through the degradation of water quality, and organic enrichment of benthic sediments, affecting benthic habitat.

Alternative 1 - No Action. The No Action alternative would result in no change to water column biota or benthic communities around the site, including stony corals, because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed action alternative, issuance of an NPDES permit, may result in impacts to invertebrate communities in the benthos around the farm site due to benthic loading of discharged solid wastes, however, any impacts to benthic invertebrates are expected to be minimal.

The siting analysis conducted during the site selection process chose an area with sufficient depth and current flow parameters that should result in rapid dilution of dissolved wastes and broad dispersion of solid wastes discharged from the facility. The relatively small fish biomass to be reared in the single cage (80,000 lbs. at harvest – one production cycle) demonstration is also expected to result in small daily loading rates of discharged pollutants downstream of the cage. Exposure of benthic invertebrates to any discharged pollutants will be minimal.

The Proposed Action alternative, issuance of an NPDES permit, will likely have no impact to protected corals as none of the listed species are expected to occur near the proposed facility. Additionally, the anchoring system and cage will be placed in an area consisting of unconsolidated sediments, away from potential hardbottom which may contain corals according to the facility's BES.

The discharge from the proposed facility will be covered by a NPDES permit with water quality conditions required by the CWA. The aquaculture-specific water quality conditions contained in the NPDES permit will generally include an environmental monitoring plan (i.e., water quality, sediment, and benthic monitoring) and effluent limitations expressed as best management practices (BMPs). Furthermore, the NPDES permit will require the proposed facility to be placed at least 500 meters from any hardbottom habitat or coral reefs to protect those communities from physical impacts due to the deposition of solids and potential impacts due to organic enrichment. Water quality effects are not expected to occur outside of 30 m due to the small size of the facility and low production levels. The impacts from water quality are expected to be minimal or insignificant, and the likelihood that deleterious water quality will contribute to any adverse effects to listed coral species is extremely unlikely.

4.3.3 Marine Mammals

Marine mammals that can occur in the vicinity of the proposed VE project area are discussed in *Section 3.3.3 Marine Mammals*. The greatest risks to bottlenose or atlantic spotted dolphins at this site are entanglement, vessel strike and behavioral disturbance. When dolphins become conditioned (a form of behavioral disturbance) to an anthropogenic food source, the risk of vessel strikes, and entanglement increases (Donaldson, Finn, & Calver, 2010).

The greatest risk to dolphins from this operation is entanglement in vertical lines that are associated with the mooring lines and net pen connections. Flexible lines that easily loop are most risk-adverse for dolphins (e.g., shrimp trawl lazy lines (Gearhart & Hataway, 2018) and crab pot buoy lines (Adimey, et al., 2014). The line proposed for the mooring and net pen connection lines (Amsteel blue) is a strong, but flexible line (pers comm. Gearhart, 2018). Entanglement risk to dolphins will depend greatly on the tautness of the line; any slack in the line poses an entanglement risk (Maze-Foley & Mullin, 2006). The copper alloy net mesh enclosing the pen is not anticipated to be an entanglement risk for dolphins given its firm and inflexible state.

Vessel strikes are also a risk for dolphins. As the density of vessels increase in areas utilized by dolphins, so does incident of boat strike injury or mortality to dolphins (Bechdel, et al., 2009). There is likely to be an increase in boat traffic moving back and forth from port to the aquaculture operation. It is recommended that the vessel captain slows to a no wake speed if dolphins are seen nearby and only resumes normal speed when the animals leave the area. If dolphins wake or bow-ride while a vessel is transiting, it is recommended that the vessel captain maintain the vessel's course and speed until the dolphins depart or as long as it is safe to do so.

Dolphins are attracted to concentrated food sources specifically when feeding opportunities exist. There is a possibility that if the animals are fed or are successful at extracting fish from divers or from the pen, the dolphins will become conditioned and change their behavior to spend more time milling around the net waiting for an opportunity to scavenge fish (Christiansen, et al., 2016). When dolphins learn to associate anthropogenic sources with food, unnatural behaviors such as begging or depredating disrupt their natural foraging repertoire and become an abnormal and detrimental feeding strategy (Powell & Wells, 2010). Conditioned dolphins approach humans or anthropogenic food sources more readily looking for handouts, thus increasing the animal's risk for boat strike or gear entanglement (Bechdel, et al., 2009; Powell & Wells, 2010; Samuels & Bejder, 2004; Wells & Scott, 1997). To minimize conditioning of dolphins to the pen, all operations staff must be educated that feeding or attempting to feed wild dolphins is illegal. It is recommended that any divers collecting fish mortalities from the tank remove and dispose of the fish in such a way that does not allow a dolphin an opportunity to scavenge or depredate the discards.

Another factor that may impact protected marine mammals around coastal offshore aquaculture operations are the discharges of dissolved and particulate inorganic and organic nutrients into the water column and discharges of total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. They can potentially impact marine mammals through the degradation of water quality, affecting pelagic plants and animals, and organic enrichment of benthic sediments, affecting benthic habitat.

Alternative 1 - No Action. The No Action alternative would result in no effect to marine mammals, because the facility would not be constructed or operated at this location on the west Florida Shelf, therefore there is no additional risks being added to this location.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The construction and operation of an aquaculture facility at this site present marine mammal risks that will include entanglement, vessel strike, and behavioral disturbance, however, the level of impact to individual dolphins from these risks is unknown. An aquaculture facility of this type has not yet been operated in the Gulf. As a means to better understand these risks and level of individual impacts, the applicant has agreed to partner with NMFS SERO to collect information on dolphin interactions and behavior around this facility. However, given the large size of these marine mammal stocks and, thus, larger potential biological removal levels, it is anticipated the impacts to the overall population would be minimal.

Entanglement risks to marine mammals will be minimized by using rigid and durable cage materials and by keeping all lines taut. The cage material for the proposed project is constructed with rigid and durable materials. The mooring lines for the proposed project will be constructed of steel chain and thick rope that are attached to a floating cage that will rotate in the prevailing current direction; the floating cage position that is influenced by the ocean currents will maintain the mooring rope and chain under tension during most times of operation. The bridle line that connects from the swivel to the cage will be encased in a rigid pipe. The risk of an entanglement interaction is likely minimal if lines are kept taut or covered in rigid pipes; however, should entanglement occur, on-site staff would follow the steps outlined in the Protected Species Management Plan (PSMP) and alert the appropriate experts for an active entanglement.

In regard to vessel strikes, facility staff will be stationed on one vessel for the duration of the project except during unsafe weather conditions. There is a low probability that collisions with the vessel associated with the proposed project would kill or injure marine mammals given the limited trips to the facility with only one vessel and that the vessel will follow the vessel strike and avoidance measures that have been developed by the NMFS.

Disturbance to marine mammals from ocean noise generated by the proposed facility is expected to be minimal given that there is one production cage and one vessel that will be deployed for a duration of approximately 18 months.

4.3.4 Sea Turtles

Sea turtles that can occur in the vicinity of the proposed VE project site are discussed in *Section 3.3.4 Sea Turtles*. The factors that may impact protected sea turtles near coastal offshore aquaculture operations are impacts to water quality, entanglement, physical encounters with the pen system, and behavioral disturbance.

Alternative 1 - No Action. The No Action alternative would result in no effect on water column biota or benthic communities around the site, including sea turtles, because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. Sea turtles frequent reefs and other areas with submerged structures (Stoneburner, 1982; Booth & Peters, 1972; Witzell W. N., 1982; Carr A. F., 1952) and may be attracted to the project area for food, shelter, and/or rest. The primary concern with marine cage culture and listed sea turtles and fish tends to be the threat of entanglement with nets, lines or other floating equipment. However, the large diameter of the anchor line as well as the stiffness of it and the other lines make it extremely unlikely that a sea turtle would be entangled. Mooring lines are designed to be kept taught, reducing the potential for entanglements. Additionally, the pen will use a rigid copper alloy mesh, which presents no entanglement hazard.

Sea turtles may be indirectly affected by the proposed facility if it concentrates hook-and-line (i.e., rod and reel) fishermen in the vicinity. Sea turtles are known to bite baited hooks and can be hooked incidentally by these fishermen.

Sea turtles may experience disturbance by stress due to a startled reaction should they encounter vessels in transit to the proposed project site. Given the limited trips to the site, opportunities for disturbance from vessels participating in the proposed project are minimal. ESA-listed sea turtles may be attracted to aquaculture facilities as potential sources of food, shelter, and rest, but behavioral effects from disturbance are expected to be insignificant. Additionally, all vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS. Furthermore, there has been a lack of documented observations and records of ESA-listed sea turtles interacting with a permitted commercial-scale marine aquaculture facility in Hawaii (Blue Ocean Mariculture, 2014). The EPA anticipates that such interactions would be unlikely. As a result, disturbance from human activities and equipment operation resulting from the proposed action is expected to have insignificant effects on ESA-listed reptiles.

Sea turtles located in close proximity to an offshore aquaculture operation could also be impacted by the discharges of dissolved and particulate inorganic and organic nutrients into the water column and discharges of total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. These discharges can impact through the degradation of water quality, affecting pelagic plants and animals, and organic enrichment of benthic sediments, affecting benthic biota and habitat. However, the siting analysis conducted during the site selection process chose an area with sufficient depth and current flow parameters that should result in rapid dilution of dissolved wastes and broad dispersion of solid wastes discharged from the facility. The relatively small fish biomass to be reared in the single cage (80,000 lbs. at harvest – one production cycle) demonstration is also expected to result in small daily loading rates of discharged pollutants downstream of the cage. In addition, it is expected that sea turtles that may occur at the proposed VE project site area would only encounter the facility temporarily since they are pelagic animals. Exposure to any discharged pollutants will be minimal.

The risk of sea turtles being entangled in offshore aquaculture operation is greatly reduced by using rigid and durable cage materials and by keeping all lines taut. The cage material for the proposed project is constructed with rigid and durable materials. The mooring lines for the proposed project will be constructed of steel chain and thick rope that are attached to a floating cage that will rotate in the prevailing current direction; the floating cage position that is influenced by the ocean currents will maintain the mooring rope and chain under tension during most times of operation. Additionally, the bridle line that connects from the swivel to the cage will be encased in a rigid pipe. Moreover, the limited number of vertical mooring lines (three) and the duration of cage deployment (less than 18 months) will reduce the risk of potential entanglement by sea turtles. Because of the proposed project operations and duration, the action agencies expect that the effects of this entanglement interaction would be discountable.

However, should entanglement occur, on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement.

4.3.5 Birds

Birds that may occur in the vicinity of the proposed VE project site are discussed in *Section 3.3.5 Birds*. Potential impacts to seabirds from the VE project could be related to the physical structure, presence of fish, and associated activities that would attract migratory seabirds as well as other migratory birds. A number of species, such as common loons (*Gavia immer*) and double-crested cormorants (*Phalacrocorax auratus*) may dive from the surface near the facility to try to access small fishes underwater, whereas brown pelicans (*Pelecanus occidentalis*), northern gannets (*Morus bassanus*), masked boobies (*Sula dactylatra*), brown boobies (*Sula leucogaster*), and red-footed boobies (*Sula sula*) may attempt to plunge dive into the cage and may be injured by the taut mesh covering the tops of the cages. Cage covering should limit the visibility of fish in cages, reducing diving activity.

Alternative 1 - No Action. The No Action alternative would result in no effect on seabirds and other migratory birds occurring in the area, because, without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed action alternative, issuance of NPDES permit will likely have only very minimal impacts to the seabirds and other migratory birds expected to occur in the vicinity of the proposed facility.

The EPA and USACE considered disturbance as the only potential stressor to ESA-protected seabirds from the proposed project. Seabirds are not expected to interact with the proposed project or become trapped in the cage due to distance of the proposed project from shore (approximately 45 miles). The piping plover is a shorebird that primarily inhabits coastal sandy beaches and mudflats. The red knot is a highly migratory species. However, their known migratory routes do not overlap with the proposed project and migration and wintering habitat for the red knot are in intertidal marine habitats such as coastal inlets, estuaries, and bays (FWS, 2014). Should there be any interaction that results in an injury to a protected seabird, the on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement.[13] The project staff will suspend all surface activities, including stocking, harvesting operations, and routine maintenance operations in the unlikely event that an ESA-listed seabird comes within 100 m of the activity until the bird leaves the area. Any potential effects from the proposed action on ESA-listed birds are discountable because the effects are extremely unlikely to occur.

[13] A PSMP has been developed by the applicant with assistance from the NMFS Protected Resources Division. The purpose of the PSMP is to provide monitoring procedures and data collection efforts for species (marine mammals, sea turtles, seabirds, or other species) protected under the MMPA or ESA that may be encountered at the proposed project.

4.3.6 Essential Fish Habitat

The Gulf of Mexico Fishery Management Plans and essential fish habitat that apply to the proposed VE project site are discussed in *Section3.3.6 Essential Fish Habitat*. The main factors most likely to impact essential fish habitat around offshore aquaculture operations are the discharges of dissolved and particulate inorganic and organic nutrients into the water column and discharges of total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. These discharges can cause impacts through the degradation of water quality, affecting pelagic early life stages and adult stages of animals, and through organic enrichment of benthic sediments, affecting demersal and benthic fish and shellfish species and critical benthic habitat. A more extensive discussion of the potential for impacts of fish farming on essential fish habitat can be found in the *ODC Evaluation*, *Appendix C and Appendix D*, *Threatened and Endangered Species Assessment*.

Alternative 1 - No Action. The No Action alternative would result in no effect on essential fish habitat around the proposed VE site because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed action alternative, issuance of NPDES permit will likely have minimal impacts to essential fish habitat expected to occur in the vicinity of the proposed facility. The siting analysis conducted during the site selection process chose an area with sufficient depth and current flow parameters that should result in rapid dilution of dissolved wastes and broad dispersion of solid wastes discharged from the facility. The relatively small fish biomass to be reared in the single cage (80,000 lbs. at harvest – one production cycle) demonstration is also expected to result in small daily loading rates of discharged pollutants downstream of the cage. The proposed VE site will be located over unconsolidated sediments, limiting any potential impacts to reef fish habitat such as live bottom areas The EPA provided an EFH assessment to the NMFS for consideration on our determination that the proposed project would not result in substantial adverse effects on EFH and the permits will have conditions to mitigate any minor impacts that may occur (Appendix E). The NMFS provided written concurrence with our determination in a letter dated March 12, 2019 (Appendix E).

4.3.7 Deepwater Benthic Communities

Deepwater benthic communities do not occur within a distance of approximately 90 miles or more, seaward of the proposed VE site. Therefore, no impact on this resource is expected.

4.3.8 Live Bottoms

Live bottom communities in the vicinity of the proposed VE project location are discussed in *Section 3.3.8 Live Bottoms*. The main impact causing factor to live bottom communities around offshore aquaculture operations is the discharge of total solids consisting of uneaten feed and fish feces, resulting in solids deposition and organic enrichments to seafloor sediments. These discharges can cause impacts through the degradation of water and sediment quality, burial, and through organic enrichment of benthic sediments, affecting demersal and benthic fish and macroinvertebrate species and critical benthic habitat. A more extensive discussion of the potential for impacts of offshore aquaculture operations to live bottom habitat and associated communities can be found in the *ODC Evaluation*, *Appendix C*.

Alternative 1 - No Action. The No Action alternative would result in no effect on live bottom habitat and associated biological communities around the proposed VE site because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed action alternative, issuance of NPDES permit will likely have minimal impacts to live bottom habitat and associated communities expected to occur in the vicinity of the proposed facility. The siting analysis conducted during the site selection process chose an area with sufficient depth and current flow parameters that should result in rapid and broad dispersion of solid wastes discharged from the facility. The relatively small fish biomass to be reared in the single cage (80,000 lbs. at harvest – one production cycle) demonstration is also expected to result in small daily loading rates of discharged pollutants downstream of the cage. The relatively low production of solid wastes from the single cage facility and the wide dispersal of discharged solids to the benthos should minimize impacts to live bottoms. Additionally, the proposed VE site will be located over unconsolidated sediments, limiting any potential physical and biological impacts to live bottoms. Positioning away from potential live bottom habitat will mitigate physical benthic impacts from anchors and mooring lines. The cage is designed to swivel around the center of a suspended 3-point mooring, further reducing anchor chain sweep.

4.3.9 Seagrasses

Seagrasses occurring on the west Florida shelf are discussed in *Section 3.3.9 Seagrasses*. Because seagrass distribution is dependent on water clarity for light penetration, the main impact causing factor to sea grasses around offshore aquaculture operations is the discharge of suspended solids consisting of uneaten feed and fish feces, resulting in reduced water clarity and light attenuation. paddle grass was not observed at the Tampa ODMDS at depths ranging from 14-27m (40-80 ft.), likely due to low water clarity. Additionally, impacts may also result from solids deposition and organic enrichments to seafloor sediments.

Alternative 1 - No Action. The No Action alternative would result in no effect on seagrasses and associated biological communities around the proposed VE site because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed action alternative, issuance of NPDES permit will likely have only very minimal impacts to sea grasses and associated communities as they are not expected to occur in the vicinity of the proposed facility. In addition, the siting analysis conducted during the site selection process chose an area with sufficient depth and current flow parameters that should result in rapid and broad dispersion of suspended solids discharged from the facility. The relatively small fish biomass to be reared in the single cage (80,000 lbs. at harvest – one production cycle) demonstration is also expected to result in small daily loading rates of discharged pollutants downstream of the cage. The relatively low production of solid wastes from the single cage facility and the wide dispersal of discharged solids to the benthos should minimize impacts to seagrasses.

4.4 Social and Economic Environment

The following sections focus on the proposed action impacts on four primary areas: aquaculture production, commercial fishing, recreational fishing, human health/public health, and environmental justice.

4.4.1 Commercial Marine Aquaculture Production

This project is not expected to have an adverse socio-economic impact on current commercial aquaculture production or producers in the Gulf because finfish production in the Gulf has been limited to freshwater species, such as catfish or tilapias, and almaco jack is not a substitute for those species.

Alternative 1: No Action. The No Action alternative would result in no effect commercial marine aquaculture production, because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2: It is not expected the proposed project will negatively impact commercial marine aquaculture production in the Gulf.

4.4.2 Commercial Fisheries

A discussion of the status of commercial fisheries is provided in *Section 3.4.3 Commercial Landings of Almaco Jack and Section 3.4.4 Commercial Fisheries*. The potential for impacts to commercially important fin fishes and invertebrates were discussed above in *Section 4.3.1 Fish and Section 4.3.2 Invertebrates.*

As stated previously and should be emphasized, almaco jack is not a targeted commercial fish. It is only harvested incidentally. Consequently, production of farmed almaco jack from the proposed VE project is not expected to have an adverse economic impact on commercial fishing businesses that land almaco jack.

Alternative 1: No Action. The No Action alternative would result in no effect on commercial fisheries around the site, because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf. The baseline conditions described in *Section 3.4.3*

Commercial Landings of Almaco Jack and Section 3.4.4 Commercial Fisheries would not be impacted.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed action alternative, issuance of NPDES permit will likely have minimal impacts to the commercial fishing industry. almaco jack is not a commercially targeted species. Instead, it is incidentally harvested by commercial vessels that target pelagic species. Consequently, almaco jack has a low dockside price. There is a low potential for almaco jack being a substitute for commercial landings of one or more species, increasing market supply, and causing a decrease in market price of those substitute species. However, based on supplemental information provided by the applicant, fish harvested from the VE project will be sold to multiple state and Federally licensed dealers in an effort to test the marketability of almaco jack. This should spread any impact across multiple markets. In addition, almaco jack are expected to be harvested over a three-month period, thus avoiding the entire project harvest hitting the market at one landing.

With regards to conflicts with commercial fishing activities, the proposed site was selected to minimize potential conflicts with shrimping and other commercial fishing activities in the area. In addition, the siting analysis conducted during the site selection process chose an area with sufficient depth and current flow parameters that should result in rapid dilution of dissolved wastes and broad dispersion of solid wastes discharged from the facility. The relatively small fish biomass to be reared in the single cage (80,000 lbs. at harvest – one production cycle) demonstration is also expected to result in small daily loading rates of discharged pollutants downstream of the cage. Species that would be commercially targeted would have minimal exposure to any discharged pollutants.

4.4.3 Recreational Fishing

Recreational fishing that may occur in the vicinity of the proposed VE site is discussed in *Section 3.4.5 Recreational Marine Fishing*. The factors most likely to impact recreational fishing around offshore aquaculture operations are the discharges of dissolved and particulate inorganic and organic nutrients into the water column and discharges of total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. These discharges can impact through the degradation of water quality, affecting sensitive early life stages of marine fishes, and organic enrichment of benthic sediments, affecting habitat that supports juvenile and adult fish communities and surrounding food sources. In addition, siting of stationary fish farms may interfere with recreational fishing activities.

Alternative 1 - No Action. The No Action alternative would result in no effect on early life stages of fish water column or benthic fish communities around the site, because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed site was selected to minimize potential conflicts with recreational fishing activities in the area, therefore, the proposed action alternative, issuance of NPDES permit will likely have minimal impacts on recreational fishing that may occur in the vicinity of the proposed facility. In addition, the siting analysis conducted during the site selection process chose an area with sufficient depth and current flow parameters that should result in rapid dilution of dissolved wastes and broad dispersion of solid wastes discharged from the facility. The relatively small fish biomass to be reared in the single cage (80,000 lbs. at harvest – one production cycle) demonstration is also expected to result in small daily loading rates of discharged pollutants downstream of the cage. Exposure to any discharged pollutants will be minimal for recreationally targeted fish.

4.4.4 Human Health/Public Health

Contamination from the use of the use of pharmaceuticals (Section 4.2.1.1) to prevent and control disease in farmed fish and impacts to water and sediment quality (Sections 4.2.1 and 4.2.2) are potential sources of bioaccumulated contaminants that can affect farmed fish quality. Consumption of farmed fish exposed to pathogens and pollutants discharged from the aquaculture facility or in the open marine environment could pose health risks to consumers. It is expected that potential adverse human health outcomes are avoided or minimized based on the impact discussions presented in the following sections of the EA: *Water Quality (4.2.1), Pharmaceuticals (4.2.1.1), and Sediment Quality (4.2.2).*

Alternative 1 - No Action. The No Action alternative would result in no effect on human health, because an aquaculture facility would not be able to discharge any operational wastes without an NPDES permit, the facility would not be constructed or operated at this location on the west Florida Shelf.

Alternative 2 - Proposed Action, Issuance of NPDES permit. The proposed action alternative, issuance of NPDES permit will likely have minimal impacts to human health due to water and sediment quality and fish health. The siting analysis conducted during the site selection process chose an area with sufficient depth and current flow parameters that should result in rapid dilution of dissolved wastes and broad dispersion of solid wastes discharged from the facility. The relatively small fish biomass to be reared in the single cage (80,000 lbs. at harvest – one production cycle) demonstration is also expected to result in small daily loading rates of discharged pollutants downstream of the cage. A small harvest is also a fishery management measure of disease control and prevention in farmed fish (Section 3.2.1.3 Pharmaceuticals). Based on these factors, there are no significant human health/public health impacts expected as a result of the proposed action.

4.4.5 Environmental Justice

Environmental justice (EJ) ensures that minority and low-income populations are not subject to disproportionately high and adverse human health or environmental effects due to a proposed action. As discussed in *Section 4.4.4 Human Health/Public Health*, contaminated fish resulting in adverse human health outcomes is the same concern for EJ communities. The discharges authorized under this permit are not expected to adversely impact farmed fish quality. Therefore, greater human health risks to minority and low-income populations from contaminated farmed fish is not expected. Refer to *Section 4.4.4 Human Health/Public Health* for the result of aquaculture and human health, and the alternative effects.

The proposed action footprint would be relatively small and located well out to sea. There are no minorities or low-income populations near the proposed action, but such populations may exist in communities living onshore near staging areas used for the proposed VE project. Based on discussion with the applicant, shared dock space at Port Manatee will be utilized for staging and any conflicts in use will be minimized.

The proposed action would not cause changes to the physical or natural environment that would affect coastal communities. The proposed action would not inhibit persons from any nearby communities from fishing near the action area. Also, farmed fish landings from the proposed action are not expected to effect commercial landings of almaco jack because it is not directly targeted and is incidentally caught by commercial fishermen. For these reasons, Alternative 2 is not likely to impact adversely fish or other wildlife, habitats, or marine plants that are subsistence resources.

Finally, the proposed action is not expected to have disproportionately high and adverse environmental or human health effects to minority and low-income populations that would require further consideration under E.O. 12898.

5.0 Cumulative Impacts

The Council on Environmental Quality's (CEQ) regulations define cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR Section 1508.7). Other actions considered in this cumulative impact analysis include the 2010 Deep Water Horizon (DWH) oil spill event, oil and gas operations, future aquaculture operations and natural disasters. As noted in *1.8 Documents Incorporated by Reference* of this EA, several previous NEPA documents are adopted by reference. Information from these documents were used extensively in determining the cumulative impacts of the proposed action. This analysis considers the cumulative impacts related to the preferred alternative (Alternative 2). Below is a brief summary of issues and resource specific discussion related to cumulative impacts in the context of the proposed action:

Based on public comments received on the draft EA, the EPA understands there are several areas of concern relating to cumulative impacts of the proposed action. Two primary concerns highlighted were the period of time that should be considered when evaluating other actions and the potential for a commercial scale VE project being permitted at or near the current location of the pilot-scale project. The EPA initially considered cumulative impacts over the full permit term (5 years), however, the NPDES permit has been modified to limit discharges from the VE project to one production cycle. The EPA expects this cycle to take no-longer than 18-months, therefore significantly shortening the time in which other offshore aquaculture projects or other actions may have an incremental impact. In addition, if a commercial scale VE project were to be authorized, the new project would be subject to a new permit process and new NEPA analysis.

5.1 Deepwater Horizon Event

On April 20, 2010, the DWH mobile drilling unit exploded, caught fire, and eventually sank in the Gulf, resulting in a massive release of oil and other substances from British Petroleum's Macondo well. The Macondo well is located more than 300 miles North/Northwest of the proposed location of the Ocean Era project. Regarding DWH, the NFMS conducted a thorough evaluation of direct, indirect and cumulative impacts associated with the DWH in their 2015 *Final Supplement to the Final Programmatic Environmental Impact Statement for the Fishery Management Plan for Regulating Offshore Marine Aquaculture in the Gulf of Mexico.* EPA notes that on page 62 of this document NFMS concluded that "*several studies have produced preliminary information on the impacts of the DWH blowout to marine organisms and ecosystems in the Gulf. More information on the short- and long-term impacts of the DWH blowout is needed to assess whether the additional stress caused by the DHW blowout has resulted in a cumulative effect beyond current thresholds."* (NMFS, 2015b). The EPA concur with these findings and recognize that the cumulative impacts associated with DWH are still relatively unknown at this time and the minor incremental impact of the proposed action would have little cumulative impact to the Gulf.

5.2 Oil and Gas Operations

Oil and gas operations are common in the Gulf. To evaluate the proposed action in the context of oil and gas activities EPA considered information from both the EPA's 2016 *National Pollutant Discharge Elimination System (NPDES) Permit for Eastern Gulf of Mexico Offshore Oil and Gas Exploration, Development, and Product Environmental Assessment* (EPA, 2016) and the NMFS's 2015 *Final Supplement to the Final Programmatic Environmental Impact Statement for the Fishery Management Plan for Regulating Offshore Marine Aquaculture in the Gulf of Mexico* (NMFS, 2015b). As noted in the EPA EA (*1.4.3 Moratoria*) (EPA, 2016). Currently, there are no OCS areas restricted under Congressional moratoria. However, in 2006 GOMESA [Gulf of Mexico Energy Security Act] was enacted to restrict oil and gas leasing in portions of the Gulf through 2022. This action restricts leasing within 125 miles of Florida in the eastern Gulf and within 100 miles of Florida in the central Gulf.

The EPA notes that the proposed action is approximately 45 miles off the coast of Florida and within the GOMESA restricted area. The EPA conclude that the proposed action would have negligible cumulative impacts regarding oil and gas operations because it is located in the drilling moratoria area.

5.3 Future Aquaculture Operations

The EPA understands that it is reasonably foreseeable that the marine aquaculture industry may expand in the Gulf, and therefore we considered expansion of the industry as a possibility in our cumulative impacts analysis. When evaluating cumulative impacts, EPA must consider past, present, and reasonably foreseeable future actions that can result in incremental impact of the proposed action (See 40 CFR § 1508.7). The EPA determined that one reasonably foreseeable action that could have an incremental impact on the environment was other offshore aquaculture operations in the Gulf (in the vicinity of the project). The EPA determined that it was not reasonable to consider future projects that are speculative. Based on information EPA had when drafting the EA, the owner/operators of the VE pilot-scale project had not committed to a location of a commercial operation and had not submitted a NPDES permit application for such an operation. Without a draft NPDES permit application and no formal pre-application process started for a commercial scale VE project, it would be unreasonable for EPA to consider impacts from such a facility.

At present, there is one other offshore aquaculture project (Manna Fish Farms) which is being proposed for an area located in the Northern Gulf. This project is in the pre-application stages, but the applicant has yet to submit a NPDES application to the EPA. Therefore, it is unclear if the Manna Fish Farms project will be permitted and operational prior to the end of the production cycle for the VE project. Manna Fish Farms has proposed siting their facility offshore and south of Pensacola, FL. The Manna Fish Farms project is planned to be a commercial scale project. The location of the proposed Manna Fish Farm operations is approximately 300 miles from the operations proposed in this EA. Because of the significant distance between the two aquaculture operations and the NPDES permit limit of one production cycle for the VE project, the EPA determined that the proposed action will not result in incremental impacts that could become significant. We base this determination on our impact analysis supporting the NPDES permitting process. Because of small scale of this project, it is not precedent setting or predictive of decision-making for commercial scale aquaculture projects. In addition, the effects of the proposed action will be monitored through submission of periodic reports to EPA.

5.4 Physical Resources

As previously discussed in *Section 4.2 Physical Resources*, solid waste from the aquaculture operations is the physical resource of concern and it was determined that the solid waste deposition would be minimal. The incremental effect of the proposed action, issuance of the NPDES permit would have minimal impact even combined with the other proposed project (Manna Fish Farms) for aquaculture operations throughout the project area. Solid waste from the VE project and any future aquaculture project would likely re-suspend and disperse. Other activities in the project area that were considered such as any future oil and gas operations would cumulatively add little solid waste to the project area.

5.4.1 Water Quality

As discussed in *Section 4.2.1 Water Quality*, the proposed action, issuance of the NPDES permit, would produce ammonia levels significantly below the published ammonia aquatic life criteria values for saltwater organisms (EPA, 1989). At present, there is only one NPDES permit application for an aquaculture facility submitted to EPA in the Gulf (for which is the proposed action of this EA) and one proposed project (Manna Fish Farms) discussed above. Because of the significant distance between the two aquaculture operations and the NPDES permit limit of one production cycle for the VE project it is anticipated that both actions combined would cause negligible cumulative impacts to water quality.

In the USEPA Region 4's 2016 Environmental Assessment (EA) for *National Pollutant Discharge Elimination System (NPDES) Permit for Eastern Gulf of Mexico Offshore Oil and Gas Exploration, Development, and Production*, it was determined that water quality impacts associated with drilling activities such as drilling fluids and cuttings during daily operations even combined with relatively infrequent and low volume discharges such as WTCW fluids; deck drainage; sanitary and domestic wastes; and miscellaneous wastes were minor water quality impacts. As previously discussed, there is a moratorium on oil and gas operations within 125 miles of the Florida coast (EPA, 2016) and the proposed action is within that moratoria zone. Also, previously discussed, it was concluded that the proposed action would have negligible cumulative impacts in relationship to large scale oil spills (such as DWH).

There is a potential for water quality impacts associated with spills related to other shipping activities (such as cargo ship spills, fuel spills due to shipwrecks or related to ship loss due to storms). However, because of the minor water quality impacts associated with the proposed action it would have minor cumulative impacts associated with spills from other shipping activities.

Additionally, the minor amount of ammonia produced by the proposed action would not incrementally increase the cumulative impacts associated with other activities such as the proposed future oil and gas activities, future aquaculture activities and any lingering environmental impacts associated with the DWH.

5.4.1.1 Pharmaceuticals

As discussed in *Section 4.2.1.1 Pharmaceuticals*, the amounts of pharmaceuticals discharged will have minimal direct impacts. The only other known facility within the Gulf that would have pharmaceutical impacts would be the proposed Manna Fish Farm facility. Because of the significant distance between the two aquaculture operations and the NPDES permit limit of one production cycle for the VE project, these facilities would have negligible cumulative impacts to the Gulf.

In addition, the NPDES permit for the VE project will require that the use of any medicinal products including therapeutics, antibiotics and other treatments are to be reported to the EPA. The report will include types and amounts of medicinal product used and the period of time it was used. In accordance with the NPDES permit, all drugs, pesticides and other chemicals must be applied in accordance with label directions. The permittee must maintain records of all drug, pesticide, and other chemical applications including date and time of application and the quantity of the drug or chemical used.

5.4.2 Sediment Quality

As discussed in *Section 4.2.2 Sediment Quality*, numerous studies within the Mediterranean have shown that organic inputs from fish farms on benthic macrofaunal are only limited up to 25 m from the edge of the cages (Lampadariou, Karakassis, & Pearson, 2005) and carbon and nitrogen produced by fish farm effluents on the seafloor is detected in an area about 1,000 m from the cages (Sara, Scilipoti, Mazzola, & Modica, 2004). Also, the organic material will most likely re-suspend and be dispersed and will not accumulate in any concentrations on the seabed floor. Any remaining accumulation of organic material would also be assimilated by macroinvertebrates living on the seafloor. Other potential sources of organic and inorganic discharges near the proposed action could potentially be from point source discharges such as land-based wastewater treatment and industrial discharges, discharges from septic tanks and non-point source discharges from stormwater. It is unlikely that organics and nitrogen from land-based discharges would reach the proposed facility 45 miles offshore. The effluent from the cage will have minimal impact on sediment quality. The results of deposition modeling, even when doubling fish production amounts, conclude that net accumulation of wastes following a 1-year production cycle would likely not be distinguishable from background levels of organic carbon. Even when the period of discharge is increased to the full 5-year permit term, the modeling report indicated that the proposed project "will not likely have a discernable impact on benthic communities around the project location." Additionally, because of the significant distance between the two aquaculture operations and the NPDES permit limit of one production cycle for the VE project the two projects would not incrementally contribute to the cumulative impacts to sediment quality in the study area.

5.4.3 Air Quality

As discussed in *Section 4.2.3 Air Quality*, there are no large sources of anthropogenic emissions expected to be released into the atmosphere from activities related to the proposed action. Aside from the aquaculture facility, there may be some emissions from outboard motors used by sport fisherman and commercial fishing operations. A tender vessel, used on site at the facility, may be a small source of emissions in offshore waters; however, cumulative impacts from sources are expected to be minimal.

5.4.4 Coastal Barrier Beaches

As discussed in *Section 4.2.4 Coastal Barrier Beaches*, the VE project is to be located approximately 45 miles southwest of Sarasota and offshore from any coastal barrier beaches. Conditions in the NPDES permit provide requirements and prohibitions relating to the discharge of solid material (if specifically not covered in the permit), discharges of domestic waste, debris during catastrophic events, and discharges associated with support vessels. Based on these permit conditions, the cumulative impact from the VE project to coastal barrier beaches will be negligible.

5.4.5 Noise Environment

As discussed in *Section 4.2.5 Noise Environment*, the VE project location is an area with ambient noise from wind, waves, and periodic noise from occasional boat and vessel traffic. Noise generated by the site would remain at low levels and likely not be heard once coupled with water and wind effects that would dampen any sounds originating at the facility. Cumulative impacts from noise are anticipated to be negligible.

5.4.6 Climate

As discussed in Section *4.2.6 Climate,* the VE project will result in negligible emissions of Green House Gasses (GHGs) resulting from operation of support vessels. In general, aquaculture is considered to make a minor, contribution to greenhouse gas emissions although the extent to which this occurs depends on the species, size and location of facilities (Food and Agriculture Organization of the United Nations, 2009). Additional contributors to GHG emissions in the Gulf include oil and gas operations, commercial and recreational fishing operations, commercial shipping, and recreational boating.

While the proposed project may minimally contribute to global emissions, global climate change could have significant effects on Gulf aquaculture operations. Climate change may affect the severity of extreme weather (e.g., hurricanes), potentially generating more intense storms which could lead to increases in storm-induced damage to equipment and facilities (IPCC, 2007; IPCC, 2013). The VE project cages could be vulnerable to more frequent storm events in the Gulf, however, mitigation measures in the NPDES permit will minimize the potential for damage to the environment from such an event.

Other possible impacts of climate change include temperature changes which can influence organism metabolism and alter ecological processes such as productivity and species interactions; changes in precipitation patterns and a rise in sea level which could change the water balance of coastal ecosystems; altering patterns of wind and water circulation in the ocean environment; and influencing the productivity of critical coastal ecosystems such as wetlands, estuaries, and coral reefs (IPCC, 2007). None of these potential climate change impacts are expected to be significant with respect to the NPDES permit duration of 5 years.

5.5 Biological Resources

As previously discussed in *Section 4.3 Biological Resources*, the factors with potential to impact biological resources around coastal fish farms are disturbance, entanglement, vessel strikes, and the discharges of dissolved and particulate inorganic and organic nutrients into the water column and discharges of total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. The latter can potentially impact biological communities through the degradation of water quality, affecting pelagic plants and animals, and organic enrichment of benthic sediments, thereby, affecting benthic biota.

The EPA has determined that due to the small incremental effect of the proposed action, issuance of the NPDES permit would have minimal impact even combined with the other proposed projects (Manna Fish Farms) for aquaculture operations throughout the project area. Solid waste from the VE project and any future aquaculture project would likely re-suspend and disperse. Other activities in the project area that were considered when evaluating potential impacts on biological resources included future oil and gas operations which would cumulatively add little solid waste to the project area.

5.5.1 Fish

Fish that can occur in the vicinity of the proposed VE project area are discussed in *Section 3.3.1 Fish*. In general, the factors that may impact fish near coastal offshore aquaculture operations are disturbance and water and sediment quality degradation as a result of waste discharges. Potential water quality impacts are associated with discharges of dissolved and particulate inorganic and organic nutrients into the water column and discharges of total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. These discharges can potentially impact fish through the degradation of water quality, affecting pelagic plants and animals, and organic enrichment of benthic sediments, affecting benthic habitat. Cumulative impacts to water quality may include discharges of dissolved and particulate inorganic and organic nutrients into the water column, and discharges of total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. Other potential sources of organic and inorganic discharges are waste from ships and point sources such as land-based wastewater treatment, industrial discharges, discharges from septic tanks, and non-point discharges from stormwater. It is not expected that the discharges from the VE project would incrementally combine with these other discharges because the proposed facility is 45 miles offshore in an area selected for enhanced currents.

There are also physical impacts throughout the Gulf that could cause fish mortality such as entanglement in fishing gear and other floating material, and digestion of plastics. However, due to the small size of the VE project and the expected temporary nature of the proposed project it is anticipated that this proposed action would have minor to negligible impacts and would not cumulatively impact fish.

As previously stated, the other only known potential aquaculture facility being proposed in the Gulf (Manna Fish Farm) is more than 300 miles away from the VE project and would not incrementally contribute to the cumulative impacts in the study area. Given the relatively small footprint of the VE project in context of the previously discussed impacts, it is anticipated that this proposed action would have minimal to negligible impacts and would not cumulatively impact fish. Furthermore, the EPA and USACE will include permit provisions that will contain environmental monitoring (water quality, sediment, benthic infauna, etc.) and other conditions that minimize potential adverse impacts to fish.

5.5.2 Invertebrates

Marine invertebrates occurring in the Gulf are discussed in *Section 3.3.2 Invertebrates*. The factors that may impact marine invertebrate communities near coastal offshore aquaculture operations are impacts to water and sediment quality. Anchor placement and mooring line sweep may impact sessile benthic invertebrates. Expected discharges from aquaculture operations include dissolved and particulate inorganic and organic nutrients into the water column, total solids deposition, and organic enrichments to seafloor sediments from uneaten feed and fish feces. These discharges can potentially impact protected corals through the degradation of water quality, and organic enrichment of benthic sediments, affecting benthic habitat. Other potential sources of organic and inorganic discharges are waste from ships and point sources such as land-based wastewater treatment, industrial discharges, discharges from septic tanks, and non-point discharges from stormwater. However, it is not expected that the discharges from the VE project would incrementally combine with these other discharges because the proposed facility is 45 miles offshore in an area selected for enhanced currents.

Additionally, as previously stated, because of the significant distance between the two aquaculture operations and the NPDES permit limit of one production cycle for the VE project the proposed action would not incrementally contribute to the cumulative impacts in the study area. Given the relatively small footprint of the VE project in context of the previously discussed impacts, it is anticipated that this proposed action would have minimal to negligible impacts and would not cumulatively impact invertebrates. Furthermore, the EPA and USACE will include permit provisions that will contain environmental monitoring (water quality, sediment, benthic infauna, etc.) and other conditions that minimize potential adverse impacts to invertebrates.

5.5.3 Marine Mammals

Marine mammals occurring in the Gulf are discussed in *Section 3.3.3 Marine Mammals*. The factors that may impact marine mammals near coastal offshore aquaculture operations are potential entanglement, vessel strikes, behavioral disturbance, and impacts to water and sediment quality. Entanglement risks to marine mammals will be minimized by using rigid and durable cage materials and by keeping all lines taut, however, should entanglement occur, on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement. Facility staff will monitor for the potential of vessel strikes, however, the probability that collisions with the vessel associated with the proposed project would kill or injure marine mammals is discountable as the vessel will not be operated at speeds known to injure or kill marine mammals. Additionally, all vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS. Disturbance to marine mammals from ocean noise generated by the proposed facility is expected to be extremely low given that the there is one production cage and one vessel that will be deployed for a duration of approximately 18 months.

Expected discharges from aquaculture operations include dissolved and particulate inorganic and organic nutrients into the water column, total solids deposition, and organic enrichments to seafloor sediments from uneaten feed and fish feces These discharges can potentially impact protected corals through the degradation of water quality, and organic enrichment of benthic sediments, affecting benthic habitat. Other potential sources of organic and inorganic discharges are waste from ships and point sources such as land-based wastewater treatment, industrial discharges, discharges from septic tanks, and non-point discharges from stormwater. However, it is not expected that the discharges from the VE project would incrementally combine with these other discharges because the proposed facility is 45 miles offshore in an area selected for enhanced currents.

Since the VE project has a very low potential of impacting marine mammals by entanglement, vessel strikes, behavioral disturbance, and impacts to water and sediment quality, the overall cumulative impact potential for VE project is negligible.

5.5.4 Sea Turtles

Sea turtles occurring in the Gulf are discussed in *Section 3.3.4 Sea Turtles*. The factors that may impact protected sea turtles near coastal offshore aquaculture operations are impacts to water quality, entanglement, physical encounters with the pen system, and behavioral disturbance.

Entanglement risks to sea turtles will be minimized by using rigid and durable cage materials and by keeping all lines taut, additionally, the pen will use a rigid copper alloy mesh, which presents no entanglement hazard. Sea turtles may experience disturbance by stress due to a startled reaction should they encounter vessels in transit to the proposed project site. Given the limited trips to the site, opportunities for disturbance from vessels participating in the proposed project are minimal. Disturbance to sea turtles by the proposed facility is expected to be extremely low given that there is one production cage and one vessel that will be deployed for a duration of approximately 18 months. Potential water quality impacts associated with discharges from aquaculture operations include dissolved and particulate inorganic and organic nutrients into the water column, total solids deposition, and organic enrichments to seafloor sediments from uneaten feed and fish feces. Other potential sources of organic and inorganic discharges are waste from ships and point sources such as land-based wastewater treatment, industrial discharges, discharges from septic tanks, and non-point discharges from stormwater. However, it is not expected that the discharges from the VE project would incrementally combine with these other discharges because the proposed facility is 45 miles offshore in an area selected for enhanced currents.

Since the VE project has a very low potential of impacting sea turtles by entanglement, physical encounters with the pen system, behavioral disturbance, and water quality the overall cumulative impact potential for VE project is negligible.

5.5.5 Birds

Birds occurring in the Gulf are discussed in *Section 3.3.5 Birds*. Potential impacts to seabirds from the VE project may be due to the physical structure, presence of fish, and associated activities that would attract migratory seabirds as well as other migratory birds. Seabirds are not expected to interact with the proposed project or become trapped in the cage due to distance of the proposed project from shore (approximately 45 miles). Should there be any interaction that results in an injury to a protected seabird, the on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement. The project staff will suspend all surface activities, including stocking, harvesting operations, and routine maintenance operations in the unlikely event that an ESA-listed seabird comes within 100 m of the activity until the bird leaves the area. Any potential effects from the proposed action on ESA-listed birds are discountable because the effects are extremely unlikely to occur.

Since the VE project has a very low potential of impacting birds due to the low potential for presence at the site the overall cumulative impact potential for VE project on birds is negligible.

5.5.6 Essential Fish Habitat

The environmental factors most likely to impact essential fish habitat around offshore aquaculture operations are the discharges of dissolved and particulate inorganic and organic nutrients into the water column and discharges of total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. These discharges can impact through the degradation of water quality, affecting habitat critical to sensitive early life stages of marine invertebrates and pelagic adult forms. Organic enrichment of benthic sediments can impact habitat that supports juvenile and adult invertebrate communities and surrounding food sources.

As previously discussed, the proposed action alternative, issuance of an NPDES permit, will likely have only very minimal impacts to essential fish habitat near the proposed facility. The siting analysis conducted during the site selection process chose an area with sufficient depth and current flow parameters that should result in rapid dilution of dissolved wastes and broad dispersion of solid wastes discharged from the facility. The relatively small fish biomass to be reared in the single cage (80,000 lbs. at harvest – one production cycle) demonstration is also expected to result in small daily loading rates of discharged pollutants downstream of the cage. In addition, pelagic animals passing through the area would be at the facility temporarily. Exposure to any discharged pollutants would be minimal.

Other potential sources of organic and inorganic discharges are from point source discharges such as land-based wastewater treatment and industrial discharges, discharges from septic tanks and non-point discharges from stormwater. Additionally, waste from ships could contribute to cumulative impacts associated with organic and inorganic pollution. It is unlikely that organic and nitrogen from land-based discharges would reach the proposed facility 45 miles offshore. Conversely, the effluent from the cages will have minimal impact and will not incrementally combine with these other organic and nitrogen laden discharges to cause a cumulative impact. The ODC Evaluation anticipates deposition from the VE facility will not likely have a discernable impact on benthic communities around the project location.

As previously stated, the other only known potential aquaculture facility (Manna Fish Farm) would occur more than 300 miles away from the proposed facility and, thus, would not incrementally contribute to significant cumulative impacts of essential fish habitat in the study area.

Additionally, impacts related to natural disasters combined with the previously discussed impacts could cumulatively impact protected marine habitat. On page 363 in the NMFS PFEIS, it was documented that the impacts related to natural disasters and economic change "*can also affect resources, ecosystems, and communities. Such events include diseases outbreaks, red tides, changes in economic conditions, foreign imports, high fuel prices, hurricanes and storm events, and hypoxia"* (Gulf of Mexico Fishery Management Council and National Oceanic and Atmospheric Administration National Marine Fisheries Service, 2009). However, it is anticipated that the cumulative impacts associated with the proposed action and natural disasters (such as storms, hurricanes, red tides, etc.) would be minor.

The EPA provided an EFH assessment to the NMFS for consideration on our determination that the proposed project would not result in substantial adverse effects on EFH and the permits will have conditions to mitigate any minor impacts that may occur (Appendix E). The NMFS provided written concurrence with our determination in a letter dated March 12, 2019 (*Appendix E*).

5.5.7 Deepwater Benthic Communities

Deepwater benthic communities do not occur within a distance of approximately 90 miles or more, seaward of the proposed VE site. Therefore, no cumulative impact on this resource is expected.

5.5.8 Live Bottoms

The main impact causing factor to live bottom communities around coastal fish farms is the discharge of total solids consisting of uneaten feed and fish feces resulting in solids deposition and organic enrichments to seafloor sediments. These discharges can affect water and sediment quality and may lead to eutrophication of both, in turn affecting the benthic habitat and dynamic as a whole.

Cumulative impacts to live bottom habitats in the vicinity of the proposed facility are expected to be minimal due to sufficient depth and flow parameters at the site that result in rapid dispersion of waste. Small daily loading rates of discharged pollutants are anticipated due to the small fish biomass being reared. This coupled with a wide dispersal of discharged solids limits impacts to live bottoms.

5.5.9 Seagrasses

Seagrass growth is dependent on water clarity for light penetration. As with live bottoms, the main impact causing factor to seagrasses around offshore aquaculture operations is the discharge of total solids consisting of uneaten feed and fish feces.

Cumulative impacts to seagrasses are expected to be minimal due to the lack of them in the vicinity of the proposed facility. Additionally, sufficient depth and flow parameters at the site should result in rapid dispersion of waste. Small daily loading rates of discharged pollutants are anticipated due to the small fish biomass being reared. This coupled with a wide dispersal of discharged solids limits impacts to seagrasses.

5.6 Social and Economic Environment

The following sections focus on the proposed action impacts on four primary areas: aquaculture production, commercial and recreational fishing, human health/public health, and environmental justice.

5.6.1 Aquaculture Production

The Gulf Region within state waters or inland is a major aquaculture producer. Freshwater aquaculture far exceeds marine aquaculture and pond aquaculture, which is the most popular method. Nonetheless, marine aquaculture production in Gulf state waters and inland has been increasing. Because almaco jack is not a commercially targeted species and is not a substitute for the Gulf's freshwater finfish production (Sections 3.4.2 Commercial Marine Aquaculture Production, 3.4.3 Commercial Landings of Almaco Jack, 4.4.1 Commercial Marine Aquaculture Production and 4.4.2 Commercial Fisheries) cumulative impacts from the proposed facility are expected to be minimal.

5.6.2 Commercial and Recreational Fishing

The proposed action alternative is expected to have minimal impacts on commercial and recreational fishing that may occur in the vicinity of the facility. Fishermen are expected to maintain a safe operating distance from the site, as trolling too closely may result in the loss of expensive fishing tackle and other gear. With respect to safety and vessel operations, the risk of gear entanglements or collisions with the feed barge, mooring line, or tethers are not expected.

One factor directly related to the proposed action that could impact commercial and recreational fisheries around coastal fish farms are the discharges of dissolved and particulate inorganic and organic nutrients into the water column and discharges of total solids deposition and organic enrichments to seafloor sediments from uneaten feed and fish feces. The area chosen for the proposed activity has depth and current flow parameters that should result in rapid and broad dispersion of solid wastes discharged from the facility. Due to the small fish biomass (80,000 lbs. produced during a 280-day fish production cycle) in the single cage facility and current flows measured in the vicinity of the selected site, impacts on water quality as it relates to commercial/recreational fishing is expected to be minimal. To put the proposed facility in perspective, the average annual catch of a single fishing ship in the U.S. is 40,000 metric tons (or the equivalent of 88,184,920 lbs.) (Stupachenko, 2018).

The rapid development of marine aquaculture around the world has raised concerns over the possible genetic and ecological impact of escaped fish on natural populations. Almaco jack, is native and common to the Gulf. The fingerlings for the VE project will be sourced from brood stock that are located at Mote Marine Aquaculture Research Park and were caught in the Gulf near Madeira Beach, Florida. As such, only F1 (first filial generation) progeny from those wild caught brood stock will be stocked into the net-pen for the proposed project. Neither the brood stock, as they are native and wild caught, or the first-generation fingerlings from that brood stock, have undergone any genetic modification or selective breeding, and would not likely pose a competitive risk to wild stock. It's also not likely that there would be any genetic contamination or weakening if any fugitive fish spawned with wild individuals. Therefore, there is limited to no risk for non-indigenous stock establishment.

Furthermore, the risks that escaped farm fish pose to wild populations are a function of the probability of escape, and the magnitude of the event that could cause an escape event. The copper mesh cage to be used is impact resistant and designed to survive storm events while being completely submerged. EPA believes that the cage design will result in a low probability of escape.

Some commercial fishermen are concerned that aquaculture will negatively affect prices for wild harvest in the U.S. through increased supply (Rubino, 2008). Competition in seafood markets will exist with or without domestic aquaculture. The U.S. cannot meet consumer seafood demand through wild caught fishing activities alone, and seafood imports and other forms of protein (such as chicken and beef) already provide significant competition. One reference source (Anderson & Shamshak, 2008) explains that even if potential offshore aquaculture species are not raised domestically, the importation of these and other aquaculture species will continue, and most likely increase, as the forecasted gap between supply and demand for seafood widens.

The permit applicant worked with the NMFS and local commercial fisheries groups to site the project in an area that would not conflict with commercial fishing activity occurring offshore Florida. An evaluation of impacts on commercial fishing is provided in section 4.4.2. In general, almaco jack is not a targeted commercial fish. It is only harvested incidentally. Consequently, production of farmed almaco jack from the proposed VE project is not expected to have an adverse economic impact on commercial fishing businesses that land almaco jack. Additionally, the proposed site was selected to minimize potential conflicts with shrimping and other commercial fishing activities in the area.

5.6.3 Human Health/Public Health

Bioaccumulation of contaminants in fish represent minimal cumulative impacts based on the relatively small fish biomass proposed by the applicant. The potential adverse impacts to seafood quality would be minimized by rapid dilution of dissolved wastes and dispersion of solid wastes discharged from the facility, fishery management controls (Sections 3.2.1.3 and 4.2.1.1

Pharmaceuticals), and permit conditions. Permit conditions that avoid or minimize potential adverse impacts to commercial and recreational fisheries are the same requirements that would address human health concerns. Therefore, it is not considered that potential impacts to human health from the activities proposed under this EA would be significant.

5.6.4 Environmental Justice

Disproportionately high and adverse human health effects on EJ communities are not expected from the permitted proposed action. Impacts on human health/public health related to farm fish quality and landings have been discussed in the Human Health (Section 4.4.4) and Environmental Justice (Section 4.4.5) sections.

6.0 Summary of Alternatives

6.1 Alternatives Summary

As discussed in *Section 2.0 Alternatives*, the EPA considered two alternatives for the proposed VE project in this EA. Alternatives considered include a No-action alternative and an action alternative, issuance of a NPDES permit for the facility.

6.1.1 Alternative 1: No Action

Under the no-action alternative the EPA would not issue the NPDES permit for the proposed VE project. The effects of the no action alternative are described in Chapter 3, Affected Environment, in which no structures or pens would exist at the site location.

6.1.2 Alternative 2: Proposed Action--Issuance of NPDES Permit a for Velella Epsilon

Under Alternative 2, the EPA would issue a NPDES permit for the proposed VE project. A summary of the permit conditions are described below:

The proposed permit would include monitoring conditions and limitations that are based on previous marine aquaculture NPDES permits and the BPJ of the permit writer. These permit conditions will be consistent with the Clean Water Act (CWA) Section 308, Section 312, Section 402, and Section 403, and 40 CFR Section 125 and the concentrated aquatic animal production facilities regulations at 40 CFR Section 122.24 and 40 CFR Part 451. While 40 CFR Part 451 applies to facilities which meet the CAAP definition, and is not directly applicable to the proposed facility which does not meet the production thresholds of the CAAP definition, the NPDES permit for the proposed facility will apply the effluent guideline limitations of 40 CFR Part 451 based on the BPJ of the permit writer and the factors in 40 CFR Part 125, Subpart A.

The aquaculture-specific water quality conditions contained in the NPDES permit will generally include an environmental monitoring plan and effluent limitations expressed as BMPs. The environmental monitoring plan is included to examine the effects of the facility's discharges on the surrounding ecosystem. The environmental monitoring plan is based upon 40 CFR Section 125.123(d). The proposed NPDES permit includes water quality monitoring (feed rate, pH, dissolved oxygen, chlorophyll a (chl-a), temperature, nitrogen, phosphorus, turbidity, drugs, and total ammonia nitrogen), sediment monitoring, and benthic macroinvertebrate sampling. The permit also includes the prohibitions on the discharge of solid materials. The BMP Plan will require implementation of practices intended to meet the effluent limit guidelines established for the Concentrated Aquatic Animal Production Point Source Category (40 CFR Section 451).

The permit also requires development and implementation of a facilities damage control plan to prevent and contain facilities damages due to man-made and natural disasters. As part of the plan, the permittee will be required to identify equipment and implement procedures to be used to prevent and contain the facility's damages due to natural disasters and storm events. The requirement for the plan is included based upon the BPJ of the permit writer. The permit also requires development and implementation of a spill control plan to prevent and control spills of toxic or hazardous substances listed under CWA Section 307(a) and Section 311 that may reach surface waters. The permittee will be required to identify any toxic chemicals used at the facility.

Additionally, the proposed USACE LOP would include special conditions protecting general navigation of the area, requirements for implementation of a tracking system for the net pen, removal of the net pen system, adherence to the proposed Marine Mammal, Sea Turtle, and Seabird Monitoring and Data Collection Plan (Protected Species Plan) and other ESA listed species standard protection measures, and other notification and compliance requirements, as deemed appropriate.

6.2 Comparison of Alternatives

The basic difference between the alternatives are action versus no action. Alternative 1 represents the baseline conditions of the project location without an offshore aquaculture project being located at the project site. The action alternative (Alternative 2) represents authorizing Ocean Era to install aquaculture pens at the project location and allows discharges associated with the operation of these pens. The anticipated impacts associated with Alternative 2 include relatively minimal impacts to physical, biological, socioeconomic resources. The EPA believes the VE NPDES, Alternative 2, will include permit conditions to avoid or minimize potential significant environmental impacts.

6.3 Preferred Alternative

The EPA has selected Alternative 2 as the preferred alternative. The major difference in the alternatives is one represents the no action, Alternative 1, and one represents issuance of the proposed NPDES permit, Alternative 2.

The proposed NPDES Individual Permit for the VE project, Alternative 2, contains provisions that are sufficiently protective of the marine waters and resources of the Gulf. As long as Ocean Era complies with the permit requirements, the EPA does not expect the discharges from the facility to materially degrade the environmental resources of the Gulf. In addition, the proposed EPA permit, Alternative 2, has a re-opener provision that authorizes EPA to modify the NPDES permit as necessary in response to new information demonstrating the provisions of the proposed permit are inadequately protective of marine resources of the Gulf.

6.4 Unavoidable Adverse Impacts

The discharges authorized by the NPDES permit from the proposed VE project are expected to have unavoidable minor impacts, primarily in the immediate vicinity of the proposed project. For the most part, these impacts would be short-term in nature, limited in spatial extent, and expected to have a low likelihood to result in cumulative impacts. The potential impacts of authorized effluent discharges are controlled through effluent discharge limits, the restricted use or prohibited use of substances contained in authorized waste streams, and best management practices.

In ODC Evaluations for other marine aquaculture NPDES permits, the EPA made the finding that those projects would not result in unreasonable degradation of, nor irreparable harm to the marine environments. The ODC Evaluation for the VE project has the same finding

6.5 Irreversible and Irretrievable Commitments of Resources

The National Environmental Policy Act Section 101 (2)(c)(v) requires a detailed statement on any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented. Irreversible and irretrievable resource commitments are related to the use of non-renewable resources and the effects that the use of those resources have on future generations. Irreversible commitments of resources are those that cannot be reversed except over an extremely long period of time. These irreversible effects primarily result from destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species or the disturbance of a cultural site).

The proposed action would constitute an irreversible or irretrievable commitment of non-renewable or depletable resources, for the materials, time, money, and energy expended during activities implementing the proposed action. Under the no-action alternative, there would be no irreversible and irretrievable commitments of resources. Irreversible and/or irretrievable impacts for the proposed action are noted below.

Consumption of fossil fuels and energy would occur during buildout of the aquaculture pens and operation activities. Fossil fuels (gasoline and diesel oil) would be used to power support vessels and generators. The energy consumed for project construction and operation represents a permanent and non-renewable commitment of these resources.

Materials for construction of the facility would be irretrievably committed for the life of the project. Use of these materials represents a further depletion of natural resources. Construction and maintenance activities are considered a long-term non-renewable investment of these resources.

Impacts to the sea bottom are expected to be temporary and are not expected to be an irreversible and irretrievable resource commitment, however access to the area around and the facility may be limited during the life of the project. There would also be commitment of time and money for the planning, permitting, and implementation of the proposed project.

6.6 Relationship Between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

The short-term uses of the environment that are considered in the EA include the water column and discharges of total solids. Issuance of an NPDES permit for VE project and the other cumulative activities in the Gulf, are compatible with the maintenance of long-term productivity in the Gulf. Any unavoidable adverse impacts associated with the proposed activity are anticipated to be primarily short-term and localized in nature.

6.7 Finding of No Significant Impact

Consistent with 40 CFR §1508.13, the EPA has determined that the proposed action (issuance of an NPDES permit, Alternative 2) will not cause a significant impact on the environment as outlined in this EA. The issuance of the NPDES permit to the applicant will not cause a significant environmental impact to water quality or result in any other significant impacts to human health or the natural environment. The Finding of No Significant Impact (FONSI) is provided in *Appendix G*.

7.0 Other Protective Measures and Agency Coordination Efforts

The proposed permit and authorization include several conditions, terms, and provisions that are protective measures against potential environmental consequences of the proposed action. The EPA and USACE consulted multiple federal and state agencies for the proposed project. These additional consultation and coordination efforts include the following:

- State Coastal Zone Management Program consistency
- National Historic Preservation Act
- The Wild and Scenic Rivers Act
- The Fish and Wildlife Coordination Act
- Endangered Species Act Consultation
- Essential Fish Habitat Consultation
- Consideration of Clean Water Act Section 401
- Marine Mammal Protection Act Coordination

7.1 State Coastal Zone Management Program Consistency

Coastal Zone Management Act (CZMA), 16 U.S.C. 1451 et seq. was enacted to protect the Nation's coastal zone and is implemented through state-federal partnerships. Section 307(c) of CZMA prohibits the issuance of NPDES permits for activities affecting land or water use in coastal zones unless the permit applicant certifies that the proposed activity complies with the state coastal zone management program.[14]

Issuing a NPDES permit and Section 10 authorization for the VE project is a federal action that requires compliance with the CZMA, therefore the applicant is required to certify that their proposed project complies with the State of Florida's Coastal Zone Management Program. On February 25, 2019, the applicant received CZMA concurrence from the State of Florida for the proposed project. Agency coordination letters and correspondences related to CZMA are provided in *Appendix H*.

7.2 National Historic Preservation Act

Under 16 U.S.C. 470 et seq. Section 106 of the Act and implementing regulations (36 CFR Part 800) require the Regional Administrator, before issuing a license (permit), to adopt measures when feasible to mitigate potential adverse effects of the licensed activity and properties listed or eligible for listing in the National Register of Historic Places. The Act's requirements are to be implemented in cooperation with state historic preservation officers and upon notice to, and when appropriate, in consultation with the Advisory Council on Historic Preservation.

[14] Cited from https://www.epa.gov/npdes/other-federal-laws-apply-npdes-permit-program

During the permitting process for the proposed project the applicant coordinated with the State Historic Preservation Office (SHPO) in Florida to ensure compliance with National Historic Preservation Act (NHPA). In a letter dated February 8, 2019, the SHPO provided concurrence that the project will have no effect on historic properties. Agency coordination letters and correspondences related to NHPA are provided in *Appendix H*.

7.3 The Wild and Scenic Rivers Act

Under 16 U.S.C. 1273 et seq. Section 7 of the Act prohibits the Regional Administrator from assisting by license or otherwise the construction of any water resources project that would have a direct, adverse effect on the values for which a national wild and scenic river was established. The proposed project selected site is located on the west Florida Shelf, approximately 45 miles west, southwest of Longboat Pass-Sarasota Bay, Florida in federal waters. It is not expected that this project will impact any wild and scenic rivers.

7.4 Fish and Wildlife Coordination Act

Under 16 U.S.C. 661 et seq. - the Regional Administrator, before issuing a permit proposing or authorizing the impoundment (with certain exemptions), diversion, or other control or modification of any body of water, consult with the United States Fish and Wildlife Service, Department of the Interior, and the appropriate state agency exercising jurisdiction over wildlife resources to conserve those resources.

The EPA has coordinated with the FWS to ensure compliance with the Fish and Wildlife Coordination Act. The EPA invited thee FWS to participate as a cooperating agency for the development of this EA for the proposed project on November 7, 2018. Agency coordination letters and correspondences related to Fish and Wildlife Coordination Act are provided in *Appendix H*.

7.5 Section 7 Endangered Species Act Coordination

16 U.S.C. 1531 et seq. Section 7 of the ESA requires that federal agencies consult with the ESA administering services to ensure that any projects authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any endangered species or threatened species, or result in the destruction or adverse modification of critical habitat of such species. The ESA requires federal agencies to consult with the appropriate administrative agency (NMFS, USFWS, or both) when proposing an action that may affect threatened or endangered species or critical habitat. Consultations are necessary to determine the potential impacts of the proposed action. They are concluded informally when proposed actions may affect but are “not likely to adversely affect” threatened or endangered species or designated critical habitat. Formal consultations, resulting in a biological opinion, are required when proposed actions may affect and are “likely to adversely affect” threatened or endangered species or adversely modify designated critical habitat.

The EPA consulted with FWS and NMFS on potential impacts to endangered and threatened species. The EPA concluded the required consultations with the USFWS on August 27, 2019 and NMFS on September 30, 2019. Consultation letters are included in *Appendix D* of this EA.

7.6 Essential Fish and Habitat Consultation

Essential Fish Habitat Provisions of the Magnuson-Stevens Act - EFH promotes the protection of essential fish habitat in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH requires that the EPA consult with the NMFS for any EPA-issued permits which may adversely affect essential fish habitat identified under the Magnuson-Stevens Act.

An EFH assessment was jointly prepared by the EPA and the USACE. On March 8, 2019, the EPA provided the EFH assessment to the NMFS and initiated abbreviated consultation with the NMFS. On March 12, 2019, the NMFS concurred with the EFH determination made by the EPA and the USACE. After completion and concurrence of the assessment, minor changes were made to the EFH document, though the updates did not change the findings of the assessment. On August 2, 2019 EPA provided the updated EFH assessment to NMFS for concurrence. Consultation with NMFS on these changes will occur during the public comment period (See Appendix E).

7.7 Clean Water Act Section 401

Under Section 401 of the Clean Water Act, a federal agency cannot issue a permit or license for an activity that may result in a discharge to waters of the U.S. until the state or tribe where the discharge would originate has granted or waived Section 401 certification. Section 401 certification provides states and authorized tribes with an effective tool to help protect state or tribal aquatic resources. The state or tribe in which the discharge originates, in exercising Section 401 certification authority, decides whether the licensed or permitted activity will be consistent with certain CWA provisions, including the state or tribe's water quality standards. The state or tribe may grant, condition, deny or waive certification. Under Section 401(d), the licensing or permitting agency must include in the license or permit any conditions identified by the state or tribe as necessary to ensure compliance with the relevant CWA provisions as well as appropriate requirements of state or tribal law.

The proposed facility is located approximately 45 miles west, southwest of Longboat Pass-Sarasota Bay, Florida. For purposes of the CWA, state waters extend three miles from shore. Accordingly, CWA Section 401 certification is not required because the proposed discharge does not originate in any state or tribal waters.

In addition to the state or tribal certification requirement for the state or tribe in which the discharge originates, Section 401 of the CWA also requires the EPA, if a proposed discharge may affect the quality of the waters of any other state or tribe (e.g., if the discharge may affect waters of a state or tribe that is nearby or downstream from the state or tribe in which the discharge originates), to notify such other state or tribe. The state or tribe, so notified, then has an opportunity to submit its views or objections to the proposed license or permit, and to request a public hearing. While the EPA is obligated to condition any permit on compliance with the water quality standards of any affected state or tribe, in the case of a nearby or neighboring state or tribe, it is not required to adopt any conditions requested by the state or tribe. In this case, the EPA has determined, based on a review of the application and other relevant information, including the location and nature of the proposed discharge, that the proposed discharge will not affect the water quality of any neighboring state or tribal waters.

7.8 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) established a moratorium, with certain exemptions(see sec. 101 and 118), on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas, and on the importing of marine mammals and marine mammal products into the United States. Under the MMPA, the Secretary of Commerce (authority delegated to NOAA Fisheries) is responsible for the conservation and management of cetaceans and pinnipeds (other than walruses). The Secretary of the Interior is responsible for walruses, sea and marine otters, polar bears, manatees, and dugongs.

Part of the responsibility NOAA Fisheries has under the MMPA involves monitoring populations of marine mammals to ensure that they stay at optimum levels. If a population falls below its optimum level, it is designated as "depleted," and a conservation plan is developed to guide research and management actions to restore the population to healthy levels.

Currently, the applicant is assisting by partnering with NMFS SERO to develop a marine mammal monitoring plan to collect data to better inform the risks associated with this type of aquaculture operation to marine mammals and, thus, help determine how better to categorize this type of aquaculture operation on future letter of authorization (LOA). The applicant will carry onboard a current MMAP certificate (Southeast MMP Authorization Certificate 2019 https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-authorization-program) and report any marine mammal injuries to NMFS within 48 hours to comply with Section 118 of the MMPA.

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9.0 Public Notice

The EPA provided the public an opportunity to review and comment on this EA during a 30-day public comment period. On August 30, 2019, the EPA released for public notice and comment a draft NPDES permit, a draft EA to comply with the NEPA, and other associated documents for the proposed project.[15] The first public comment period lasted for 30-days and ended on September 30, 2019.

On December 12, 2019, EPA released a notice of public hearing and extended the public comment period regarding the proposed issuance of a NPDES permit and supporting documents. On January 18, 2020, EPA published a public notice as a reminder of the public hearing. A public hearing was held on January 28, 2020. The second public comment period ended on February 4, 2020 and lasted for 54 days. The public was able to submit comments orally or in writing at the public hearing or by submitting written comments to EPA.

In accordance with 40 CFR § 124.17, EPA must issue a response to comment (RTC) document at the time of the final permit decision. The RTC is required to have certain information: 1) specify any provisions of the draft permit that have been changed in the final permit and the reason for the change; and 2) briefly describe and respond to all significant comments on the draft permit and supporting documents raised during the public comment period including the public hearing. Additionally, the implementing regulations for NEPA require the EPA to respond to all substantive comments received on the preliminary FONSI (40 CFR § 6.206(f)).

EPA received approximately 44,500 comments from various interested individuals and parties during the public comment period. In addition to written comments, EPA received about 50 verbal comments during the public hearing. Written and verbal comments were provided by national, regional, and local non-governmental organizations;[16] university and research organizations;[17] aquaculture associated organizations;[18] fishing groups;[19] and federal, state, and local governments.[20]

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[15] In accordance with 40 CFR § 124.10, the public notices were published on EPA's website and in the Sarasota Herald-Tribune, and sent to the applicant, federal and state agencies, and various interested parties.

[16] Non-government organizations included: C.A. Goudey & Associates, Center for Biological Diversity, Center for Food Safety, Citizens of Sarasota County, Clean Water Tribe, Community Alliance for Global Justice, Cuna Del Mar, Environmental Confederation of Southwest Florida, Farmworker Association of Florida, Friends of Animals, Friends of the Earth, Food and Water Watch, Green Justice Legal, Gulf Fisheries Management Council, Hands Along the Water, Healthy Gulf, Mansoatta-88, National Family Farm Coalition, Northwest Atlantic Marine Alliance, Ocean Conservation Research, Paradise Cove Association, Potesta & Associates, Sierra Club, Siesta Key Association, Sarasota County Council of Neighborhood Associations, Solutions to Avoid Redtide, Stocking Savvy Environmental Consulting, Suncoast Waterkeeper, and Wildlife Law Center.

[17] Universities and research organizations included: Coonamessett Farm Foundation, Mote Marine Laboratory, University of Miami, and University of South Florida.

[18] Aquaculture associated groups: Aquaculture Consulting Services, Aquarium of the Pacific, Florida Aquaculture Association, Manna Fish Farms, National Aquaculture Association, Recirculating Farms Coalition, and Sanibel-Captiva Conservation Foundation Marine Laboratory.

[19] Fishing associated groups: Bonefish and Tarpon Trust, Fish for America USA, Kirk Fishing Company, and Live Advantage Bait.

[20] Government entities included: City of Naples, City of Sarasota, City of Sanibel, Florida Department of State, Lee County Natural Resources, Mississippi-Alabama Sea Grant Consortium, and Siesta Key Chamber of Commerce.

The EPA's responses to significant public comments received on the proposed draft NPDES permit, draft EA and FONSI, and all supporting documents can be found in the RTC. The EPA has addressed all significant issues raised during the public comment period. Where multiple comments were received on similar topics, the comments are grouped together and summarized. Excerpts from some comments have been included to provide context. All comments are part of the administrative record.

10.0 Preparers

This EA was prepared by the EPA Region 4 Office with the assistance of personnel from cooperating agencies.

Primary responsibility and direction for preparing this document included the following EPA Region 4 personnel:

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Appendix A –Baseline Environmental Survey
Appendix B – Cage/Pen Design
Appendix C – ODC Evaluation
Appendix D – ESA Consultation Documents
Appendix E – EFH Consultation Documents
Appendix F – CASS Technical Reports
Appendix G – Preliminary Finding of No Significant Impact
Appendix H - State Consultations (Section 106/CZMA)

Appendix A

Updated - Final

Baseline Environmental Survey Report

For the

Velella Epsilon Project –

Pioneering Offshore Aquaculture in the Southeastern Gulf of Mexico

NOAA Sea Grant 2017 Aquaculture Initiative

Submitted to:

U.S. Environmental Protection Agency (EPA) Region 4
National Pollutant Discharge and Elimination System (NPDES)
Permitting and Enforcement Branch

Prepared by:

Kampachi Farms, LLC

Report Contributions from:

APTIM Environmental and Infrastructure, Inc.
Tidewater Atlantic Research, Inc.
NOS-NCCOS, NOAA

November 2018

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The Velella Epsilon Project – Baseline Environmental Survey

1.0 Description of the Survey Area & Project Overview

The project area is in the Gulf of Mexico (GOM) in approximately 40m water depth off southwest Florida, generally located 45 miles southwest of Sarasota, Florida. **Figure 1** provides the location of two alternative site locations (Site A and Site B), originally under consideration. APTIM Environmental and Infrastructure, Inc. (APTIM) was subsequently hired by Kampachi Farms, LLC to conduct a geophysical baseline survey of the proposed site locations for siting the VE Project demonstration aquaculture farm. Contents of the APTIM Geophysical Survey Report to Kampachi Farms, LLC have been summarized, reorganized, and augmented to fulfil the requirements of the *Baseline Environmental Survey Guidance and Procedures for Marine Aquaculture Activities in U.S. Federal Waters of the Gulf of Mexico, October 24th, 2016.* The original APTIM report; *Results of Baseline Geophysical Survey for the Siting of Aquaculture Operations in the Gulf of Mexico*, is provided in Appendix A.

Tidewater Atlantic Research, Inc. (TAR) was subsequently hired by Kampachi Farms, LLC to conduct the marine archaeological review and analysis of the geophysical baseline survey data. The original TAR report; *Submerged Cultural Resource Data Analysis Letter Report For: The Velella Epsilon Project Pioneering Offshore Aquaculture in the Southeastern Gulf of Mexico"*, is provided in Appendix B.

The purpose of the geophysical investigation was to characterize the sub-surface and surface geology of the sites and identify areas with a sufficient thickness of unconsolidated sediment near the surface while also clearing the area of any geohazards and structures that would impede the implementation of an aquaculture operation. The geophysical survey for the VE Project consisted of collecting single beam bathymetry, side scan sonar, sub-bottom profiler (seismic reflection), and magnetometer data within the GOM at Sites A and B. Each site was defined as approximately 1.3 x 1.3 nautical miles (nm; 1.7-square nm-site areas) which was filled with 200m (meters) spaced survey lines, running north/south, as well as two tie lines running east/west.

Site #A:

Location	Latitude	Longitude
Top Left	27.087752° N	-83.218684° W
Top Right	27.086662° N	-83.178426° W
Bottom Left	27.051718° N	-83.219894° W
Bottom Right	27.050629° N	-83.179649° W

Site #B:

Location	Latitude	Longitude
Top Left	27.145665° N	-83.258456° W
Top Right	27.144584° N	-83.218175° W
Bottom Left	27.109629° N	-83.259656° W
Bottom Right	27.108550° N	-83.219389° W

Water depths across each of these areas ranged from a minimum depth of 38.3m to a maximum depth of 42.6m.

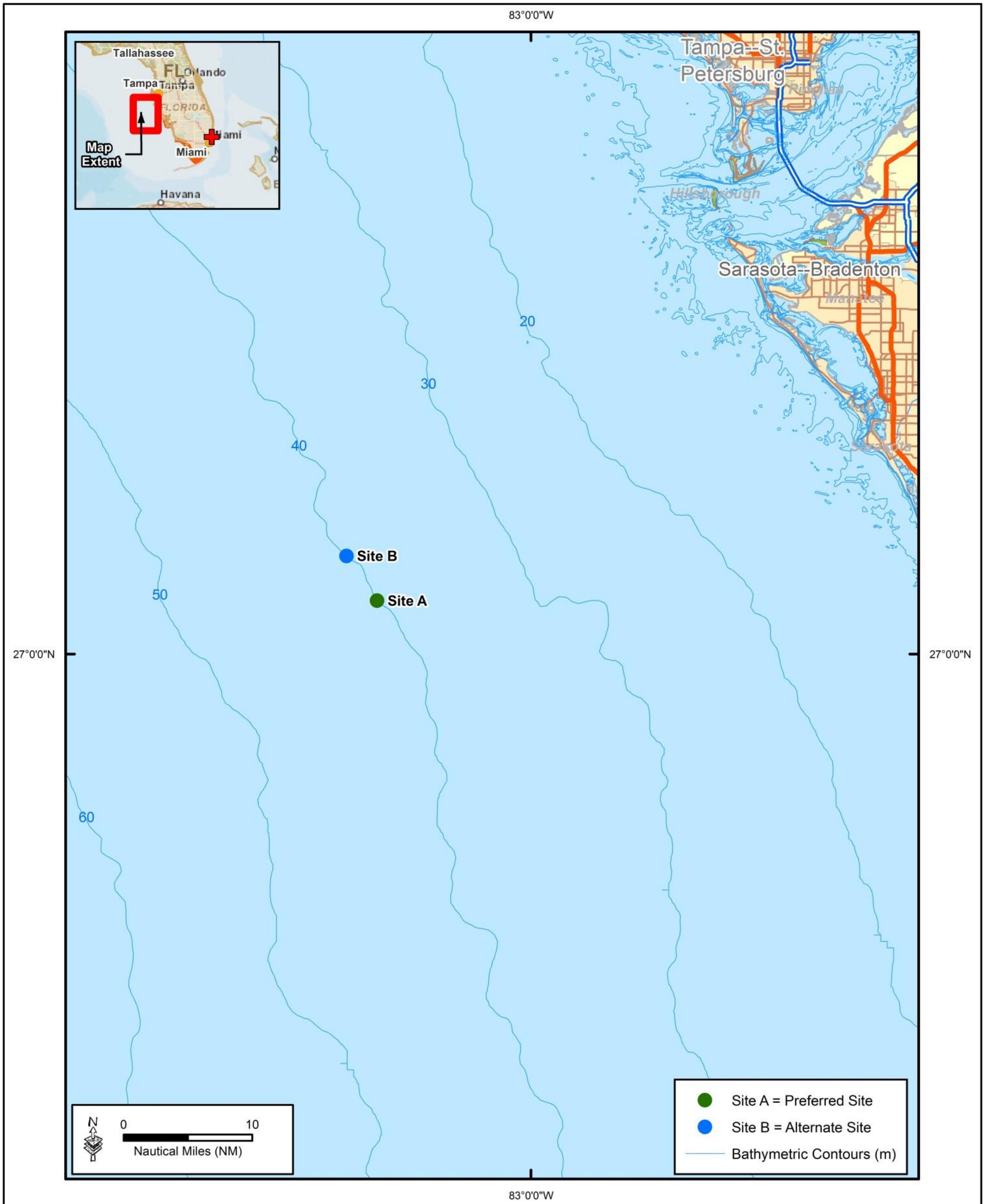

Figure 1. Proposed Alternative Site Locations for the VE Project

2.0 BES Planning, Fieldwork, and Report Investigators

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3.0 Description of the Field Survey Methodology

3.1 Navigation System

Navigational, magnetometer, and depth sounder systems were interfaced with an onboard computer, and the data were integrated in real time using Hypack Inc.'s Hypack 2017® software. Hypack 2017® is a state-of-the-art navigation and hydrographic surveying system. The location of the fish tow-point or transducer mount on the vessel in relation to the Trimble DGPS was measured, recorded and entered into the Hypack 2017® survey program. The length of cable deployed between the tow-point and each towfish was also measured and entered into Hypack 2017®. Hypack 2017® then takes these values and monitors the actual position of each system in real time. Online screen graphic displays include the replotted survey lines, the updated boat track across the survey area, adjustable left/right indicator, as well as other positioning information such as boat speed, and line bearing. The digital data are merged with the positioning data (Trimble DGPS), video displayed and recorded to the acquisition computer's hard disk for post processing and/or replay.

The navigation and positioning system deployed for the geophysical survey was a Trimble® Differential Global Positioning System (DGPS) interfaced to Hypack, Inc.'s Hypack 2017®. A Pro Beacon receiver provided DGPS correction from the nearest U.S. Coast Guard Navigational Beacon. The DGPS initially receives the civilian signal from the global positioning system (GPS) NAVSTAR satellites. The locator automatically acquires and simultaneously tracks the NAVSTAR satellites, while receiving precisely measured code phase and Doppler phase shifts, which enables the receiver to compute the position and velocity of the vessel. The receiver then determines the time, latitude, longitude, height, and velocity once per second. The GPS accuracy with differential correction provides for a position accuracy of one (1) to four (4) feet during most of the operations. This is within the accuracy needed for geophysical investigations.

3.2 Survey Instrumentation

3.2.1 Single Beam Bathymetry

The bathymetric survey was conducted using an ODOM Echotrac MKIII sounder with a 200 kHz transducer pole mounted on the port side of the on the R/V Eugenie Clark. A TSS DMS-05 dynamic motion sensor was used to provide attitude corrections. For Quality Assurance/Quality Control and data reduction purposes, APTIM water level recorder data, and NOAA water level data were used to verify and/or correct onboard bathymetric readings.

Upon completion of the field work, data were edited and reduced using Hypack 2017® using Single Beam Max application. Water level corrected data were exported and a comma delimited XYZ file was created. All overlapping profile data were compared in cross section format to ensure system accuracy. For surface and map creation the final XYZ data files were processed through Golden Software's Surfer 12 for interpolation and grid creation. ERSI's Arc GIS 10.3 was used for final interpolation and presentation.

3.2.2 Sidescan Sonar

Sidescan sonar data were collected to verify the location and extent of the surficial unconsolidated sediment and to map ocean bottom features such as benthic habitats, exposed pipelines, cables, underwater wrecks, potential cultural resources, etc. APTIM utilized a dual frequency EdgeTech 4200® sidescan sonar, which uses a full-spectrum chirp technology to deliver wide-band, high-energy pulses coupled with high resolution and good signal to noise ratio echo data. The sonar package includes a portable configuration with a laptop computer running EdgeTech's Discover® acquisition software and dual frequency (300/600 kHz) towfish running in high definition mode. The EdgeTech 4200® has a maximum range of 754ft (230 m) to either side of the towfish at the 300kHz frequency and 394ft (120 m) to either side of the towfish at the 600kHz frequency.

Post processing of the sidescan sonar data was completed using Chesapeake Technology, Inc.'s SonarWiz 7® software. This software allows the user to apply specific gains and settings in order to produce enhanced sidescan sonar imagery that can be interpreted and digitized for specific seafloor features, including potential areas indicative of consolidated and unconsolidated sediment Post collection processing of the sidescan sonar data were completed using Chesapeake Technology, Inc.'s SonarWiz 7® software. This software allows the user to apply specific gains and settings in order to produce enhanced sidescan sonar imagery that can be interpreted and digitized for specific benthic habitat features and debris throughout the study area. The first step in processing was to import the data into the software and bottom track the data. This is achieved using an automated bottom tracking routine and in some cases done manually. This step provides the data with an accurate baseline representation of the seafloor and eliminates the water column from the data.

Once the data were bottom tracked, they were processed to reduce noise effects (commonly due to the vessel, sea state, or other anthropogenic phenomenon) and enhance the seafloor definition. All of the sidescan sonar data utilized empirical gain normalization (EGN). An empirical gain normalization table was built including all of the sidescan sonar data files. Once the table was built it was applied to all of the sidescan sonar data. EGN is a relatively new gain function that works extremely well in most situations and can be considered a replacement for Beam Angle Correction (BAC). EGN is a function that sums and averages up all of the sonar amplitudes in all pings in a set of sonar files by altitude and range. The amplitude values are summed and averaged by transducer (port and starboard) so there are actually two tables. A given sonar amplitude sample is placed in a grid location based on the geometry of the ping. On the x-axis of the grid is range, and on the y-axis of the grid is altitude. The resulting table is used to work out the beam pattern of sonar by empirically looking at millions of samples of data.

After processing each line, the data were inspected and interpreted for the location and extent of unconsolidated sediment as well as ocean bottom features such as benthic habitats, exposed pipelines, cables, underwater wrecks, potential cultural resources, etc. All geologic features and sediment boundaries were digitized in SonarWiz 7® by encapsulating the feature into a geographically referenced polygon/polyline shapefile for integration into ArcGIS®.

3.2.3 Sub-Bottom Profiler

An EdgeTech 3200® sub-bottom profiler with a 512i towfish was used to collect the high-resolution seismic reflection profile data. This system is a versatile wideband frequency modulated (FM) sub-bottom profiler that collects digital normal incidence reflection data over many frequency ranges within the 0.5kHz – 12kHz range, also called a "chirp pulse". This instrumentation generates cross-sectional images of the seabed capable of resolving bed separation resolutions of 0.06m to 0.10m (depending on selected pulse/ping rate). The tapered waveform spectrum results in images that have virtually constant resolution with depth. The data were collected and recorded in the systems native, EdgeTech® .jsf format. The seismic system was monitored and adjusted, if needed, in real-time to use the optimal settings for environmental, oceanographic and geologic conditions in order to ensure the highest quality data is being collected. Navigation and horizontal positioning for the sub-bottom system were provided by the Trimble® DGPS system via Hypack® utilizing the Hypack® towfish layback correction. The chirp sub-bottom profiler was operated using a pulse with a frequency sweep of 1.0 kilohertz (kHz) to 10.0kHz with a 5 millisecond (ms) pulse length. The system was set to ping at a rate of 7 hertz (Hz) and was run with a 60% pulse power level.

Post-collection processing of the chirp sub-bottom profiler data was completed using Chesapeake Technology, Inc.'s SonarWiz 7® software. This software allows the user to apply specific gains and settings in order to produce enhanced sub-bottom imagery that can then be interpreted and digitized for specific 4 stratigraphic facies relevant to the project goals. The data were continuously bottom-tracked to allow for the application of real-time gain functions in order to have an optimal in-the-field view of the data.

Raw *.jsf files were imported into SonarWiz 7® and the data were then bottom tracked, gained and swell filtered. The process of bottom tracking uses the high-amplitude signal associated with the seafloor to map it as the starting point for gains and swells. Swell filtering is a ping averaging function, which allows for the elimination of vertical changes caused from towfish movement produced from changes in sea state. The swell filter was increased or decreased depending on the period and frequency of the sea surface wave conditions and special care was taken not to over-smooth and eliminate features on the seafloor. Time-varying gain (TVG) was applied and manipulated to produce a better image (contrasts between low and high return signals) below the seafloor to increase the contrast within the stratigraphy, and increase the amplitude of the stratigraphy with depth, accounting for some of the signal attenuation normally associated with sound penetration over time. A blank-water column function was also applied to eliminate any features such as schools of fish under the chirp system which could produce noise within the water column.

3.2.4 Magnetometer

A Geometrics G-882 Digital Cesium Marine Magnetometer was used to perform a cursory investigation of the magnetic anomalies within the study area. The magnetometer runs on 110/220 volts alternating current (VAC) power and capable of detecting and aiding the identification of any ferrous, ferric or other objects that may have a distinct magnetic signature. Factory set scale and sensitivity settings were used for data collection (0.004 nT/ πHz rms [nT = nanotesla or gamma]. Typically 0.02 nT P-P [P-P = peak to peak] at a 0.1 second sample rate or 0.002 nT at 1 second sample rate). Sample frequency is factory-set at up to 10 samples per second. The magnetometer was towed in tandem with the sidescan system at an altitude of no greater than 6 meters (m) above the seafloor, per BOEM regulations, and far enough from the vessel to minimize boat interference since the instrument has a sensitivity of 1 gamma. The tandem systems were attached to a marine grade hydraulic winch to adjust for changes in the seafloor and maintain an altitude of no greater than 20 feet (ft; 6m) above the seafloor. Navigation and horizontal positioning for the magnetometer were provided by the Trimble® DGPS system via Hypack® utilizing the Hypack towfish layback correction. Magnetometer data were recorded in .raw Hypack® file format.

The magnetometer data were post processed by APTIM's personnel in Hypack® 2018's MagEditor software to identify any potential magnetic anomalies. In order to normalize the magnetic field and select anomalies with the finest data resolution possible, the background magnetic field and background noise was adjusted to negate for diurnal variations. Within MagEditor, the diurnal magnetic readings were duplicated and cropped. The cropped data were then deducted from the original gamma readings to normalize the magnetometer data from any diurnal variations. Anomalies were then selected with the Whole Magnetic Analysis tool, accounting for the distance over ground, time elapsed, the minimum and maximum gamma readings and the total peak to peak gamma readings.

3.3 Survey Vessel

3.3.1 Vessel Description

The R/V Eugenie Clark (**Photograph 1**) is a shallow-water hydrographic survey vessel owned and operated by Mote Marine Laboratory. Based out of Sarasota, FL, the R/V Eugenie Clark has operated on a number of offshore and nearshore surveys along the gulf coast of Florida. It is a 46 ft fiberglass hulled vessel with a 16 ft beam and 3.3 ft draft. The vessel is equipped with twin inboard C7 Caterpillar Diesel engines (470 HP each), a Northern Lights 12KW Marine generator (120/208V), an A-Frame, and twin hydraulic 2 winches. With a cruising speed of 17 knots (kts) and a maximum speed of 20kts, the R/V Eugenie Clark was an efficient vessel, which allowed for quick transit between survey areas, and fulfilled the necessary requirements for survey operations.

Photograph 1. Survey Vessel R/V Eugenie Clark used for the VE Project BES

3.3.2 Sensor Configuration and Set-backs

The geophysical survey consisted of collecting single beam bathymetry, side scan sonar, sub-bottom profiler (seismic reflection), and magnetometer data (**Photograph 2**). The instrument set-backs identify the distances from the zero mark (vessel GPS) to each of the towed/mounted systems. As such, the system set-backs were measured from the GPS antenna (placed on vessels Port side on the second deck) to each of the towpoints/mounted instruments and inputted into the system set-up in Hypack®. Sidescan sonar and seismic sub-bottom had an additional offset length of cable out from the towpoint to the instrument. The magnetometer position was based on the sidescan sonar offset, and was set-back with an additional 20 ft of cable (i.e., the magnetometer was set-back 20 ft behind the sidescan sonar). The raw data for each survey system was recorded with the layback (set-back) already corrected during navigation (**Table 1**).

Photograph 2. Sensors Deployed during the BES Fieldwork

Table 1. Summary System Set-backs (Offsets) Used during the BES Fieldwork

System	X Offset (ft)	Y Offset (ft)	Z Offset (ft)
Vessel GPS (zero)	0	0	-15.5
Odom/Hydrotrack-mounted	-3.2	-5.5	0
Motion Reference Unit- mounted	2.5	15.3	-15.5
Chirp-towed	10.4	-13.6	-3.3
SSS-towed	2.7	-18	-7.4

3.4 Vessel Speed and Course Changes

The survey began with the APTIM crew mobilizing the R/V Eugenie Clark on August 12, 2018, at the Mote Marine Laboratory's Facility in Sarasota, Florida. Once the vessel was mobilized, it began its transit to the survey sites on August 14, 2018, and collected geophysical data between August 14, 2018, and August 15, 2018. Average vessel speeds during the surveys ranged from 4 kts to 7 kts.

3.5 Sea State and Weather Conditions

Weather conditions were characterized as relatively calm sunny days and mild breezes with winds at approximately 5 to 10kts. Air temperatures ranged from 75 degrees Fahrenheit (°F) to 90°F, and sea temperatures between 85.5°F and 86.5°F. Seas were calm with swells at approximately 2ft on both survey days.

3.6 Original Daily Survey Operation Logs and Sensor Tow Depths

Due to their file size (>18.3 GB), the original daily survey logs will be made available digitally upon request. These files also include the sensor height for each towed system off the seafloor for the beginning and end of each survey trackline (**Table 2**). On average, the magnetometer and the sidescan sonar tows were maintained at relatively constant depths from the seafloor of 6m and 12m; respectively. The sub-bottom profiler was maintained within a range of depths from the seafloor of approximately 14m to 21m, based on trackline bathymetry.

3.7 Description of Survey Procedures

During survey operations, APTIM personnel reviewed the data in real time, in order to establish a basic site characterization and determine any structures or geology that would impede the development of an aquaculture operation. APTIM began by collecting seismic sub-bottom, sidescan sonar, magnetometer and bathymetric data along four (4) tracklines at a wide spacing of 1968 ft (600 m) at Site A. Based on the data collected, it was evident that the area contained more consolidated sediments (i.e. hardbottom) near the seafloor and very little unconsolidated sediments (such as sands or siltier sands) at Site A.

APTIM communicated these preliminary findings to the Kampachi, LLC, Project Manager on the evening of Tuesday, August 14, 2018 and a collective decision was made to move to Site B to determine if Site B contained more unconsolidated than consolidated sediments. APTIM began collecting seismic sub-bottom, sidescan sonar, magnetometer and bathymetric data along three (3) tracklines at a wide spacing of 1968 ft (600 m) at Site B and reviewed the data in real time. Based on the data collected, it was evident that the south eastern portion of the Site B survey area contained more unconsolidated sediments (such as sands or siltier sands). As a result of this information, APTIM revised the survey area and collected approximately 27 nautical miles (nm) (46 line kilometers [km]) of data in a roughly 1.6nm x 1.4nm (3.0 km x 2.5 km) area, targeting an area with a thicker (2 to 8ft) surficial layer of unconsolidated sediments near the seafloor in the south eastern portion, and mostly outside of Site B (here forward referred to as Modified Site B). A total of 16 tracklines were surveyed within this area (**Figure 2**). The depth profiles are illustrated in **Figure 3**.

Table 2. Sensor Heights off the Seafloor for Start and End of each Survey Trackline

Line	Start Latitude	Start Longitude	Sidescan Altitude (m)	Mag Altitude (m)	Sub-bottom Altitude (m)	End Latitude	End Longitude	Sidescan Altitude (m)	Mag Altitude (m)	Sub-bottom Altitude (m)
Number	**(DD MM.mmm')**	**(DD MM.mmm')**	**SOL**	**SOL**	**SOL**	**(DD MM.mmm')**	**(DD MM.mmm')**	**EOL**	**EOL**	**EOL**
100	27° 5.270'	-83° 13.118'	17	9	23	27° 3.079'	-83° 13.188'	14	11	23
103	27° 5.277'	-83° 12.769'	18	13	23	27° 3.091'	-83° 12.821'	16	13	24
106	27° 5.247'	-83° 12.382'	11	9	20	27° 3.061'	-83° 12.464'	14	11	21
109	27° 5.256'	-83° 12.043'	17	13	22	27° 3.070'	-83° 12.090'	17	14	23
170	27° 8.689'	-83° 13.097'	14	7	22	27° 6.492'	-83° 13.161'	11	9	19
210	27° 8.157'	-83° 15.523'	16	13	22	27° 8.058'	-83° 12.500'	13	11	20
211	27° 7.169'	-83° 15.582'	14	13	23	27° 7.089'	-83° 13.136'	16	12	21
211_1	27° 7.093'	-83° 13.321'	21	15	25	27° 7.059'	-83° 12.177'	16	7	20
211_2	27° 7.032'	-83° 11.634'	14	5	22	27° 7.061'	-83° 12.359'	8	7	15
311	27° 7.916'	-83° 13.480'	17	11	20	27° 6.527'	-83° 13.534'	15	11	25
312	27° 7.897'	-83° 13.368'	9	5	16	27° 6.498'	-83° 13.403'	7	4	16
313	27° 7.905'	-83° 13.238'	14	8	22	27° 6.498'	-83° 13.282'	9	6	17
315	27° 7.902'	-83° 12.995'	16	10	19	27° 6.510'	-83° 13.038'	13	9	20
316	27° 7.904'	-83° 12.878'	15	10	20	27° 6.508'	-83° 12.925'	13	11	22
317	27° 7.883'	-83° 12.758'	9	6.5	17	27° 6.483'	-83° 12.806'	9	6	18
318	27° 7.883'	-83° 12.643'	8	5	16	27° 6.473'	-83° 12.685'	12	6	21
319	27° 7.901'	-83° 12.508'	12	8	18	27° 6.496'	-83° 12.558'	11	8	19
320	27° 7.896'	-83° 12.395'	12	9	20	27° 6.492'	-83° 12.450'	13	9	20
321	27° 8.398'	-83° 12.288'	16	8	18	27° 6.445'	-83° 12.318'	11	9	23
322	27° 7.889'	-83° 12.151'	14	10	20	27° 6.480'	-83° 12.191'	13	9	20
323	27° 7.886'	-83° 12.027'	15	10	19	27° 6.484'	-83° 12.068'	12	11	21
324	27° 7.862'	-83° 11.911'	9	4	15	27° 6.460'	-83° 11.958'	9	5	16
325	27° 7.866'	-83° 11.792'	15	6	21	27° 6.457'	-83° 11.835'	8	5	16
326	27° 7.878'	-83° 11.666'	15	11	21	27° 6.470'	-83° 11.710'	14	12	21

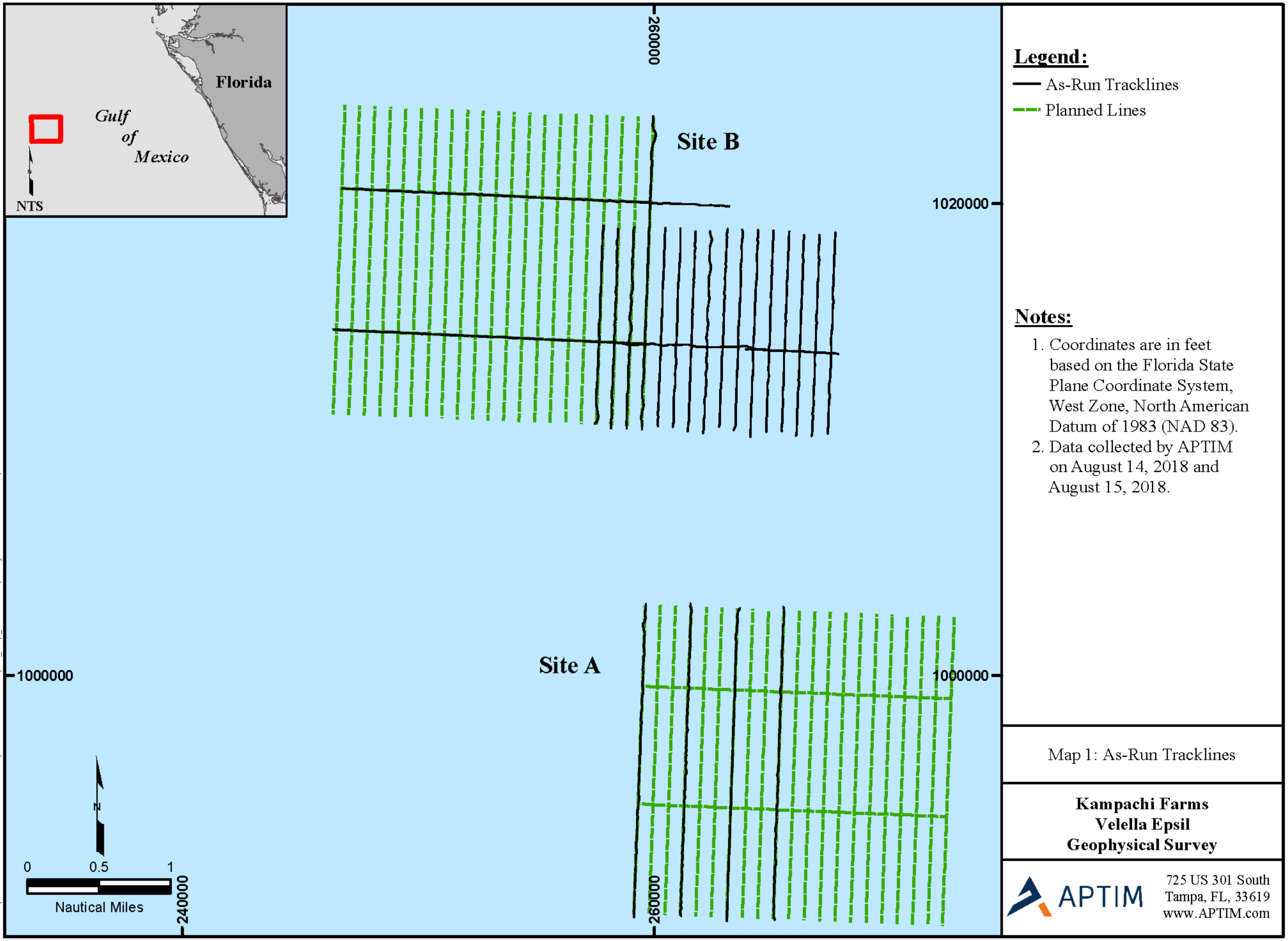

Figure 2. Survey Tracklines Conducted during the BES Fieldwork

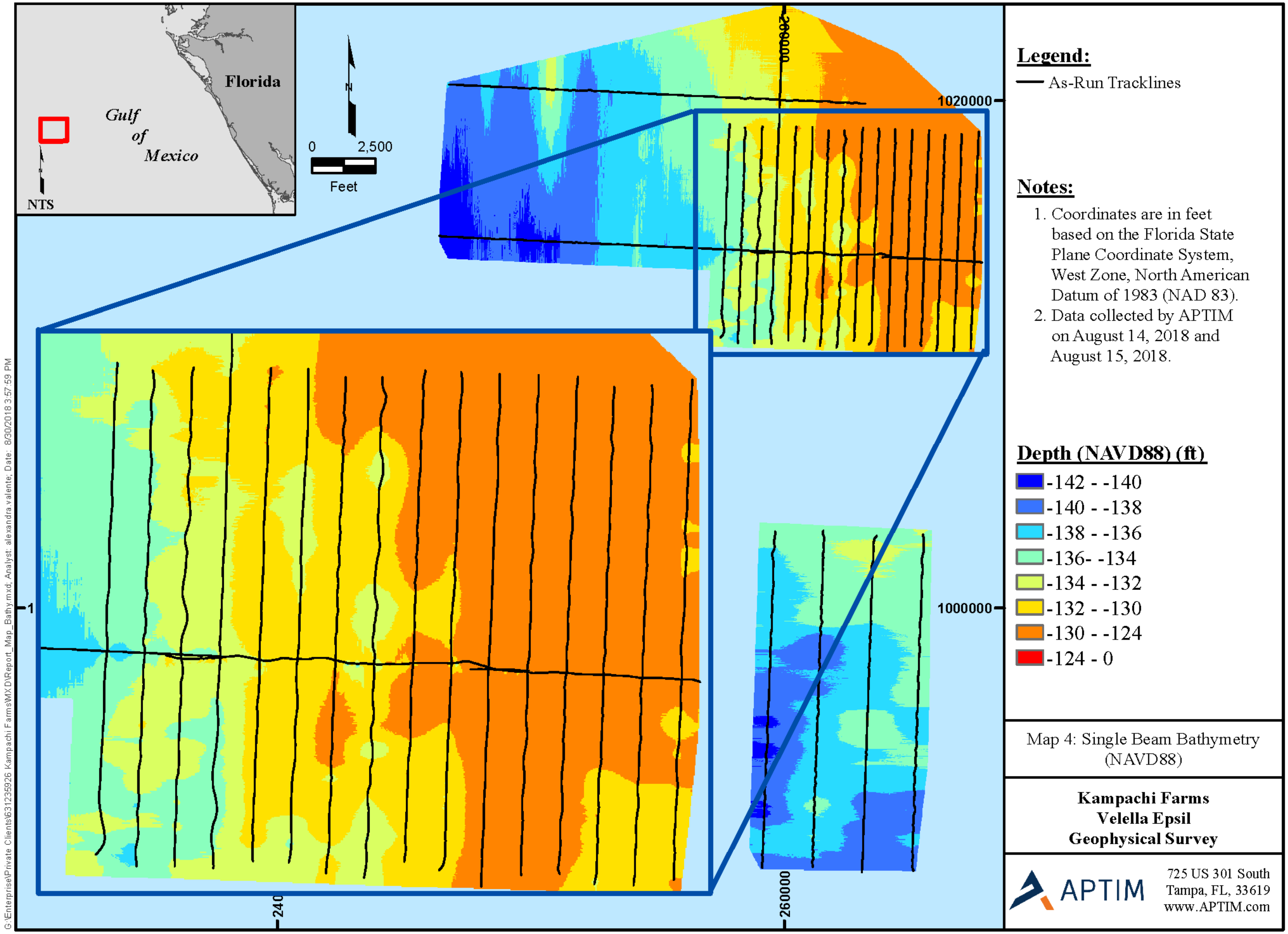

Figure 3. Single Beam Bathymetry Conducted at Modified Site B during the BES Fieldwork

Modified Site #B:

Location	Latitude	Longitude
Top Left	27.131143° N	-83.224303° W
Top Right	27.130512° N	-83.193872° W
Bottom Left	27.107230° N	-83.194890° W
Bottom Right	27.108377° N	-83.225442° W

During the processing of the sidescan sonar data, no contacts or targets were identified in the entire survey area, indicating that the seafloor is free of any exposed pipelines, marine debris, underwater wrecks, potential cultural resources, etc. Only two types of bottom textures were identified throughout the study area (**Figure 4**). In order to characterize the two surficial sediment types, sidescan sonar data were compared to the seismic isopach (i.e., sub-bottom profiler data). Upon careful examination of the two data types, it was evident that areas with high intensity backscatter and sand ripples (Texture 1) correlated to areas with exposed consolidated sediments or a thin layer of unconsolidated sediments (upper portion of **Figure 3**).

Figure 4. Example of Surface Sediment Types Identified from the BES Fieldwork

The second texture (Texture 2), consisted of a medium intensity backscatter, and correlated with a thick unconsolidated sediment layer (lower portion of **Figure 3**) in the seismic data (i.e., sub-bottom profiler data). Geologists typically utilize the backscatter intensity, distribution, and texture to make educated interpretations as to the location of consolidated and unconsolidated sediments; however, these interpretations are based solely on the acoustic interpretation. As such, additional investigation (i.e., ground-truthing or surface samples) may be required in order to characterize the sediment properties, as deemed necessary.

No survey difficulties or problems were encountered during the deployment; operations; or data capture, analysis, and interpretation from any of the sensor systems that would affect the ability APTIM, TAR, or Kampachi investigators to determine the potential for the presence of hazards, debris, human activities (i.e., oil/gas structure, artificial reefs), and biological and archaeological resources in the survey area.

3.8 Explanation of Problems

None were encountered.

4.0 Navigational Post Plot

4.1 Sub-Bottom Profiler Data Analysis

Bottom tracked chirp sub-bottom profile lines were opened to digitally display the recorded subsurface stratigraphy. Given the large extent of the consolidated sediment layer, data interpretation consisted of highlighting the top of consolidated sediment layer which was generally associated with the layer causing the blanking of the seismic signal impeding the penetration of the chip pulse further below the seafloor. The green line in **Figure 5** indicates the digitized consolidated sediment boundary with unconsolidated sediments above.

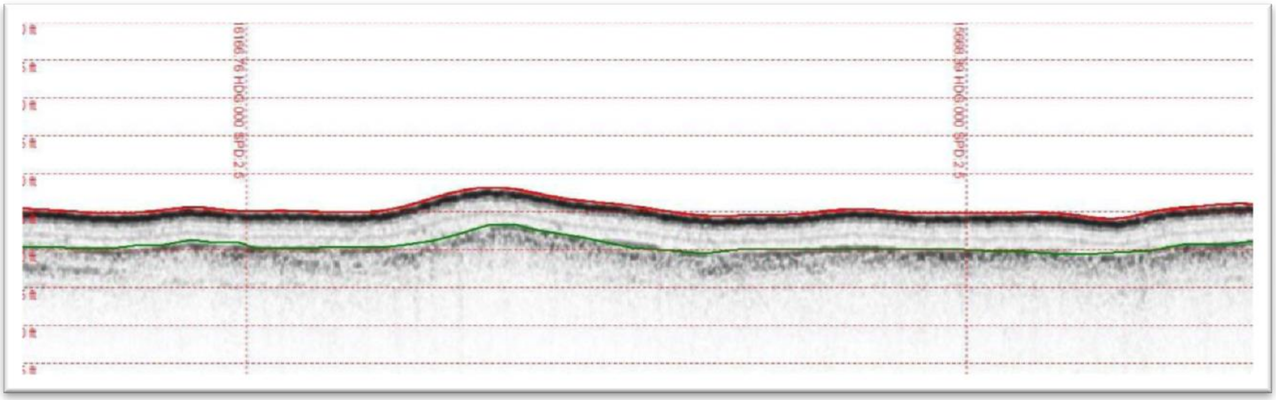

Figure 5. Seismic Line 324 from Modified Site B Trending North (left) to South (right) (APTIM 2018)

The stratigraphic reflector that best correlated with this layer was digitized by digitally clicking on the reflector within SonarWiz to create a color-coded boundary. This boundary appears on the subsequent chirp sub-bottom imagery (see Figure 5) to allow for an easy, visual reference for the boundary between consolidated and unconsolidated material.

Figure 6 illustrates areas of high intensity backscatter (i.e., consolidated sediments, or thin unconsolidated sediments encompassed in green) that are mostly located on the outer edges of the revised study area, indicating that the thicker unconsolidated layer is located mostly in the central portion of the investigation area. As previously mentioned, no contacts were identified within the area therefore no additional features were plotted onto the map.

The SonarWiz® boundary was used to compute the thickness of the unconsolidated deposit by calculating the distance between the digitized seafloor and the digitized top of consolidated sediment boundary. Once the seismic data were reviewed in SonarWiz 7®, the thickness (xyz) of the unconsolidated sediment unit was imported into Surfer 13 and gridded to create an interpolated surface depicting the general trend of sand deposits within the area. This isopach was then imported into ArcMap® 10.6 to compare to the digitized sidescan sonar interpretations. Some of the thicker areas digitized throughout the area appear to be isolated depressions (**Figure 7**) where the consolidated sediment has deepened allowing for more unconsolidated sediment to be deposited. Seismic Line 323 (trending south to north) illustrates an example of the deepening of the consolidated sediment layer.

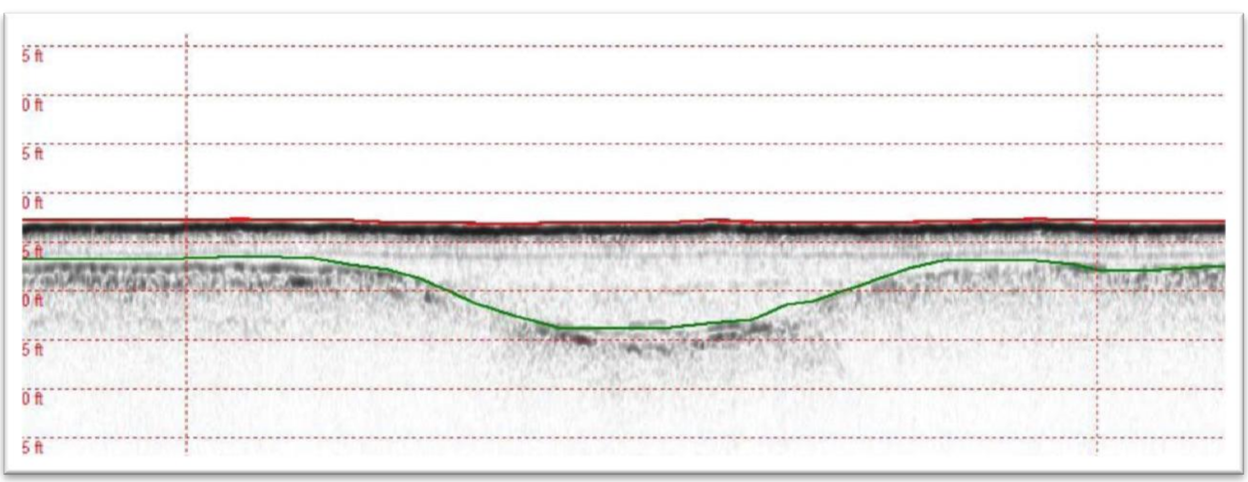

Figure 7. Seismic Line 323 from Modified Site B Trending South (left) to North (right) (APTIM 2018)

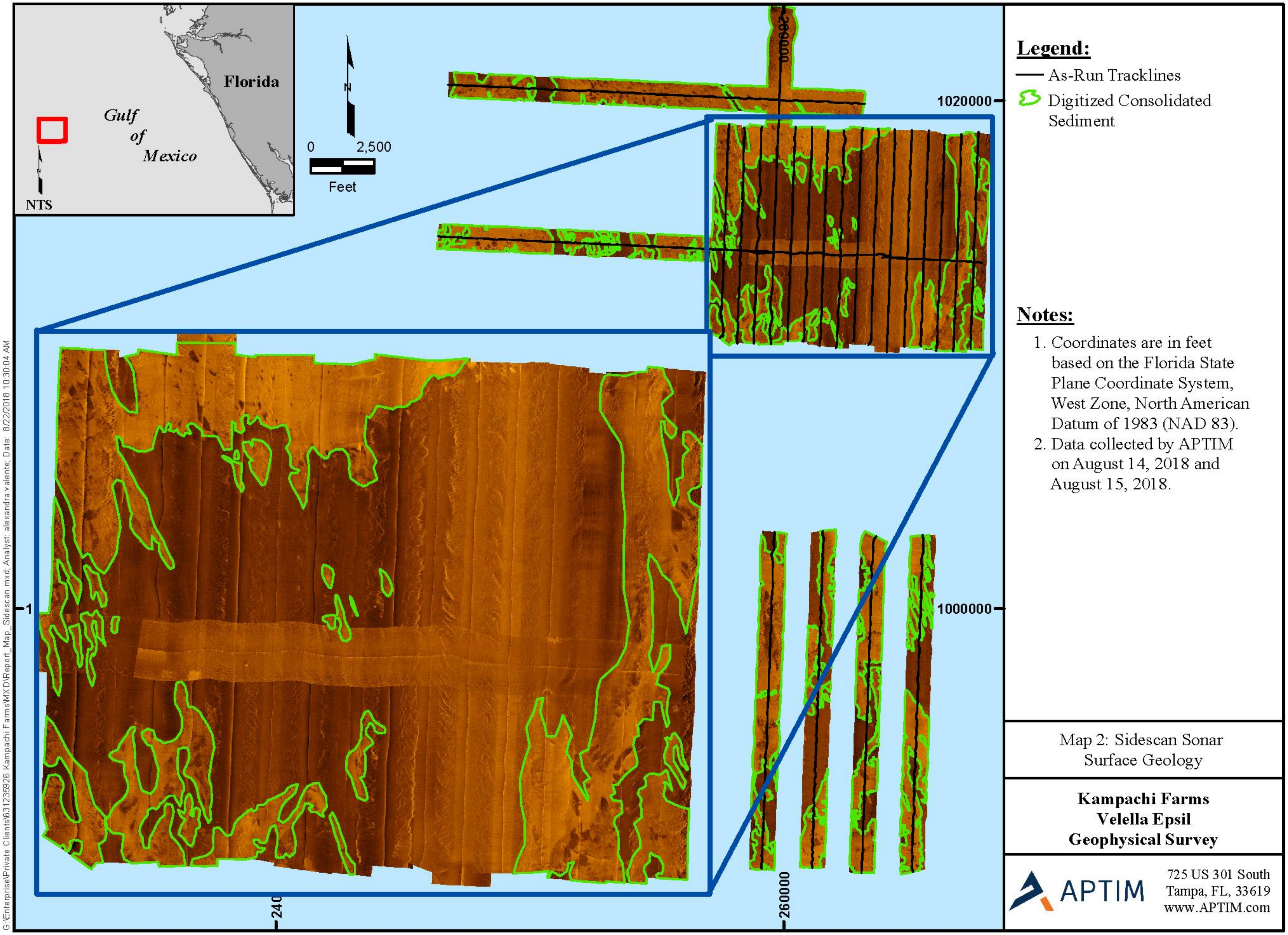

Figure 6. Surface Sediment Types Identified from Modified Site B Data Analysis (APTIM 2018)

Figure 8 illustrates the unconsolidated sediment thickness of the surface sediments with a general sediment trend across the area. The central and eastern areas demonstrate a thicker unconsolidated sediment layer, which appears to migrate west. Statistics on the surface indicate that the average thickness of the area is 2.6ft, with a standard deviation (+/-) of 1.4ft. Maximum thickness reaches 13ft, with the minimum being zero (predominant on the western side).

4.2 Sidescan Sonar and Magnetometer Data Analysis

As previously mentioned in Section 3.7, processing of the sidescan sonar data identified no contacts or targets in the entire Modified Site B survey area, indicating that the seafloor is free of any exposed pipelines, marine debris, underwater wrecks, potential cultural resources, etc. Only two types of bottom textures (Texture 1, Consolidated Sediments; and Texture 2, Unconsolidated Sediments) were identified throughout the study area (see Figure 3).

While no absolute criteria for identification of potentially significant magnetic and/or acoustic target signatures exist, available literature confirms that reliable analysis must be made on the basis of certain characteristics. Magnetic signatures must be assessed on the basis of three basic factors. The first factor is intensity and the second is duration. The third consideration is the nature of the signature; e.g., positive monopolar, negative monopolar, dipolar or multi-component. Unfortunately, shipwreck sites have been demonstrated to produce each signature type under certain circumstances. Some shipwreck signatures are more apparent than others.

Large vessels, whether constructed of iron or wood, produce magnetic signatures that can be reliably identified. Smaller vessels, or disarticulated vessel remains, are more difficult to identify. Their signatures are frequently difficult, if not impossible, to distinguish from single objects and/or modern debris. In fact, some small vessels produce little or no magnetic signature. Unless ordnance, ground tackle, or cargo associated with the hull produces a detectable signature, some sites are impossible to identify magnetically. It is also difficult to magnetically distinguish some small wrecks from modern debris. As a consequence, magnetic targets must be subjectively assessed according to intensity, duration and signature characteristics. The final decision concerning potential significance must be made on the basis of anomaly attributes, historical patterns of navigation in the project area, and a responsible balance between historical and economic priorities.

Acoustic signatures must also be assessed on the basis of several basic characteristics. Perhaps the most important factor in acoustic analysis is the configuration of the signature. As the acoustic record represents a reflection of specific target features, wreck signatures are often a highly detailed and accurate image of architectural and construction features. On sites with less structural integrity, acoustic signatures often reflect more of a geometric pattern that can be identified as structural material. Where hull remains are disarticulated, the pattern can be little more than a texture on the bottom surface representing structure, ballast, or shell hash associated with submerged deposits. Unfortunately, shipwreck sites have been demonstrated to produce a variety of signature characteristics under different circumstances. Like magnetic signatures, some acoustic shipwreck signatures are more apparent than others.

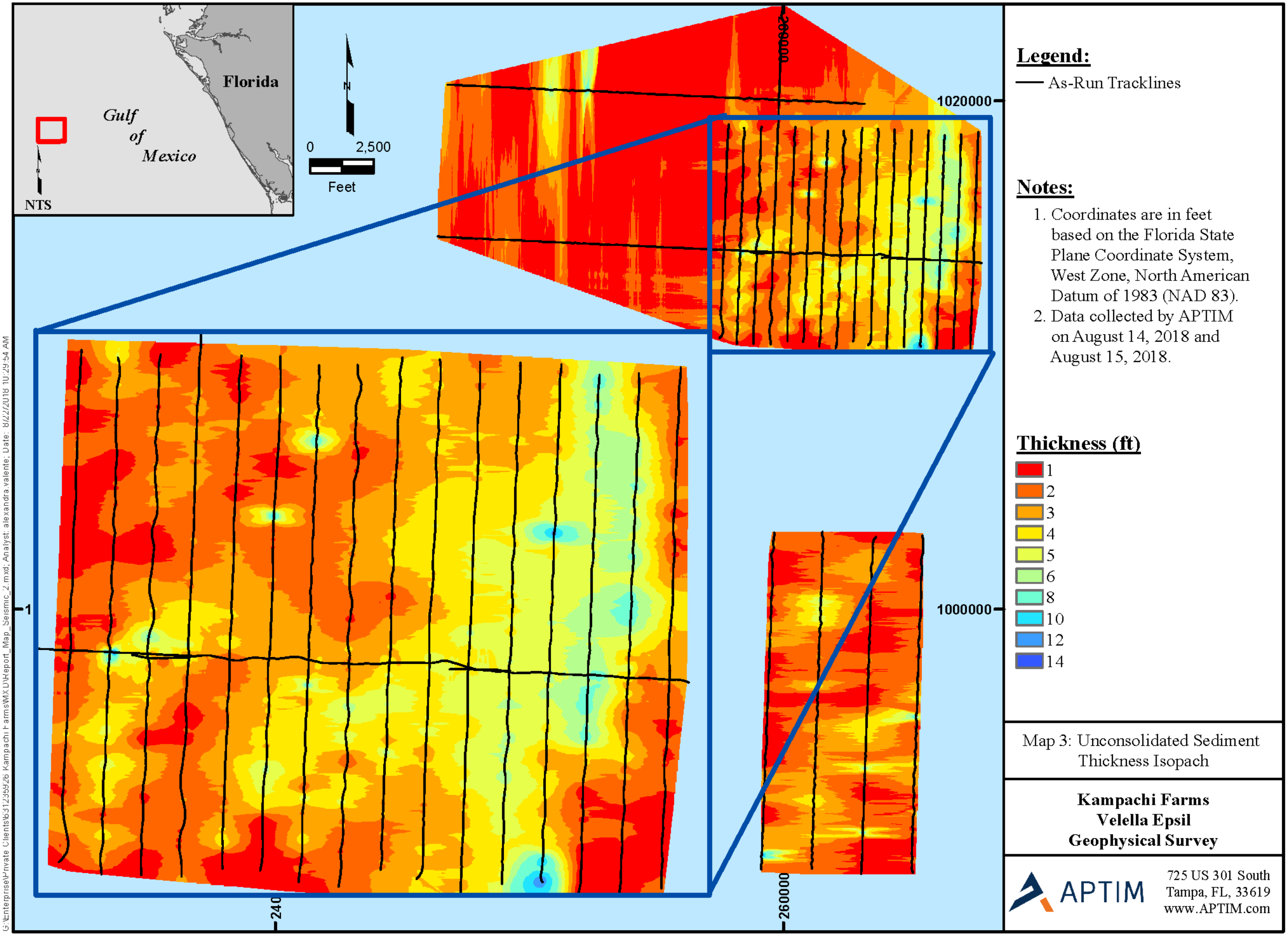

Figure 8. Unconsolidated Sediment Thickness Isopach from Modified Site B (APTIM 2018)

In summary; ferrous items, detected via the magnetometer, are typically observed with an increased gamma intensity reading and seen as monopoles, dipoles and multi-component signals. These varying signals distinguish the anomalies from the natural environment. Anomalies identified throughout the processing and identification phase were then classified based on their magnetic signatures and intensity.

Different ferrous objects emit different signal types; for example, shipwrecks and pipelines are normally associated with multicomponent signals and single monopole signals are normally associated with small objects such as crab pots and other isolated ferrous objects. Each survey line was viewed and interpreted in great detail for any magnetic anomalies. Throughout the entire survey area, APTIM recorded a total of 45 magnetometer anomalies (**Figure 9**). Almost all magnetometer hits observed throughout the survey site were minute, (less than 7 gammas (g)) and do not appear to be of any significant impact in the development of the area. One magnetometer anomaly (which was observed at over 1000g) is located outside of the Modified Site B survey area. Due to the signature's disarrangement, the anomaly is likely noise due to a change in the elevation of the magnetometer (**Table 3**).

This assumption is based on a combination of causes: (a) the as-run track for the magnetometer position on that line extends itself further than the planned line so the system was possibly recording while it was being retrieved at the end of the day; (b) when plotting the towfish elevation data, towards the end of the line the fish's depth below water line changes significantly and eventually reaches less than 10ft which would only occur when retrieving the fish; and (c) the magnetometer anomaly extends itself 332ft, which makes it a significant impact area and given the overall type and size of anomalies in the area, this is very unexpected.

When the fish is being retrieved, the gamma signal is constantly changing based on several effects, such as the fish's proximity to the boat, other towed systems, and its overall movement (pitching and rolling) while its coming up through the water column. All these factors increase the overall magnetic field the sensor is capturing, therefore causing a large magnetic hit (especially large objects like the boat). Additionally, when retrieving the geophysical equipment, the vessel would have had to maintain its bearing for a significant period of time so the towed systems would not get tangled; therefore, explaining the distance the "hit" was sensed.

TAR provided a seasoned marine archaeologist to additionally review each identified anomaly and make a determination of the significant submerged cultural resources (SCR) potential, and therefore, classify it based on its importance using both the geophysical data collected and other sources that provide historical records of the area in question (see Sections 5.0 and 6.0 below).

4.3 Current Oil and Gas Operations

There are no current or planned oil and gas operations (e.g., well locations, platform sites, and/or pipelines) in the vicinity of Site A, Site B, or Modified Site B at the time of this report preparation.

4.4 Former Oil and Gas Operations

There are no former oil and gas operations (e.g., well locations, platform sites, and/or pipelines) in the vicinity of Site A, Site B, or Modified Site B at the time of this report preparation.

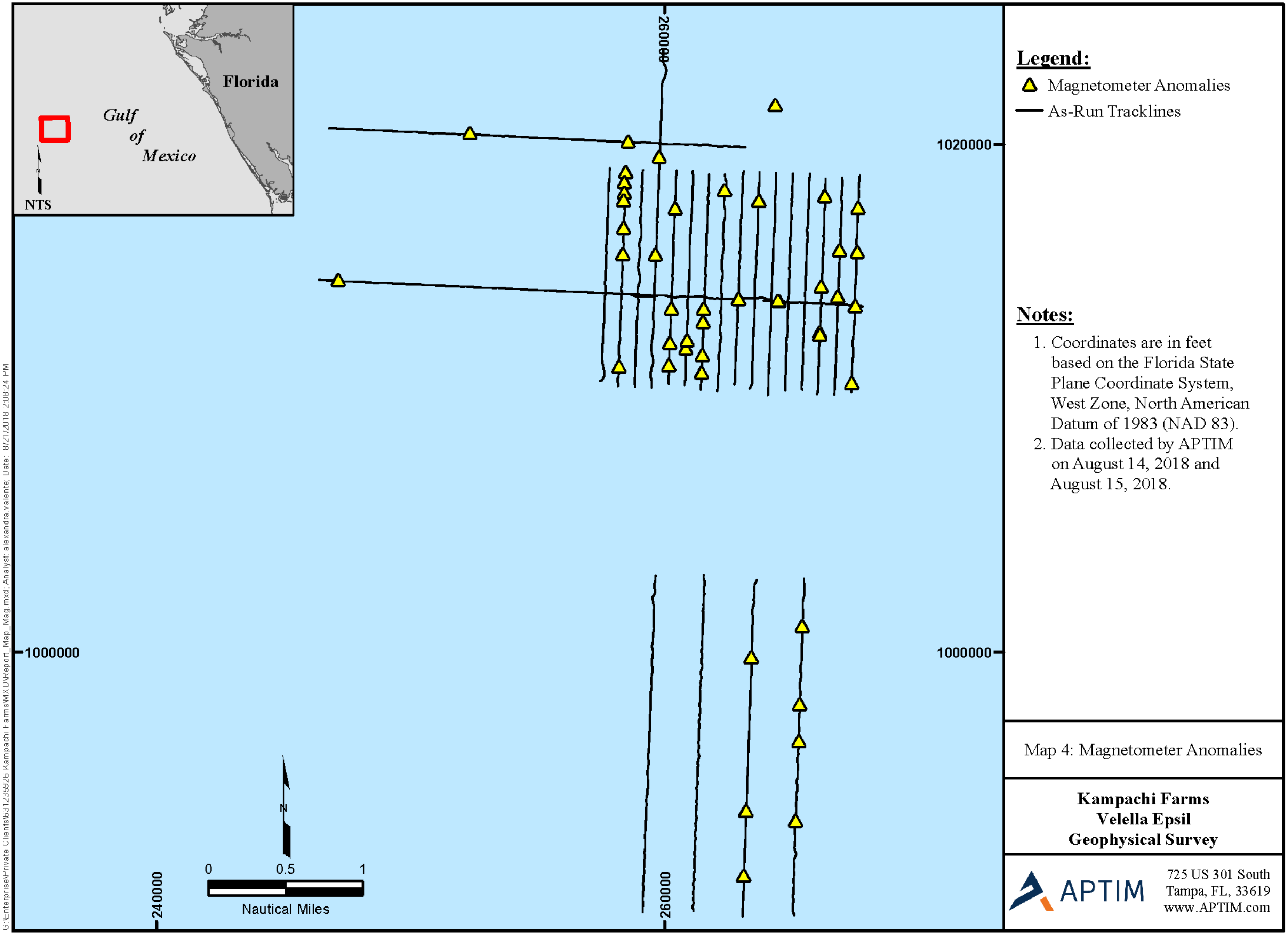

Figure 9. Magnetometer Anomalies Detected during BES Fieldwork (APTIM 2018)

Table 3. Magnetometer Anomalies Detected from Modified Site B (APTIM 2018)

Anomaly ID	X Coordinate	Y Coordinate	Line No	Signature Type	Gammas	DOG	Signature
106-1-DP-0.6g-768.69ft	263408	999787	106	1 Dipolar	0.6g	768.69ft	DP
106-2-MC-1.1g-1219.05ft	263200	993737	106	2 Multi-Component	1.1g	1219.05ft	MC
106-3-DP-1.9g-1694.3ft	263118	991183	106	3 Dipolar	1.9g	1694.3ft	DP
109-1-DP-1.6g-1128.71ft	265146	993344	109	1 Dipolar	1.6g	1128.71ft	DP
109-2-MP-0.9g-486.39ft	265277	996490	109	2 Monopolar	0.9g	486.39ft	MP
109-3-MP-1.1g-826.66ft	265316	997929	109	3 Monopolar	1.1g	826.66ft	MP
109-4-MP-0.9g-646.36ft	265413	1001015	109	4 Monopolar	0.9g	646.36ft	MP
211-1-MP-1.9g-962.03ft	247156	1014649	211	1 Monopolar	1.9g	962.03ft	MP
210-1-MP-1.4g-1880.73ft	252338	1020431	210	1 Monopolar	1.4g	1880.73ft	MP
210-2-MP-0.8g-510.25ft	258571	1020109	210	2 Monopolar	0.8g	510.25ft	MP
170-1-DP-1.8g-753.87ft	259787	1019498	170	1 Dipolar	1.8g	753.87ft	DP
170-2-MP-3g-752.38ft	259637	1015659	170	2 Monopolar	3g	752.38ft	MP
211-1-MP-1g-673.81ft	264504	1013816	211	1 Monopolar	1g	673.81ft	MP
319-1-DP-0.8g-557.5ft	262897	1013895	319	1 Dipolar	0.8g	557.5ft	DP
317-1-MP-1.4g-514.64ft	261534	1013526	317	1 Monopolar	1.4g	514.64ft	MP
317-2-MP-0.6g-467.79ft	261508	1013004	317	2 Monopolar	0.6g	467.79ft	MP
317-3-DP-3.5g-650.89ft	261479	1011686	317	3 Dipolar	3.5g	650.89ft	DP
317-4-DP-3.2g-712ft	261450	1011002	317	4 Dipolar	3.2g	712ft	DP
315-1-DP-0.8g-704.95ft	260169	1011279	315	1 Dipolar	0.8g	704.95ft	DP
315-1-DP-0.6g-520.56ft	260202	1012165	315	1 Dipolar	0.6g	520.56ft	DP
315-2-DP-0.7g-440.43ft	260266	1013511	315	2 Dipolar	0.7g	440.43ft	DP
315-3-DP-0.4g-368.96ft	260416	1017470	315	3 Dipolar	0.4g	368.96ft	DP
312-1-DP-4.2g-351.39ft	258458	1018900	312	1 Dipolar	4.2g	351.39ft	DP
312-2-MP-3.5g-538.53ft	258419	1018495	312	2 Monopolar	3.5g	538.53ft	MP
312-3-MP-3.3g-467.99ft	258413	1018090	312	3 Monopolar	3.3g	467.99ft	MP
312-4-DP-2.4g-674.78ft	258384	1017783	312	4 Dipolar	2.4g	674.78ft	DP
312-5-DP-1.3g-464.63ft	258383	1016708	312	5 Dipolar	1.3g	464.63ft	DP
312-6-DP-3.6g-517.58ft	258351	1015675	312	6 Dipolar	3.6g	517.58ft	DP
312-7-DP-2.7g-454.22ft	258193	1011227	312	7 Dipolar	2.7g	454.22ft	DP
316-1-DP-3.2g-1258.05ft	260835	1011954	316	1 Dipolar	3.2g	1258.05ft	DP
316-2-MP-1.6g-449.32ft	260881	1012275	316	2 Monopolar	1.6g	449.32ft	MP
320-1-DP-1.2g-498.23ft	263710	1017768	320	1 Dipolar	1.2g	498.23ft	DP
211-1-MP-1.8g-286.83ft	264462	1013842	211	1 Monopolar	1.8g	286.83ft	MP
326-1-MP-2.1g-551.41ft	267371	1010591	326	1 Monopolar	2.1g	551.41ft	MP
326-2-DP-0.9g-560.88ft	267492	1013618	326	2 Dipolar	0.9g	560.88ft	DP
326-3-MP-4.3g-1070.04ft	267580	1015760	326	3 Monopolar	4.3g	1070.04ft	MP
326-4-MP-0.7g-426.31ft	267620	1017488	326	4 Monopolar	0.7g	426.31ft	MP
324-1-DP-1g-361.51ft	266293	1017957	324	1 Dipolar	1g	361.51ft	DP
324-2-DP-1.9g-394.94ft	266165	1014388	324	2 Dipolar	1.9g	394.94ft	DP
324-3-MC-4.1g-281.09ft	266097	1012586	324	3 Multi-Component	4.1g	281.09ft	MC
324-4-MP-7g-416.61ft	266105	1012488	324	4 Monopolar	7g	416.61ft	MP
325-1-MP-1.7g-235.45ft	266884	1015812	325	1 Monopolar	1.7g	235.45ft	MP
325-2-DP-1.6g-422.34ft	266811	1014000	325	2 Dipolar	1.6g	422.34ft	DP
321-1-MC-1305.5g-332.08ft	264353	1021535	321	1 Multi-Component	1305.5g	332.08ft	MC
320-2-MC-1.2g-534.6ft	263709	1017773	320	2 Multi-Component	1.2g	534.6ft	MC
318-1-MC-2g-260.45ft	262340	1018178	318	1 Multi-Component	2g	260.45ft	MC

Note: Coordinates are in feet based on the Florida State Plane Coordinate System, West Zone, North American Datum of 1983 (NAD 83). DOG = Distance Over Ground (length of anomaly signature). MP = Monopolar. DP = Dipolar.

5.0 Potential for Prehistoric Sites

5.1 Relict Geomorphic Features

The survey area appears to be typical west-Florida continental shelf geomorphology, consisting of a thin siliciclastic sediment veneer (0m to 2m) overlying a consolidated limestone surface likely of upper Oligocene (28 million years ago - mya) to middle Miocene (15 mya) in origin. The thin siliciclastic sediment veneer is relict material that was transported from the north (from the southern Appalachian Mountains and Piedmont) to the south during the late Miocene (10 mya) and Pliocene (5 to 3 mya), resulting in a relatively thin late Neogene to modern quartz-rich veneer covering a thick (2km to 6km) Jurassic-to-Neogene carbonate succession (Hine et al. 2009).

There is no evidence in the sub-bottom data of any paleochannels, fluvial downcutting, infill, or any paloefluvial activity anywhere within the survey area. The only evidence of erosion is the top of the Miocene limestone layer, and is indicative of much lower eustatic sea levels from the middle-Miocene, well before prehistoric times. Based on the geologic analysis of the data, including the age of the geologic materials in question, the lack of relict geomorphic features indicative of artifact preservation potential, and the relative deep elevation (>120 feet NAVD88) and distant offshore location of the survey area, the likelihood for the presence and/or preservation of prehistoric sites and geomorphic features with archaeological potential is very low.

5.2 Buried Prehistoric Sites

Based on the capabilities of current technology in relation to the thickness and composition of sediments overlying the area of Modified Site B, there is little to no potential for the identification nor evaluation of buried prehistoric sites.

6.0 Existing Records Review of Reported Shipwrecks

6.1 Unidentified Magnetic Anomalies

Based on the results and conclusions presented earlier in Section 4.2, there were neither unidentified magnetic anomalies viewed nor interpreted from surveys conducted at Modified Site B, as previously confirmed in Table 2.

6.2 Sidescan Sonar Contacts

Based on the results and conclusions presented earlier in Section 4.2, there was no sidescan sonar contacts identified from surveys conducted at Modified Site B.

6.3 Unknown Sources of Magnetic Anomalies and Sidescan Sonar Contacts

Based on the results and conclusions presented earlier in Section 4.2, there was neither unknown sources of magnetic anomalies or sidescan sonar contacts identified from surveys conducted at Modified Site B.

6.4 Correlation between Magnetic Anomalies and Sidescan Sonar Contacts

Magnetic and acoustic data were collected on 16 survey lines and one tie line associated with Modified Site B. Magnetometer data was collected as Hypack® raw data. Each line file was reviewed by the TAR marine archaeologist to identify and characterize anomalies that could be generated by submerged cultural resources. Anomaly signatures were analyzed in accordance with intensity, duration, areal extent and signature characteristics.

A total of 36 anomalies were identified in the data (**Figure 10**) associated with Modified Site B. Analysis of each anomaly included consideration of magnetic and acoustic signature characteristics previously demonstrated to be reliable indicators of historically significant submerged cultural resources.

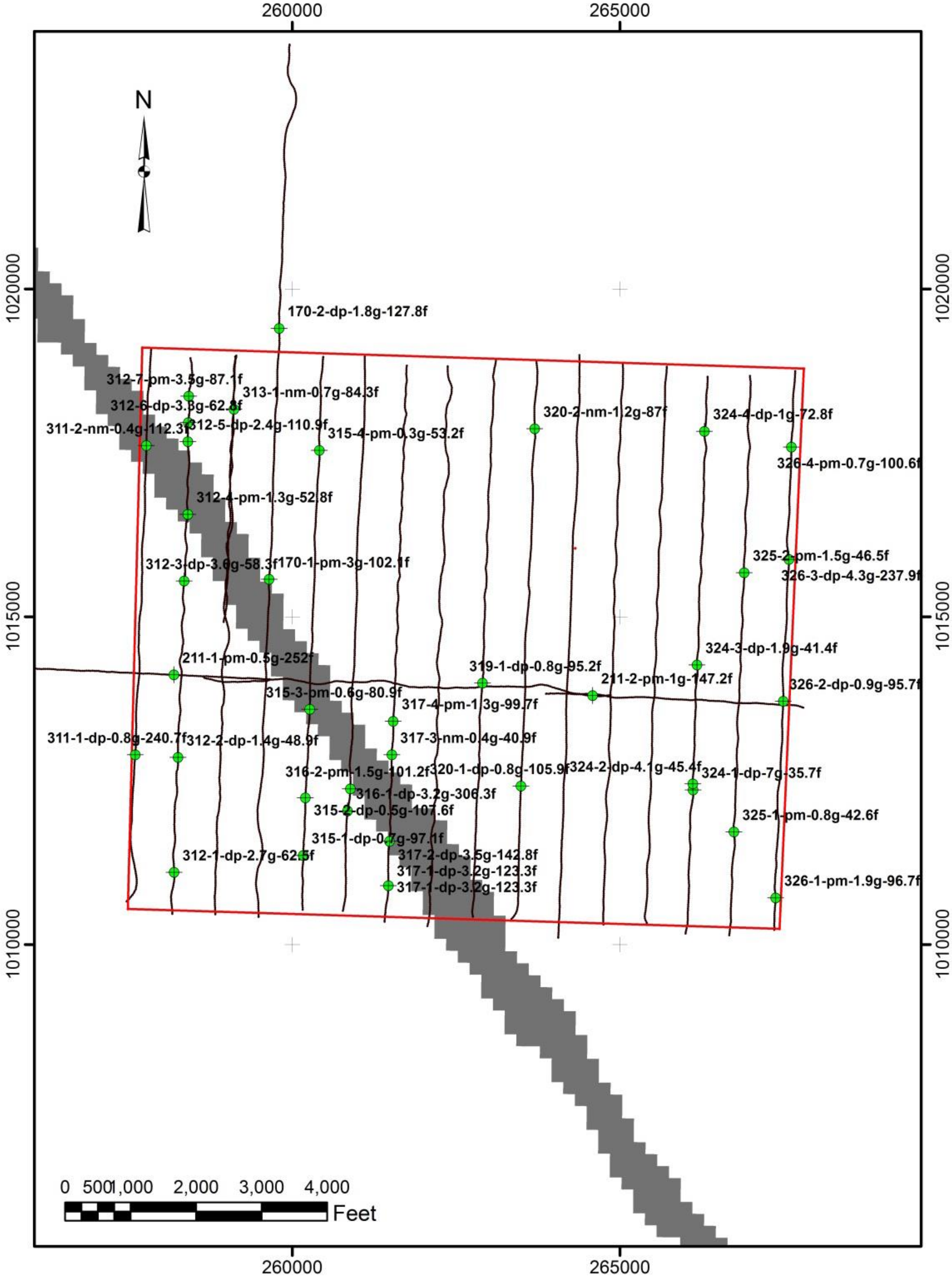

Figure 10. Magnetometer Anomalies Analyzed within Modified Site B (TAR 2018)

Analysis of each anomaly included consideration of magnetic and acoustic signature characteristics previously demonstrated to be reliable indicators of historically significant submerged cultural resources. Assessment of each anomaly included recommendations for additional investigation (if required) to determine the exact nature of the cultural material that generated the signature and its potential National Register of Historic Places (NRHP) significance. A magnetic contour map of the survey area was not produced to aid in analysis and data representation as the survey line spacing was too broad. TAR prepared a table listing all magnetic anomalies located during the survey (**Table 4**). This table includes the anomaly name, identification number, signature characteristics, location coordinates and assessment of the type of material generating the signature.

Acoustic sidescan sonar data was collected in the form of raw EdgeTech JSF data files. Acoustic sub-bottom profiler data was also collected in the form of raw EdgeTech JSF data files. Each line of acoustic data was reviewed by TAR using SONARWIZ software to identify and characterize targets that could be generated by submerged cultural resources. Using SONARWIZ software, APTIM produced a sonar coverage mosaic of the survey area to aid in analysis and data representation (see Figure 6). Acoustic signatures suggestive of significant submerged cultural material were to be isolated and analyzed in accordance with image intensity, duration, a real extent and configuration characteristics. Analysis of target images would normally include consideration of acoustic signature characteristics previously demonstrated to be reliable indicators of historically significant submerged cultural resources. However, no sonar targets were identified in the acoustic data. SONARWIZ software was also used to review the sub-bottom profiler date and identify any relict landforms that could be associated with prehistoric habitation. All lines of sub-bottom data confirmed a shallow sandy deposit of varying thickness overlying hard bottom likely limestone (see Figures 5 and 7). As stated previously, no relict landforms of potential significance were identified.

6.5 Positive Identification of Archaeological Resources

TAR's analysis of the APTIM magnetic data identified a total of 36 anomalies in the project survey. All of the anomalies are very low intensity (see Table 4) and represent small ferrous objects such as commercial crab or fish traps or debris lost or intentionally case overboard. None of the anomalies appear to represent potentially significant submerged cultural resources. Analysis of the sonar data confirmed that nothing associated with those magnetic anomalies or nonferrous structures or cultural material is exposed on the bottom surface. Sub-bottom profiler data confirmed that bottom sediment in the survey area consists of unconsolidated sediment, such as sand of varying thickness, overlying hard bottom. Hard bottom in the area is likely limestone and no karst or relict landforms were apparent.

6.6 Potential for Shipwreck Preservation

Based on the results and conclusions presented earlier in Section 4.2, there was no potential for shipwreck preservation neither in terms of sediment type and thickness, nor from the effects of past and present marine processes from surveys conducted at Modified Site B.

6.7 Potential for Identification and Evaluation of Potential Shipwrecks

Based on NOAA's Office of Coast Survey's Automated Wreck and Obstruction Information System (AWOIS), the closest documented shipwreck (Record Number 2884; Kingfisher [sunk in 1980]) to Modified Site B is located at 26.833669° N and -83.166503° W, or approximately 18 nm SSW of Modified Site B. Therefore, there is little to no potential for the identification or evaluation of potential shipwrecks at Modified Site B.

Table 4. SCR Potential from Magnetometer Anomalies Detected from Modified Site B (TAR 2018)

Anomaly	X Coordinate	Y Coordinate	Line #	Anomaly #	Signature	Intensity	Duration	Identification	SCR Potential
170-1-pm-3g-102.1f	259646.3	1015574.1	170	1	Positive Monopolar	3g	102.1f	Small Ferrous Object	Very Low
211-1-pm-0.5g-252f	258192.6	1014115.9	211	1	Positive Monopolar	0.5g	252f	Small Ferrous Object	Very Low
211-2-pm-1g-147.2f	264584.7	1013799.7	211	2	Positive Monopolar	1g	147.2f	Small Ferrous Object	Very Low
311-1-dp-0.8g-240.7f	257602.7	1012897.4	311	1	Dipolar	0.8g	240.7f	Small Ferrous Object	Very Low
311-2-nm-0.4g-112.3f	257774.3	1017613	311	2	Negative Monopolar	0.4g	112.3f	Small Ferrous Object	Very Low
312-1-dp-2.7g-62.5f	258196.7	1011103.8	312	1	Dipolar	2.7g	62.5f	Small Ferrous Object	Very Low
312-2-dp-1.4g-48.9f	258255.6	1012855.9	312	2	Dipolar	1.4g	48.9f	Small Ferrous Object	Very Low
312-3-dp-3.6g-58.3f	258349.6	1015546.3	312	3	Dipolar	3.6g	58.3f	Small Ferrous Object	Very Low
312-4-pm-1.3g-52.8f	258407.9	1016565.6	312	4	Positive Monopolar	1.3g	52.8f	Small Ferrous Object	Very Low
312-5-dp-2.4g-110.9f	258406.5	1017673.1	312	5	Dipolar	2.4g	110.9f	Small Ferrous Object	Very Low
312-6-dp-3.3g-62.8f	258412.2	1017965.6	312	6	Dipolar	3.3g	62.8f	Small Ferrous Object	Very Low
312-7-pm-3.5g-87.1f	258420.7	1018366.8	312	7	Positive Monopolar	3.5g	87.1f	Small Ferrous Object	Very Low
313-1-nm-0.7g-84.3f	259109.5	1018169	313	1	Negative Monopolar	0.7g	84.3f	Small Ferrous Object	Very Low
315-1-dp-0.7g-97.1f	260165.4	1011362.4	315	1	Dipolar	0.7g	97.1f	Small Ferrous Object	Very Low
315-2-dp-0.5g-107.6f	260198.3	1012241.8	315	2	Dipolar	0.5g	107.6f	Small Ferrous Object	Very Low
315-3-pm-0.6g-80.9f	260266.6	1013589.3	315	3	Positive Monopolar	0.6g	80.9f	Small Ferrous Object	Very Low
315-4-pm-0.3g-53.2f	260411.9	1017541.9	315	4	Positive Monopolar	0.3g	53.2f	Small Ferrous Object	Very Low
316-1-dp-3.2g-306.3f	260842.4	1012042	316	1	Dipolar	3.2g	306.3f	Small Ferrous Object	Low
316-2-pm-1.5g-101.2f	260886.4	1012378.4	316	2	Positive Monopolar	1.5g	101.2f	Small Ferrous Object	Very Low
317-1-dp-3.2g-123.3f	261465.4	1010900.1	317	1	Dipolar	3.2g	123.3f	Small Ferrous Object	Low
317-2-dp-3.5g-142.8f	261482.8	1011578.5	317	2	Dipolar	3.5g	142.8f	Small Ferrous Object	Low
317-3-nm-0.4g-40.9f	261518.4	1012897.5	317	3	Negative Monopolar	0.4g	40.9f	Small Ferrous Object	Very Low
317-4-pm-1.3g-99.7f	261541.1	1013409	317	4	Positive Monopolar	1.3g	99.7f	Small Ferrous Object	Very Low
319-1-dp-0.8g-95.2f	262902.4	1013990.7	319	1	Dipolar	0.8g	95.2f	Small Ferrous Object	Very Low
320-1-dp-0.8g-105.9f	263488.9	1012419.3	320	1	Dipolar	0.8g	105.9f	Small Ferrous Object	Very Low
320-2-nm-1.2g-87f	263700.7	1017869.7	320	2	Negative Monopolar	1.2g	87f	Small Ferrous Object	Very Low
324-1-dp-7g-35.7f	266115.1	1012361.5	324	1	Dipolar	7g	35.7f	Small Ferrous Object	Very Low
324-2-dp-4.1g-45.4f	266114	1012454.8	324	2	Dipolar	4.1g	45.4f	Small Ferrous Object	Very Low
324-3-dp-1.9g-41.4f	266176.6	1014267.3	324	3	Dipolar	1.9g	41.4f	Small Ferrous Object	Very Low
324-4-dp-1g-72.8f	266291.1	1017831.4	324	4	Dipolar	1g	72.8f	Small Ferrous Object	Very Low
325-1-pm-0.8g-42.6f	266738.9	1011720	325	1	Positive Monopolar	0.8g	42.6f	Small Ferrous Object	Very Low
325-2-pm-1.5g-46.5f	266896.2	1015675	325	2	Positive Monopolar	1.5g	46.5f	Small Ferrous Object	Very Low
326-1-pm-1.9g-96.7f	267376.3	1010714.4	326	1	Positive Monopolar	1.9g	96.7f	Small Ferrous Object	Very Low
326-2-dp-0.9g-95.7f	267493.5	1013713.2	326	2	Dipolar	0.9g	95.7f	Small Ferrous Object	Very Low
326-3-dp-4.3g-237.9f	267579.1	1015878.3	326	3	Dipolar	4.3g	237.9f	Small Ferrous Object(s)	Low
326-4-pm-0.7g-100.6f	267616.4	1017590.3	326	4	Positive Monopolar	0.7g	100.6f	Small Ferrous Object	Very Low

7.0 Representative Data Samples

7.1 Sub-Bottom Profiler Data

Representative data samples from the sub-bottom profiler data were provided in Section 4.1. Due to the file size (>18.3 GB), the complete APTIM geophysical survey dataset, including the 16 survey tracklines from the original daily survey logs from Modified Site B were made available digitally to NOAA Fisheries, EPA, USACE, and FL SHPO on September 19, 2018.

7.2 Recorded Unidentified Objects

Based on the results and conclusions presented earlier in Sections 4.2 and 6.3, there are no contacts representing unidentified objects from surveys conducted at Modified Site B.

8.0 Conclusions and Recommendations

8.1 Known or Potential Physical, Biological, and Archaeological Resources

Based on the contents and data analyses provided by APTIM's Geophysical Survey Report to Kampachi Farms, LLC, "there are no features (physical, biological, and archaeological resources) that would preclude the siting of an aquaculture operation within Modified Site B.

8.2 Recommendations for Avoidance or Further Investigations

Based on the absence of any physical, biological, and archaeological resources, there are no recommendations for avoidance. Further, while APTIM marine geologists utilized the backscatter intensity, distribution, and texture to make educated interpretations as to the location of consolidated and unconsolidated sediments, these interpretations are based solely on the acoustic interpretation; therefore, additional investigation (i.e., ground-truthing or surface samples) would be advisable in order to characterize the sediment properties of the desired mooring locations at the time of deployment.

TAR's marine archaeologist summarized that based on the limited amount of bottom disturbance associated with deployment of the ground tackle necessary for anchoring the proposed floating structure, it is apparent that no submerged cultural resources will be impacted if anchors and/or sinkers can be located on, or within 50 feet, of the surveyed lines. If that can be accomplished, no additional archaeological investigation at the site is recommended. If the anchoring design requires placing ground tackle outside the 100 foot corridors centered on the data tracklines, additional investigation should be carried out to clear those sites.

TAR's marine archaeologist further recommended the institution of, and compliance with, an "Unexpected Discovery Protocol". In the event that any project activities expose potential prehistoric/historic cultural materials not identified during the remote-sensing survey, operations should be *immediately* shifted from the site. The respective Point of Contact for regulatory agencies with jurisdictional oversight should be *immediately* appraised of the situation. Notification should address the exact location, where possible, the nature of material exposed by project activities, and options for immediate archaeological inspection and assessment of the site.

9.0 Additional Investigations Required by NOAA Fisheries and EPA

Due to the conclusions and recommendations of this BES Report, as well as the individual conclusions and recommendations from the APTIM and TAR reports (Appendix A and B, respectively), no additional investigations would be anticipated to be required by NOAA Fisheries or EPA.

10.0 Hydrological Measurements

Hydrological data were captured from the NOAA Data Buoy Center; Station 42022 - C12 - WFS Central Buoy located on the 50 m Isobath at approximately 27.505 N and 83.741 W; located approximately 34 NM northwest of Modified Site B. These data represent approximately 66,711 records over nearly a 4 year summary from 2015 through 2018 of surface (4m; **Figure 11**), midwater (22m; **Figure 12**), and bottom (44m; **Figure 13**) current speed and direction. As such, these results provide a description of maximum, minimum and average currents, and are provide as rose plots representative of near surface, mid-water, and near bottom currents. These raw data file is being submitted electronically as part of this report and may be located at:

https://www.ndbc.noaa.gov/station_history.php?station=42022.

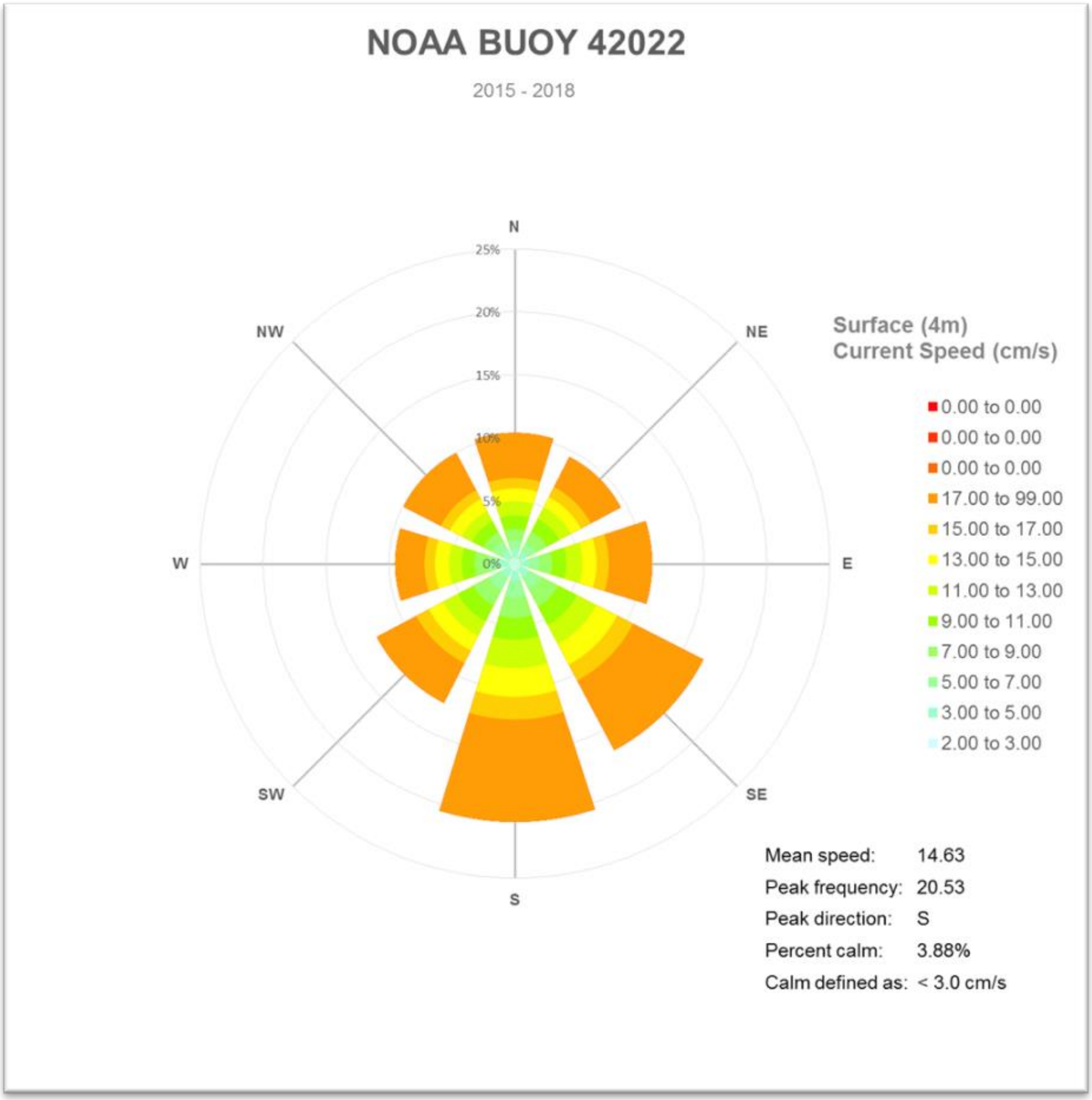

Figure 11. Near Surface (4m) Current Speed & Direction from NOAA Buoy Station 42022

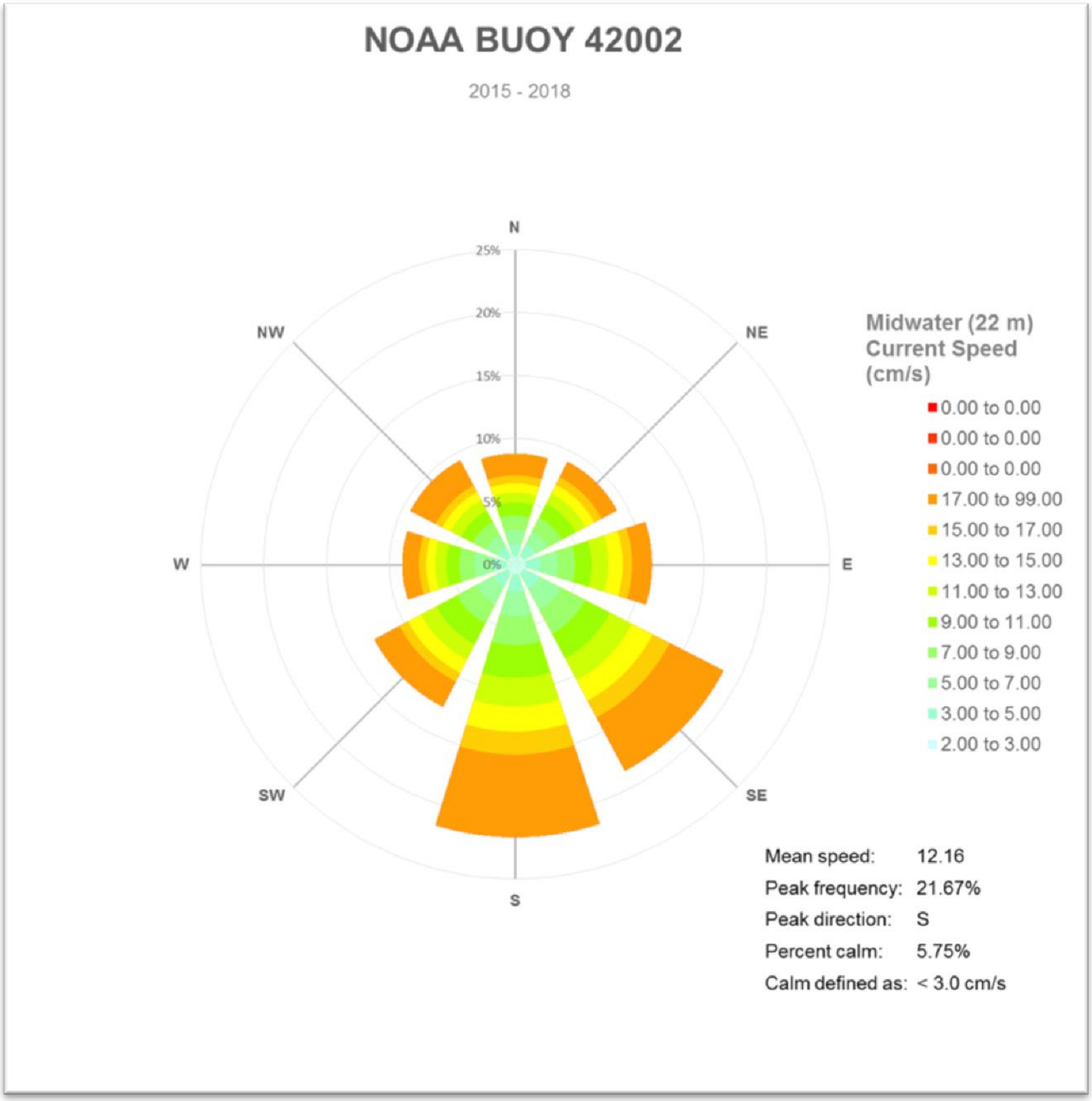

Figure 12. Midwater (22m) Current Speed and Direction from NOAA Buoy Station 42022

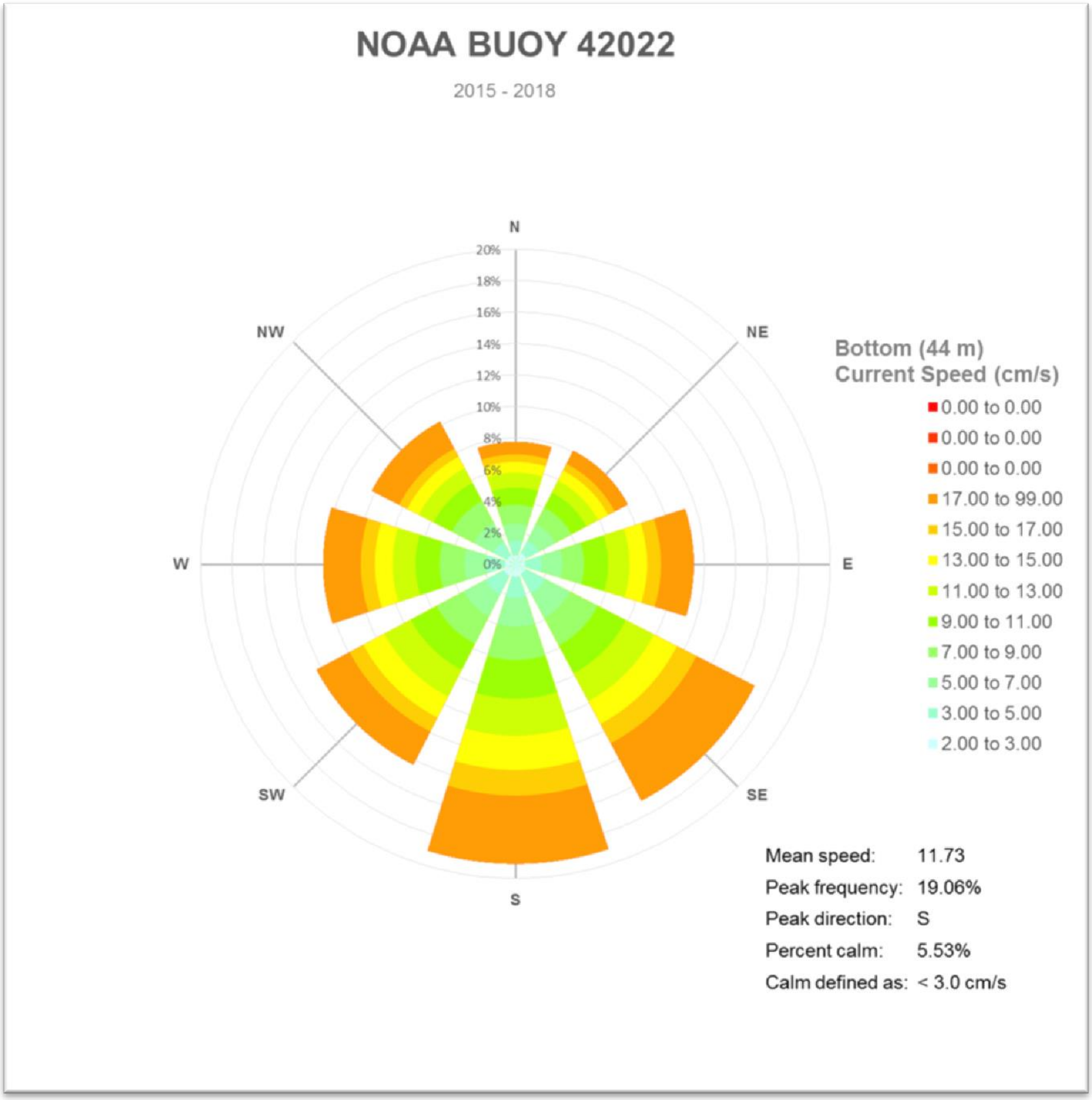

Figure 13. Bottom (44m) Current Speed and Direction from NOAA Buoy Station 42022

APPENDIX A

APTIM 2018 Report

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August 22, 2018

Dennis J. Peters (via email)
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Subject: Results of Baseline Geophysical Survey for the Siting of Aquaculture Operations in the Gulf of Mexico.

APTIM Environmental and Infrastructure, Inc. (APTIM) was hired by Kampachi Farms, LLC to conduct a geophysical baseline survey of a potential area offshore Sarasota Florida that will be used for aquaculture activities. The area consisted of two (2) survey sites, proposed Site A and proposed Site B. The purpose of the geophysical investigation was to characterize the sub-surface and surface geology of the sites and identify areas with a sufficient thickness of unconsolidated sediment near the surface while also clearing the area of any geohazards and structures that would impede the implementation of an aquaculture operation.

<u>Survey Operations</u>

The Kampachi Farms, LLC Velella Epsilon Geophysical Survey consisted of collecting single beam bathymetry, side scan sonar, sub-bottom profiler (seismic reflection) and magnetometer data within the Gulf of Mexico at the proposed survey Sites A and B. Each site was 1.7 x 1.7 miles which was filled with 200 m (meters) spaced survey lines, running north/south, as well as two tie lines running east/west. A detailed description of the vessel and equipment utilized for this survey can be found below.

The survey began with the APTIM crew mobilizing the *R/V Eugenie Clark* on August 12, 2018 at the Mote Marine Laboratory's Facility in Sarasota, FL. Once the vessel was mobilized, it began its transit to the survey sites on August 14, 2018 and collected geophysical data between August 14, 2018 and August 15, 2018. On both days, winds were approximately 5-10kts and swells were approximately 2 feet (ft). During survey operations, APTIM personnel reviewed the data in real time in order to establish a basic site characterization and determine any structures or geology that would impede the development of an aquaculture operation. APTIM began by collecting seismic sub-bottom, sidescan sonar, magnetometer and bathymetric data along four (4) tracklines at a wide spacing of 1968 ft (600m) and reviewed the data in real time. Based on the data collected, it was evident that the area contained more consolidated sediments (i.e. hardbottom) near the seafloor and very little unconsolidated sediments (such as sands or siltier sands). APTIM personnel then moved over to Site B and determined that the south eastern portion of the survey area contained more unconsolidated than consolidated sediments. Therefore APTIM revised the survey area and collected approximately 27 nautical miles (nm) (46 line kilometers (km)) of data in a roughly 1.6 x 1.4 nm (3.0 x 2.5 km) area, targeting an area with a thicker surficial layer of unconsolidated sediments near the seafloor (Map 1 in Appendix A).

<u>R/V Eugenie Clark</u>

The *R/V Eugenie Clark* is a shallow-water hydrographic survey vessel owned and operated by Mote Marine Laboratory. Based out of Sarasota, FL, the *R/V Eugenie Clark* has operated on a number of offshore and nearshore surveys along the gulf coast of Florida. It is a 46 ft fiberglass hulled vessel with a 16 ft beam and 3.3 ft draft. The vessel is equipped with twin inboard C7 Caterpillar Diesel engines (470 HP each), a Northern Lights 12KW Marine generator (120/208V), an A-Frame, and twin hydraulic winches. With a cruising speed of 17 knots and a maximum speed of 20 knots, the *R/V Eugenie Clark* was an efficient vessel, which allowed for quick transit between survey areas, and fulfills the necessary requirements for survey operations.

Hypack

Navigational, magnetometer, and depth sounder systems were interfaced with an onboard computer, and the data were integrated in real time using Hypack Inc.'s Hypack 2017® software. Hypack 2017® is a state-of-the-art navigation and hydrographic surveying system. The location of the fish tow-point or transducer mount on the vessel in relation to the Trimble DGPS was measured, recorded and entered into the Hypack 2017® survey program. The length of cable deployed between the tow-point and each towfish was also measured and entered into Hypack 2017®. Hypack 2017® then takes these values and monitors the actual position of each system in real time. Online screen graphic displays include the pre-plotted survey lines, the updated boat track across the survey area, adjustable left/right indicator, as well as other positioning information such as boat speed, and line bearing. The digital data are merged with the positioning data (Trimble DGPS), video displayed and recorded to the acquisition computer's hard disk for post processing and/or replay.

Navigation

The navigation and positioning system deployed for the geophysical survey was a Trimble Differential Global Positioning System (DGPS) interfaced to Hypack, Inc.'s Hypack 2017®. A Pro Beacon receiver provided DGPS correction from the nearest U.S. Coast Guard Navigational Beacon. The DGPS initially receives the civilian signal from the global positioning system (GPS) NAVSTAR satellites. The locator automatically acquires and simultaneously tracks the NAVSTAR satellites, while receiving precisely measured code phase and Doppler phase shifts, which enables the receiver to compute the position and velocity of the vessel. The receiver then determines the time, latitude, longitude, height, and velocity once per second. Most of the time the GPS accuracy with differential correction provides for a position accuracy of one (1) to four (4) ft. This is within the accuracy needed for geophysical investigations.

Single Beam Bathymetry

The bathymetric survey was conducted using an ODOM Echotrac MKIII sounder with a 200 kHz transducer pole mounted on the port side of the on the *R/V Eugenie Clark*. A TSS DMS-05 dynamic motion sensor was used to provide attitude corrections. For Quality Assurance/Quality Control and data reduction purposes, APTIM water level recorder data, and NOAA water level data were used to verify and/or correct onboard bathymetric readings.

Upon completion of the field work, data were edited and reduced using Hypack 2017® using Single Beam Max application. Water level corrected data were exported and a comma delimited XYZ file was created. All overlapping profile data were compared in cross section format to ensure system accuracy. For surface and map creation the final XYZ data files were processed through Golden Software's Surfer 12 for interpolation and grid creation. ERSI's Arc GIS 10.3 was used for final interpolation and presentation.

Sidescan Sonar

Sidescan sonar data were collected to verify the location and extent of the surficial unconsolidated sediment and to map ocean bottom features such as benthic habitats, exposed pipelines, cables, underwater wrecks, potential cultural resources, etc. APTIM utilized a dual frequency EdgeTech 4200 sidescan sonar, which uses a full-spectrum chirp technology to deliver wide-band, high-energy pulses coupled with high resolution and good signal to noise ratio echo data. The sonar package includes a portable configuration with a laptop computer running EdgeTech's Discover® acquisition software and dual frequency (300/600 kHz) towfish running in high definition mode. The EdgeTech 4200 has a maximum range of 754 ft (230 m) to either side of the towfish at the 300 kHz frequency and 394 ft (120 m) to either side of the towfish at the 600 kHz frequency.

Post processing of the sidescan sonar data was completed using Chesapeake Technology, Inc.'s SonarWiz 7 software. This software allows the user to apply specific gains and settings in order to produce enhanced sidescan sonar imagery that can be interpreted and digitized for specific seafloor features, including potential areas indicative of consolidated and unconsolidated sediment

Post collection processing of the sidescan sonar data were completed using Chesapeake Technology, Inc.'s SonarWiz 7 software. This software allows the user to apply specific gains and settings in order to produce enhanced sidescan sonar imagery that can be interpreted and digitized for specific benthic habitat features and debris throughout the study area. The first step in processing was to import the data into the software and bottom track the data. This is achieved using an automated bottom tracking routine and in some cases done manually. This step provides the data with an accurate baseline representation of the seafloor and eliminates the water column from the data.

Once the data were bottom tracked, they were processed to reduce noise effects (commonly due to the vessel, sea state, or other anthropogenic phenomenon) and enhance the seafloor definition. All of the sidescan sonar data utilized empirical gain normalization (EGN). An empirical gain normalization table was built including all of the sidescan sonar data files. Once the table was built it was applied to all of the sidescan sonar data. EGN is a relatively new gain function that works extremely well in most situations and can be considered a replacement for Beam Angle Correction (BAC). EGN is a function that sums and averages up all of the sonar amplitudes in all pings in a set of sonar files by altitude and range. The amplitude values are summed and averaged by transducer (port and starboard) so there are actually two tables. A given sonar amplitude sample is placed in a grid location based on the geometry of the ping. On the x-axis of the grid is range, and on the y-axis of the grid is altitude. The resulting table is used to work out the beam pattern of a sonar by empirically looking at millions of samples of data.

After processing each line, the data were inspected and interpreted for the location and extent of unconsolidated sediment as well as ocean bottom features such as benthic habitats, exposed pipelines, cables, underwater wrecks, potential cultural resources, etc. All geologic features and sediment boundaries were digitized in SonarWiz 7 by encapsulating the feature into a geographically referenced polygon/polyline shapefile for integration into ArcGIS.

Sub-Bottom Profiler

An EdgeTech 3200 sub-bottom profiler with a 512i towfish was used to collect the high-resolution seismic reflection profile data. This system is a versatile wideband frequency modulated (FM) sub-bottom profiler that collects digital normal incidence reflection data over many frequency ranges within the 0.5 kHz – 12 kHz range, also called a "chirp pulse". This instrumentation generates cross-sectional images of the seabed capable of resolving bed separation resolutions of 0.06 m to 0.10 m (depending on selected pulse/ping rate). The tapered waveform spectrum results in images that have virtually constant resolution with depth. The data were collected and recorded in the systems native, EdgeTech .jsf format. The seismic system was monitored and adjusted, if needed, in real-time to use the optimal settings for environmental, oceanographic and geologic conditions in order to ensure the highest quality data is being collected. Navigation and horizontal positioning for the sub-bottom system were provided by the Trimble DGPS system via Hypack utilizing the Hypack towfish layback correction. The chirp sub-bottom profiler was operated using a pulse with a frequency sweep of 1.0 kilohertz (kHz) to 10.0 kHz with a 5 millisecond (ms) pulse length. The system was set to ping at a rate of 7 hertz (Hz) and was run with a 60% pulse power level.

Post-collection processing of the chirp sub-bottom profiler data was completed using Chesapeake Technology, Inc.'s SonarWiz 7 software. This software allows the user to apply specific gains and settings in order to produce enhanced sub-bottom imagery that can then be interpreted and digitized for specific stratigraphic facies relevant to the project goals. The data were continuously bottom-tracked to allow for the application of real-time gain functions in order to have an optimal in-the-field view of the data.

Raw .jsf files were imported into SonarWiz 7 and the data were then bottom tracked, gained and swell filtered. The process of bottom tracking uses the high-amplitude signal associated with the seafloor to map it as the starting point for gains and swells. Swell filtering is a ping averaging function, which allows for the elimination of vertical changes caused from towfish movement produced from changes in sea state. The swell filter was increased or decreased depending on the period and frequency of the sea surface wave conditions and special care was taken not to over-smooth and eliminate features on the seafloor. Time-varying gain (TVG) was applied and manipulated to produce a better image (contrasts between low and high return signals) below the seafloor to increase the contrast within the stratigraphy, and increase the amplitude of the stratigraphy with depth, accounting for some of the signal attenuation normally associated with sound penetration over time. A blank-water column function was also applied to eliminate any features such as schools of fish under the chirp system which produce noise within the water column.

Magnetometer
A Geometrics G-882 Digital Cesium Marine Magnetometer was used to perform a cursory investigation of the magnetic anomalies within the study area. The magnetometer runs on 110/220 volts alternating current (VAC) power and capable of detecting and aiding the identification of any ferrous, ferric or other objects that may have a distinct magnetic signature. Factory set scale and sensitivity settings were used for data collection (0.004 nT/ πHz rms [nT = nanotesla or gamma]. Typically 0.02 nT P-P [P-P = peak to peak] at a 0.1 second sample rate or 0.002 nT at 1 second sample rate). Sample frequency is factory-set at up to 10 samples per second. The magnetometer was towed in tandem with the sidescan system at an altitude of no greater than 6 meters (m) above the seafloor, per BOEM regulations, and far enough from the vessel to minimize boat interference since the instrument has a sensitivity of 1 gamma. The tandem systems were attached to a marine grade hydraulic winch to adjust for changes in the seafloor and maintain an altitude of no greater than 20ft (6m) above the seafloor. Navigation and horizontal positioning for the magnetometer were provided by the Trimble DGPS system via Hypack utilizing the Hypack towfish layback correction. Magnetometer data were recorded in .raw Hypack file format.

The magnetometer data were post processed by APTIM's personnel in Hypack 2018's MagEditor software to identify any potential magnetic anomalies. In order to normalize the magnetic field and select anomalies with the finest data resolution possible, the background magnetic field and background noise was adjusted to negate for diurnal variations. Within MagEditor, the diurnal magnetic readings were duplicated and cropped. The cropped data were then deducted from the original gamma readings to normalize the magnetometer data from any diurnal variations. Anomalies were then selected with the Whole Magnetic Analysis tool, accounting for the distance over ground, time elapsed, the minimum and maximum gamma readings and the total peak to peak gamma readings.

Data Interpretation

Sidescan Sonar
During the processing of the sidescan sonar data, no contacts or targets were identified in the entire survey area, indicating that the seafloor is free of any exposed pipelines, marine debris, underwater wrecks, potential cultural resources, etc. Only two types of bottom textures were identified throughout the study area (Figure 1). In order to understand the two surficial sediment types, sidecan sonar data were compared to the seismic isopach (detailed in the seismic sub-bottom section). Upon careful examination of the two data types, it was evident that areas with high intensity backscatter and sand ripples (Texture 1) correlated to areas with exposed consolidated sediments or a thin layer of unconsolidated sediments.

The second texture (medium intensity backscatter) correlated with a thick unconsolidated sediment layer in the seismic data. While APTIM geologists utilized the backscatter intensity, distribution, and texture to make educated interpretations as to the location of consolidated and unconsolidated sediments, these interpretations are based solely on the acoustic interpretation therefore additional investigation (i.e ground-truthing or surface samples) would be advisable in order to characterize the sediment properties if deemed necessary.

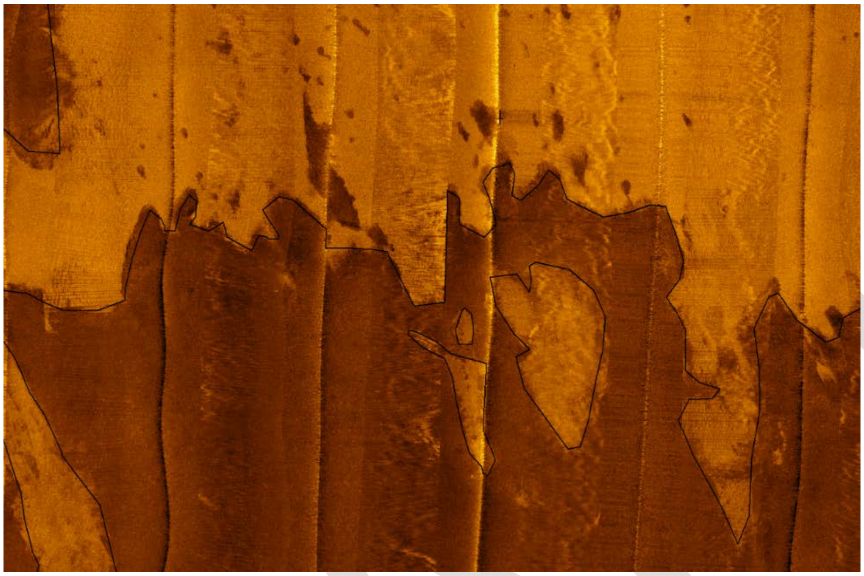

Figure 1: Example of the two identified surface sediment types. Texture 1: high backscatter (upper portion of image). Texture 2: medium intensity backscatter (lower part of image).

As can be seen in Map 2 in Appendix A, areas of high intensity backscatter (i.e, consolidated sediments, or thin unconsolidated sediments encompassed in green) are mostly located on the outer edges of the revised study area, indicating that the thicker unconsolidated layer is located mostly in the central portion of the investigation area. As previously mentioned, no contacts were identified within the area therefore no additional features were plotted onto the map.

<u>Chirp Sub-Bottom Profiler</u>

Bottom tracked chirp sub-bottom profile lines were opened to digitally display the recorded subsurface stratigraphy. Given the large extent of the consolidated sediment layer, data interpretation consisted of highlighting the top of consolidated sediment layer (Figure 2) which was generally associated with the layer causing the blanking of the seismic signal impeding the penetration of the chip pulse further below the seafloor.

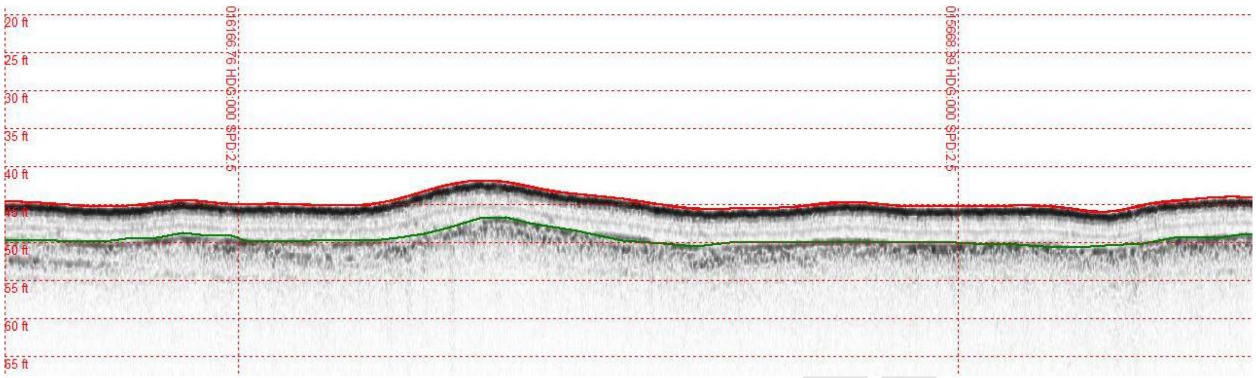

Figure 2: Seismic Line 324 in Site B trending north to south. Green line indicates the digitized consolidated sediment boundary with unconsolidated sediments above.

The stratigraphic reflector that best correlated with this layer was digitized by digitally clicking on the reflector within SonarWiz to create a color-coded boundary. This boundary appears on the subsequent chirp sub-bottom imagery to allow for an easy, visual reference for the boundary between consolidated and unconsolidated material. This boundary was used within SonarWiz to compute the thickness of the unconsolidated deposit by calculating the distance between the digitized seafloor and the digitized top of consolidated sediment boundary. Once the seismic data were reviewed in SonarWiz 7, the thickness (xyz) of the unconsolidated sediment unit was imported into Surfer 13 and gridded to create an interpolated surface depicting the general trend of sand deposits within the area. This isopach was then imported into ArcMap 10.6 to compare to the digitized sidescan sonar interpretations.

The unconsolidated sediment thickness surface (depicted in Map 3 in Appendix A) shows a general sediment trend across the area. As can be seen on Map 3, the central and eastern area have a thicker unconsolidated sediment layer, which appears to migrate west. Statistics on the surface indicate that the average thickness of the area is 2.6 (ft), with a standard deviation (+/-) of 1.4ft. Maximum thickness reaches 13 ft, with the minimum being zero (predominant on the western side). Some of the thicker areas digitized throughout the area appear to be isolated depressions (Figure 3) where the consolidated sediment has deepened allowing for more unconsolidated sediment to be deposited.

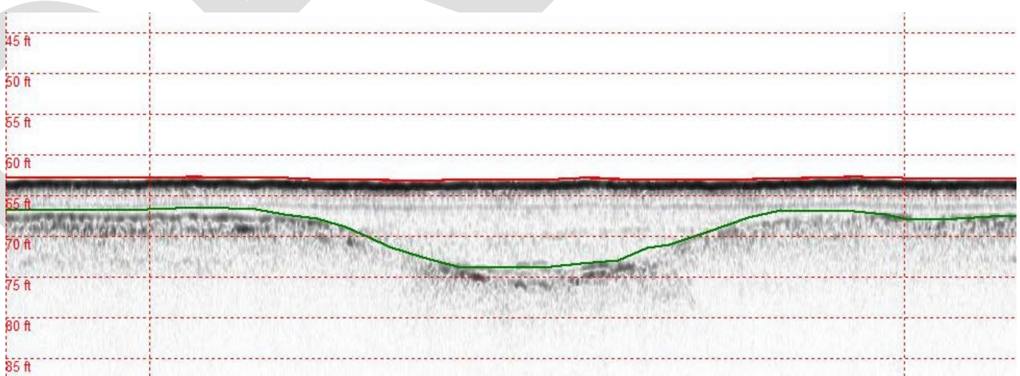

Figure 3: Seismic Line 323 trending south to north showing the deepening of the consolidated sediment layer.

Gridding of the xy-thickness data calculated for the four (4) lines in Site A indicate that the average sediment thickness is 1.7ft (+/- 0.9ft) with a few isolated areas that are slightly thicker, as well as some depressions like the example shown in Figure 3.

A seismic web project has been exported and is included in the digital version of this submittal. The data can be viewed by either opening each PNG line image file in any image viewer, or by opening the

“2018_Kampachi_Seismic_Data_viewer.htm” file in any web browser to view the data interactively (showing coordinates/depths and a location on a map).

Magnetometer

Ferrous items, detected via the magnetometer, are typically observed with an increased gamma intensity reading and seen as monopoles, dipoles and multi-component signals (Figure 4). These varying signals distinguish the anomalies from the natural environment. Anomalies identified throughout the processing and identification phase were then classified based on their magnetic signatures and intensity.

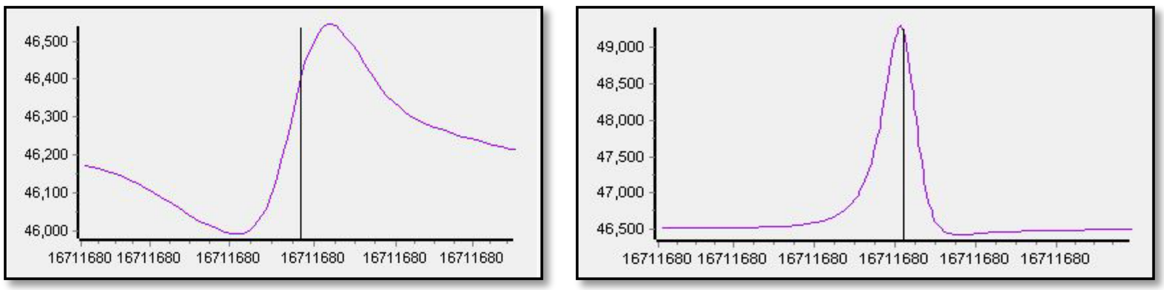

Figure 4: Magnetometer gamma signatures; Left: Dipole anomaly and Right: Monopole anomaly.

Each survey line was viewed and interpreted in great detail for any magnetic anomalies. Throughout the entire survey area APTIM recorded a total of 45 magnetometer anomalies (Map 4 in Appendix A and table in Appendix B). Almost all magnetometer hits observed throughout the survey site were minute, (less than 7 gammas (g)) and do not appear to be of any significant impact in the development of the area. One magnetometer anomaly, which is observed over 1000 g, is located outside of the survey area. Due to the signature’s disarrangement, the anomaly is likely noise due to a change in the elevation of the magnetometer.

Results

APTIM has reviewed the data and has determined that there are no features that would preclude the siting of an aquaculture operation within Site B and the area adjacent to it on the southeastern portion. It is important to note that this data has not been reviewed by a professional and licensed archaeologist and as such does not constitute a full evaluation of the geophysical data as required by National Oceanic and Atmospheric Administration (NOAA) Fisheries in its Baseline Environmental Survey Guidance and Procedures for Marine Aquaculture Activities in U.S. Federal Waters of the Gulf of Mexico.

Sincerely,

Beau Suthard
Client Program Manager
Aptim Environmental and Infrastructure, Inc.

Appendix A
Maps

Legend:

— As-Run Tracklines

- - Planned Lines

Notes:

1. Coordinates are in feet based on the Florida State Plane Coordinate System, West Zone, North American Datum of 1983 (NAD 83).
2. Data collected by APTIM on August 14, 2018 and August 15, 2018.

Map 1: As-Run Tracklines

Kampachi Farms
Velella Epsil
Geophysical Survey

APTIM

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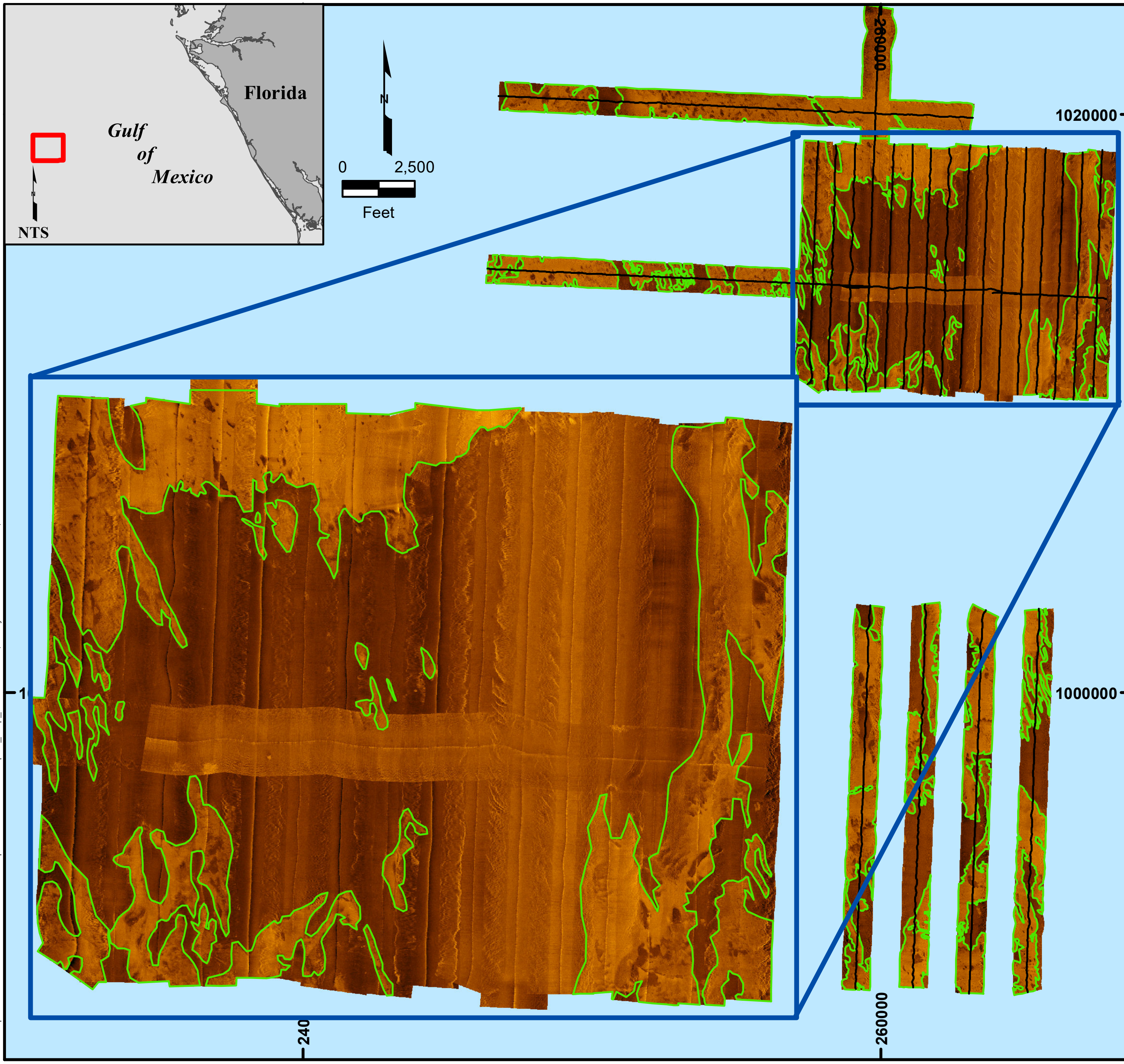

Legend:

- As-Run Tracklines
- Digitized Consolidated Sediment

Notes:

1. Coordinates are in feet based on the Florida State Plane Coordinate System, West Zone, North American Datum of 1983 (NAD 83).
2. Data collected by APTIM on August 14, 2018 and August 15, 2018.

Map 2: Sidescan Sonar Surface Geology

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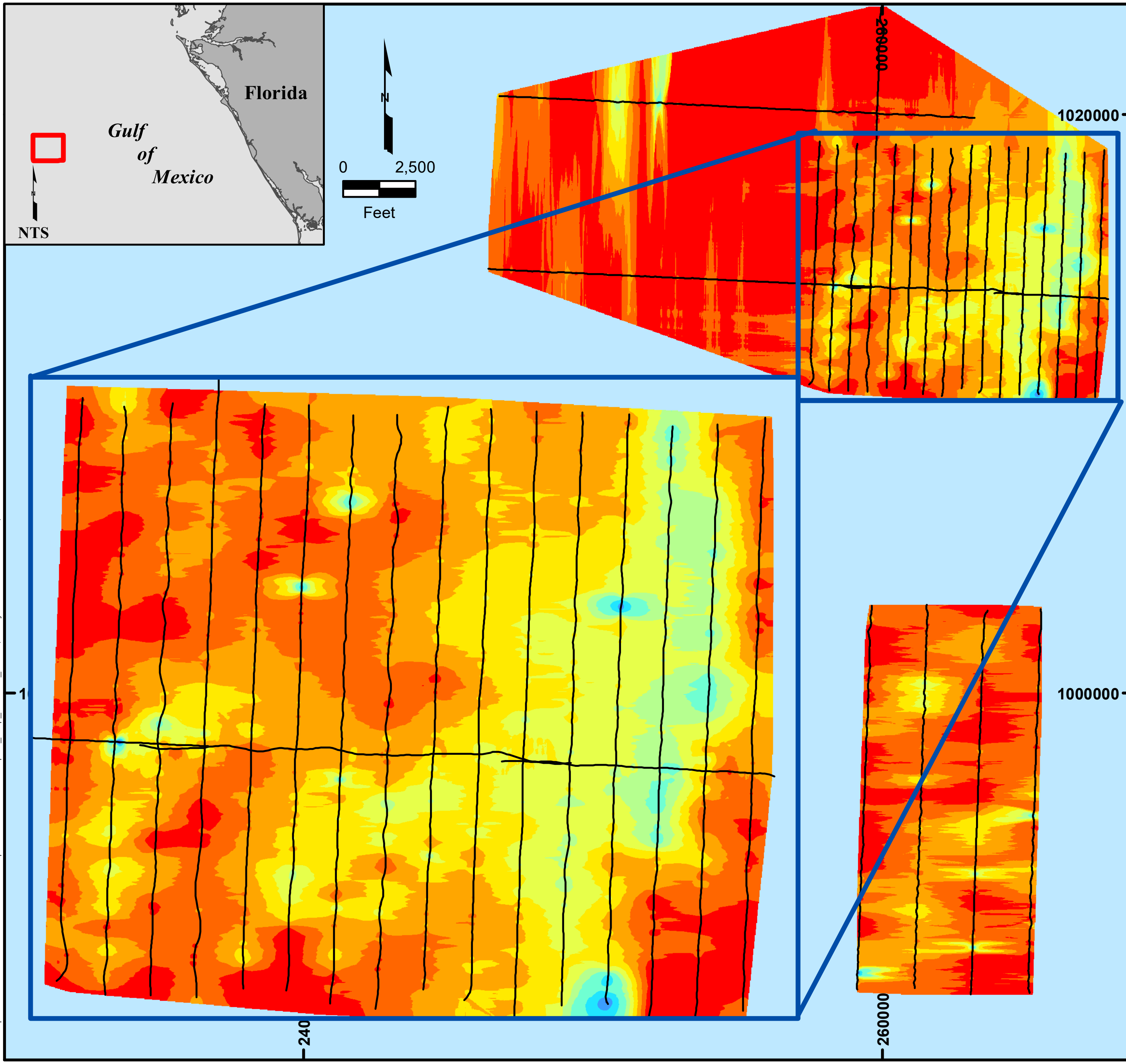
Tampa, FL, 33619
www.APTIM.com



Legend:

—— As-Run Tracklines

Notes:

1. Coordinates are in feet based on the Florida State Plane Coordinate System, West Zone, North American Datum of 1983 (NAD 83).
2. Data collected by APTIM on August 14, 2018 and August 15, 2018.

Thickness (ft)

- 1
- 2
- 3
- 4
- 5
- 6
- 8
- 10
- 12
- 14

Map 3: Unconsolidated Sediment Thickness Isopach

Kampachi Farms
Velella Epsil
Geophysical Survey

APTIM
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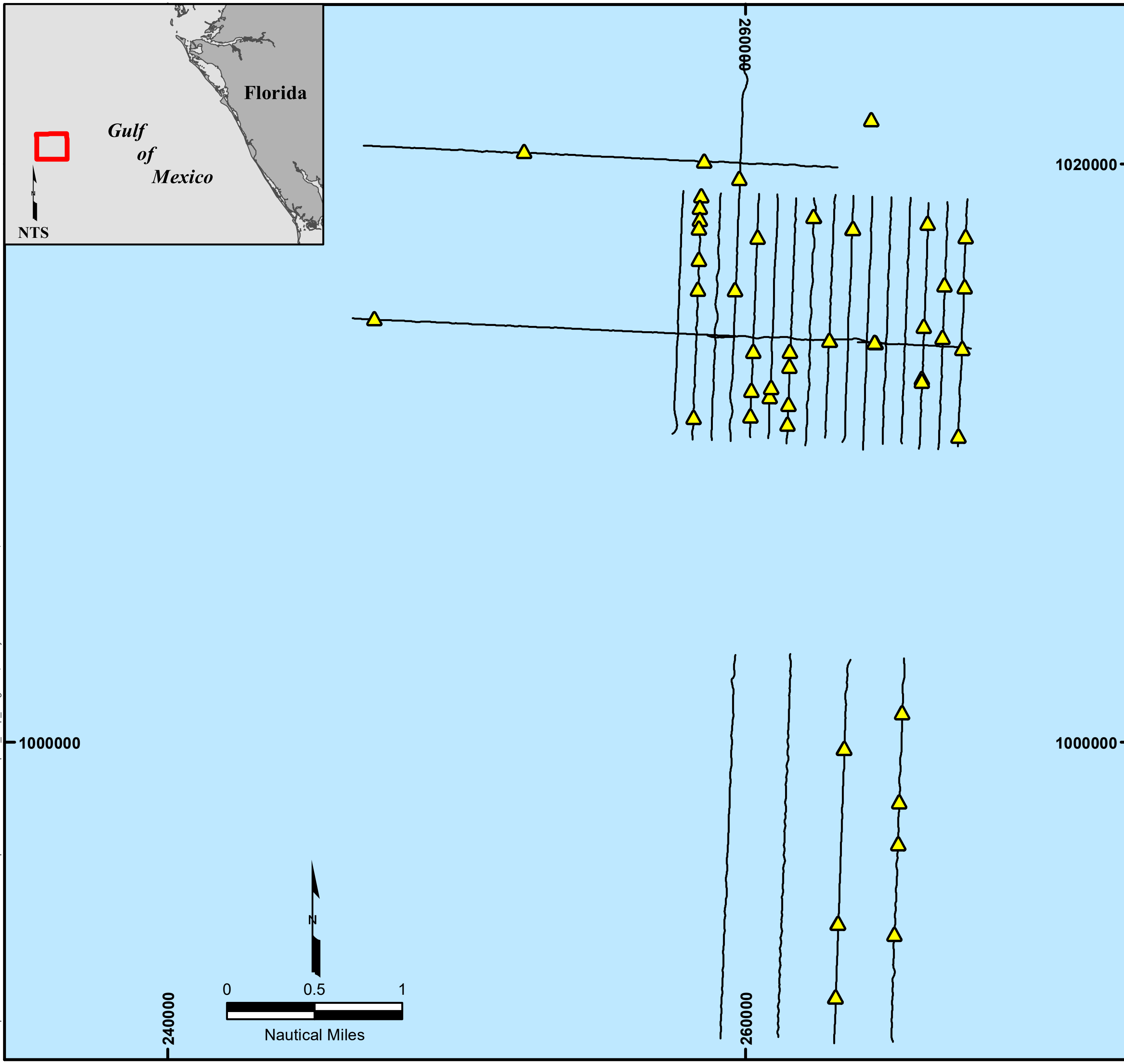

Legend:

- Magnetometer Anomalies
- As-Run Tracklines

Notes:

1. Coordinates are in feet based on the Florida State Plane Coordinate System, West Zone, North American Datum of 1983 (NAD 83).
2. Data collected by APTIM on August 14, 2018 and August 15, 2018.

Map 4: Magnetometer Anomalies

Kampachi Farms
Velella Epsil
Geophysical Survey

APTIM

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Appendix B
Magnetometer Anomaly Table

Anomaly ID	X Cooridnate	Y Coordinate	Line Number	Anomaly Number	Signature Type	Gammas	DOG	Signature
106-1-DP-0.6g-768.69ft	263408	999787	106	1	Dipolar	0.6g	768.69ft	DP
106-2-MC-1.1g-1219.05ft	263200	993737	106	2	Multi-Component	1.1g	1219.05ft	MC
106-3-DP-1.9g-1694.3ft	263118	991183	106	3	Dipolar	1.9g	1694.3ft	DP
109-1-DP-1.6g-1128.71ft	265146	993344	109	1	Dipolar	1.6g	1128.71ft	DP
109-2-MP-0.9g-486.39ft	265277	996490	109	2	Monopolar	0.9g	486.39ft	MP
109-3-MP-1.1g-826.66ft	265316	997929	109	3	Monopolar	1.1g	826.66ft	MP
109-4-MP-0.9g-646.36ft	265413	1001015	109	4	Monopolar	0.9g	646.36ft	MP
211-1-MP-1.9g-962.03ft	247156	1014649	211	1	Monopolar	1.9g	962.03ft	MP
210-1-MP-1.4g-1880.73ft	252338	1020431	210	1	Monopolar	1.4g	1880.73ft	MP
210-2-MP-0.8g-510.25ft	258571	1020109	210	2	Monopolar	0.8g	510.25ft	MP
170-1-DP-1.8g-753.87ft	259787	1019498	170	1	Dipolar	1.8g	753.87ft	DP
170-2-MP-3g-752.38ft	259637	1015659	170	2	Monopolar	3g	752.38ft	MP
211-1-MP-1g-673.81ft	264504	1013816	211	1	Monopolar	1g	673.81ft	MP
319-1-DP-0.8g-557.5ft	262897	1013895	319	1	Dipolar	0.8g	557.5ft	DP
317-1-MP-1.4g-514.64ft	261534	1013526	317	1	Monopolar	1.4g	514.64ft	MP
317-2-MP-0.6g-467.79ft	261508	1013004	317	2	Monopolar	0.6g	467.79ft	MP
317-3-DP-3.5g-650.89ft	261479	1011686	317	3	Dipolar	3.5g	650.89ft	DP
317-4-DP-3.2g-712ft	261450	1011002	317	4	Dipolar	3.2g	712ft	DP
315-1-DP-0.8g-704.95ft	260169	1011279	315	1	Dipolar	0.8g	704.95ft	DP
315-1-DP-0.6g-520.56ft	260202	1012165	315	1	Dipolar	0.6g	520.56ft	DP
315-2-DP-0.7g-440.43ft	260266	1013511	315	2	Dipolar	0.7g	440.43ft	DP
315-3-DP-0.4g-368.96ft	260416	1017470	315	3	Dipolar	0.4g	368.96ft	DP
312-1-DP-4.2g-351.39ft	258458	1018900	312	1	Dipolar	4.2g	351.39ft	DP
312-2-MP-3.5g-538.53ft	258419	1018495	312	2	Monopolar	3.5g	538.53ft	MP
312-3-MP-3.3g-467.99ft	258413	1018090	312	3	Monopolar	3.3g	467.99ft	MP
312-4-DP-2.4g-674.78ft	258384	1017783	312	4	Dipolar	2.4g	674.78ft	DP
312-5-DP-1.3g-464.63ft	258383	1016708	312	5	Dipolar	1.3g	464.63ft	DP
312-6-DP-3.6g-517.58ft	258351	1015675	312	6	Dipolar	3.6g	517.58ft	DP
312-7-DP-2.7g-454.22ft	258193	1011227	312	7	Dipolar	2.7g	454.22ft	DP
316-1-DP-3.2g-1258.05ft	260835	1011954	316	1	Dipolar	3.2g	1258.05ft	DP
316-2-MP-1.6g-449.32ft	260881	1012275	316	2	Monopolar	1.6g	449.32ft	MP
320-1-DP-1.2g-498.23ft	263710	1017768	320	1	Dipolar	1.2g	498.23ft	DP
211-1-MP-1.8g-286.83ft	264462	1013842	211	1	Monopolar	1.8g	286.83ft	MP
326-1-MP-2.1g-551.41ft	267371	1010591	326	1	Monopolar	2.1g	551.41ft	MP
326-2-DP-0.9g-560.88ft	267492	1013618	326	2	Dipolar	0.9g	560.88ft	DP
326-3-MP-4.3g-1070.04ft	267580	1015760	326	3	Monopolar	4.3g	1070.04ft	MP
326-4-MP-0.7g-426.31ft	267620	1017488	326	4	Monopolar	0.7g	426.31ft	MP
324-1-DP-1g-361.51ft	266293	1017957	324	1	Dipolar	1g	361.51ft	DP
324-2-DP-1.9g-394.94ft	266165	1014388	324	2	Dipolar	1.9g	394.94ft	DP
324-3-MC-4.1g-281.09ft	266097	1012586	324	3	Multi-Component	4.1g	281.09ft	MC
324-4-MP-7g-416.61ft	266105	1012488	324	4	Monopolar	7g	416.61ft	MP
325-1-MP-1.7g-235.45ft	266884	1015812	325	1	Monopolar	1.7g	235.45ft	MP
325-2-DP-1.6g-422.34ft	266811	1014000	325	2	Dipolar	1.6g	422.34ft	DP
321-1-MC-1305.5g-332.08ft	264353	1021535	321	1	Multi-Component	1305.5g	332.08ft	MC
320-2-MC-1.2g-534.6ft	263709	1017773	320	2	Multi-Component	1.2g	534.6ft	MC
318-1-MC-2g-260.45ft	262340	1018178	318	1	Multi-Component	2g	260.45ft	MC

Note: Coordinates are in feet based on the Florida State Plane Coordinate System, West Zone, North American Datum of 1983 (NAD 83).

Appendix C (Digital Only)
Seismic Web Project

APPENDIX B

TAR 2018 Report

Submerged Cultural Resource Data Analysis Letter Report For:

The Velella Epsilon Project
"Pioneering Offshore Aquaculture in the Southeastern Gulf of Mexico"

Submitted to:

Gulf South Research Corporation
815 Bayshore Drive, Suite B
Niceville, Florida 32578

Submitted by:

Tidewater Atlantic Research, Inc.
P. O. Box 2494
Washington, North Carolina 27889

With Significant Contributions from:

APTIM Environmental and Infrastructure, Inc.
101 16th Avenue South, Ste. 4
St. Petersburg, Florida 33701

Submittal Date:

24 October 2018

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Survey Area Location and Project Overview

The Velella Epsilon project area is in the Gulf of Mexico (GOM) in approximately 40m water depth off southwest Florida, generally located 45 miles southwest of Sarasota, Florida (Figure 1). APTIM Environmental and Infrastructure, Inc. (APTIM) was hired by Kampachi Farms, LLC (Kampachi) to conduct a geophysical baseline survey of the proposed location for siting the Velella Epilon (VE) Project demonstration aquaculture farm. The purpose of the geophysical investigation was to characterize the sub-surface and surface geology of the sites and identify areas with a sufficient thickness of unconsolidated sediment near the surface while also clearing the area of any geohazards and structures that would impede the implementation of an aquaculture operation (Figure 2). The geophysical survey for the VE Project consisted of collecting single beam bathymetry, sidescan sonar, sub-bottom profiler (seismic reflection), and magnetometer data within the Gulf of Mexico project site.

Under contract with Kampachi, those data were reviewed by Tidewater Atlantic Research, Inc. (TAR) of Washington, North Carolina to identify and assess the significance of any submerged cultural resources that might be impacted by project related activities in the site location identified on the basis of APTIM's data (Appendix A). The descriptions of survey equipment and methodology that follow are taken directly from the report prepared by APTIM as presented by Kampachi (2018).

APTIM Field Survey Methodology and Equipment

Navigation System

Navigational, magnetometer, and depth sounder systems were interfaced with an onboard computer, and the data were integrated in real time using Hypack 2017® software. Hypack 2017® is a state-of-the-art navigation and hydrographic surveying system. The location of the fish tow-point or transducer mount on the vessel in relation to the Trimble DGPS was measured, recorded and entered into the Hypack 2017® survey program. The length of cable deployed between the tow-point and each towfish was also measured and entered into Hypack 2017®. Hypack 2017® then takes these values and monitors the actual position of each system in real time. Online screen graphic displays include the replotted survey lines, the updated boat track across the survey area, adjustable left/right indicator, as well as other positioning information such as boat speed, and line bearing. The digital data are merged with the positioning data (Trimble DGPS), video displayed and recorded to the acquisition computer's hard disk for post processing and/or replay.

The navigation and positioning system deployed for the geophysical survey was a Trimble® Differential Global Positioning System (DGPS) interfaced to Hypack 2017®. A Pro Beacon receiver provided DGPS correction from the nearest U.S. Coast Guard Navigational Beacon. The DGPS initially receives the civilian signal from the global positioning system (GPS) NAVSTAR satellites. The locator automatically acquires and simultaneously tracks the NAVSTAR satellites, while receiving precisely measured code phase and Doppler phase shifts, which enables the receiver to compute the position and velocity of the vessel. The receiver then determines the time, latitude, longitude, height, and velocity once per second. The GPS accuracy with differential correction provides for a position accuracy of one (1) to four (4) feet during most of the operations. This is within the accuracy needed for geophysical investigations.

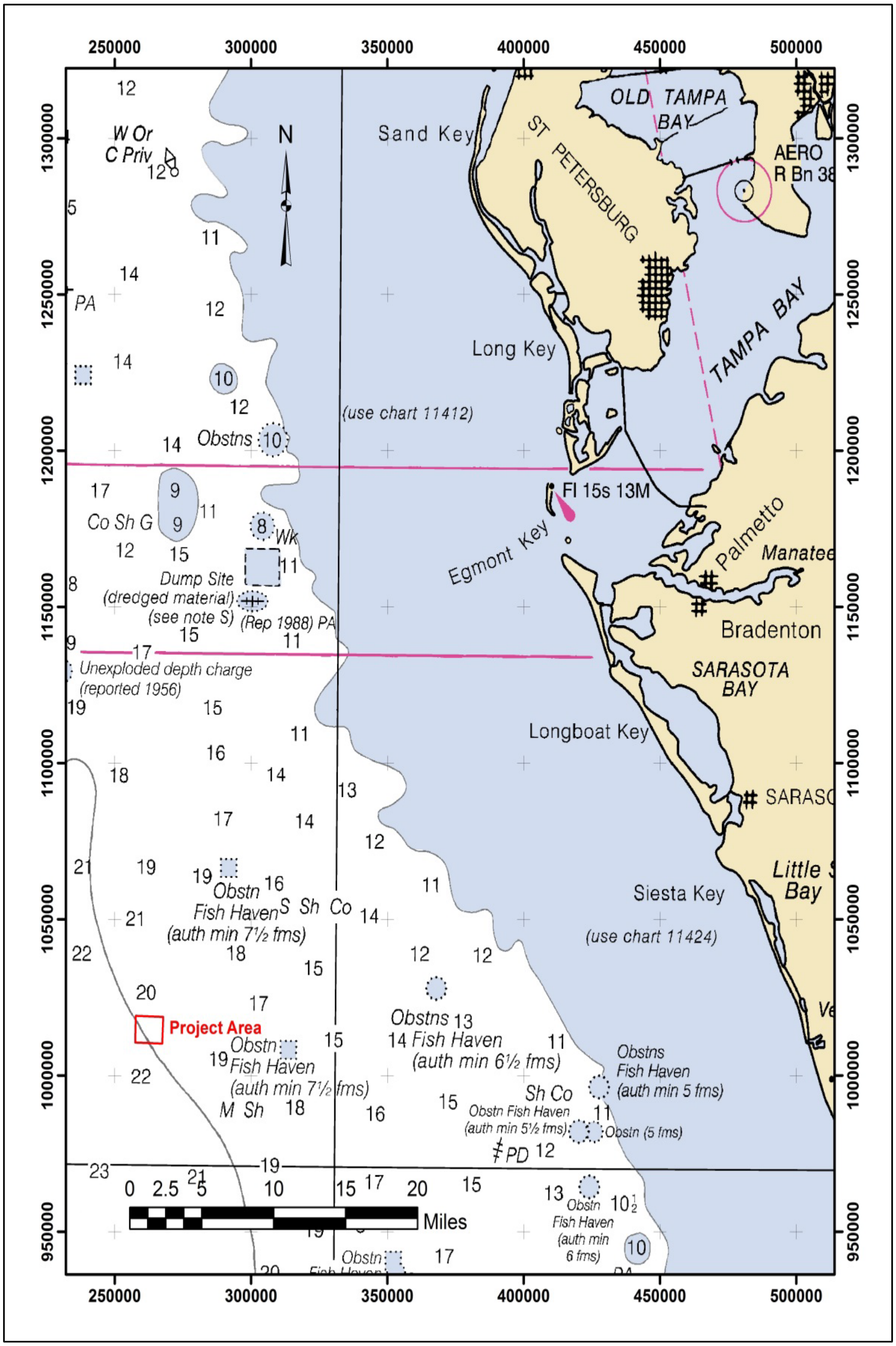

Figure 1. Velella Epsilon (VE) proposed project area.

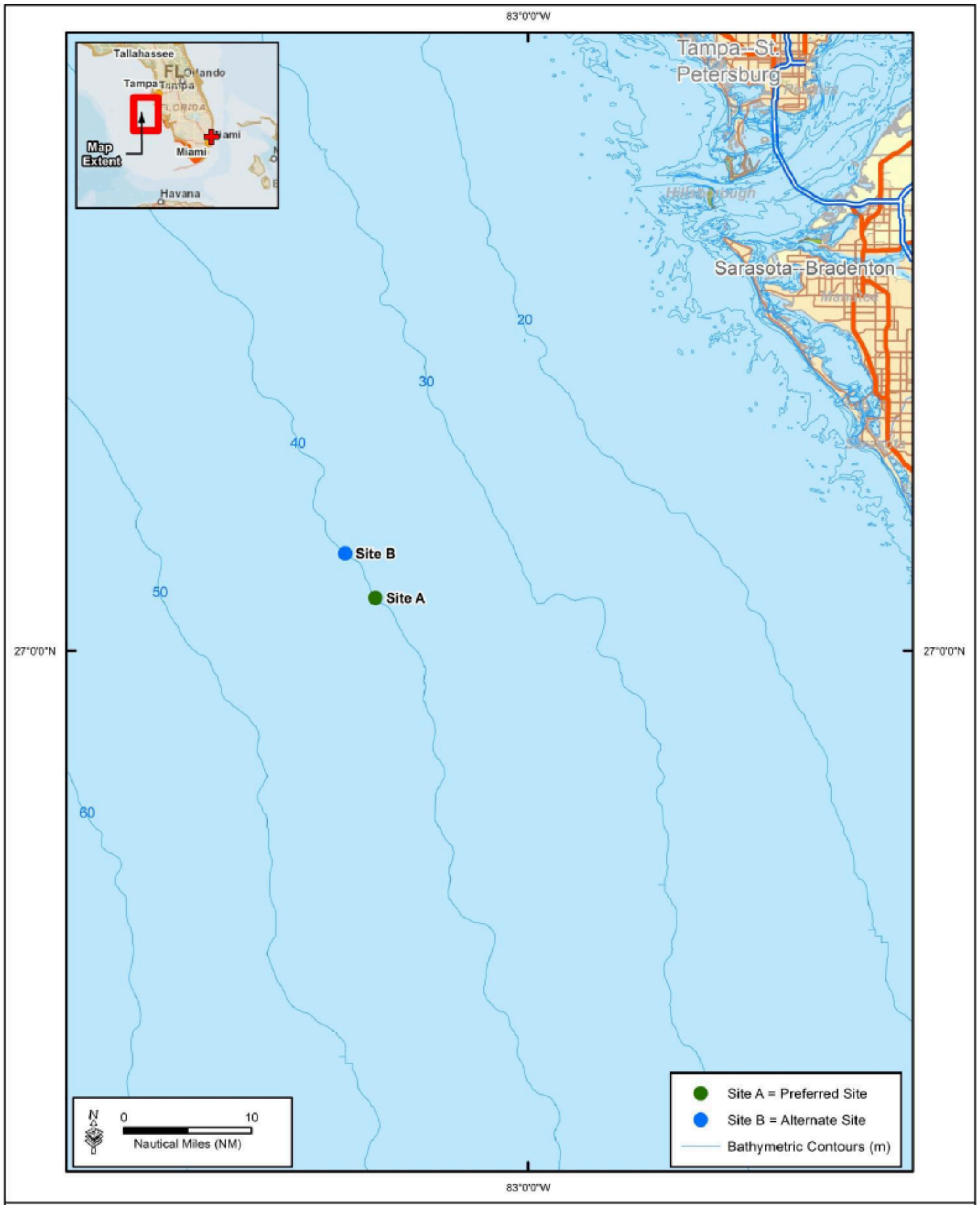

Figure 2. Proposed site locations for VE project as presented by Kampachi (2018:2).

Survey Instrumentation

Single Beam Bathymetry

The bathymetric survey was conducted using an ODOM Echotrac MKIII sounder with a 200-kHz transducer pole mounted on the port side of the on the R/V *Eugenie Clark*. A TSS DMS-05 dynamic motion sensor was used to provide attitude corrections. For Quality Assurance/Quality Control and data reduction purposes, APTIM water level recorder data, and NOAA water level data were used to verify and/or correct onboard bathymetric readings. Upon completion of the field work, data were edited and reduced using Hypack 2017® using Single Beam Max application. Water level corrected data were exported and a comma delimited XYZ file was created. All overlapping profile data were compared in cross section format to ensure system accuracy. For surface and map creation the final XYZ data files were processed through Golden Software's Surfer 12 for interpolation and grid creation. ERSI's Arc GIS 10.3 was used for final interpolation and presentation.

Sidescan Sonar

Sidescan sonar data were collected to verify the location and extent of the surficial unconsolidated sediment and to map ocean bottom features such as benthic habitats, exposed pipelines, cables, underwater wrecks, potential cultural resources, etc. APTIM utilized a dual frequency EdgeTech 4200® sidescan sonar, which uses a full-spectrum chirp technology to deliver wide-band, high-energy pulses coupled with high resolution and good signal to noise ratio echo data. The sonar package includes a portable configuration with a laptop computer running EdgeTech's Discover® acquisition software and dual frequency (300/600 kHz) towfish running in high definition mode. The EdgeTech 4200® has a maximum range of 754ft (230 m) to either side of the towfish at the 300kHz frequency and 394ft (120 m) to either side of the towfish at the 600kHz frequency.

Post processing of the sidescan sonar data was completed using Chesapeake Technology, Inc.'s SonarWiz 7® software. This software allows the user to apply specific gains and settings in order to produce enhanced sidescan sonar imagery that can be interpreted and digitized for specific seafloor features, including potential areas indicative of consolidated and unconsolidated sediment Post collection processing of the sidescan sonar data were completed using Chesapeake Technology, Inc.'s SonarWiz 7® software. This software allows the user to apply specific gains and settings in order to produce enhanced sidescan sonar imagery that can be interpreted and digitized for specific benthic habitat features and debris throughout the study area. The first step in processing was to import the data into the software and bottom track the data. This is achieved using an automated bottom tracking routine and in some cases done manually. This step provides the data with an accurate baseline representation of the seafloor and eliminates the water column from the data.

Once the data were bottom tracked, they were processed to reduce noise effects (commonly due to the vessel, sea state, or other anthropogenic phenomenon) and enhance the seafloor definition. All of the sidescan sonar data utilized empirical gain normalization (EGN). An empirical gain normalization table was built including all of the sidescan sonar data files. Once the table was built it was applied to all of the sidescan sonar data. EGN is a relatively new gain function that works extremely well in most situations and can be considered a replacement for Beam Angle Correction (BAC). EGN is a function that sums and averages up all of the sonar amplitudes in all pings in a set of sonar files by altitude and range. The amplitude values are summed and averaged by transducer (port and starboard) so there are actually two tables. A given sonar amplitude sample is placed in a grid location based on the geometry of the ping. On the x-axis of the grid is range, and on the y-axis of the grid is altitude. The resulting table is used to work out the beam pattern of sonar by empirically looking at millions of samples of data.

After processing each line, the data were inspected and interpreted for the location and extent of unconsolidated sediment as well as ocean bottom features such as benthic habitats, exposed pipelines, cables, underwater wrecks, potential cultural resources, etc. All geologic features and sediment boundaries were digitized in SonarWiz 7® by encapsulating the feature into a geographically referenced polygon/polyline shapefile for integration into ArcGIS®.

Sub-Bottom Profiler

An EdgeTech 3200® sub-bottom profiler with a 512i towfish was used to collect the high-resolution seismic reflection profile data. This system is a versatile wideband frequency modulated (FM) sub-bottom profiler that collects digital normal incidence reflection data over many frequency ranges within the 0.5kHz – 12kHz range, also called a "chirp pulse". This instrumentation generates cross-sectional images of the seabed capable of resolving bed separation resolutions of 0.06m to 0.10m (depending on selected pulse/ping rate). The tapered waveform spectrum results in images that have virtually constant resolution with depth. The data were collected and recorded in the systems native, EdgeTech® .jsf format. The seismic system was monitored and adjusted, if needed, in real-time to use the optimal settings for environmental, oceanographic and geologic conditions in order to ensure the highest quality data is being collected. Navigation and horizontal positioning for the sub-bottom system were provided by the Trimble® DGPS system via Hypack® utilizing the Hypack® towfish layback correction. The chirp sub-bottom profiler was operated using a pulse with a frequency sweep of 1.0 kilohertz (kHz) to 10.0kHz with a 5 millisecond (ms) pulse length. The system was set to ping at a rate of 7 hertz (Hz) and was run with a 60% pulse power level.

Post-collection processing of the chirp sub-bottom profiler data was completed using SonarWiz 7® software. This software allows the user to apply specific gains and settings in order to produce enhanced sub-bottom imagery that can then be interpreted and digitized for specific 4 stratigraphic facies relevant to the project goals. The data were continuously bottom-tracked to allow for the application of real-time gain functions in order to have an optimal in-the-field view of the data.

Raw .jsf files were imported into SonarWiz 7® and the data were then bottom tracked, gained and swell filtered. The process of bottom tracking uses the high-amplitude signal associated with the seafloor to map it as the starting point for gains and swells. Swell filtering is a ping averaging function, which allows for the elimination of vertical changes caused from towfish movement produced from changes in sea state. The swell filter was increased or decreased depending on the period and frequency of the sea surface wave conditions and special care was taken not to over-smooth and eliminate features on the seafloor. Time-varying gain (TVG) was applied and manipulated to produce a better image (contrasts between low and high return signals) below the seafloor to increase the contrast within the stratigraphy, and increase the amplitude of the stratigraphy with depth, accounting for some of the signal attenuation normally associated with sound penetration over time. A blank-water column function was also applied to eliminate any features such as schools of fish under the chirp system which could produce noise within the water column.

Magnetometer

A Geometrics G-882 Digital Cesium Marine Magnetometer was used to perform a cursory investigation of the magnetic anomalies within the study area. The magnetometer runs on 110/220 volts alternating current (VAC) power and capable of detecting and aiding the identification of any ferrous, ferric or other objects that may have a distinct magnetic signature. Factory set scale and sensitivity settings were used for data collection (0.004 nT/ πHz rms [nT = nanotesla or gamma]. Typically, 0.02 nT P-P [P-P = peak to peak] at a 0.1 second sample rate or 0.002 nT at 1 second sample rate). Sample frequency is factory-set at up to 10 samples per second. The magnetometer was towed in tandem with the sidescan system at an altitude of no greater than 6 meters (m) above the seafloor, per BOEM regulations, and far enough from the vessel to minimize boat interference since the instrument has a sensitivity of 1 gamma. The tandem systems were attached to a marine grade hydraulic winch to adjust for changes in the seafloor and maintain an altitude of no greater than 20 feet (ft; 6m) above the seafloor. Navigation and horizontal positioning for the magnetometer were provided by the Trimble® DGPS system via Hypack® utilizing the Hypack towfish layback correction. Magnetometer data were recorded in .raw Hypack® file format.

The magnetometer data were post processed by APTIM's personnel in Hypack® 2018's MagEditor software to identify any potential magnetic anomalies. In order to normalize the magnetic field and select anomalies with the finest data resolution possible, the background magnetic field and background noise was adjusted to negate for diurnal variations. Within MagEditor, the diurnal magnetic readings were duplicated and cropped. The cropped data were then deducted from the original gamma readings to normalize the magnetometer data from any diurnal variations. Anomalies were then selected with the Whole Magnetic Analysis tool, accounting for the distance over ground, time elapsed, the minimum and maximum gamma readings and the total peak to peak gamma readings.

Survey Vessel

Vessel Description

The R/V *Eugenie Clark* is a shallow-water hydrographic survey vessel owned and operated by Mote Marine Laboratory. Based out of Sarasota, FL, the R/V *Eugenie Clark* has operated on a number of offshore and nearshore surveys along the gulf coast of Florida. It is a 46-ft fiberglass hulled vessel with a 16-ft beam and 3.3-ft draft. The vessel is equipped with twin inboard C7 Caterpillar Diesel engines (470 HP each), a Northern Lights 12KW Marine generator (120/208V), an A-Frame, and twin hydraulic 2 winches. With a cruising speed of 17 knots (kts) and a maximum speed of 20 kts, the R/V *Eugenie Clark* was an efficient vessel, which allowed for quick transit between survey areas, and fulfilled the necessary requirements for survey operations.

Remote-Sensing Sensor Configuration and Set-backs

The geophysical survey consisted of collecting single beam bathymetry, sidescan sonar, sub- bottom profiler (seismic reflection), and magnetometer data. The instrument set-backs identify the distances from the zero mark (vessel GPS) to each of the towed/mounted systems. As such, the system set-backs were measured from the GPS antenna (placed on vessels Port side on the second deck) to each of the towpoints/mounted instruments and inputted into the system set-up in Hypack®. Sidescan sonar and seismic sub-bottom had an additional offset length of cable out from the towpoint to the instrument. The magnetometer position was based on the sidescan sonar offset, and was set-back with an additional 20 ft of cable (i.e., the magnetometer was set-back 20 ft behind the sidescan sonar). The raw data for each survey system was recorded with the layback (set-back) already corrected during navigation (Table 1).

System	**X Offset (ft)**	**Y Offset (ft)**	**Z Offset (ft)**
Vessel GPS (zero)	0	0	-15.5
Odom/Hydrotrack-mounted	-3.2	-5.5	0
Motion Reference Unit- mounted	2.5	15.3	-15.5
Chirp-towed	10.4	-13.6	-3.3
SSS-towed	2.7	-18	-7.4

Table 1. System set-backs used during fieldwork.

Original Daily Survey Operation Logs and Sensor Tow Depths

These files include the sensor height for each towed system off the seafloor for the beginning and end of each survey trackline. On average, the magnetometer and the sidescan sonar tows were maintained at relatively constant depths from the seafloor of 6m and 12m; respectively. The sub-bottom profiler was maintained within a range of depths from the seafloor of approximately 14m to 21m, based on trackline bathymetry.

Description of Survey Procedures

During survey operations, APTIM personnel reviewed the data in real time, in order to establish a basic site characterization and determine any structures or geology that would impede the development of an aquaculture operation. APTIM began by collecting seismic sub-bottom, sidescan sonar, magnetometer and bathymetric data along four (4) tracklines at a wide spacing of 1968 ft (600 m) at Site A. Based on the data collected, it was evident that the area contained more consolidated sediments (i.e. hardbottom) near the seafloor and very little unconsolidated sediments (such as sands or siltier sands) at Site A.

APTIM communicated these preliminary findings to the Kampachi, LLC, Project Manager on the evening of Tuesday, August 14, 2018 and a collective decision was made to move to Site B to determine if Site B contained more unconsolidated than consolidated sediments. APTIM began collecting seismic sub-bottom, sidescan sonar, magnetometer and bathymetric data along three (3) tracklines at a wide spacing of 1968 ft (600 m) at Site B and reviewed the data in real time. Based on the data collected, it was evident that the southeastern portion of the Site B survey area contained more unconsolidated sediments (such as sands or siltier sands). As a result of this information, APTIM revised the survey area and collected approximately 27 nautical miles (nm) (46 line kilometers [km]) of data in a roughly 1.6nm x 1.4nm (3.0 km x 2.5 km) area, targeting an area with a thicker (2 to 8ft) surficial layer of unconsolidated sediments near the seafloor in the southeastern portion, and mostly outside of Site B (here forward referred to as Modified Site B). A total of 16 tracklines were surveyed within this area.

During the processing of the sidescan sonar data, no contacts or targets were identified in the entire survey area, indicating that the seafloor is free of any exposed pipelines, marine debris, underwater wrecks, potential cultural resources, etc. Only two types of bottom textures were identified throughout the study area. In order to characterize the two surficial sediment types, sidescan sonar data were compared to the seismic isopach (i.e., sub-bottom profiler data). Upon careful examination of the two data types, it was evident that areas with high intensity backscatter and sand ripples (Texture 1) correlated to areas with exposed consolidated sediments or a thin layer of unconsolidated sediments.

The second texture (Texture 2), consisted of a medium intensity backscatter, and correlated with a thick unconsolidated sediment layer in the seismic data (i.e., sub-bottom profiler data). Geologists typically utilize the backscatter intensity, distribution, and texture to make educated interpretations as to the location of consolidated and unconsolidated sediments; however, these interpretations are based solely on the acoustic interpretation. As such, additional investigation (i.e., ground-truthing or surface samples) may be required in order to characterize the sediment properties, as deemed necessary.

No survey difficulties or problems were encountered during the deployment; operations; or data capture, analysis, and interpretation from any of the sensor systems that would affect the ability APTIM or Kampachi investigators to determine the potential for the presence of hazards, debris, human activities (i.e., oil/gas structure, artificial reefs), and biological and archaeological resources in the survey area (Kampachi 2018).

Sub-Bottom Profiler Data Analysis

Bottom tracked chirp sub-bottom profile lines were opened to digitally display the recorded subsurface stratigraphy. Given the large extent of the consolidated sediment layer, data interpretation consisted of highlighting the top of consolidated sediment layer which was generally associated with the layer causing the blanking of the seismic signal impeding the penetration of the chip pulse further below the seafloor. The stratigraphic reflector that best correlated with this layer was digitized by digitally clicking on the reflector within SonarWiz to create a color-coded boundary. This boundary appears on the subsequent chirp sub-bottom imagery to allow for an easy, visual reference for the boundary between consolidated and unconsolidated material.

The SonarWiz® boundary was used to compute the thickness of the unconsolidated deposit by calculating the distance between the digitized seafloor and the digitized top of consolidated sediment boundary. Once the seismic data were reviewed in SonarWiz 7®, the thickness (xyz) of the unconsolidated sediment unit was imported into Surfer 13 and gridded to create an interpolated surface depicting the general trend of sand deposits within the area. This isopach was then imported into ArcMap® 10.6 to compare to the digitized sidescan sonar interpretations. Some of the thicker areas digitized throughout the area appear to be isolated depressions where the consolidated sediment has deepened allowing for more unconsolidated sediment to be deposited.

Signature Analysis and Target Assessment

While no absolute criteria for identification of potentially significant magnetic and/or acoustic target signatures exist, available literature confirms that reliable analysis must be made on the basis of certain characteristics. Magnetic signatures must be assessed on the basis of three basic factors. The first factor is intensity and the second is duration. The third consideration is the nature of the signature; e.g., positive monopolar, negative monopolar, dipolar or multi-component. Unfortunately, shipwreck sites have been demonstrated to produce each signature type under certain circumstances. Some shipwreck signatures are more apparent than others.

Large vessels, whether constructed of iron or wood, produce magnetic signatures that can be reliably identified. Smaller vessels, or disarticulated vessel remains, are more difficult to identify. Their signatures are frequently difficult, if not impossible, to distinguish from single objects and/or modern debris. In fact, some small vessels produce little or no magnetic signature. Unless ordnance, ground tackle or cargo associated with the hull produces a detectable signature, some sites are impossible to identify magnetically. It is also difficult to magnetically distinguish some small wrecks from modern debris. As a consequence, magnetic targets must be subjectively assessed according to intensity, duration and signature characteristics. The final decision concerning potential significance must be made on the basis of anomaly attributes, historical patterns of navigation in the project area and a responsible balance between historical and economic priorities.

Acoustic signatures must also be assessed on the basis of several basic characteristics. Perhaps the most important factor in acoustic analysis is the configuration of the signature. As the acoustic record represents a reflection of specific target features, wreck signatures are often a highly detailed and accurate image of architectural and construction features. On sites with less structural integrity acoustic signatures often reflect more of a geometric pattern that can be identified as structural material. Where hull remains are disarticulated the pattern can be little more than a texture on the bottom surface representing structure, ballast or shell hash associated with submerged deposits. Unfortunately, shipwreck sites have been demonstrated to produce a variety of signature characteristics under different circumstances. Like magnetic signatures, some acoustic shipwreck signatures are more apparent than others. Large vessels, whether iron or wood, can produce acoustic signatures that can be reliably identified. Smaller vessels, or disarticulated vessel remains are inevitably more difficult. Their acoustic signatures are frequently difficult, if not impossible, to distinguish from concentrations of snags and/or modern debris. In fact, some small vessels produce little or no acoustic signature. As a consequence, acoustic targets must be subjectively assessed according to intensity of return over background, elevation above bottom and geometric image characteristics. The final decision concerning potential significance of less readily identifiable targets must be made on the basis of anomaly attributes, historical patterns of navigation in the project area and a responsible balance between historical and economic priorities.

VE Project Data Analysis

Magnetic and acoustic data was collected on 16 survey lines and one tie line (Figure 3). Magnetometer data was collected as Hypack® raw data. Each line file was reviewed by the TAR marine archaeologist to identify and characterize anomalies that could be generated by submerged cultural resources. Anomaly signatures were analyzed in accordance with intensity, duration, areal extent and signature characteristics. A total of 38 anomalies were identified in the data (Figure 4; Appendix A).

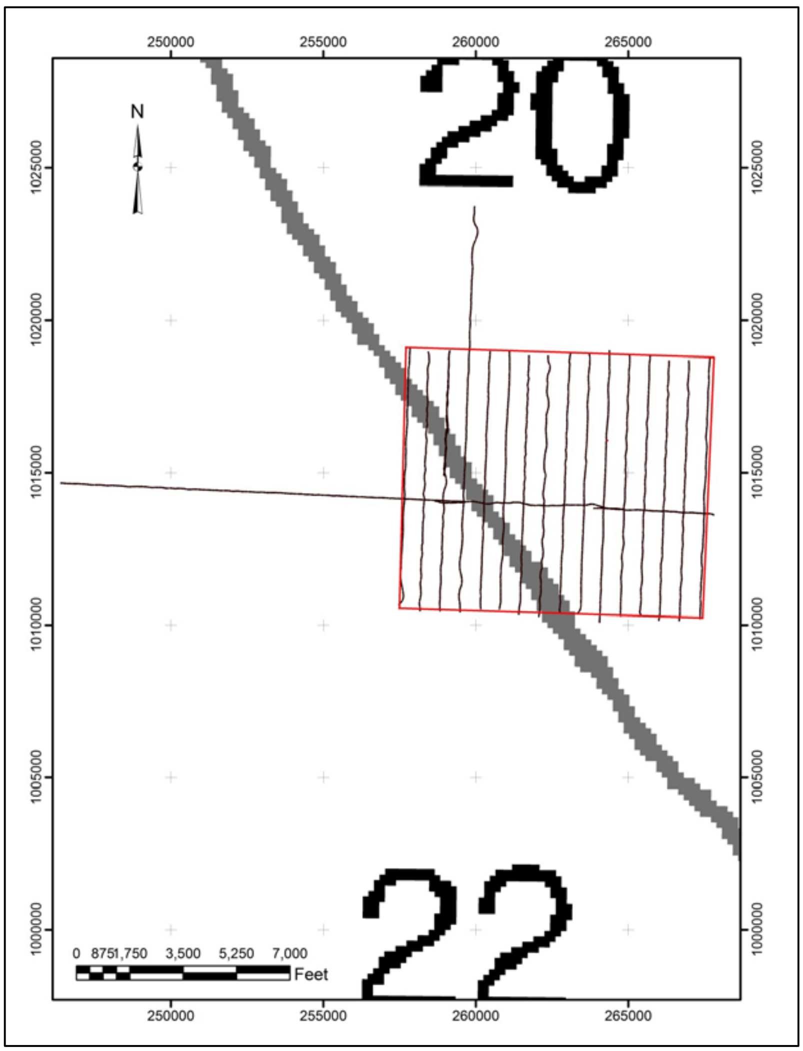

Figure 3. Project as-run track lines.

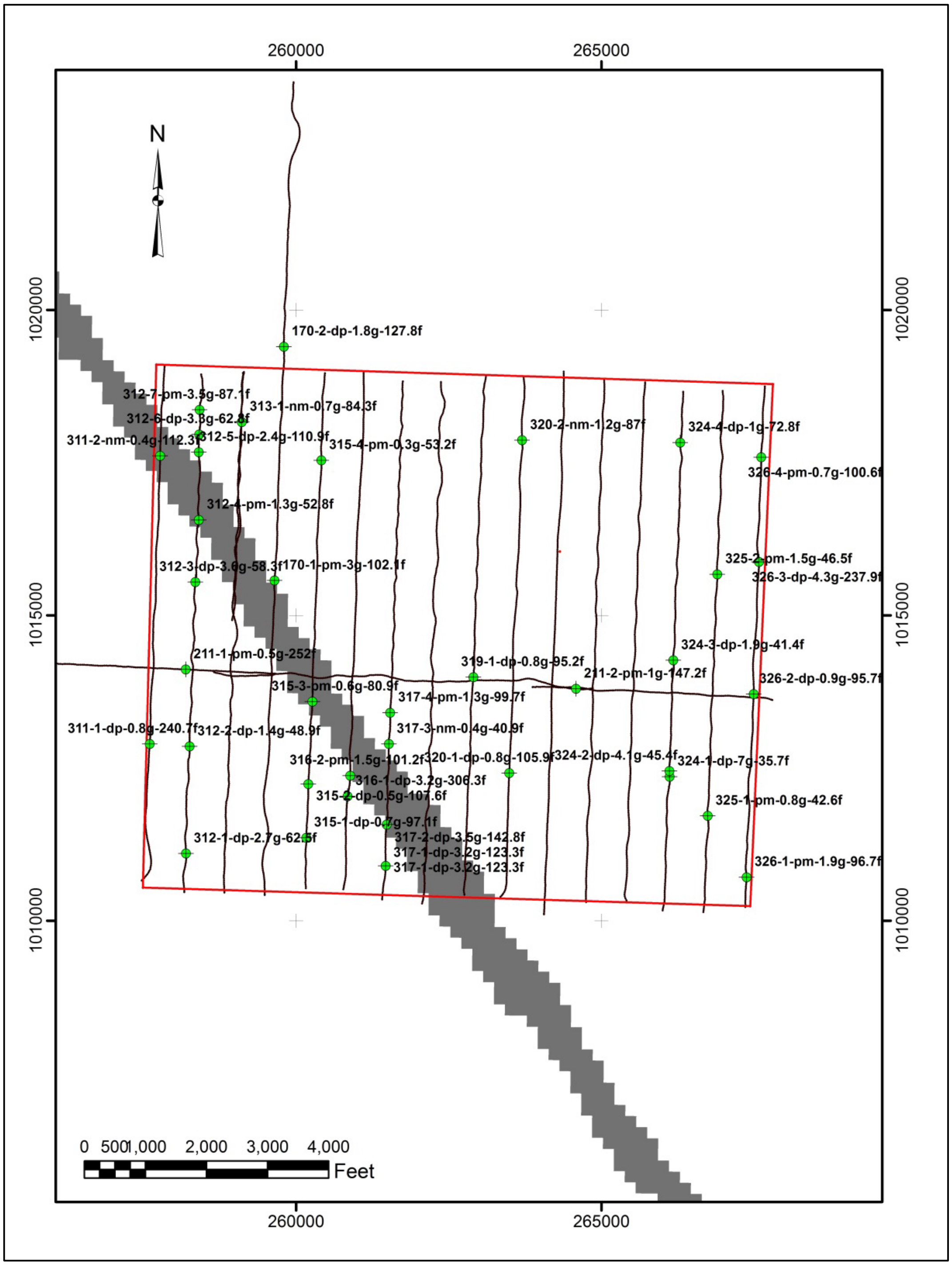

Figure 4. Location of magnetic anomalies in survey area.

Analysis of each anomaly included consideration of magnetic and acoustic signature characteristics previously demonstrated to be reliable indicators of historically significant submerged cultural resources. Assessment of each anomaly included recommendations for additional investigation to determine the exact nature of the cultural material that generated the signature and its potential National Register of Historic Places significance. A magnetic contour map of the survey area was not produced to aid in analysis and data representation as the survey line spacing was too broad. TAR prepared a table listing all magnetic anomalies located during the survey (Appendix A). This table includes the anomaly name, identification number, signature characteristics, location coordinates and assessment of the type of material generating the signature.

Acoustic sidescan sonar data was collected in the form of raw Edgetech JSF data files. Acoustic subbottom profiler data was also collected in the form of raw Edgetech JSF data files. Each line of acoustic data was reviewed by TAR using SONARWIZ software to identify and characterize targets that could be generated by submerged cultural resources. Using SONARWIZ software APTIM produced a sonar coverage mosaic of the survey area to aid in analysis and data representation (Figure 5). Acoustic signatures suggestive of significant submerged cultural material were to be isolated and analyzed in accordance with image intensity, duration, areal extent and configuration characteristics. Analysis of target images would normally include consideration of acoustic signature characteristics previously demonstrated to be reliable indicators of historically significant submerged cultural resources. However, no sonar targets were identified in the acoustic data. SONARWIZ software was also used to review the subbottom profiler date and identify any relict landforms that could be associated with prehistoric habitation. All lines of subbottom data confirmed a shallow sandy deposit of varying thickness overlying hard bottom likely limestone (Figure 6). No relict landforms of potential significance were identified.

Conclusions and Recommendations

Analysis of the APTIM magnetic data identified a total of 36 anomalies in the project survey. All of the anomalies are very low intensity and represent small ferrous objects such as commercial crab or fish traps or debris lost or intentionally case overboard. None of the anomalies appear to represent potentially significant submerged cultural resources. Analysis of the sonar data confirmed that nothing associated with those magnetic anomalies or nonferrous structures or cultural material is exposed on the bottom surface. Subbottom profiler data confirmed that bottom sediment in the survey area consists of unconsolidated sediment such as sand of varying thickness overlying hard bottom. Hard bottom in the area is likely limestone and no karst or relict landforms were apparent.

Based on the limited amount of bottom disturbance associated with deployment of the ground tackle necessary for anchoring the proposed floating structure, it is apparent that no submerged cultural resources will be impacted if anchors and/or sinkers can be located on, or within 50 feet, of the surveyed lines. If that can be accomplished, no additional archaeological investigation at the site is recommended. If the anchoring design requires placing ground tackle outside the 100 foot corridors centered on the data tracklines, additional investigation should be carried out to clear those sites.

Unexpected Discovery Protocol

In the event that any project activities expose potential prehistoric/historic cultural materials not identified during the remote-sensing survey, operations should be *immediately* shifted from the site. The respective Point of Contact for regulatory agencies with jurisdictional oversight should be *immediately* apprised of the situation. Notification should address the exact location, where possible, the nature of material exposed by project activities, and options for immediate archaeological inspection and assessment of the site.

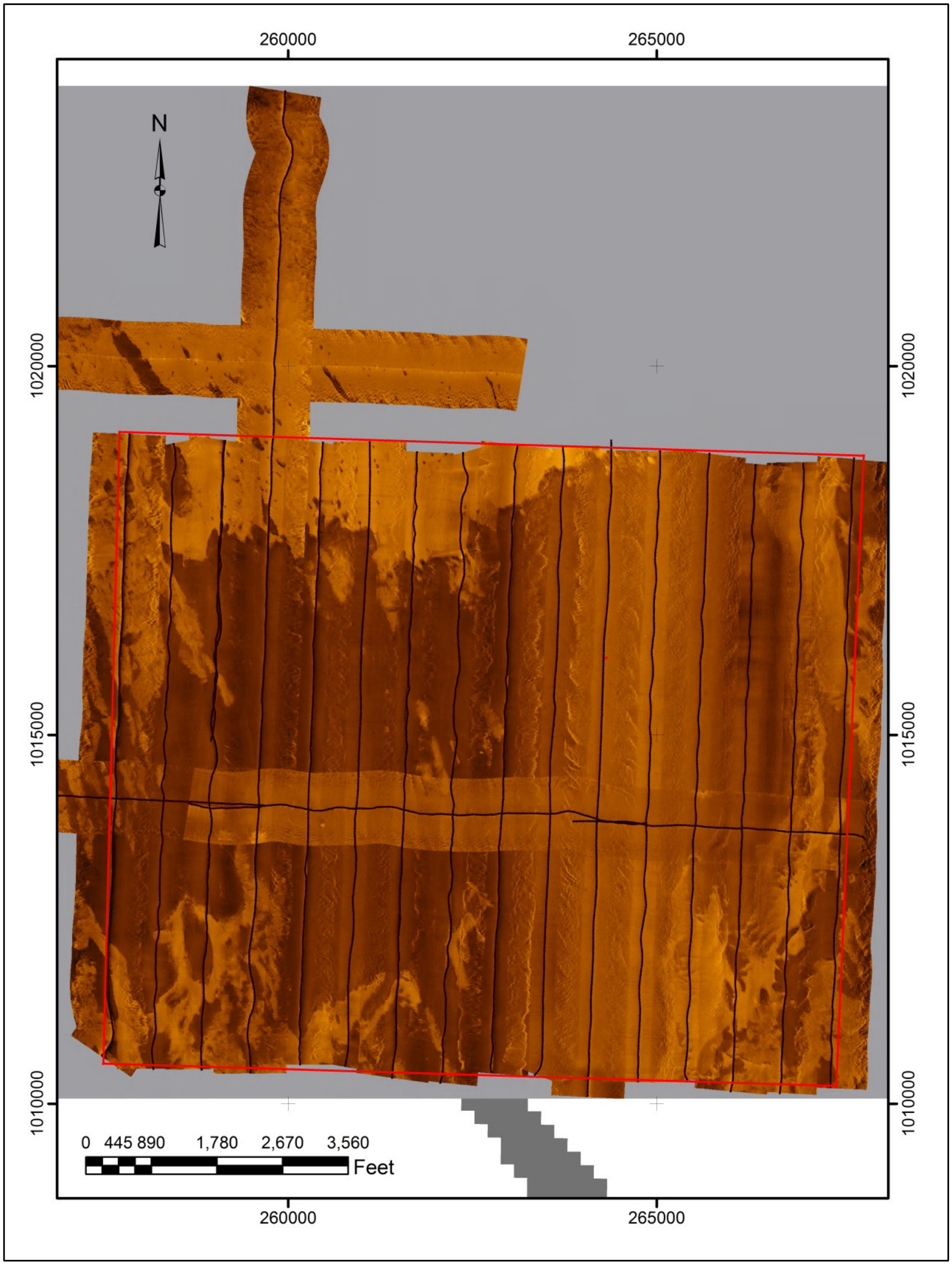

Figure 5. Sonar coverage mosaic presented by Kampachi (2018).

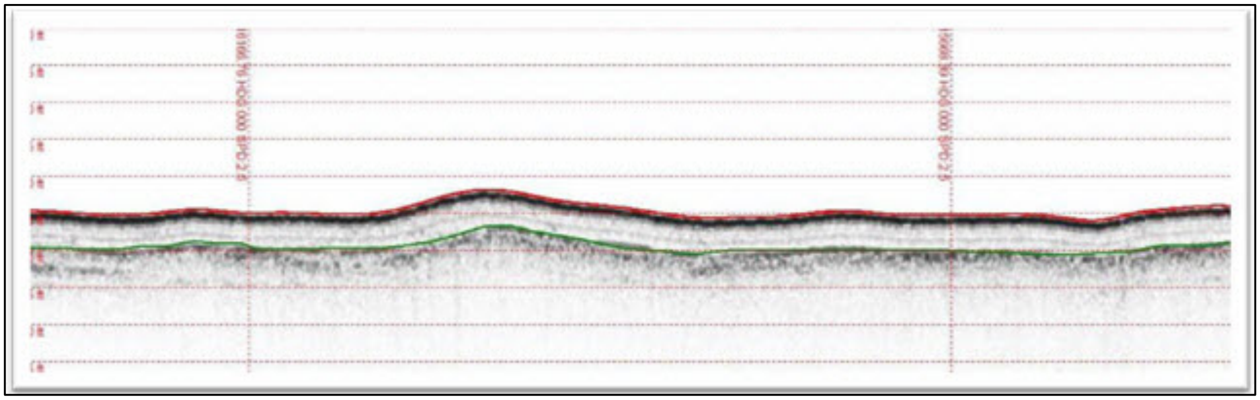

Figure 6. Example of subbottom profiler data collected from Survey Line No. 324.

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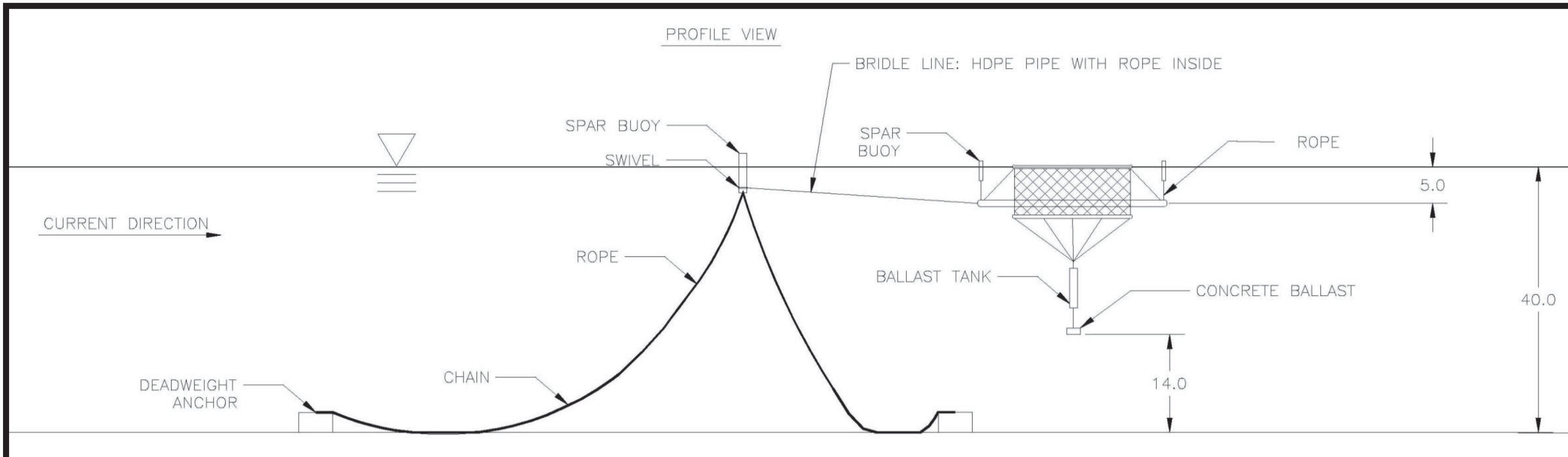
Kampachi Farms
2018 Draft-Final Baseline Environmental Survey Report for the Velella Epsilon Project. Pioneering Offshore Aquaculture in the Southeastern Gulf of Mexico. NOAA Sea Grant 2017 Aquaculture Initiative. Report to U.S. Environmental Protection Agency, Region 4, Atlanta, from Kampachi Farms.

Appendix A

Appendix A

Anomaly	X Coordinate	Y Coordinate	Line #	Anomaly #	Signature	Intensity	Duration	Identification	SCR Potential
170-1-pm-3g-102.1f	259646.3	1015574.1	170	1	Positive Monopolar	3g	102.1f	Small Ferrous Object	Very Low
211-1-pm-0.5g-252f	258192.6	1014115.9	211	1	Positive Monopolar	0.5g	252f	Small Ferrous Object	Very Low
211-2-pm-1g-147.2f	264584.7	1013799.7	211	2	Positive Monopolar	1g	147.2f	Small Ferrous Object	Very Low
311-1-dp-0.8g-240.7f	257602.7	1012897.4	311	1	Dipolar	0.8g	240.7f	Small Ferrous Object	Very Low
311-2-nm-0.4g-112.3f	257774.3	1017613	311	2	Negative Monopolar	0.4g	112.3f	Small Ferrous Object	Very Low
312-1-dp-2.7g-62.5f	258196.7	1011103.8	312	1	Dipolar	2.7g	62.5f	Small Ferrous Object	Very Low
312-2-dp-1.4g-48.9f	258255.6	1012855.9	312	2	Dipolar	1.4g	48.9f	Small Ferrous Object	Very Low
312-3-dp-3.6g-58.3f	258349.6	1015546.3	312	3	Dipolar	3.6g	58.3f	Small Ferrous Object	Very Low
312-4-pm-1.3g-52.8f	258407.9	1016565.6	312	4	Positive Monopolar	1.3g	52.8f	Small Ferrous Object	Very Low
312-5-dp-2.4g-110.9f	258406.5	1017673.1	312	5	Dipolar	2.4g	110.9f	Small Ferrous Object	Very Low
312-6-dp-3.3g-62.8f	258412.2	1017965.6	312	6	Dipolar	3.3g	62.8f	Small Ferrous Object	Very Low
312-7-pm-3.5g-87.1f	258420.7	1018366.8	312	7	Positive Monopolar	3.5g	87.1f	Small Ferrous Object	Very Low
313-1-nm-0.7g-84.3f	259109.5	1018169	313	1	Negative Monopolar	0.7g	84.3f	Small Ferrous Object	Very Low
315-1-dp-0.7g-97.1f	260165.4	1011362.4	315	1	Dipolar	0.7g	97.1f	Small Ferrous Object	Very Low
315-2-dp-0.5g-107.6f	260198.3	1012241.8	315	2	Dipolar	0.5g	107.6f	Small Ferrous Object	Very Low
315-3-pm-0.6g-80.9f	260266.6	1013589.3	315	3	Positive Monopolar	0.6g	80.9f	Small Ferrous Object	Very Low
315-4-pm-0.3g-53.2f	260411.9	1017541.9	315	4	Positive Monopolar	0.3g	53.2f	Small Ferrous Object	Very Low
316-1-dp-3.2g-306.3f	260842.4	1012042	316	1	Dipolar	3.2g	306.3f	Small Ferrous Object	Low
316-2-pm-1.5g-101.2f	260886.4	1012378.4	316	2	Positive Monopolar	1.5g	101.2f	Small Ferrous Object	Very Low
317-1-dp-3.2g-123.3f	261465.4	1010900.1	317	1	Dipolar	3.2g	123.3f	Small Ferrous Object	Low
317-2-dp-3.5g-142.8f	261482.8	1011578.5	317	2	Dipolar	3.5g	142.8f	Small Ferrous Object	Low
317-3-nm-0.4g-40.9f	261518.4	1012897.5	317	3	Negative Monopolar	0.4g	40.9f	Small Ferrous Object	Very Low
317-4-pm-1.3g-99.7f	261541.1	1013409	317	4	Positive Monopolar	1.3g	99.7f	Small Ferrous Object	Very Low
319-1-dp-0.8g-95.2f	262902.4	1013990.7	319	1	Dipolar	0.8g	95.2f	Small Ferrous Object	Very Low
320-1-dp-0.8g-105.9f	263488.9	1012419.3	320	1	Dipolar	0.8g	105.9f	Small Ferrous Object	Very Low
320-2-nm-1.2g-87f	263700.7	1017869.7	320	2	Negative Monopolar	1.2g	87f	Small Ferrous Object	Very Low
324-1-dp-7g-35.7f	266115.1	1012361.5	324	1	Dipolar	7g	35.7f	Small Ferrous Object	Very Low
324-2-dp-4.1g-45.4f	266114	1012454.8	324	2	Dipolar	4.1g	45.4f	Small Ferrous Object	Very Low
324-3-dp-1.9g-41.4f	266176.6	1014267.3	324	3	Dipolar	1.9g	41.4f	Small Ferrous Object	Very Low
324-4-dp-1g-72.8f	266291.1	1017831.4	324	4	Dipolar	1g	72.8f	Small Ferrous Object	Very Low
325-1-pm-0.8g-42.6f	266738.9	1011720	325	1	Positive Monopolar	0.8g	42.6f	Small Ferrous Object	Very Low
325-2-pm-1.5g-46.5f	266896.2	1015675	325	2	Positive Monopolar	1.5g	46.5f	Small Ferrous Object	Very Low
326-1-pm-1.9g-96.7f	267376.3	1010714.4	326	1	Positive Monopolar	1.9g	96.7f	Small Ferrous Object	Very Low
326-2-dp-0.9g-95.7f	267493.5	1013713.2	326	2	Dipolar	0.9g	95.7f	Small Ferrous Object	Very Low
326-3-dp-4.3g-237.9f	267579.1	1015878.3	326	3	Dipolar	4.3g	237.9f	Small Ferrous Object(s)	Low
326-4-pm-0.7g-100.6f	267616.4	1017590.3	326	4	Positive Monopolar	0.7g	100.6f	Small Ferrous Object	Very Low

Appendix B



1) **Deadweight Anchors (concrete):**
- Three (3) anchors equally spaced @:
  - 120m from mooring centerline
  - 120 degrees from each other
- Each @ 3 ton Stevpris Mk-5 drag embedment anchor

2) **Mooring Chain (Grade 2 steel):**
- 80m length on each anchor
- 50mm (2") thick links
- No load = 70m length of each on seafloor
- Design load = some entirely off seafloor/ others completely on seafloor

3) **Mooring Lines (rope):**
- 40m length on each chain
- AMSTEEL®-BLUE
- 36mm (1 1/2") thick lines

4) **Spar Buoy w/ Swivel (steel):**

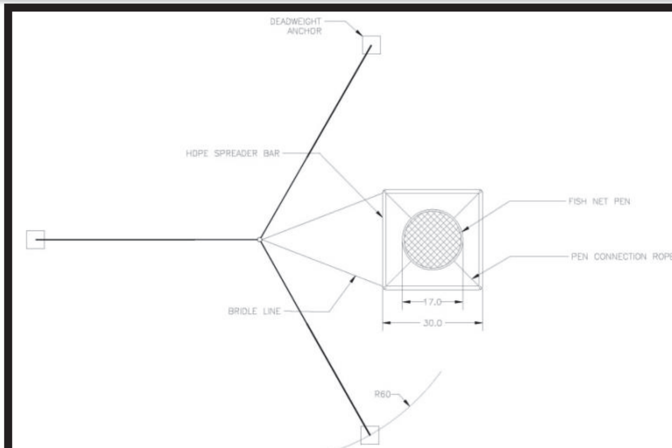
5) **Bridle Lines (rope inside HDPE pipe):**
- Three (3) ~30m bridle lines (rope) from swivel to spreader bar
- AMSTEEL®-BLUE
- 33.3mm (1 5/16") lines inside HDPE pipe

6) **Spreader Bar (HDPE):**
- Header Bar (load bearing) connected to Bridle Lines
  - 30m in length
  - 0.36m OD DR 11 HDPE pipe
- Side and Rear Bars (smaller load bearing)
  - 30m in length
  - 0.36m OD DR 17 HDPE pipe
- Four (4) corner spar buoys

7) **Net Pen Connection Lines (rope):**
- Four (4) ~13m connection lines (rope)
- Connected from Spreader Bar to Net Pen Float Rings
- AMSTEEL®-BLUE
- 33.3mm (1 5/16") lines

8) **Net Pen Frame Structure (HDPE):**
- Top Frame Structure
  - 18m in diameter
  - One (1) HDPE side-by-side Float Rings
    - On the sea surface
    - ~ 0.36m OD DR 11 HDPE pipe
  - One (1) HDPE net ring (railing)
    - Connected ~ 1.0m above Float Rings
    - Connected to Net Pen Mesh
    - ~ 0.15m OD DR 17 HDPE pipe
- Bottom Frame Structure
  - 18m in diameter
  - One (1) HDPE sinker ring
    - 7.0m below Float Rings
    - Connected to Net Ring
    - ~ 0.36m OD DR 11 HDPE pipe
  - One (1) HDPE net ring
    - 7.0m below float rings
    - Connected to copper alloy mesh
    - ~ 0.15m OD DR 17 HDPE pipe

9) **Net Pen Mesh (copper alloy):**
- 17m diameter x 7m depth
- Top connected to top net ring (railing)
- Bottom connected to bottom net ring
  - 4mm wire diameter
  - 40mm x 40mm mesh square
- Effective volume of 1,600m^3

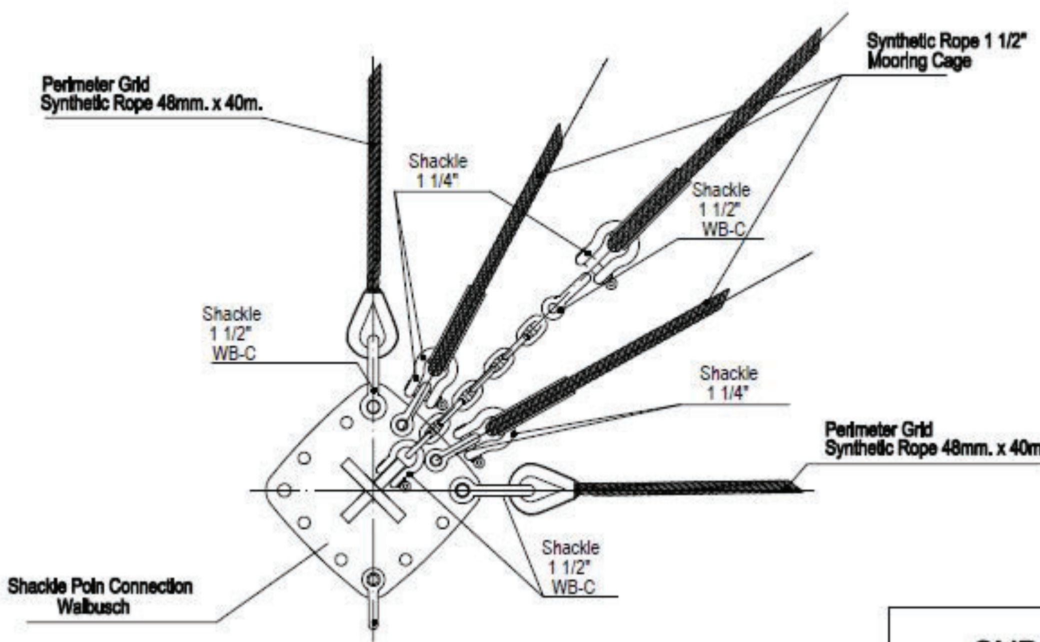


10) **Shackle Point Connection (steel):**
- One (1) ~0.13m^2 shackle plate
- Four (4) connection lines
  - 12 mm in diameter x 10m in length
  - Connected from shackle plate to HDPE sinker ring
- ~1m Grade 2 steel chain (32mm) connected to Floatation Capsule

11) **Floatation Capsule (steel):**
- ~ 1.5m in diameter x ~3.45m in length
- Effective floatation volume = 6m^3
- ~3m Grade 2 steel chain (32mm) connected to Counter Weight

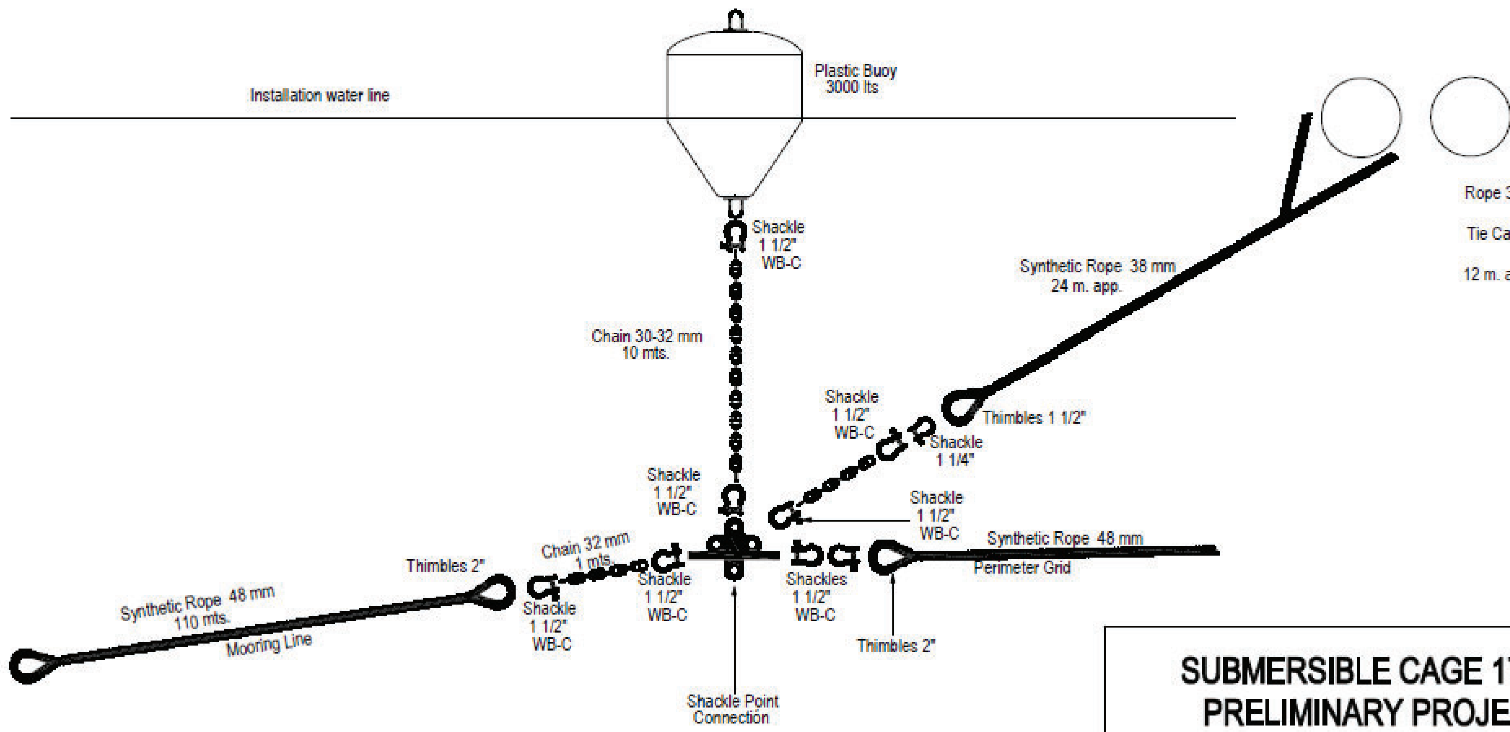
12) **Counter Weight (concrete):**
- ~ 1.1m in diameter x ~2.2m in length
- Effective weight of 5 MT

Detail 1
(Shackle Point Connection Accorging to Grid and Mooring Cage)

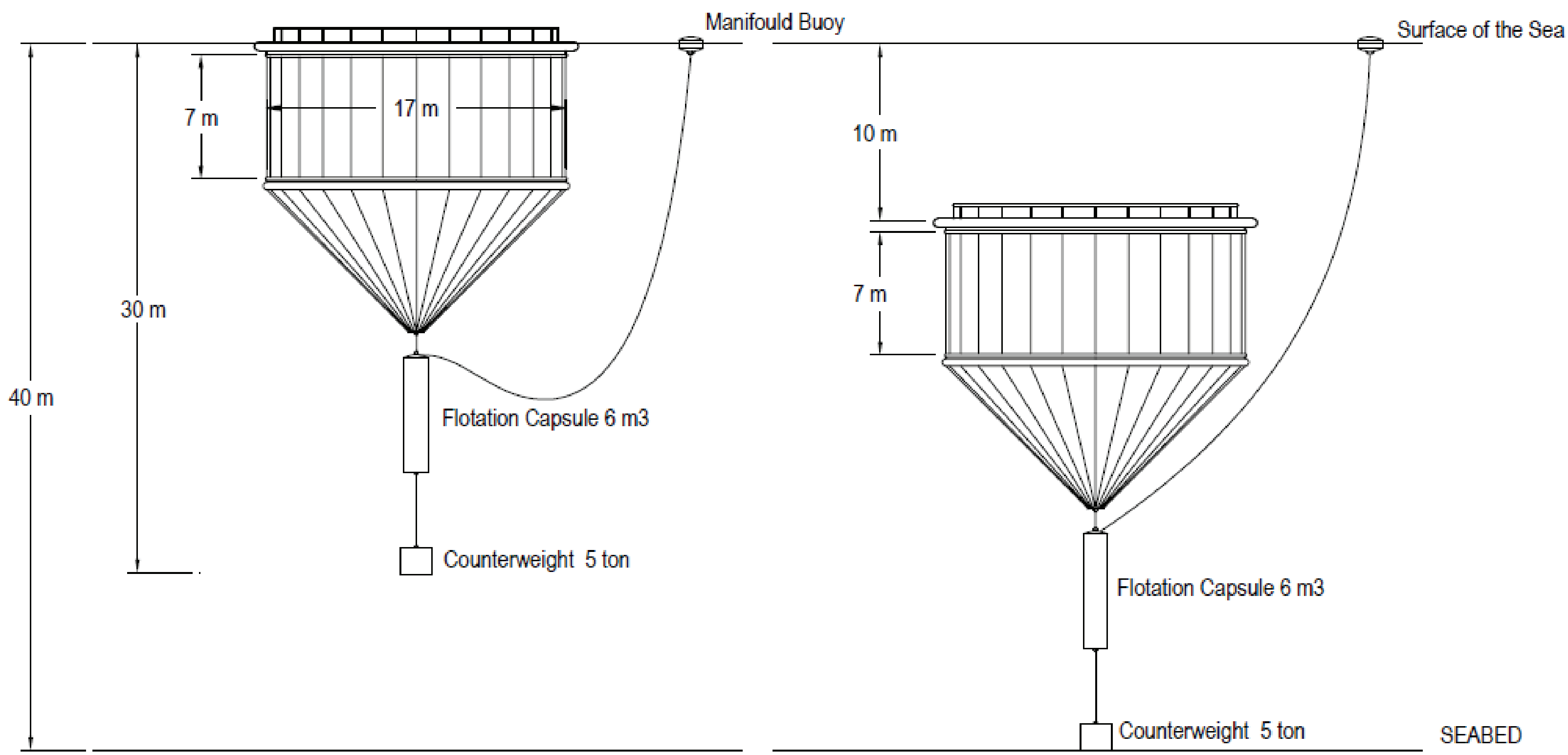


SUBMERSIBLE CAGE 17 M
PRELIMINARY PROJECT

BUOY INSTALLATION DETAIL



**SUBMERSIBLE CAGE 17 M
PRELIMINARY PROJECT**



Manifould Buoy
Surface of the Sea
7 m
17 m
30 m
40 m
Flotation Capsule 6 m3
Counterweight 5 ton
10 m
7 m
Flotation Capsule 6 m3
Counterweight 5 ton
SEABED

Appendix C

Final
OCEAN DISCHARGE CRITERIA EVALUATION

Ocean Era, Inc. - Velella Epsilon
Net Pen Aquaculture Facility
Outer Continental Shelf
Federal Waters of the Gulf of Mexico

NPDES Permit Number
FL0A00001

September 30, 2020

U.S. Environmental Protection Agency
Region 4
Water Division
61 Forsyth Street SW
Atlanta Georgia 30303

Table of Contents

List of Acronyms

BES	Baseline Environmental Survey
BMP	Best Management Practices
BOEM	Bureau of Ocean and Energy Management
CAAP	Concentrated Aquatic Animal Production
CFR	Code of Federal Regulations
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DEP	Department of Economic Opportunity
DWH	Deep Water Horizon
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FAO	Food and Agriculture Organization of the United Nations
FCR	Feed Conversion Ratio
FCMP	Florida Coastal Management Program
FDA	U.S. Food and Drug Administration
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FMP	Fishery Management Plan
FWC	Florida Fish and Wildlife Conservation Commission
GMFMC	Gulf of Mexico Fishery Management Council
HAB	Harmful Algal Blooms
HAPC	Habitat Area of Particular Concern
ITI	Infaunal Tropic Index
MAS	Multi-anchor Swivel
MMS	Minerals Management Service
MMPA	Marine Mammal Protection Act
NCCOS	National Ocean Service National Centers for Coastal Ocean Science
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
OCS	Outer Continental Shelf
ODC	Ocean Discharge Criteria
ODMDS	Ocean Dredge Material Disposal Site
OTC	Oxytetracycline
PSMP	Protected Species Monitoring Plan
SAFMC	South Atlantic Fishery Management Council
SOD	Sediment Oxygen Demand
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
VE	Velella Epsilon
WQS	Water Quality Standards

1.0 Introduction

1.1 Proposed Agency Action

Ocean Era, Inc. (applicant) is proposing to operate a pilot-scale marine aquaculture facility (proposed project) in federal waters of the Gulf of Mexico (Gulf). Clean Water Act (CWA) Section 402 authorizes the Environmental Protection Agency (EPA) to issue National Pollutant Discharge Elimination System (NPDES) permits to regulate the discharge of pollutants into waters of the United States. The EPA action is the issuance of a NPDES permit that authorizes the discharge of pollutants from an aquatic animal production facility that is considered a point source into federal waters of the Gulf.

1.2 Evaluation Purpose

The purpose of this Ocean Discharge Criteria (ODC) Evaluation is to identify pertinent information relative to the ODC and address the EPA's regulations for preventing unreasonable degradation of the receiving waters for the discharges covered under this NPDES permit. CWA Sections 402 and 403 require that a NPDES permit for a discharge into the territorial seas (coast to 12 nautical miles, or farther offshore in the contiguous zone or the ocean), be issued in compliance with EPA's regulations for preventing unreasonable degradation of the receiving waters. Before issuing a NPDES permit, discharges must be evaluated against EPA's published criteria for a determination of unreasonable degradation. The NPDES implementing regulations at 40 CFR § 125.121(e) defines unreasonable degradation of the marine environment as the following:

1. Significant adverse changes in ecosystem diversity, productivity, and stability of the biological community within the area of discharge and surrounding biological communities
2. Threat to human health through direct exposure to pollutants or through consumption of exposed aquatic organisms, or
3. Loss of aesthetic, recreational, scientific or economic values, which is unreasonable in relation to the benefit derived from the discharge.

This ODC evaluation addresses the 10 factors for determining unreasonable degradation as required by 40 CFR § 125.122. It also assesses whether the information exists to make a "no unreasonable degradation" determination, including any recommended permit conditions that may be necessary to reach that conclusion. The following ten factors are specified at 40 CFR § 125.122 for determining unreasonable degradation:

1. The quantities, composition, and potential for bioaccumulation or persistence of the pollutants to be discharged;
2. The potential transport of such pollutants by biological, physical or chemical processes;
3. The composition and vulnerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act (ESA), or the presence of those species critical to the structure or function of the ecosystem, such as those important for the food chain;
4. The importance of the receiving water area to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, migratory pathways, or areas necessary for other functions or critical stages in the life cycle of an organism;

5. The existence of special aquatic sites including, but not limited to, marine sanctuaries and refuges, parks, national and historic monuments, national seashores, wilderness areas, and coral reefs;
6. The potential impacts on human health through direct and indirect pathways;
7. Existing or potential recreational and commercial fishing, including fin fishing and shell fishing;
8. Any applicable requirements of an approved Coastal Zone Management plan;
9. Such other factors relating to the effects of the discharge as may be appropriate; and
10. Marine water quality criteria developed pursuant to CWA Section 304(a)(1).

If, on the basis of all available information, the EPA determines that the discharge will not cause unreasonable degradation of the marine environment after application of any necessary conditions, an NPDES permit containing such conditions can be issued. If it is determined, on the basis of the available information, that the discharge will cause unreasonable degradation of the marine environment after application of all possible permit conditions, the EPA may not issue an NPDES permit which authorizes the discharge of pollutants. If the EPA has insufficient information to determine that there will be no unreasonable degradation of the marine environment, there shall be no discharge of pollutants into the marine environment unless the director of the EPA determines that:

1. Such discharge will not cause irreparable harm to the marine environment during the period in which monitoring is undertaken, and
2. There are no reasonable alternatives to the on-site disposal of these materials, and
3. The discharge will be in compliance with all permit conditions established pursuant to 40 CFR § 125.123(d).

1.3 ODC Evaluation Report Overview

The ODC Evaluation focuses on the sources, fate, and potential effects from discharges at a small-scale marine aquaculture facility on various groups of marine aquatic life. It also assesses whether the information exists to make a "no unreasonable degradation" determination, including any recommended permit conditions that may be necessary to reach that conclusion. Each section of the ODC Evaluation addresses one of the 10 factors used in making a determination about whether the discharge will cause unreasonable degradation as shown in Table 1.1.

Table 1.1 – Summary of the ODC Topics

Section	ODC Factor	Description
3	2	Physical and chemical oceanography relevant to the action area
4	1 and 10	Characteristics, composition, and quantities of materials that potentially will be discharged from the facility; transport and persistence of pollutants in the marine environment
5	3 and 4	Biological overview of the affected environment
6	7	Information on commercial and recreational fisheries in the receiving water environment
7	5 and 8	Florida Coastal Zone Management Plan (CZMP) and Special Aquatic Sites
8	10	Federal Water Quality Criteria and State Water Quality Standards Analysis
9	1, 2, and 6	Potential impacts on human health, and describes the toxicity and potential for bioaccumulation of contaminants
10	Summary	Evaluation of the ODC

2.0 Proposed Project Information

2.1 Proposed Project

The proposed project would allow the applicant to operate a pilot-scale marine aquaculture facility with up to 20,000 almaco jack (*Seriola rivoliana*) being reared in federal waters for a period of approximately 12 months (total deployment of the cage system is 18 months). Based on an estimated 85 percent survival rate, the operation is expected to yield approximately 17,000 fish. Final fish size is estimated to be approximately 4.4 lbs/fish, resulting in an estimated final maximum harvest weight of 80,000 lbs (or 74,800 lbs considering the anticipated survival rate). The fingerlings will be sourced from brood stock that are located at Mote Aquaculture Research Park (Sarasota, FL) and were caught in the Gulf near Madeira Beach, Florida. As such, only F1 progeny will be stocked into the proposed project.

One support vessel will be used throughout the life of the project. The boat will always be present at the facility except during certain storm events or times when resupplying is necessary. The support vessel would not be operated during any time that a small craft advisory is in effect for the proposed action area. The support vessel is expected to be a 70 foot (ft) long Pilothouse Trawler (20 ft beam and 5 ft draft) with a single 715 HP engine. The vessel will also carry a generator that is expected to operate approximately 12 hours per day. Following harvest, cultured fish would be landed in Florida and sold to federally-licensed dealers in accordance with state and federal laws. The exact type of harvest vessel is not known; however, it is expected to be a vessel already engaged in offshore fishing activities in the Gulf.

A single cage, that is offshore strength fully enclosed submersible fish pen will be deployed on an engineered multi-anchor swivel (MAS) mooring system. The engineered MAS will have up to three anchors for the mooring, with a swivel and bridle system. The cage material for the proposed project is constructed with rigid and durable materials (copper mesh net with a diameter of 4-millimeter (mm) wire and 40 mm x 40 mm mesh square). The mooring lines for the proposed project will be constructed of steel chain (50 mm thick) and thick rope (36 mm) that are attached to a floating cage which will rotate in the prevailing current direction; the floating cage position that is influenced by the ocean currents will maintain the mooring rope and chain under tension during most times of operation. The bridle line that connects from the swivel to the cage will be encased in a rigid pipe. Structural information showing the MAS and pen, along with the tethered supporting vessel, is provided in Appendix A. The anchoring system for the proposed project is being finalized by the applicant. While the drawings in Appendix A show concrete deadweight anchors, it is likely that the final design will utilize appropriately sized embedment anchors instead.

The cage design is flexible and self-adjusts to suit the constantly changing wave and current conditions. As a result, the system can operate floating on the ocean surface or submerged within the water column of the ocean; however, the normal operating condition of the cage is below the water surface. When a storm approaches the area, the entire cage can be submerged by using a valve to flood the floatation system with water. A buoy remains on the surface, marking the net pen's position and supporting the air hose. When the pen approaches the bottom, the system can be maintained several meters above the sea floor. The cage system is able to rotate around the MAS and adjust to the currents while it is submerged and protected from storms near the water surface. After storm events, the cage system is made buoyant, causing the system to resume normal operational conditions. The proposed project cage will have at least one properly functioning global positioning system device to assist in locating the system in the event it is damaged or disconnected from the mooring system.

In cooperation with the National Marine Fishery Service (NMFS), a protected species monitoring plan (PSMP) has been developed for the proposed action to protect all marine mammal, reptiles, sea birds, and other protected species. Monitoring will occur throughout the life of the project and is an important minimization measure to reduce the likelihood of any unforeseen potential injury to all protected species including ESA-listed marine animals. The data collected will provide valuable insight to resource managers about potential interactions between aquaculture operations and protected species. The PSMP also contains important mitigative efforts such as suspending vessel transit activities when a protected species comes within 100 meters (m) of the activity until the animal(s) leave the area. The project staff will suspend all surface activities (including stocking fish, harvesting operations, and routine maintenance operations) in the unlikely event that any protected species comes within 100 m of the activity until the animal leaves the area. Furthermore, should there be activity that results in an entanglement or injury to protected species, the on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement.[1]

2.2 Proposed Action Area

The proposed project would be placed in the Gulf at an approximate water depth of 130 ft (40 m), generally located 45 miles southwest of Sarasota, Florida. The proposed facility will be placed within an area that contains unconsolidated sediments that are 3 – 10 ft deep (see Table 2.1). The applicant will select the specific location within that area based on diver-assisted assessments of the sea floor when the cage and MAS are deployed. More information about the proposed project boundaries are shown in Appendix B. The proposed action area is a 1,000-meter radius measured from the center of the MAS.

The facility potential locations were selected with assistance from the National Oceanic and Atmospheric Administration's (NOAA) National Ocean Service National Centers for Coastal Ocean Science (NCCOS). The applicant and the NCCOS conducted a site screening process over several months to identify an appropriate project site. Some of the criteria considered during the site screening process included avoidance of corals, coral reefs, submerged aquatic vegetation, and hard bottom habitats, and avoidance of marine protected areas, marine reserves, and habitats of particular concern. This siting assessment was conducted using the Gulf AquaMapper tool developed by NCCOS.[2]

Upon completion of the site screening process with the NCCOS, the applicant conducted a Baseline Environmental Survey (BES) in August 2018 based on guidance developed by the NMFS and EPA.[3] The BES included a geophysical investigation to characterize the sub-surface and surface geology of the sites and identify areas with a sufficient thickness of unconsolidated sediment near the surface while also clearing the area of any geohazards and structures that would impede the implementation of the aquaculture operation. The geophysical survey for the proposed project consisted of collecting single beam bathymetry, side scan sonar, sub-bottom profiler, and magnetometer data within the proposed area. The BES report noted that there were no physical, biological, or archaeological features that would preclude the siting of the proposed aquaculture facility at one of the four potential locations shown in Table 2.1.

Table 2. 1 – Target Area With 3' to 10' of Unconsolidated Sediments

Location	Latitude	Longitude
Upper Left Corner	27° 7.70607' N	83° 12.27012' W
Upper Right Corner	27° 7.61022' N	83° 11.65678' W
Lower Right Corner	27° 6.77773' N	83° 11.75379' W
Lower Left Corner	27° 6.87631' N	83° 12.42032' W

[1] A PSMP has been developed by the applicant with assistance from the NMFS Protected Resources Division. The purpose of the PSMP is to provide monitoring procedures and data collection efforts for species (marine mammals, sea turtles, seabirds, or other species) protected under the MMPA or ESA that may be encountered at the proposed project.

[2] The Gulf AquaMapper tool is available at: https://coastalscience.noaa.gov/products-explorer/

[3] The BES guidance document is available at: http://sero.nmfs.noaa.gov/sustainable_fisheries/Gulf_fisheries/aquaculture/

3.0 Physical Environment

3.1 Physical Oceanography

The Gulf is bounded by Cuba on the southeast; Mexico on the south and southwest; and the United States (U.S.) Gulf Coast on the west, north, and east. The Gulf has a total area of 564,000 square kilometers (km^2). Shallow and intertidal areas (water depths of less than 20 m) compose 38 percent of the total area, with continental shelf (22 percent), continental slope (20 percent), and abyssal (20 percent) composing the remainder of the basin.

The Gulf is separated from the Caribbean Sea and Atlantic Ocean by Cuba and other islands and has relatively narrow connections to the Caribbean and Atlantic through the Florida and Yucatan Straits. The Gulf is composed of three distinct water masses, including the North and South Atlantic Surface Water (less than 100 m deep), Atlantic and Caribbean Subtropical Water (up to 500 m deep), and Sub Antarctic Intermediate Water.

3.1.1 Circulation

Circulation patterns in the Gulf are characterized by two interrelated systems, the offshore or open Gulf, and the shelf or inshore Gulf. Both systems involve the dynamic interaction of a variety of factors. Open Gulf circulation is influenced by eddies, gyres, winds, waves, freshwater input, density of the water column, and currents. Offshore water masses in the eastern Gulf may be partitioned into a Loop Current, a Florida Estuarine Gyre in the northeastern Gulf, and a Florida Bay Gyre in the southeastern Gulf (Austin, 1970).

The strongest influence on circulation in the eastern Gulf is the Loop Current (Figure 3.1). The location of the Loop Current is variable, with fluctuations that range over the outer shelf, the slopes, and the abyssal areas off Mississippi, Alabama, and Florida. Within this zone, short-term strong currents exist, but no permanent currents have been identified (MMS, 1990). The Loop Current forms as the Yucatan Current enters the Gulf through the Yucatan Straits and travels through the eastern and central Gulf before exiting via the Straits of Florida and merging with other water masses to become the Gulf Stream (Leipper, 1970; Maul, 1977). Currents associated with the Loop Current and its eddies extend to at least depths of 700 m with surface speeds as high as 150-200 centimeters (cm/s), decreasing with depth (BOEM, 2012).

In the shelf or inshore Gulf region, circulation within the Mississippi, Alabama, and west Florida shelf areas is controlled by the Loop Current, winds, topography, and tides. Freshwater input also acts as a major influence in the Mississippi/Alabama shelf and eddy-like perturbations play a significant role in the west Florida shelf circulation. Current velocities along the shelf are variable. Brooks (1991) found that average current velocities in the Mississippi/Alabama shelf area are about 1.5 cm/s, and east-west and northeast/southwest directions dominate. MMS (1990) data showed that winter surface circulation is directed along shore and westward with flow averaging 4 cm/s to 7 cm/s. During the spring and summer, the current shifts to the east with flow averaging 2 cm/s to 7 cm/s. The mean circulation on the west Florida shelf is directed southward with mean flow ranging from 0.2 cm/s to 7 cm/s (MMS, 1990).

An EPA study of ocean currents at the Tampa Ocean Dredged Material Disposal Site, which lies 18 miles due west of Tampa Bay, FL was conducted between 2008-2009 (EPA, 2012). The study showed that current flow off the west FL coast is predominately in the south-southwest direction (Figure 3.2). Winter months appear to be dominated by south-southwest currents, whereas north-northeast currents dominated the spring months. The median surface current was 13 cm/s whereas the median bottom currents were 7 cm/s. The depth average median current velocity was 9 cm/s.

Figure 3. 1 - Major current regime in the Gulf

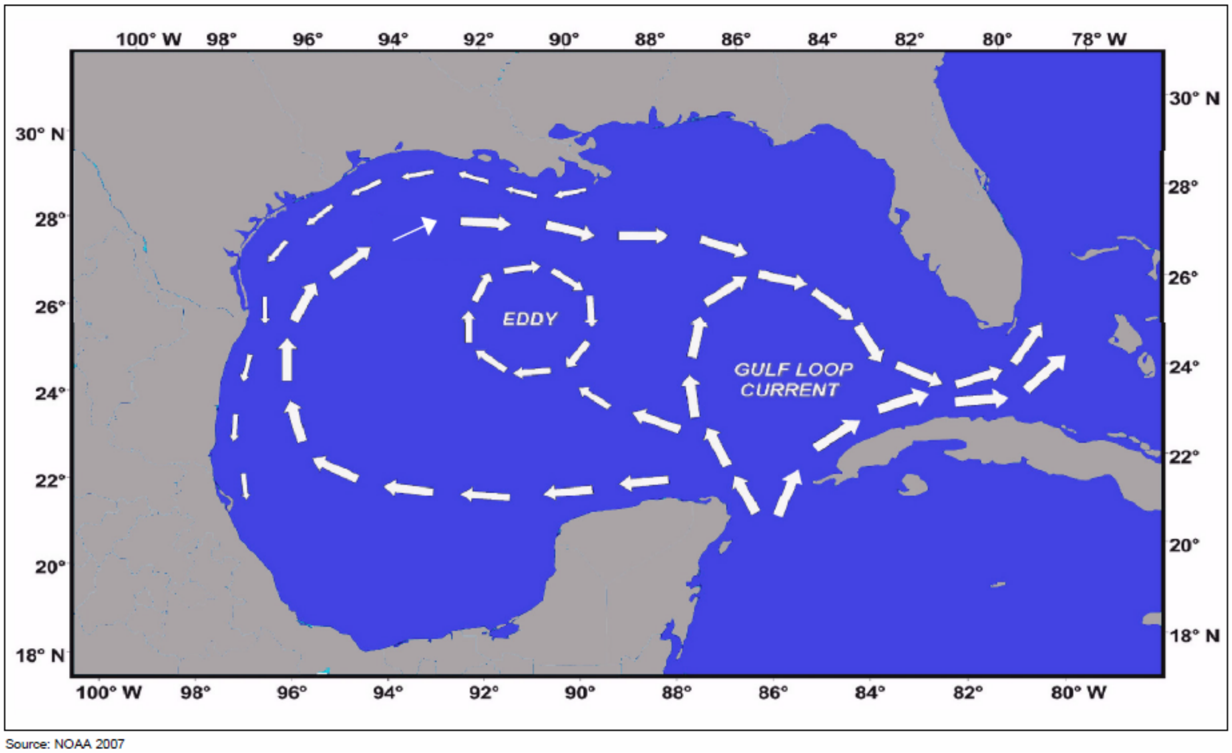
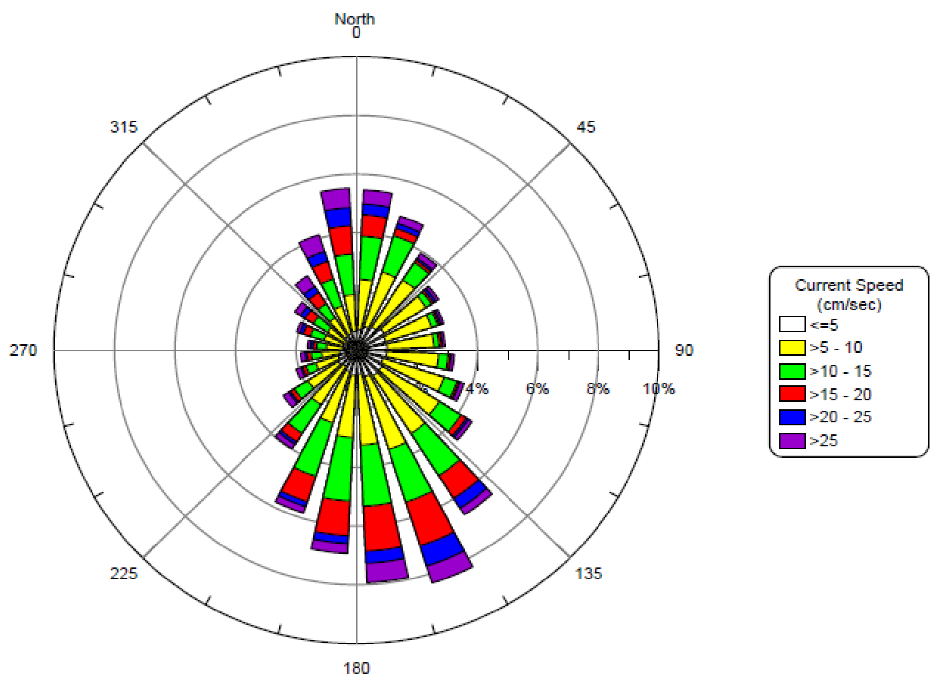


Figure 3. 2 - Depth average current rose diagram for the Tampa ODMDS showing current speeds and direction. (EPA, 2012)



Wind patterns in the Gulf are primarily anticyclonic (clockwise around high-pressure areas) and tend to follow an annual cycle; winter winds from the north and southeast and summer winds from the northeast and south. During the winter, mean wind speeds range from 8 knots to 18 knots. Several examples of mean annual wind speeds in the eastern Gulf are 8.0 millibars (mb) in Gulf Port, Mississippi; 8.3 mb in Pensacola, Florida; and 11.2 mb in Key West, Florida (NOAA, 1986).

The tides in the Gulf are less developed and have smaller ranges than those in other coastal areas of the United States. The range of tides is 0.3 meters to 1.2 meters, depending on the location and time of year. The Gulf has three types of tides, which vary throughout the area: diurnal, semidiurnal, and mixed (both diurnal and semidiurnal). Wind and barometric conditions will influence the daily fluctuations in sea level. Onshore winds and low barometric readings, or offshore winds and high barometric readings, cause the daily water levels either to be higher or lower than predicted. In shelf areas, meteorological conditions occasionally mask local tide induced circulation. Tropical storms in summer and early fall may affect the area with high winds (18+ meters per second), high waves (7+ meters), and storm surge (3 to 7.5 meters). Winter storm systems also may cause moderately high winds, waves, and storm conditions that mask local tides.

3.1.2 Climate

The Gulf is influenced by a maritime subtropical climate controlled mainly by the clockwise wind circulation around a semi-permanent, high barometric pressure area alternating between the Azores and Bermuda Islands. The circulation around the western edge of the high-pressure cell results in the predominance of moist southeasterly wind flow in the region. However, winter weather is quite variable. During the winter months, December through March, cold fronts associated with outbreaks of cold, dry continental air masses influence mainly the northern coastal areas of the Gulf. Tropical cyclones may develop or migrate into the Gulf during the warmer season, especially in the months of August through October. In coastal areas, the land-sea breeze is frequently the primary circulation feature in the months of May through October. (BOEM, 2012)

3.1.3 Temperature

In the Gulf, sea surface temperatures range from nearly isothermal (29 - 30°C) in August to a sharp horizontal gradient in January, ranging from 25°C in the Loop core to values of 14-15°C along the shallow northern coastal estuaries. A 7°C sea surface temperature gradient occurs in winter from north to south across the Gulf. During summer, sea surface temperatures span a much narrower range. The range of sea surface temperatures in the eastern Gulf tends to be greater than the range in the western Gulf, illustrating the contribution of the Loop Current.

Eastern Gulf surface temperature variation is affected by season, latitude, water depth, and distance offshore. During the summer, surface temperatures are uniformly 26.6°C or higher. The mean March isotherm varies from approximately 17.8°C in the northern regions to 22.2°C in the south (Smith, 1976). Surface temperatures range as low as 10°C in the Louisiana-Mississippi shelf regions during times of significant snow melt in the upper Mississippi valley (MMS, 1990).

At a depth of 1,000 m, the temperature remains close to 5°C year-round (MMS, 1990). In winter, nearshore bottom temperatures in the northern Gulf are 10°C cooler than those temperatures offshore. A permanent seasonal thermocline occurs in deeper off shelf water throughout the Gulf. In summer, warming surface waters help raise bottom temperatures in all shelf areas, producing a decreasing distribution of bottom temperatures from about 28°C at the coast to about 18-20°C at the shelf break.

The depth of the thermocline, defined as the depth at which the temperature gradient is a maximum, is important because it demarcates the bottom of the mixed layer and acts as a barrier to the vertical transfer of materials and momentum. The thermocline depth is approximately 30 m in the eastern Gulf during January (MMS, 1990). In May, the thermocline depth is about 46 m throughout the entire Gulf (MMS, 1990).

3.1.4 Salinity

Characteristic salinity in the open Gulf is generally between 36.4 and 36.5 parts per thousand (ppt). Coastal salinity ranges are variable due to freshwater input, draught, etc. (MMS, 1990). During months of low freshwater input, deep Gulf water penetrates the shelf and salinities near the coastline range from 29-32 ppt. High freshwater input conditions (spring-summer months) are characterized by strong horizontal gradients and inner shelf salinity values of less than 20 ppt (MMS, 1990).

3.2 Chemical Composition

Of the 92 naturally occurring elements, nearly 80 have been detected in seawater (Kenisha, 1989). The dissolved material in seawater consists mainly of eleven elements. These are, in decreasing order, chlorine, sodium, magnesium, calcium, potassium, silicon, zinc, copper, iron, manganese, and cobalt (Smith, 1981). The major dissolved constituents in seawater are shown in Table 3.1. In addition to dissolved materials, trace metals, nutrient elements, and dissolved atmospheric gases comprise the chemical makeup of seawater.

Table 3. 1 - Major dissolved constituents in seawater with a chlorinity of 19‰ and a salinity of 34‰

Dissolved substance (Ion or Compound)	Concentration (grams per kilogram)	Percent (by weight)
Chloride (Cl^-)	18.98	55.04
Sodium (Na^+)	10.56	30.61
Sulfate (SO_4^{2-})	2.65	7.68
Magnesium (Mg^{2+})	1.27	3.69
Calcium (Ca^{2+})	0.40	1.16
Potassium (K^+)	0.38	1.1
Bicarbonate (HCO_3^-)	0.14	0.41
Bromide (Br^-)	0.07	0.19
Boric Acid (H_3BO_3)	0.03	0.07
Strontium (Sr^{2+})	0.01	0.04
Fluoride (F^-)	0.00	0.00
Totals	34.48	99.99

3.2.1 Micronutrients

In Gulf waters, generalizations can be drawn for three principal micronutrients; phosphate, nitrate, and silicate. Phytoplankton consume phosphorus and nitrogen in an approximate ratio of 1:16 for growth. The following nutrient levels and distribution values were obtained from MMS (1990): phosphates range from 0 ppm to 0.25 ppm, averaging 0.021 ppm in the mixed layer, and with shelf values similar to open Gulf values; nitrates range from 0.0031 ppm to 0.14 ppm, averaging 0.014 ppm; silicates range predominantly from 0.048 ppm to 1.9 ppm, with open Gulf values tending to be lower than shelf values.

In the eastern Gulf, inner shelf waters tend to remain nutrient deficient, except in the immediate vicinity of estuaries. On occasions when the loop current occurs over the Florida slope, nutrient rich waters are upwelled from deeper zones (MMS, 1990).

3.2.2 Dissolved Gases

Dissolved gases found in seawater include oxygen, nitrogen, and carbon dioxide. Oxygen is often used as an indicator of water quality of the marine environment and serves as a tracer of the motion of deep-water masses of the oceans. Dissolved oxygen values in the mixed layer of the Gulf average 4.6 milligrams per liter (mg/l), with some seasonal variation, particularly during the summer months when a slight lowering can be observed. Oxygen values generally decrease with depth to about 3.5 mg/l through the mixed layer (MMS, 1990). In some offshore areas in the northern Gulf, hypoxic (<2.0 mg/l) and occasionally anoxic (<0.1 mg/l) bottom water conditions are widespread and seasonally regular (Rabalais, 1986). These conditions have been documented since 1972 and have been observed mostly from June to September on the inner continental shelf at a depth of 5 to 50 meters (Renauld, 1985; Rabalais et al., 1985).

4.0 Discharged Materials

The composition, characteristics, and quantities of materials that will or potentially will be discharged from the facility under the NPDES permit are considerations under Factor 1 of the 10 factors used to determine whether unreasonable degradation may occur. The materials to be discharged under NPDES permit to the Gulf from the proposed project will consist of uneaten fish food pellets and fish wastes.

4.1 Fish Feed

Much of the discussion in this section was developed from information concerning large production scale fish farms. It is important to note that the proposed project under consideration for this permit will be a small demonstration project. The proposed project will grow out a maximum of 20,000 fish that would be grown to 1.8-2.0 kg for one year. The total maximum biomass assuming no mortality is estimated to be approximately 36,288 kg. Fish will be fed a commercially available grow out diet with 43 percent protein content. The total maximum daily feed ration at harvest is equivalent to 399 kg at harvest. Maximum daily excretion of total ammonia nitrogen is estimated at 18-19 kg and maximum total solids production is 161 kg. A total of 66,449 kg of feed will be used for production of each cohort of fish to achieve a feed conversion ratio (FCR) of 1.8.

The quantities of food supplied per unit of fish depend on the type of food used, size of the fish, and the water temperature. A typical salmon farm producing 340 metric tons (748,000 lbs) of fish annually will feed 340 to 680 metric tons (748,000-1,496,000 lbs) of food (Wash Dept. Fisheries, 1989). Fish cultured around the world are fed a variety of foods, ranging from minced trash fish, to semi-moist pellets of minced fish and various binders, to dry pellets. Semi-moist or dry pellets are used extensively in U.S. fish farms and consist of a combination of fish meal and vegetable matter, mixed with vitamins, essential oils and other organic material. Some studies have shown that when feeding methods are optimized, there is generally no significant difference between pelletized artificial feeds and the use of trash fish regarding the discharge of nutrients and solid materials from cages (Hasan, 2012). Table 4.1 shows the composition of several commonly used prepared fish diets. Typical average levels of protein, fats and carbohydrates in fish feeds ranges from 18-50 percent, 10-25 percent and 15-20 percent respectively, depending on targeted species (Waldemar Nelson International, 1997; Craig, 2009). The proposed permit prohibits the discharge of un-pelletized wet feeds.

The effectiveness of cultured fish feeding methods and diets are measured by calculating a FCR - the ratio of food fed (dry weight) to fish produced (wet weight). Typically, average FCR's range from 1:1 for salmonid fishes to 2:1 for some freshwater species (Hasan and Soto, 2017). That is, for every pound of fish produced, 1 to 2 lbs of feed were introduced into the water. In some laboratory experiments, FCR's of less than 1:1 have been achieved, and most fish farmers now claim values between 1 and 1.5. The amount fed during any period depends primarily upon the type of food used, the size of the fish, and the water temperature. Farmed fish are typically fed 1-4 percent of their body weight per day. Though protein content may vary, generally, fish feed includes about 7.7 percent nitrogen (Edwards, 1978) and 37.7 percent organic carbon (Waldemar Nelson International, 1997).

Modern feeds are designed to reduce solid wastes by improving digestibility, ingredient selection and nutrient balance (Cho and Bureau, 2001). Even with the highest FCRs, a portion of fish feed is not eaten and settles to the bottom. Feed wastage has proven difficult to ascertain in field conditions. However, several studies in Europe have suggested that a range of 1 to 30 percent of the feed may be lost (Gowen et al 1988; Pencsak et al., 1982). Dry feed consistently showed the least amount of wastage (1 to 5 percent) while 5 to 10 percent of moist fish foods were lost (Gowen and Bradbury, 1987). In Puget Sound farms, fish growers report that food wastage is typically less than 5 percent (Weston, 1986). Specific studies of food wastage at a commercial salmon farm in Sooke Inlet, B.C., showed that hand feeding, the most common practice in Puget

Sound, resulted in wastage of 3.6 percent. The use of automatic feeders increased wastage to 8.8 percent (Cross, 1988).

Since food pellets do not decompose appreciably as they settle to the bottom, they are unlikely to experience substantial reduction in nitrogen or carbon, either through solution or microbial activity, before depositing on the bottom (Collins, 1983; Gowen and Bradbury, 1987). Thus, any food particles or pellets lost during feeding will retain their nutrients essentially unaltered. Development of slower settling feeds, which are available to the fish in the pens for longer periods, and feeds with more uniform size have reduced wastage. However, the amount of wastage is still highly dependent upon the care used by the fish farmer during feeding.

Table 4. 1 – Nutritional composition of commonly used prepared fish diets [4]

Source	Fish Species	Feed Brand	Feed Type	% Protein	% Fats	% Carbohydrates
BioProducts, Inc (EPA, 1991)	Salmon	Biodry 3000	Dry	44.5	15.0	14.7
Moore-Clark Co. (EPA, 1991)	Salmon	Select Ext.	Dry	45.0	22.0	14.0
BioProducts, Inc (EPA, 1991)	Salmon	Biomoist F.3	Moist	39.0	13.5	11.8
Moore-Clark Co. (EPA, 1991)	Salmon	Oregon Moist	Dry	35.0	11.0	13.0
Ziegler Bros. (Ellis, 1996)	Grouper	Trout Grower	Dry	43.5	5.9	34.8
Rangen, Inc. (Ellis, 1996)	Grouper	Salmon Grower	Dry	52.7	15.2	13.8
Dainichi Corp. (Ellis, 1996)	Grouper	Carn. Fish Diet	Dry	55.6	7.8	20.7
Oceanic Institute (Ellis, 1996)	Grouper	Mahi ex.diet	Dry	61.8	14.2	12.9
Corey Feed Mills	Salmon	Fundy Choice	Dry	43.0	30.0	11.0
Aquaculture 1997 v. 151	Grouper	-	Dry	43.0	14.0	8.0
Oceanic Institute, 1993	Mahi-Mahi	OI prepared diet	Dry	60.0	12.0	10.0
Williams, 1985	Pompano	Menhaden oil diet	Dry	42.0	12.0	7.0
Burris Mill & Feed	Hybrid Bass	Grower	Dry	42.0	7.0	19.0
Burris Mill & Feed	Red Drum	Grower	Dry	42.0	7.0	19.0
Burris Mill & Feed	Red Drum	Grower	Dry	40.0	10.0	30.0
Mean				**45.9**	**13.1**	**16.0**

4.2 Fish Wastes

Of the feed consumed, about 10 percent is lost as solid wastes and 30 percent lost as liquid wastes (Butz and Vens-Capell, 1982; Craig, 2009). Unlike feed pellets, fish feces are more variable in size and density. Consequently, the settling rate of these particles will vary greatly, but will be less than that of feed pellets. The composition of the feces is dependent upon the chemical composition of the feed and its digestibility. Gowen and Bradbury (1987) estimated from the literature that about 30 percent of the consumed carbon would be excreted in the feces, along with about 10 percent of the consumed nitrogen.

[4] Source: Modified from Waldemar Nelson International, 1997.

Estimates of the total particulate matter emanating from net pens, for eventual deposit on the sea floor, have been calculated. Weston (1986), assuming an FCR of 2:1 with 5 percent wastage and a third of the consumed food being lost as feces, estimated that 733 kg (1,600 lbs) of sediment would be produced for every metric ton (2200 lbs) of fish grown. The Institute of Aquaculture (1988) estimated sediment production of 820 kg (1800 lbs), assuming 20 percent wastage and a 30 percent loss as feces.

A discharge limitation will be placed in the NPDES permit to state that fish food and metabolic wastes discharged from the facility shall not cause unreasonable degradation of the environment beneath the facility and/or the surrounding area as defined in 40 CFR § 125.122(a).

5.0 Biological Overview

This chapter describes the biological communities and processes in the eastern Gulf in general and in the specific area of the proposed facility which may be exposed to pollutants, the potential presence of endangered species, any unique species or communities of species, and the importance of the receiving water to the surrounding biological communities.

5.1 Primary Productivity

Primary productivity is "the rate at which radiant energy is stored by photosynthetic and chemosynthetic activity of producer organisms in the form of organic substances which can be used as food materials" (Odum, 1971). Primary productivity is affected by light, nutrients, and zooplankton grazing, as well as other interacting forces such as currents, diffusion, and upwelling. The producer organisms in the marine environment consist primarily of phytoplankton and benthic macrophytes. Since benthic macrophytes are depth/light limited, primary productivity in the open ocean is attributable primarily to phytoplankton. The productivity of nearshore waters can be attributed to benthic macrophytes--including seagrasses, mangroves, salt marsh grasses, and seaweeds--and phytoplankton.

There are numerous methods for estimating primary productivity in marine waters. One method is to measure chlorophyll content per volume of seawater and compare results over time to establish a productivity rate. The chlorophyll measurement, typically of chlorophyll a, gives a direct reading of total plant biomass. Chlorophyll a is generally used because it is considered the "active" pigment in carbon fixation (Steidinger and Williams, 1970). Another method, the C^{14} (radiocarbon) method, measures photosynthesis (a controversy exists as to whether "net", "gross", or "intermediate" photosynthesis is measured by this method; Kennish, 1989). The C^{14} method introduces radiolabeled carbon into a sample and estimates the rate of carbon fixation by measuring the sample's radioactivity. The units used to express primary productivity are grams of carbon produced in a column of water intersecting one square meter of sea surface per day (g $C/m^2/d$), or grams of carbon produced in a given cubic meter per day (g $C/m^3/d$).

C^{14} uptake throughout the Gulf is 0.25 g $C/m^3/hr$ or less, and chlorophyll measurements range from 0.05 to 0.30 mg/m^3 (ppb). Eastern regions of the Gulf are generally less productive than western regions, and throughout the eastern Gulf, primary productivity is generally low. However, outbreaks of "red-tide" caused by pathogenic phytoplankton may occur in the mid- to inner-shelf. Also, depth-integrated productivity values in the area of the Loop Current (primarily the outer shelf and slope) are actually higher than western and central Gulf values. Enhanced productivity occurs in areas affected by upwelling. Near the bottom of the euphotic zone, chlorophyll and productivity values are about an order of magnitude greater, probably due to the often intruded, nutrient-rich Loop undercurrent waters (MMS, 1990).

Productivity measurements in the oceanic waters of the Gulf include: 0.1 g $C/m^2/d$ yielding 17 g $C/m^2/yr$ or 86 million tons of phytoplankton biomass (MMS, 1983); 103-250 g $C/m^2/yr$ (Flint and Kamykowski, 1984); 103 g $C/m^2/yr$ (Flint and Rabalais, 1981). For comparisons, the following data on primary productivity are presented for coastal wetland systems as compiled by Thayer and Ustach (1981):

- Salt Marshes, 200-2000 g $C/m^2/yr$
- Mangroves, 400 g $C/m^2/yr$
- Seagrasses, 100-900 g $C/m^2/yr$
- *Spartina alterniflora,* 1300 g $C/m^2/yr$
- *Thalassia*, 580-900 g $C/m^2/yr$
- Phytoplankton, 350 g $C/m^2/yr$

Biomass (chlorophyll a) measurements in the predominantly oceanic waters of the Gulf include: 0.05-0.30 mg Chl a/m^3 (MMS, 1983a); 0.05-0.1 mg Chl a/m^3 (Yentsch, 1982); 0.22 mg Chl a/m^3 (El-Sayed, 1972); and 0.17 mg Chl a/m^3 (Trees and El-Sayed, 1986). For the eastern Gulf, biomass (chlorophyll a) measurements include the following (Yoder and Mahood, 1983):

- Surface mixed layer values of 0.1 mg/m^3;
- Subsurface measurements at 40-60 m ranged from 0.2 to 1.2 mg/m^3;
- Average integrated values for the water column over the 100-200 m isobath was 10 mg/m^2; and
- Average integrated values for the water column greater than 200 m isobath was 9 mg/m^2.

5.2 Phytoplankton

5.2.1 Distribution

Phytoplankton distribution and abundance in the Gulf is difficult to measure. Shipboard or station measurements cannot provide information about large areas at one moment in time, and satellite imagery cannot provide definitive information about local conditions that may be important. Due to fluctuations in light and nutrient availability and the immobility of phytoplankton, distribution is temporally and spatially variable. Seasonal fluctuations in location and abundance are often masked by patchy distributions which human sampling designs must attempt to interpret. In addition, methods for measurement of chlorophyll or uptake of carbon cannot always resolve all questions concerning variability among or within species under different conditions, or those concerning the effects of grazing on abundance.

As mentioned in the previous section, phytoplankton occupy a niche at the base of food chain as primary producers of our oceans. Herbivorous zooplankton populations require phytoplankton for maintenance and growth -- generally 30-50 percent of their weight each day and surpassing 300 percent of their weight in exceptional cases (Kennish, 1989). In the Gulf, phytoplankton are also often closely associated with bottom organisms, and may also contribute to benthic food sources for demersal feeding fish.

Phytoplankton seasonality has been explained in terms of salinity, depth of light penetration, and nutrient availability. Generally, diversity decreases with decreased salinity and biomass decreases with distance from shore (MMS, 1990).

5.2.2 Principal Taxa

The principal taxa of planktonic producers in the ocean are diatoms, dinoflagellates, coccolithophores, silicoflagellates and blue-green algae (Kennish, 1989).

Diatoms

Many specialists regard diatoms as the most important phytoplankton group, contributing substantially to oceanic productivity. Diatoms consist of single cells or cell chains, and secrete an external rigid silicate skeleton called a frustule. In 1969, Saunders and Glenn reported the following for diatom samples collected 5.6 to 77.8 kilometers (km) from shore in the Gulf between St. Petersburg and Ft. Myers, Florida. Diatoms averaged 1.4 x $10^7\mu^2$/l surface area offshore, 13.6 x $10^7\mu^2$/l at intermediate locations and 13.0 x $10^8\mu^2$/l inshore. The ten most important species in terms of their cellular surface area were: Rhizosolenia alata, R. setigera, R. stolterfothii, Skeletonema costatum, Leptocylindrus danicus, Rhizosolenia fragilissima, Hemidiscus hardmanianus, Guinardia flaccida, Bellerochea malleus, and Črataulina pelagica.

Dinoflagellates

Dinoflagellates are typically unicellular, biflagellated autotrophic forms that also supply a major portion of the primary production in many regions. Some species generate toxins and when blooms reach high densities, mass mortality of fish, shellfish, and other organisms can occur (Kennish, 1989). Notably, Gymnodinium breve is responsible for most of Florida's red tides and several of the Gonyaulax species are known to cause massive blooms (Steidinger and Williams, 1970). Table 5.1 lists species and varieties of dinoflagellates found to be abundant during the Hourglass Cruises (a systematic sampling program in the eastern Gulf.)

Table 5. 1 - Significant Dinoflagellate Species of the Eastern Gulf [5]

Species	Biomass Value (μ^3)
Amphibologia bidentata	67,039 - 95,406
Ceratium carriense	637,219 - 1,115,367
C. carriense var. *volans*	622,206 - 1,196,643
C. contortum var. *karstenii*	943,121 - 1,655,573
C. extensum	189,709 - 323,546
C. furca	23,157 - 43,369
C. fusus	34,463 - 154,722
C. hexacanthum	687,593 - 1,384,016
Ceratium hircus	211,709
C. inflatum	145,897 - 221,276
C. massiliense	543,762 - 1,002,222
C. trichoceros	104,110 - 357,437
C. tripos var. *atlanticum*	518,659 - 964,436
Dinophysis caudata var. *pedunculata*	92,153 - 231,405
Gonyaulax splendens	51,651
Prorocentrum crassipes	329,540
P. gracile	25,773
P. micans	65,412

Coccolithophores

Coccolithophores are unicellular, biflagellated algae named for their characteristic calcareous plate, the coccolith, which is embedded in a gelatinous sheath that surrounds the cell. Phytoplankton of offshore Gulf are reported to be dominated by coccolithophores (Iverson and Hopkins, 1981).

Silicoflagellates

Silicoflagellates are unicellular flagellated (single or biflagellated) organisms that secrete an internal skeleton composed of siliceous spicules (Kennish, 1989). Perhaps because of their small size (usually less than 30 µm in diameter) little specific information relative to Gulf distribution and abundance, is available for this group.

Blue Green Algae

Blue green algae are prokaryotic organisms that have chitinous walls and often contain a pigment called phycocyanin that gives the algae their blue green appearance (Kennish, 1989). On the west Florida shelf, inshore blooms of the blue green algae Oscillatoria erethraea sometimes occur in spring or fall.

[5] Source: Steidinger and Williams, 1970.

5.3 Zooplankton

Like phytoplankton, zooplankton are seasonal and patchy in their distribution and abundance. Zooplankton standing stocks have been associated with the depth of maximum primary productivity and the thermocline (Ortner et al., 1984). Zooplankton feed on phytoplankton and other zooplankton, and are important intermediaries in the food chain as prey for each other and larger fish.

As in many marine ecosystems, zooplankton fecal pellets contribute significantly to the detrital pool. The ease of mixing in Gulf coastal waters may make them extremely important to nutrient circulation and primary productivity, as well as benthic food stocks. Also contributing to the detrital pool is the concentration of zooplankton in bottom waters, coupled with phytoplankton in the nepheloid layer during times of greater water stratification.

Copepods are the dominant zooplankton group found in all Gulf waters. They can account for as much as 70 percent by number of all forms of zooplankton found (NOAA, 1975). In shallow waters, peaks occur in the summer and fall (NOAA, 1975), or in spring and summer, (MMS, 1983a). When salinities are low, estuarine species such as *Acartia tonsa* become abundant.

The following information on zooplankton distribution and abundance in the eastern Gulf is summarized from Iverson and Hopkins (1981):

- During Bureau of Land Management-sponsored studies, small copepods predominated in net catches over the shelf regions of the eastern and western Gulf.
- During Department of Energy-sponsored studies at sights located over the continental slope of Mobile and Tampa Bays, small calanoids such as *Parcalanus*, and *Clausocalanus* and cyclopoids such as *Farralanula, Oncaea*, and *Oithona* predominated at the 0-200 m depths; and larger copepods such as *Eucalanus, Rhincalnus,* and *Pleuromamma* dominated at 1,000 m depths. Euphausiids were also more conspicuous. Night-time samples taken near Tampa showed larger crustaceans such as Lucifer and Euphasia. Biomass data for the same site revealed a decrease in zooplankton with increasing depth. The mean cumulated biomass value for the upper 1,000 m was 21.9 ml/m^2.
- Studies funded by the National Science Foundation in the east-central Gulf found diurnal patterns of distribution in the upper 1,000 m, with increases in the 50 m range at night and in the 300-600 m zone during the day, most likely attributable to vertical migration. In the upper 200 m, in addition to copepods, group such as chaetognaths, tunicates, hydromedusae, and euphausiids were significant contributors to the biomass.

Icthyoplankton studies for the eastern Gulf conducted during 1971-1974 found fish eggs to be more abundant in the northern half and fish larvae to be more abundant in the southern half of the eastern Gulf. Mean abundances were 5,454 $eggs/m^2$ and 3,805 $larvae/m^2$ in the northern Gulf and 4,634 $eggs/m^2$ and 4,869 $larvae/m^2$ in the southern Gulf. Eggs were more abundant in waters less than 450 meters deep, whereas larvae were more abundant in-depth zones greater than 50 meters (Houde and Chitty, 1976).

5.4 Habitats

5.4.1 Seagrasses

Seagrasses are vascular plants that serve a variety of ecologically important functions. As primary producers, seagrasses are a direct food source and also contribute nutrients to the water column. Seagrass communities serve as a nursery habitat for juvenile fish and invertebrates and seagrass blades provide substrate for epiphytes. Species such as *Thalassia testudinum* have an extensive root system that stabilize substrate, and broad ribbon-like blades that increase sedimentation. Seagrasses mainly occur in shallow, clear, highly saline waters. Seagrass beds do not occur in the proposed activity area.

Approximately 1.25 million acres of seagrass beds are estimated to exist in exposed, shallow, coastal/nearshore waters and embayments of the Gulf**.** About 3 percent of these beds are in Mississippi. Florida with Florida Bay and coastal Florida accounting for more than 80 percent. True seagrasses that occur in the Gulf are shoal grass, paddle grass, star grass, manatee grass, and turtle grass. Although not considered a true seagrass because it has hydroanemophilous pollination (floating pollen grains) and can tolerate freshwater, widgeon grass is common in the brackish waters of the Gulf. (BOEM, 2012).

5.4.2 Offshore Habitats

Offshore habitats include the water column and the sea floor. The west Florida Shelf extends seaward of Tampa Bay approximately 200 km to a depth of 200 m and consists mainly of unconsolidated sediments punctuated by low-relief rock outcroppings and several series of high relief ridges. The seafloor on the west Florida shelf in the proposed project area consists mainly of course to fine grain sands with scattered limestone outcroppings making up about 18 percent of the seafloor habitat. These limestone outcroppings provide substrata for the attachment of macroalgae, stony corals, octocorals, sponges and associated hard-bottom invertebrate and fish communities (EPA, 1994).

5.5 Fish and Shellfish Resources

The distribution of fish resources in the eastern Gulf are highly dependent on a variety of factors including habitat type, chemical and physical water quality variables, biological, and climatic factors. The Gulf contains both a temperate fish fauna and a tropical fauna arrayed into inshore and offshore habitats depending on latitude. To the south of the 20°C winter isotherm, approximately middle Florida, the more tropical fish fauna occupies inshore habitats replacing the temperate fauna. To the north the tropical fauna is pushed further offshore to avoid cold winter temperature and by increased competition by temperate species able to tolerate cooler waters. In the northern Gulf where temperate species dominate inshore, a well-developed tropical fauna occurs on offshore structures, particularly reefs (Hoese and Moore, 1977). During warm weather the early life stages of the tropical fauna move further inshore around piers and jetties.

The temperate fish and invertebrate fauna of the north-central Gulf tend to be dominated by estuary dependent species such as sciaenids (i.e., croaker, red and black drum, spotted seatrout), menhaden, shrimp, oysters and crabs. These species require the transportation of early life stages into estuaries for grow out into mature adults or juveniles and migration out to shelf environments. Shellfish resources in the Gulf tend to be more estuarine dependent than finfishes. Gulf shellfish habitats range from brackish wetlands to nearshore shelf environments. Of the 15 penaeid shrimp species found in the Gulf the brown, white and pink shrimp are the most important. Adults of these species spawn in offshore marine waters and the free-swimming post larvae move into estuaries to remain through their juvenile stages. Juvenile shrimp move back offshore to molt into adults.

Reef fish assemblages may consist of mainly temperate species in the more northern Gulf with increasing dominance of more tropical fish species, typically associated with coral reefs, further offshore and in the more southern portions of the Gulf. Natural reef habitat in the eastern Gulf ranges from low relief (>1 m) live bottom, high relief ridge habitats along the Florida shelf break and pinnacle formations of the Florida Middle Grounds on the west Florida shelf. Man-made or artificial reef habitats also exist from oil and gas platforms, sunken vessels and a variety of other structures placed intentionally for fisheries enhancement. These structures comprise critical habitats for many important commercial and recreational fishes such as groupers and snappers.

Pelagic fish species are distributed by water column depth and relationship to the shore. Coastal pelagic fish are those that move mainly around the continental shelf year-round, singly or in schools of various size. These include some commercially important groups of fishes including sharks, anchovies, herring, mackerel, tuna, mullet, bluefish and cobia. Oceanic pelagic fish occur at or seaward of the shelf edge throughout the Gulf. Oceanic pelagic fish include many larger species such as sharks, tuna, bill fishes, dolphin and wahoo.

Extensive discussions of reef and migratory fish species in the Gulf can be found in the Final Programmatic Environmental Impact Statement. Fishery Management Plan for Regulating Offshore Marine Aquaculture in the Gulf (NOAA 2009).

A 2010 survey of the Tampa Ocean Dredge Material Disposal Site (ODMDS) that is approximately 18 miles west of Tampa Bay, identified 29 species of demersal fishes associated with the high relief habitat created by the dredged material spoil mound, with only 9 species on nearby natural low-relief hard bottom habitat. Abundances of fishes on natural low-relief hard bottom in the area were also significantly smaller than on the spoil mound (EPA, 2011).

5.6 Marine Mammals

All marine mammals are protected under the Marine Mammal Protection Act of 1972 (MMPA). There are 22 marine mammal species that may occur in the Gulf (i.e., one sirenian species (a manatee), and 21 cetacean species (dolphins and whales)) based on sightings and/or strandings (Schmidly, 1981; NOAA, 2009). Three of the marine mammals (sperm whales, Gulf Bryde's whale, and manatees) are also currently protected under the ESA.

Cetaceans (whales, dolphins, and porpoises) are the most common. Six of the seven baleen whales in the Gulf are currently listed as threatened or endangered and of the 20 toothed whales present only the sperm whale is endangered. During 1978 to 1987, a total of 1,200 cetacean strandings/sightings was reported for Alabama, Florida and Mississippi to the Southeastern U.S. Marine Strandings Network. Ninety percent of these stranding/sighting occurred off Florida coasts (the Florida figure reflects strandings from both the Gulf and the Atlantic waters (NOAA, 1991). The cetaceans found in the Gulf include species that occur in most major oceans, and for the most part are eurythermic with a broad range of temperature tolerances (Schmidly, 1981). An introduced species of pinniped, the California sea lion, occurred in small numbers only in the feral condition, however no sightings of this species has been reported in the Gulf since 1990.

Most of the Gulf cetacean species reside in the oceanic habitat (greater than or equal to 200 m). However, the Atlantic spotted dolphin (*Stenella frontalis*) is found in waters over the continental shelf (10-200 m), and the common bottlenose dolphin (*Tursiops truncatus truncatus*) (hereafter referred to as bottlenose dolphins) is found throughout the Gulf, including within bays, sounds, and estuaries; coastal waters over the continental shelf; and in deeper oceanic waters. Bottlenose dolphins in the Gulf can be separated into demographically independent populations called stocks. Bottlenose dolphins are currently managed by NOAA Fisheries as 36 distinct stocks within the Gulf. These include 31 bay, sound, and estuary stocks, three coastal stocks, one continental shelf stock, and one oceanic stock (Hayes et al., 2017).[6]

More extensive discussions about marine mammals for the proposed project are within the Environmental Assessment (EA) for the proposed project. Additionally, more information about marine mammals in the Gulf can be found in the Final Programmatic Environmental Impact Statement (EIS) Fishery Management Plan for Regulating Offshore Marine Aquaculture in the Gulf (NOAA, 2009), the EA for the EPA Oil and Gas general

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[6] Marine Mammal Stock Assessment Reports and additional information on these species in the Gulf are available on the NOAA Fisheries Office of Protected Species website: www.nmfs.noaa.gov/pr/sspecies/.

NPDES permit (EPA, 2016), and in recent Bureau of Ocean and Energy Management (BOEM) EIS documents (BOEM, 2012).

5.7 Endangered Species

The USFWS and NMFS evaluate the conditions of species and their populations within the United States. Those species populations considered in danger of extinction are listed as endangered species pursuant to the Endangered Species Act of 1973. In addition, Section 7(a)(2) of the ESA requires federal agencies to ensure that their action do not jeopardize the continued existence of listed species or destroy or adversely modify critical habitat. Table 5.2 provides the list of ESA-listed species that were considered by the EPA and could potentially occur in or near the proposed action area.

More information about endangered species can be found in the Biological Evaluation for the proposed project. Overall, potential impacts to the ESA-listed species considered by the EPA are expected to be extremely unlikely and insignificant due to the small size of the facility, the short deployment period, unique operational characteristics, lack of geographic overlap with habitat or known migratory routes, or other factors that are described in the below sections for each species.

Threatened and endangered species that occur in the Gulf are discussed extensively in the 2016 EPA Environmental Assessment for the EPA Oil and Gas general NPDES permit (EPA, 2016), BOEM EIS documents (BOEM, 2013), and the Final PEIS for Offshore Marine Aquaculture in the Gulf (NOAA, 2009).

Table 5.2 – Federally Listed Species, Listed Critical Habitat, Proposed Species, and Proposed Critical Habitat Considered for the Proposed Action

	Species Considered	ESA Status	Critical Habitat Status	Potential Exposure to Proposed Action Area
Birds				
1	Piping Plover	Threatened	Yes	No
2	Red Knot	Threatened	No	No
Fish				
1	Giant Manta Ray	Threatened	No	Yes
2	Nassau Grouper	Threatened	No	Yes
3	Oceanic Whitetip Shark	Threatened	No	Yes
4	Smalltooth Sawfish	Endangered	No	Yes
Invertebrates				
1	Boulder Star Coral	Threatened	No	No
2	Elkhorn Coral	Threatened	No	No
4	Mountainous Star Coral	Threatened	No	No
5	Pillar Coral	Threatened	No	No
7	Staghorn Coral	Threatened	No	No
6	Rough Cactus Coral	Threatened	No	Yes
3	Lobed Star Coral	Threatened	No	Yes
Marine Mammals				
1	Blue Whale	Endangered	No	Yes
2	Bryde's Whale	Endangered	No	Yes
3	Fin Whale	Endangered	No	Yes
4	Humpback Whale	Endangered	No	Yes
5	Sei Whale	Endangered	No	Yes
6	Sperm Whale	Endangered	No	Yes
Reptiles				
1	Green Sea Turtle	Threatened	No	Yes
2	Hawksbill Sea Turtle	Endangered	Yes	Yes
3	Kemp's Ridley Sea Turtle	Endangered	No	Yes
4	Leatherback Sea Turtle	Endangered	Yes	Yes
5	Loggerhead Sea Turtle	Threatened	Yes	Yes

6.0 Commercial and Recreational Fisheries

6.1 Overview

Though the Gulf Region includes Alabama, Louisiana, Mississippi, Texas, and West Florida, much of the following discussion will focus on Gulf states in the eastern portion of the Gulf. Federal fisheries in this region are managed by the Gulf Fishery Management Council (GMFMC) and the NMFS under seven fishery management plans (FMPs): Red Drum, Shrimp, Reef Fish, Coastal Migratory Pelagic Resources (with SAFMC), Spiny Lobster (with SAFMC), Corals, and Aquaculture. The coastal migratory pelagic resources and spiny lobster fisheries are managed in conjunction with the South Atlantic Fishery Management Council (SAFMC).

Several of the stocks or stock complexes covered in these fishery management plans, are currently listed as overfished: gray snapper, greater amberjack, and lane snapper.[7] Other impacts to commercial fisheries in the Gulf in recent years include a number of hurricanes, especially with major storms making landfall in Louisiana and Texas in 2005 (Hurricanes Katrina and Rita) and 2008 (Hurricanes Gustav and Ike). Locally, these storms severely disrupted or destroyed the infrastructure necessary to support fishing, such as vessels, fuel and ice suppliers, and fish houses.[8]

The Deepwater Horizon oil spill in 2010 severely affected fisheries in the Gulf. Large parts of the Gulf, including state and federal waters, were closed to fishing during May through October, 2010. Both Alabama and Mississippi reported less than half and Louisiana about three quarters of their annual shrimp landings compared to the average of the previous three years. The impacts of the spill remain under study and the long-term consequences of the oil spill on fish stocks and the fishing industry have yet to be fully assessed.

6.2 Commercial Fisheries

Information from the NMFS in 2013 shows that commercial fishermen in the Gulf Region landed 1.4 billion pounds of finfish and shellfish, earning $937 million in landings revenue (NMFS, 2014; NMFS, 2015). In 2014 1.1 billion pounds were landed at a value of over $1.0 billion. From 2003 to 2013, most of the commercial fisheries revenue and catch (91 percent and 96 percent respectively) was dominated by ten key species or species groups (Table 6.1).

Commercially important species groups in the Gulf include oceanic pelagic (epipelagic) fishes, reef (hard bottom) fishes, coastal pelagic species, and estuarine-dependent species. Landings revenue in 2012 was dominated by shrimp ($392 million) and menhaden ($87 million). These species comprised 63 percent of total landings revenue, and 90 percent of total landings in the Gulf Region. Other invertebrates such as blue crab, spiny lobster, and stone crab also contributed significantly to the value of commercial landings. Other finfish species that contributed substantially to the overall commercial value of the Gulf fisheries included red grouper, red snapper, and yellowfin tuna. In terms of landing weight, Atlantic menhaden far surpassed other commercial fish species in the Gulf, accounting for approximately 73 percent of the total weight of landed commercial species in 2013 (Table 6.2). However, Atlantic menhaden accounted for only about 10 percent of the total value of the Gulf commercial fishery. The portion of commercial fishery landings that occurred in nearshore and offshore waters of the Gulf States is presented in Table 6.3

In 2013, the eastern Gulf Region's seafood industry generated $527 million in sales in Alabama, $268 million in sales in Mississippi, and $15 billion in sales in Florida Table 6.4). Florida generated the largest employment, income, and value-added impacts, generating 78,000 jobs, $2.9 billion, and $5.1 billion, respectively. The

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[7] Updated information on fishery stock is available at: www.fisheries.noaa.gov/national/population-assessments/fishery-stock-status-updates

[8] Current information on US fisheries can be found at: www.nmfs.noaa.gov/sfa/fisheries_eco/status_of_fisheries/

smallest income impacts were generated in Mississippi ($200 million) and the smallest employment impacts were also generated in Mississippi (6,432 jobs) (NMFS, 2015).

Table 6.1 - Key Gulf Region Commercial Species or Species Groups

Shellfish	Finfish
Crawfish	Groupers
Blue Crab	Menhaden
Oysters	Mullets
Shrimp	Red Snapper
Stone Crab	Tunas

Table 6.2 - Total Weights and Values of Key Commercial Fishery Species in the Gulf Region in 2013 [9]

Species	Weight (thousands of lbs)	Value (Thousands of dollars)	% Weight	% Value
Menhaden	1,020,244	95,277	73.3	10.2
Shrimp	204,527	503,842	14.7	53.8
Blue crab	46,543	61,264	3.3	6.5
Oyster	19,230	76,729	1.4	8.2
Crayfish	19,823	16,593	1.4	1.8
Mullets	13,482	13,222	0.01	0.01
Stone crab	3,778	24,762	0.003	2.6
Groupers	7,280	23,396	0.005	2.5
Red snapper	5,286	20,493	0.004	2.2
Tuna	2,107	7,352	0.002	0.008
Total	1,392,364	936,660	-	-

Table 6.3 - Value of Gulf Coast Fish Landings by Distance from Shore and State for 2012 ($1,000) [10]

State	Distance from Shore	
	0-3 miles	3-200 miles
Florida (Gulf)	$ 64,727	$ 75,232
Alabama	$ 15,870	$ 27,195
Mississippi	$ 29,767	$ 19,509

In 2013 1.4 billion pounds of finfish and shellfish were landed in the Gulf Region. This was a 6.7 percent decrease from the 1.5 billion pounds landed in 2004 and a 7.0 percent increase from the 1.3 billion pounds

[9] NMFS, 2015.

[10] https://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/other-specialized-programs/preliminary-annual-landings-by-distance-from-shore/index

landed in 2012. Finfish landings experienced a 9.6 percent decrease between 2012 and 2013 while shellfish landings experienced a 1.6 percent decrease over the same period (Table 6.5).

From 2004 to 2013, species or species groups with large changes in landings include tunas (decreasing 46 percent), groupers (decreasing 39 percent), and oysters (decreasing 23 percent). Species or species groups with large changes in landings between 2012 and 2013 include crawfish (increasing 66 percent), and red snapper (increasing 24 percent) (NMFS, 2015).

The Deep-Water Horizon event had immediate effects on the Gulf fishing industry between April and November 2010, with up to 40 percent of Federal waters being closed to commercial fishing in June and July (CRS 2010). Portions of Louisiana, Alabama, Mississippi, and Florida state waters have also been closed. These areas are some of the richest fishing grounds in the Gulf for major commercial species such as shrimp, blue crab, and oysters, and as prices for these items have increased, imports of these species have likely taken the place of lost Gulf coast production. NOAA continued to reopen areas to fishing once chemical tests revealed levels of hydrocarbons or dispersants in commercial species were not of concern to human health.

It cannot be determined from these data whether the decreases in fin and shell fish landings were the result of reduced stock sizes, changes in stock geographic distribution or changes in fishing effort, however studies are currently on going and it is not known at this time whether there are long term affects to fisheries due to the spill.

Table 6.4 - 2013 Economic Impacts of the Eastern Gulf Region Seafood Industry (thousands of dollars)[11]

State	Jobs	Landings Revenue	Sales	Income	Value Added
Alabama	$ 12,090	$ 55,434	$ 526,767	$ 200,494	$ 265,580
Mississippi	$ 6,432	$ 46,618	$ 268,367	$ 107,340	$ 138,779
Florida	$ 78,378	$ 148,058	$ 15,319,435	$ 2,878,309	$ 5,136,623

Table 6.5 - Total Landings and Landings of Key Species/Species Groups From 2010 to 2013 (thousands of pounds)[12]

Landings	2010	2011	2012	2013
Finfish & other	810,649	1,472,798	987,374	1,092,148
Shellfish	261,419	319,752	305,821	300,216
Total landings	1,072,068	1,792,550	1,293,195	1,392,364

6.3 Recreational Fisheries

The NMFS (2015) estimates that in 2013, over 3.3 million recreational anglers took 25 million fishing trips in the Gulf Region. The key fish species or species groups making up most of the recreational fishery in the Gulf are listed in Table 6.6.

Of the three eastern Gulf states, western Florida had the highest number of anglers and fishing trips in 2013 (15.9 million), followed by Alabama (2.8 million), and Mississippi (1.8 million) (Table 6.7). Almost 67 percent

[11] NMFS, 2015

[12] NMFS, 2015

of the fishing trips in the Gulf coast left out of west Florida, followed by Alabama (7 percent), and Mississippi (5 percent). 41.8 percent of the total recreational fish landings (by weight) in the Gulf occurred in Florida, 12.8 percent 33 in Alabama, and 5.3 percent in Mississippi.

In Mississippi, nearly all landings were made in inland waters (98.6 percent). While the inland catch was important in Alabama (50.0 percent) and Florida (44.0 percent), the offshore catch was larger in these states, with 34.1 percent of the total catch landed up to 5 km (3 mi) from shore, and 16 percent at more than 5 km (3 mi) in Alabama and 28.7 percent at less than 16 km (10 mi), and 27.3 percent at more than 16 km (10 mi) in Florida.

Recreational fishing contributes to the Gulf state economies mainly through employment, expenditures (fishing trips and durable good), and sales. Table 6.8 shows the economic impacts of recreational fisheries by Gulf state. Recreational fishing activities generated over 87,000 full- and part-time jobs in Alabama, Mississippi and West Florida, and over $10.0 billion in sales.

Table 6.6 - Key Gulf Region Recreational Species [13]

Atlanta Croaker	Gulf and Southern Kingfish
Sand and Silver Seatrout	Spotted Seatrout
Sheepshead porgy	Red Drum
Red Snapper	Southern Flounder
Spanish Mackerel	Striped Mullet

Table 6.7 - Estimated Number of People Participating in Eastern Gulf Marine Recreational Fishing in 2013 (thousands)[14]

Location	Coastal	Non-coastal	Out of state	Total
West Florida	1,813	NA	2,538	4,351
Alabama	279	224	549	1,050
Mississippi	171	67	101	339
Gulf Total	2,263	291	3,098	5,740

Table 6.8 - 2013 Economic Impacts of Recreational Fishing Expenditures in the Eastern Gulf (thousands of dollars)[15]

Location	Trips	Jobs	Sales	Income	Value Added
Alabama	$ 2,862	$ 10,163	$ 927,409	$ 358,769	$ 569,144
Mississippi	$ 1,761	$ 1,583	$ 146,333	$ 53,602	$ 87,684
West Florida	$ 15,949	$ 76,236	$ 9,086,311	$ 3,423,836	$ 5,341,420
Total	$ 20,572	$ 87,982	$ 10,160,053	$ 3,836,207	$ 5,998,248

[13] NMFS, 2015
[14] NMFS, 2015
[15] NMFS, 2015

7.0 Coastal Zone Management Consistency and Special Aquatic Sites

This chapter addresses two of the 10 ODC: (5) The existence of special aquatic sites including, but not limited to marine sanctuaries and refuges, parks, national and historic monuments, national seashores, wilderness areas and coral reefs, and (8) Any applicable requirements of an approved Coastal Zone Management plan.

7.1 Coastal Zone Management Consistency

The Coastal Zone Management Act (CZMA) requires that any Federally-licensed or permitted activity affecting the coastal zone of a state that has an approved coastal zone management program (CZMP) be reviewed by that state for consistency with the state's program (16 USC § 1456(c)(A) Subpart D). Under the Act, applicants for Federal licenses and permits must submit a certification that the proposed activity complies with the state's approved CZMP and will be conducted in a manner consistent with the CZMP. The state then has the responsibility to either concur with or object to the consistency determination under the procedures set forth by the Act and their approved plan.

Consistency certifications are required to include the following information (15 CFR § 930.58): "A detailed description of the proposed activity and its associated facilities, including maps, diagrams, and other technical data; a brief assessment relating the probable coastal zone effects of the proposal and its associated facilities to relevant elements of the CZMP; a brief set of findings indicating that the proposed activity, its associated facilities, and their effects are consistent with relevant provisions of the CZMP; and any other information required by the state."

The states of Mississippi, Alabama, and Florida have federally approved CZMP. Each Gulf state has specific requirements in their CZMA plans that outline procedures for determining whether the permitted activity is consistent with the provision of the program.

Discharges covered by the proposed permit will occur in Federal waters outside the boundaries of the coastal zones of the State of Florida. However, because these discharges could create the potential for impacts on state waters, consistency determinations for the individual NPDES permit will be prepared by the proposed project and submitted to the State of Florida. The following summaries describe the requirements of the state's management plan for consistency determination. The permit applicant must provide the necessary data and information for the state to determine that the proposed activities comply with the enforceable policies of the states' approved program, and that such activities will be conducted in a manner consistent with the program.

7.2 Florida Coastal Management Program

The Florida Coastal Management Program (FCMP) was approved by NOAA in 1981 and is codified at Chapter 380, Part II, F.S. The State of Florida's coastal zone includes the area encompassed by the state's 67 counties and its territorial seas. The FCMP consists of a network of 24 state statutes administered by eight state agencies and five water management districts.

The review of federal activities is coordinated with the appropriate state agency. Each agency is given an opportunity to provide comments on the merits of the proposed action, address concerns, make recommendations, and state whether the project is consistent with its statutory authorities in the FCMP. Regional planning councils and local governments also may participate in the federal consistency review process by advising the Department of Economic Opportunity (DEO) on the local and regional impact of proposed federal actions. Comments provided by regional planning councils and local governments are considered by the DEO in determining whether the proposed federal activity is consistent with specific sections of Chapter 163, Part II, F.S., that are included in the FCMP. If a state agency determines that a proposed activity is inconsistent, the agency must explain the reason for the objection, identify the statutes the activity conflicts with and identify any alternatives that would make the project consistent.

Federal consistency reviews are integrated into other review processes conducted by the state depending on the type of federal action being proposed. The Florida State Clearinghouse administered by the Florida Department of Environmental Protection (FDEP) Office of Intergovernmental Programs, is the primary contact for receipt of consistency evaluations from federal agencies. The Clearinghouse coordinates the state's review of applications for federal permits other than permits issued under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act. As the designated lead coastal agency for the state, the FDEP communicates the agencies' comments and the state's final consistency decision to federal agencies and applicants for all actions other than permits issued under CWA Section 404 and Section 10 of the Rivers and Harbors Act.

7.3 Special Aquatic Sites

Special aquatic sites are "geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region" (40 CFR § 230.3). Areas of high relief ridges and outcroppings occur on the west Florida Shelf (Figure 7-1). These include the Madison-Swanson Marine Reserve, Florida Middle Grounds, Pulley Ridge, Steamboat Lumps Special Management Area, and Sticky Ground Mounds (BOEM, 2013).

7.3.1 Madison-Swanson/Steamboat Lumps Marine Reserves/The Edges

Madison-Swanson and Steamboat Lumps Marine Reserves are at two ends of a line of ridges beginning north of Tampa Bay along the 100 m isobath. Madison-Swanson and Steamboat Lumps were protected initially in 2002 and are now established Marine Protected Areas; no-take marine reserves sited on gag spawning aggregation areas where all fishing is prohibited (219 square nautical miles). With the addition of The Edges, during seasonal closures, Madison-Swanson and Steamboat Lumps cover 600 square miles.

7.3.2 Florida Middle Grounds HAPC (1984)

These reefs consist of a series of both high and low relief limestone ledges and pinnacles that exceed 15 meters (49 feet) in some areas. The area consists of roughly 348 nm² of this hardbottom region 150 kilometers (93 miles) south of the panhandle coast and 160 kilometers (99 miles) northwest of Tampa Bay. It is a Habitat Area of Particular Concern protected by preventing use of any fishing gear interfacing with bottom.

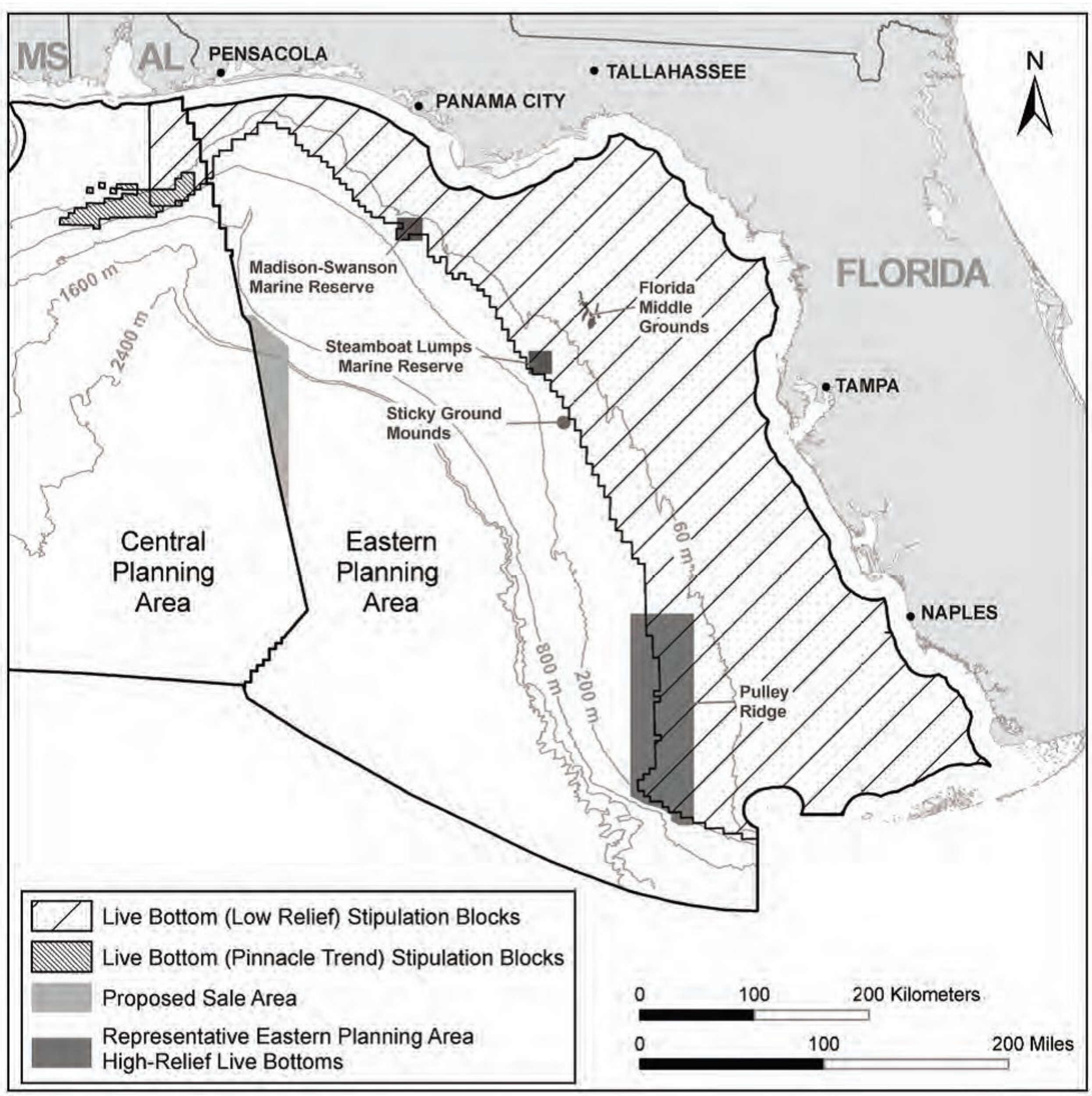
7.3.3 Pulley Ridge

Pulley Ridge is the deepest known photosynthetic coral reef off the continental United States. The area contains a near pristine, deep water reef characteristic of the coral reefs of the Caribbean Sea which are located in the southern quadrant of Pulley Ridge. These coral reefs occupy an area of about 111 square nautical miles. In 2005, a section of Pulley Ridge was designated as Habitat Area of Particular Concern (HAPC), which prohibited bottom anchoring by fishing vessels, bottom trawling, bottom longlines, buoy gear, and all trap/pot use in the area.

7.3.4 Sticky Ground Mounds

Shelf-margin carbonate mounds in water depths of 116–135 m in the eastern Gulf along the central west Florida shelf, off Tampa Bay. Various species of sessile attached reef fauna and flora grow on the exposed hard grounds. Some taller species (e.g., sea whips and other gorgonians) appear to survive this intermittent sand movement and accretion. Surveys on the southwest Florida Shelf revealed that the biotic cover on the live bottom patches is generally low and that the patches tend to be dominated by either algae or encrusting invertebrates (Woodward Clyde Consultants and CSA, 1984).

Figure 7. 1 – High Relief Live Bottom Areas in the Central and Eastern Gulf[16]



[16] BOEM, 2015

8.0 Federal Water Quality Criteria and Florida Water Quality Standards

Factor 10 of the 10 factors used to determine no unreasonable degradation requires the assessment of Federal marine water quality criteria and applicable state water quality standards (WQS).

8.1 Federal Water Quality Criteria

Pursuant to CWA § 303(c), the implementing regulations in 40 CFR § 131 establish the requirements for states and tribes to review, revise and adopt WQS. The regulations also establish the procedures for EPA to review, approve, disapprove and promulgate WQS pursuant to the CWA. State WQS apply within the jurisdictional waters of the state. For marine waters, state WQS apply within three nautical miles of shore. There are no WQS that apply for marine waters in the Gulf seaward of the three nautical mile boundary.

Section 304 of the CWA requires EPA to develop criteria for ambient water quality that accurately reflect the latest scientific knowledge on the impacts of pollutants on human health and the environment.[17] EPA designs aquatic life criteria to protect both freshwater and saltwater organisms from short-term and long-term exposure. Aquatic life criteria are based on how much of a chemical can be present in surface water before it is likely to harm plant and animal life. EPA's Section 304(a) criteria are not laws or regulations; they are guidance that states or Tribes may use as a starting point when developing their own WQS.

8.2 Florida Water Quality Standards

The proposed facility will be located approximately 45 miles seaward of Sarasota Bay, Florida, beyond the jurisdictional waters of the State of Florida. The WQS promulgated by Florida are not applicable to the proposed project because the project is within federal waters of the Gulf; however, some information about Florida's WQS is presented below.

WQS for the surface waters of Florida are established by the Department of Environmental Regulation in the Official Compilation of Rules and Regulations of the State of Florida, Chapter 62-302: Surface Water Quality Standards (Effective March 27, 2018).[18] Minimum criteria apply to all surface waters of the state and require that all places shall at all times be free from discharges that, alone or in combination with other substances or in combination with other components of discharges, cause any of the following conditions.

- Settleable pollutants to form putrescent deposits or otherwise create a nuisance
- Floating debris, scum, oil, or other matter in such amounts as to form nuisances
- Color, odor, taste, turbidity, or other conditions in such degree as to create a nuisance
- Acute toxicity (defined as greater than 1/3 of the 96-hour LC_{50})
- Concentrations of pollutants that are carcinogenic, mutagenic, or teratogenic to human beings or to significant, locally occurring wildlife or aquatic species
- Serious danger to the public health, safety, or welfare.

These general criteria of surface water apply to all surface waters except within zones of mixing. A mixing zone is defined as the surface water surrounding the area of discharge "within which an opportunity for the mixture of wastes with receiving waters has been afforded." Effluent limitations can be set where the analytical detection limit for pollutants is higher than the limitation based on computation of concentration in the receiving water.

[17] Current federal water quality criteria are found here: www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table

[18] https://floridadep.gov/dear/water-quality-standards

The antidegradation policy of the standards that applies in Florida waters requires that new and existing sources be subject to the highest statutory and regulatory requirements under Sections 301(b) and 306 of the CWA. In addition, water quality and existing uses of the receiving water shall be maintained and violations of WQS shall not be allowed.

As discussed in Section 3, all point source wastewater discharges are subject to a NPDES permit. Potential impacts from fish wastes will be determined by water quality and benthic monitoring to ensure that no unreasonable degradation of the marine environment will occur in accordance with Section 403 of the CWA.

9.0 Potential Impacts

This section summarizes the potential impacts to receiving waters of the Gulf that might occur as a result of the discharges from the proposed project. Also discussed in this section is the transport and persistence (Factor 2) and the toxicity and bioaccumulation potential (Factors 1 and 6) of pollutants discharged from the proposed facility.

9.1 Overview

Net pen aquaculture and its resultant discharges may have effects on water and sediment quality and the plant and animal communities living in the water column and those in close association with, on or in the sediments. The major discharges, uneaten fish food and fish metabolic wastes, are likely to have their greatest impacts on the water column, benthos and related communities.

The two major factors which determine the geographic distribution and severity of impacts of net pens on the water column, seafloor sediments and benthic communities are farm operations management and siting.

Farm Operations Management

1. Loading. The biomass of fish reared in the pens is proportional to the amount of organic matter deposited from the pens. The greater the density of fish, the more concentrated the deposition of organic waste.
2. Pen size. Larger pens, with the same loading, deposit sediments over a relatively smaller area (Earll et al 1984). Thus, the effects are more concentrated, however, the size of the area affected is less.
3. Pen configuration. Pen configuration and orientation to the predominant currents can significantly affect the dispersion of wastes.
4. Feed type. Different feeds have different settling rates. Slower rates allow greater dispersion. In addition, feed that has lower carbon and nitrogen levels and higher digestibility will produce less organic matter on the bottom.
5. Feeding method. Feeding methods can affect both wastage of feed and utilization of that feed by the fish. In one study, hand feeding resulted in 3.6 percent wastage, and up to 27.0 grams per meter squared per day (g/m2/day) organic matter deposition on the bottom. The use of automatic feeders resulted in wastage of 8.8 percent and a maximum deposition of 88.1 g/m2/day (Cross, 1988).

Siting

1. Water depth and current velocity. In deeper water and faster currents, the dispersion of wastes will be greater.
2. Bottom current velocity. High bottom current velocities can erode and disperse resuspended sediments regardless of dispersion in the total water column.
3. Bottom sediments and community. The benthic community will also affect the impact. Areas of high biological productivity may be able to assimilate higher organic deposition. However, adverse impacts may have greater significance due to the importance of such productive areas. Conversely, areas having few organisms may have less assimilative capacity, but creation of an azoic zone may have less effect on the biological community

9.2 Water Column Impacts

The water quality around coastal fish farms is affected by the release of dissolved and particulate inorganic and organic nutrients. Water column effects around fish farms include a decrease in dissolved oxygen and increases in biological oxygen demand, and nutrients (P, total C and organic and inorganic N) (Penczak et al., 1982). Degradation of water quality parameters is greatest within the fish culture structures and improves rapidly with distance from holding pens. Recent studies have documented only limited water column impacts due to rapid dispersal (Holmer, 2010). The health of the fish stocks is a self-limiting control on water column pollution. Another review found that though the probability of any measurable impact from an offshore farm appears to significantly decrease with distance from the farm, such information suffers from a general lack of robustness and should be quantified with better systematic and standardized reporting with respect to physical farm characteristics (Froehlich et. al., 2017).

9.2.1 Turbidity

Turbidity, an indication of water clarity, may be affected by fish farming operations. The loss of fish food and feces is the largest source of increase in turbidity around net pens. Net cleaning can also significantly increase turbidity down current of net pens. Turbidity will likely be most affected by cage siting with current velocities and tidal influence the major factors. A study in the Puget Sound reported that floating net pens did not affect turbidity (NMFS 1983). Turbidity ranged from 0.5 to 2.0 NTU throughout the study, but measurements were not taken during net cleaning. In other studies, suspended solid concentrations and light attenuation (due to turbidity) were found to be insignificant or localized.

9.2.2 pH

The effects of fish farming on water column pH was studied by Pease (1977) who reported that a net-pen facility in a poorly flushed, log rafting area (Henderson Inlet, Washington) did not affect pH. Pease also reported that tidal factors were the primary factor regulating pH at all sites.

9.2.3 Temperature

The operation of floating net pens would not affect water temperatures in the Gulf. Net pens have no features that would measurably change heat loss or heat gain in surrounding waters.

9.2.4 Fecal Coliforms

Fecal coliform bacteria are produced in the digestive tracts of warm-blooded animals. Net pens do not directly affect ambient (existing) fecal coliform concentrations in surrounding waters because fecal coliforms are not produced in fish. However, fecal coliform levels could indirectly increase near net pens from increased marine bird and mammal activity or human activity.

9.2.5 Nutrients

Nutrient addition to the Gulf is of concern because they contribute to certain harmful algal blooms (HABs). HABs are on the rise in frequency, duration, and intensity in the Gulf, largely because of human activities (Corcoran, et.al., 2013). Of the more than 70 HAB species occurring in the Gulf, the best-known is the red tide organism, *Karenia brevis*, which blooms frequently along the west coast of Florida. Macronutrients, micronutrients and vitamins characteristic of fish farms are growth-promoting factors for phytoplankton. The primary nutrients of interest in relation to net pens are nitrogen and phosphorus; both may cause excess growth of phytoplankton and lead to both aesthetic and water quality problems. Generally, in marine waters, phytoplankton growth is either light or nitrogen limited, and phosphorus is not as critical a nutrient as it is in fresh water (Ryther and Dunstan, 1971; Welch, 1980). However, it has been shown that because nutrient fluctuations in the Gulf can be significant due to the large inputs from river systems, both nitrogen limitation and phosphorus limitation can happen in different locations, but during the same time frame (Turner and Rabalais, 2013)

Nitrogen may be categorized as: (1) inorganic (nitrate, nitrite and ammonia and nitrogen gas); and (2) organic (urea and cellular tissue). Most of the organic matter in waste food and feces from net pens is composed of organic carbon and nitrogen (Liao and Mayo, 1974; Clark et al., 1985). About 22 percent of the consumed nitrogen is retained within the fish tissue and the remainder (78 percent) is lost as excretory and fecal matter (Gowen and Bradbury 1987). In a summary of nitrogen budgets in marine cage aquaculture, Islam (2005) reported that 68–86 percent of the nitrogen input as feed is eventually released to the environment. In a recent study, it was determined that about 63 percent of nitrogen fed at a rainbow trout *Oncorhynchus mykiss* farm was lost as dissolved nitrogen (Norði et al., 2011).

Approximately 87 percent of the metabolic waste nitrogen is in the dissolved form of ammonia and urea; the remainder (13 percent) is lost with the feces (Hochachaka, 1969). Salmon will produce approximately 0.22 to 0.28 grams of all forms of dissolved nitrogen per day per kilogram of fish produced annually (Ackefors and Sodergren, 1985; Penczak et al., 1982; Warren-Hansen, 1982). Ammonia and urea are essentially interchangeable as phytoplankton nutrients. Immediately downstream of most net pens (5-30 m) the concentration of ammonia diminishes greatly. This decrease is probably due to the natural microbial process of nitrification (oxidation of ammonia to nitrites and nitrates). Rapid rates of nitrification are expected in any well-oxygenated aquatic environment (Harris 1986). The effects of these factors on phytoplankton near fish farms are variable and not enough scientific evidence is available to suggest that macronutrients and micronutrients from fish farming, or the proposed project, can be directly related to the occurrence of red tides.

9.2.6 Ammonia Toxicity

Toxic chemicals would not be introduced into the net pens from fish stock or food. Ammonia in the un-ionized form (NH_3) is toxic to fish at high concentrations depending on water temperature and pH (EPA, 1986). High ammonia levels in fish excrement have been shown to raise ambient (existing) ammonia concentrations. Normal concentrations of ionized and un-ionized ammonia in Gulf waters are very low, with some variability. A small percentage of the ammonia originating from net pens typically about 2 percent, will be of the toxic, un-ionized form.

Near-field studies in Washington state (Milner-Rensel, 1986; Rensel, 1988 b,c) have shown increased concentrations of ammonia immediately downstream or within the net pens. Total ammonia values typically have increased from 3 to 55 percent above the low background levels. The highest observed concentrations were only a small fraction of the maximum four-day, chronic exposure level recommended by EPA (1986). A long-term study, under worst-case conditions in southern Puget Sound, found that the greatest concentration of total ammonia observed at any time was 0.176 mg/l, equivalent to 0.006 mg/l un-ionized ammonia, well below chronic exposure threshold (Pease, 1977).

In summary, increases in dissolved nitrogen (including ammonia) are typically seen within salmon net pens. Immediately downstream, nitrogen or ammonia levels may also be elevated compared to ambient, upstream values. However, results are variable (Price and Morris, 2013). In some cases, concentrations were greater or much less than expected compared to predicted values based on freshwater hatchery data. However, even within the net pens, toxic concentrations of un-ionized ammonia were not approached. Net pen fish culture in open Gulf waters will be characterized by relatively large volumes of water passing through cages per unit of fish production. This results in much greater dilution of waste products such as ammonia in net pens when compared to freshwater hatcheries or municipal sewage discharges (Weston, 1986).

9.2.7 Phosphorus

Although nitrogen is generally considered to be the limiting macro-nutrient in many ocean waters, increasing phosphorus levels in coastal waters due to anthropogenic sources is also of concern because some marine systems can be phosphorus limited. Increased phosphorus may, along with nitrogen, contribute to algal blooms and coastal eutrophication. Like nitrogen, the principal sources of phosphorus from fish farms are uneaten food, fecal matter and metabolic wastes. A review of phosphorus budgets of marine cage aquaculture reported that an average of 71.4 percent of the phosphorus in feed was released into the environment, the amounts depending on species cultured, feed type, and feeding efficiency (Islam, 2005). Though fewer studies looked at phosphorus impacts, of those that did, a number showed measurable increases in dissolved phosphorus around net pens, several showed statistically significant increases (Price and Morris, 2013).

9.2.7 Dissolved Oxygen

Dissolved oxygen consumption by fish, and by microbial decomposition of fish wastes and excess food, could significantly reduce water column dissolved oxygen concentrations near the pens. Most of the microbial decomposition is associated with solids that settle to the bottom (Institute of Aquaculture, 1988). Thus, the greatest potential for oxygen consumption would be from fish respiration near the surface and microbial decomposition near the bottom.

The total effect of oxygen consumption from net-pen operations on dissolved oxygen concentrations near the pens is highly variable. The loss of dissolved oxygen depends on the water exchange rate near pens, fish density, and fish feeding rate. If the water exchange rate near the pens is high, there will be less reduction of dissolved oxygen. If the fish density and fish feeding rate are high, there will be increased dissolved oxygen.

In general, the dissolved oxygen requirements of fish raised in net pens limit the impact net pens can have on the environment. The lowest oxygen levels caused by net pens are likely to occur within the net pens and immediately down current. Thus, the impact of low dissolved oxygen is likely to affect the net-pen operation before having an effect on the surrounding environment.

9.3 Organic Enrichment Impacts to Seafloor Sediments

Numerous studies have shown that organic enrichment of the seabed is the most widely encountered environmental effect of culturing fish in cages (Karakassis et al., 2000, Karakassis et al., 2002, Price and Morris, 2013). The spatial patterns of organic enrichment from fish farms varies with physical conditions at the sites and farm specifics and has been detected at distances from meters to several hundred meters from the perimeter of the cage array (Mangion et al., 2014). Studies of fish farms in the Mediterranean showed that the severe effects of organic inputs from fish farming on benthic macrofauna are limited to up to 25 m from the edge of the cages (Lampadariou et al., 2005) although the influence of carbon and nitrogen from farm effluents in sea floor can be detected in a wide area about 1,000 m from the cages (Sara et al., 2004). The impacts on the seabed beneath the cages were found to range from very significant to relatively negligible depending on sediment type and the local water currents, with silty sediments having a higher potential for degradation.

Sedimentation rates are often 1-3 orders of magnitude higher at fish farms compared to unaffected areas of the coast (Brown et al., 1987; Hall et al., 1990). Weston and Gowen (1988) found the greatest sediment deposition occurred in the direction of the dominant current. Sediment traps under the pens estimated deposition of 52.1 kilograms dry weight per meter squared per year (kg dry wt./m^2/yr) and 29.7 kg dry wt./m^2/yr at the pen perimeter.

Sedimentation effects from net pens are the result of two major factors, additional particulate organic input and inorganic sediment deposition. An additional factor contributing to sedimentation is organic matter that grows on nets and is dislodged from the net during cleaning. This source contributes relatively little to the total sedimentation generated by a net-pen operation (Weston, 1986). The organic input from these sources affects both the chemical composition of the sediments and the responses of the organisms in the sediment (Pearson and Rosenberg, 1978). A review of more recent studies pertaining to nutrient and organic carbon loading to sediments from fish farms around the world can be found in Price and Morris (2013).

One of the main impacts of organic enrichment to seafloor sediments is the stimulation of sediment metabolism, i.e., increased microbial activity, sediment oxygen demand and nutrient release (Holmer, 1991). High organic loading to the sea floor may result in the development of anoxic and reducing conditions and the production of toxic gases, i.e., ammonia, methane and hydrogen sulfide (H_2S).

In undisturbed sediments, oxygen is only able to penetrate a short distance depending upon sediment porosity, bioturbation (activity of burrowing organisms), and current velocity, which controls the rate at which oxygen is renewed at the sediment surface. Oxygenated sediments are typically light tan to light grey in color. Below this oxic layer, sediments are oxygen depleted (anoxic). Anoxic sediments are characterized by their dark black color, and the production of hydrogen sulfide gas. With increasing organic loading, the demand for oxygen for microbial processes and reoxidation of reduced mineralization products increases.

Sediment oxygen demand (SOD) near fish farms can exceed the diffusive oxygen influx and the anoxic layer moves closer to the surface (Brown et al., 1987). Studies have shown that sediment oxygen demand of sediments enriched by fish-farming activities can be 2-5 times higher than in control areas (Hargrave, et al., 1993). In these cases, the organic material often forms a layer over the original sediments. In stagnant areas of poor circulation, oxygen demand by the anoxic sediments will reduce the dissolved oxygen in the overlying water. Anaerobic metabolism of sediments becomes important in organic matter decomposition near farms (Hall et al., 1990). Studies show that soleplate reduction is the terminal process for organic oxidation. Anaerobic decomposition of the organic matter under these conditions may also lead to production of methane in sufficient quantities to produce visible bubbles at the surface. At this point hydrogen sulfide will reach concentrations that allow its distinctive "rotten egg" smell to be detected in the water. H_2S is highly toxic, making these sediments toxic, and at higher concentrations can lead to mortality of fish in pens.

The oxidation-reduction (redox) potential (positive = oxic; negative = anoxic) gives a relative indication of the degree of enrichment. Negative oxidation-reduction (redox) values, indicating a strong possibility of anaerobic conditions and the production of H_2S, are common in sediments near and beneath net pens (Brown et al., 1987). As organic matter continues to accumulate oxygen penetration into sediments are decreased and redox potential values become more negative. Mats of white supplied oxidizing bacteria *Beggiatoa spp*. covering the seafloor beneath salmonid cages have been observed (Hall et al. 1990).

It is estimated that only about 10 percent of the organic matter deposited from net pens each year is broken down through microbial decomposition (Aure and Stigebrandt, 1990), and decomposition has been shown to be inversely related to accumulation. Of the total carbon, nitrogen and phosphorous deposited to sediments, around 79 percent, 88 percent and 95 percent respectively will accumulate and become unavailable to the environment. Release of phosphorous to the environment is insignificant when deposits are greater than 7 cm. Nitrogen mineralization is very slow in normally anaerobic sediments beneath net pens where bioturbation and epifaunal reworking of sediments is minimized. In some studies, it was shown that nitrogen cycling, nitrification (converting ammonium to nitrate) and denitrification (converting nitrate to N_2 gas) ceased. Most of the nitrogen is released to the water as ammonium and dissolved organic nitrogen.

A review of 41 papers (Kalantzi and Karakassis, 2006) covering a wide range of cultured species, habitats, site characteristics and farm management practices concluded that their analysis suggests that the impact radius at fish farms generally decreases with increased depth, at low latitudes and over fine sediment. The authors, however, state that applying common standards over large geographic areas is challenging due to the complex interplay of site characteristics among the studies they reviewed. A 2012 study of a farm in Norway in 190 meters of water showed that despite deep water and low water currents, sediments underneath the farm were heavily enriched with organic matter, resulting in stimulated biogeochemical cycling concluding that water depth alone may not be sufficient (Valdemarsen, et.al., 2012). In another review of 64 studies of benthic fish farm impacts, Giles (2008) developed a quantitative assessment of the relationships between impact parameters and site and farm characteristics. The analysis showed that benthic impact was a function of fish density, farm volume, food conversion ratio, water depth, current strength and sediment mud content. The analysis also suggested that fish farm impacts were confined to a radius of about 40 to 70 m around the farms, however, the inability to satisfactorily model parameters as a function of distance from farms demonstrated the complexity of the spatial distribution of the farms studied.

9.4 Organic Enrichment Impacts to Benthic Communities

The deposition of uneaten fish feed and feces may affect benthic communities in several ways. The accumulation of organic and inorganic particulates may impact benthic flora and fauna. Significant changes in the proportion of the fine sediment fractions can alter the microstructure of the habitat supporting macroinfauna and meiofauna communities resulting in changes in both structure and function. High sedimentation rates may interfere with feeding mechanisms of deposit and filter feeders. Benthic epifauna and flora may be buried at very high rates of sedimentation. Sedimentation rates are often 1-3 orders of magnitude higher at fish farms compared to unaffected areas (Brown et al., 1987; Hall et al., 1990; Holmer, 1991).

Sedimentation from net pens decreases sediment oxygen levels by increasing the demand for oxygen, and by decreasing both diffusion and water flow into the interstitial spaces of the sediment. As increasing amounts of fine sediment accumulate, the depth to which oxygen penetrates is reduced and the underlying sediment layers become devoid of oxygen (anoxic) and unable to support animal life. The only organisms found in such sediments will be those that have access to the surface waters for respiration via burrows or siphons, and anaerobic bacteria, which derive energy from sources other than oxygen.

Depending on the rates of organic loading, community structure near net pens may become dominated by pollution tolerant species or fauna may disappear entirely. Impact studies show variable results with some showing a clear correlation between the deposition of fish wastes and community changes (Brown et al., 1987). Pearson and Rosenberg (1978) present a comprehensive review of the impacts of organic enrichment from a variety of natural and man-made sources on bottom sediments and the associated benthic community. The authors show that benthic communities tend to respond along a gradient of organic loading with effects most pronounced near the source and decrease progressively with increasing distance.

In undisturbed sediments a stable, diverse benthic community exists comprised of relatively large epibenthic (surface dwelling) organisms, smaller burrowing organisms (< 0.5 mm) comprising the macroinfauna and the meiofauna, smaller (< 0.064 mm) that occupy the interstitial spaces between sediment particles. As organic matter is introduced into an undisturbed environment, it provides an additional source of nutrition for the benthic organisms. This additional organic matter benefits the existing filter- and deposit- feeders, and encourages colonization by additional species. Thus, both species diversity and biomass (total weight) of the benthic organisms increases, and the benthic community is enhanced. The authors refer to this as the "transition zone."

Earll et al. (1984) observed benthic conditions below 25 net-pen facilities in Scotland. He noted that the redox potentials were reduced to a distance of 20 to 30 m from the pens and that Beggiatoa first appeared 10 to 15 m from the pen perimeter. Outside this zone, the sediment surface appeared normal and was light brown in color with a thin covering of diatoms. Predator species such as crab, flatfish, nudibranchs, and anenomes were abundant. Scallops, starfish, and sea cucumbers were also observed. Stewart (1984) noted that organic loading, carbon:nitrogen ratios, and redox potentials were essentially normal beyond 40 m of a pen site. He concluded that the transition zone extended 37 to 100 m from the pens.

High species abundance and diversity, representing both pre-existing species and newly colonized species, were found in a zone 15 to 120 m from pens by Brown et al. (1987). Gowen et al. (1988) observed that total organic carbon, redox potentials and dissolved oxygen levels were normal beyond 15 m of the pens, and that opportunistic species dominated the zone between 15 and 120 m, with the inner boundary of the transition zone being 20 to 25 m from the pen boundary.

In studies conducted by Weston and Gowen (1988) it was estimated that normal benthic communities extended to within 150 to 450 m of the pens. Mobile predators are also abundant in this area, including flat fish (Pease 1984) and crab (Earll et. al., 1984; Cross, 1988). Weston and Gowen (1988) concluded that changes in the biological community extended beyond the zone where chemical changes were detectable. Weston (1990) studied benthic infauna response to organic enrichment at a large Puget sound fish farm. Species richness, biomass and size of organisms decreased near the cages. Total abundance of individuals increased when nematodes (pollution tolerant species) were included. Suspension and deposit feeders found at 450 m either disappeared or were greatly reduced near cages.

Pearson and Rosenberg (1978) observed that as the level of organic input continues to increase, the sediments become progressively dominated by various opportunistic deposit feeders which are able to flourish under these conditions. The most notable deposit feeder is the small, common polychaeta worm *Capitella capitata,* indicative of organic enrichment. Under these conditions, the abundance of these opportunistic species can reach very high densities, to the exclusion of other species. Elimination of the larger, deeper borrowing animals further reduces the ability of oxygen to penetrate the sediments.

Gowen et al. (1988), and Brown et al. (1987) observed that the area between 3 and 15 m was almost exclusively dominated by opportunistic polychaete worms, especially *Capitella capitata.* The total number of species in this zone was about 20 percent of that in undisturbed sediments. The number of individuals, however, was 2 to 3 times normal with total biomass slightly below normal. All of the organisms were polychaete worms, with *Capitella capitata* representing 80 percent of the total organisms. Weston and Gowen (1988) observed increased concentrations of carbon, nitrogen, and reduced redox potentials between 15 and 60 m down current (east) from net pens in the Puget Sound. The abundance of organisms was approximately 4 times greater than background at the pen perimeter and declined to background levels at about 45 m, with *Capitella capitata* the dominant species. Biomass was reduced to about 45 m and increased moderately between 90 and 150 m. Normal conditions were reached between 150 and 450 m from the pens. Pease (1984) reported that geoduck (bivalve mollusk) abundance increased in this area away from the pens. No geoducks were found in the area occupied by *Bogota*. However, in a more recently developed site in British Columbia, geoducks were observed in within the more distant area occupied by *Beggiotoa* (Cross 1988).

At very high rates of organic sedimentation, few species can survive. At this point, the anoxic layer reaches the sediment surface, depriving the animals of oxygen and exposing them to toxic H2S. In these sediments, the surface is black and devoid of any animals (azoic). Gowen et al. (1988) estimated that input of organic matter at rates greater than about 8 g carbon/m /day resulted in production of methane and azoic conditions. At low concentrations, H_2S can reduce fish health through gill damage and at higher concentrations be toxic to fish in the pens above the sediments. Such affects have only been reported in stagnant areas with little water circulation.

Azoic zones have been reported under most net pens, though their presence depends on the size (amounts of wastes produced) of the fish farm (Weston and Gowen 1988) and water circulation beneath and around cages (Weston 1986; Institute of Aquaculture 1988). The absence of *Beggiotoa* under the pens observed by Earll et al. (1984) was attributed to its need for both oxygen from surface water and H_2S from the anoxic sediments. No live animals were observed in this zone; however, occasional dead starfish, nudibranchs and sea cucumbers were observed on the surface. Gas bubbles (methane) were evident in the sediment and redox potentials were severely depressed. Stewart (1984) observed these conditions to extend to about 3 m from the pen perimeter. observed a zone of dark, black sediments under most net pens observed. Similar observations are reported by Gowen et al., (1988) extending 3 m from the pens. In this zone, total organic carbon levels are about twice background levels and redox potentials were consistently less than -100 mV, despite seasonal variations. Dissolved oxygen in the overlying water was reduced and gas bubbles were observed. Hall and Holy (1986) measured chemical changes below a small net pen complex. Both total organic carbon and nitrogen concentrations were increased ten-fold above background levels, and benthic oxygen consumption was increased 12 to 15 times. Deposition under these pens was 50 to 200 g/m2/day total solids, about 20 times higher than background.

The effects of organic enrichment of the sediments begins quickly after installation and operation of the net pens. Weston and Gowen (1988) observed only limited changes in the community at the Squaxin Island site after 18 months of operation. Ritz et al. (1989) saw a decline in macroinfauna signifying moderately disturbed conditions (biomass>abundance) beneath salmonid cages in Tasmania within seven weeks of fish stocking. Infauna community conditions (biomass<abundance) returned to normal within seven weeks after harvest. Further measurable change at 14 weeks post-harvest. Species richness increased by a factor of 2.5 after fish were harvested. Mazzola et al. (1999) examined changes in meiofauna community structure at a Mediterranean fish farm. Sediments reached reducing conditions within 6 weeks of commencement of culture operations. Meiofauna species richness and abundance decreased (on average 70 percent) within three months.

Recovery of affected benthic communities may take a period of months or years, however, the benthic sediment chemistry appears to recover to normal levels relatively rapidly. In Puget Sound, Pamatmat et al. (1973) observed normal benthic oxygen consumption 2 months after pen removal. Dixon (1986) noted that bottom sediments appeared normal at two pen sites in the Shetland Island, 12 months after removal of the pens. Biological recovery may take much longer depending on the successional colonization of the area by different species and normal recruitment cycles (Pearson and Rosenberg, 1978). Species abundance will recover more quickly than biomass due to the growth rates of the larger animals. Rosenberg (1976) observed that the recovery of the area surrounding a pulp mill discharged required 3 to 8 years to recover.

An extensive review of more recent studies (since 2000) of fish farming impacts to benthic communities can be found in Price and Morris (2013).

9.5 Antibiotics

Three antibiotics are currently registered by the U.S. Food and Drug Administration (FDA) for use in treating fishes farmed for human consumption. Austin (1985) discussed the effects of antimicrobial compounds that are used in fish farming and that may escape into the environment. He noted that data are not available on the quantities of antimicrobial compounds entering the environment from fish farming. However, his research provides estimates of probable concentrations of antibiotics leaving freshwater fish farms. The estimated dilution of Oxytetracycline (OTC), based on maximum allowable levels of administration, was 1 part in 50,000,000. This dilution was regarded as a worst-case estimate, based on no retention of the administered drug in the fish. Thus, Austin (1985) concludes that the concentrations of drugs reaching the environment are very small.

Austin (1985) noted that use of antibiotics in fish farms could lead to an increase in antibiotic resistance among bacteria in the farm effluent. Other authors have reported the phenomenon of antibiotic resistance of bacteria near fish farms in which the medications are applied (Aoki, 1975, 1988; Aoki et al., 1971, 1972b, 1974, 1977, 1980, 1984, 1985, 1986a, 1987a; Aoki and Takahashi, 1986; Takashima, et al 1985; Bullock et al., 1974; Toranzo et al., 1983). Bacteria can gain antibiotic resistance through the selection of bacteria which contain resistance factors, or plasmids, some of which may be transferable from one fish pathogenic bacterium to another under certain conditions (Akashi and Aoki, 1986b; Aoki and Kitao, 1985; Aoki and Takahashi, 1987; Aoki et al., 1972a, 1986b, 1987b, 1981; Mitoma et al., 1984; Toranzo et al., 1984). It is also known that the plasmids, or resistance factors, can confer resistance to more than one antibiotic when transferred from one bacterium to another (Aoki et al., 1987a). The presence of plasmids has been documented in both fish pathogenic bacteria (see above citations) and in native aquatic bacteria (Burton et al., 1982).

An FDA study to evaluate the use of OTC for aquatic applications analyzed the environmental impact of the antibiotic on disease control in lobsters held in impoundments Katz (1984). Based on seawater dilution and lack of long-term selective pressure favoring the persistence of OTC resistant organisms, Katz (1984) concluded that "there should be no build-up of antibiotic resistant population of microorganisms from the use of OTC in treating gaffkemia in lobsters." In the same report, Katz concluded that "the potential of R-factor (resistance-factor) transfer between organisms should be minimal", due to dilution, low levels of nutrients, low temperatures, and high salinity of seawater.

The technical literature cited above indicates the several factors. They are occurrence of antibiotic resistant bacteria in association with aquaculture depends on the diversity, frequency, and dosage of antibiotic administration, and environmental conditions of culture including temperature, dilution of the antibiotics, and the containment of the fish and associated bacteria.

The reports of antibiotic resistance from Japan are from very intensive aquaculture sites characterized by warm temperatures, high densities of fish grown in confined ponds, and the use of a variety of antibiotics not registered for use in the United States. As well, the dosage and duration of antibiotic treatment in Japan appears to exceed both legal and general practices in the United States. Thus, while these studies document antibiotic resistance in fish pathogenic bacteria due to the administration of antibiotics, they should not be interpreted to indicate that similar antibiotic resistance will occur under very different environmental conditions and fish husbandry practices. Importantly, studies (Austin, 1985; Aoki et al., 1984) have noted that the increased level of antibiotic resistance associated with antibiotic use around fish farms was soon reduced after antibiotic use stopped. This phenomenon has been observed in human medicine (Forfar et al., 1966) where dramatic declines in resistance levels of bacteria occur after antibiotic treatments are stopped.

The possibility of transfer of drug-resistance factors from a fish disease-causing bacteria to a potential human disease-causing bacteria*, V. parahaemolyticus,* was investigated in Japan (Hayashi et al., 1982). Using test tube conditions and temperatures of about 86°F to 96°F, these authors were able to transfer drug resistance to *V. parahaemolyticus*. These authors also noted that in Japan, where antibiotics have been extensively used in aquaculture, drug-resistant strains of the *V. parahaemolyticus* have never been found in the environment.

Toranzo et al (1984) reported the transfer of drug resistance from several bacteria isolated from rainbow trout to the bacterium, *Escherichia coli*. The transfer to resistance was performed under laboratory conditions at 25° C (77° F). The studies demonstrated the potential for transfer under controlled laboratory conditions and these authors concluded that "Responsible use of drugs in aquaculture will aid in minimizing the development and spread of R+ factor-carrying microorganisms that may confer drug resistance…".

The accumulation of antibiotic residues in shellfish near fish farms has received little study. In the Puget Sound area (Tibbs et al., 1988) found that mussels, oysters, and clams suspended within a matrix of net pens in which coho salmon were being given food supplemented with OTC had no detectable levels of the antibiotic in their tissues. That study examined the phenomenon of antibiotic accumulation in shellfish under worst-case conditions with regard to the distance between the fish pen and shellfish (the shellfish were placed within the matrix of fish pens). Weston (1986) noted the large dilution factor that would occur when antibiotics are used in a net pen. He made conservative calculations and computed a diluted level of 3 parts per billion of OTC in a parcel of water passed through a fish pen receiving medicated feed. Given this dilution factor and the water-soluble nature of antibiotics like OTC, Weston (1986) concluded that there was little potential for bioaccumulation of antibiotics used in fish farming.

Jacobsen and Bergline (1988) reported the persistence of OTC in sediments from fish farms in Norway. These authors also conducted laboratory tests and concluded that the half-life (time required for a given concentration to decay to 50 percent of the starting concentration) for OTC in marine sediments was about ten weeks, but would likely depend on sediment type and other factors. They examined sediments from underneath four farms, but did not report the duration or quantities of OTC applied at each location. OTC was found in sediments from three of the four farms at levels from 0.1 to 4.0 mg/kg (ppm) of dry matter. This level would potentially be high enough to be inhibitory to marine bacteria (1-2 ppm is considered inhibitory) including vibrios. However, since the concentration is reported relative to dry weight, it overestimates the actual concentration in hydrated sediment. The study does demonstrate that measurable OTC can accumulate below fish farms. Conservatively, the study can be interpreted to show the highest concentrations were just above inhibitory levels on a dry-weight basis. The authors also noted that the oxidation state of the sediments would affect the half-life of OTC. An Environmental Assessment of OTC by the FDA (USFDA, 1983) concluded that "the use of OTC is beneficial to control diseases in aquatic environment and does not pose adverse effects on this compartment. However, steps should be developed to avoid the emergence of drug-resistant organisms."

Accumulation of antibiotics in marine sediments is also a function of the dilution factor (which determines the level of antibiotic reaching the sediment), biotransformation of the compound in the sediment, oxidation state of the sediment, and water solubility of the antibiotic. Levels of OTC such as those calculated by Weston (1986) to reach sediments are not likely to have inhibitory effects on non-pathogenic bacteria, which are little affected at levels below 1 ppm (Carlucci and Pramer, 1960). In their study of the microbial quality of water in intensive fish rearing, Austin and Allen-Austin (1985) note that while it is difficult to make generalizations, their study indicated that two freshwater fisheries they monitored did not produce "a major imbalance in the aquatic bacterial communities."

Although some technical details require further study, the issues surrounding antibiotic use in fish farming have received some detailed study. Studies demonstrate that antibiotics will be released into the environment when used as a medication for farmed fish. Antibiotics have not been detected in shellfish held near salmon net pens. One Norwegian study found concentrations of one antibiotic may have been close to inhibitory levels in three of four farms. The concentrations of antibiotics outside of the immediate proximity of the fish pens are regarded by most authors as being too low to have adverse effects.

The presence of plasmids, a mechanism by which bacteria transfer resistance, is documented in pathogenic and native aquatic bacteria. Antibiotic resistance has been recorded in bacteria around fish farms. Most of the technical literature describing antibiotic resistance in fish pathogenic bacteria is based on studies of aquaculture practices and environmental conditions not comparable with salmon net-pen farming in the Puget Sound region. These conditions include high temperatures, high densities of fish, close proximity of multiple farms, and use of a variety of antibiotics not used in fish farming in the United States. Conditions in the studies reporting antibiotic resistance favor the development of resistance. In comparison, salmon net-pen farming in the Puget Sound region would not favor the development of antibiotic resistance. In addition, the federal regulations that apply to the use of antibiotics in fish farming in the United States appear to be much more stringent than those that apply in Japan and Europe, where most of the technical literature has originated. Antibiotic resistance tends to disappear when antibiotic administration is stopped. Shellfish held within a net-pen complex did not accumulate detectable levels of OTC. This observation and the calculated dilution of antibiotics away from the fish pens further suggest that any quantities of antibiotics accumulated in shellfish, or other benthic or planktonic marine invertebrates not near the pens would be substantially below levels of concern.

The lack of antibiotic resistance in a potential human disease-causing bacteria such as V. parahaemolyticus in Japan, despite the extensive use of antibiotics in aquaculture there, indicates the transfer of drug resistance from fish to human pathogenic bacteria is unlikely. It appears such transfer is a laboratory phenomenon, which requires highly controlled conditions and is not representative of phenomena that occur in the environment. The Toranzo et al (1984) study further demonstrates the potential for drug resistance transfer under controlled conditions (77°F).

The applicant has indicated that FDA-approved antibiotics or other therapeutants will not likely be used (within any feed or dosing the rearing water) during the proposed project.[19] The need for drugs is minimized by the strong currents expected at the proposed action area, the low fish culture density, the cage material being used, and the constant movement of the cage. In the event that drugs are used, the NPDES permit requires that the use of any medicinal products including therapeutics, antibiotics, drugs, and other treatments are to be reported to the EPA. The report must include types and amounts of medicinal product used and the period of time it was used.

9.6 Waste Deposition Analysis

The proposed project generates and discharges various amounts of solid and dissolved wastes depending on the fish biomass contained and amount of feed added daily. Solid waste consists primarily of unconsumed feed and fecal material. Other minor sources of solid wastes include dead fish, fish parts (i.e. scales, mucous, etc.) and material dislodged during net cleaning operations. Dissolved wastes include fish metabolic wastes, plus therapeutic agents (e.g. antibiotics), if used, antifoulants, if applicable. The focus of this analysis is the discharge of the primary solid wastes, feed and fecal material and dissolved metabolic wastes.

This facility as proposed consists of a single 17 m diameter floating cage estimated to hold approximately 80,000 lbs of fish at harvest. It is estimated that feeding rates would approximately 745 lbs per day at the maximum expected fish biomass. Factors influencing the transport and fate of materials discharged from net-pen facilities include oceanographic characteristics of the receiving water, physical characteristics of the net-pen, water depth below the net-pen, configuration and orientation of the net-pen system in relation to predominant currents, type of food used, fish feeding rates and stock size. Oceanographic considerations include tides, wind, stratification, and current velocities and direction.

The NCCOS conducted environmental modelling analysis of the proposed project to help determine the fate and effects of solid wastes discharged from the net-pen at maximum production rates. Numerical models were constructed based upon anticipated farming parameters including configuration (net pen volume and mooring configuration), fish production (species, biomass, size) and feed input (feed rate, formulation, protein content). It should be noted that the models used the maximum fish production amounts for the entirety of the simulation period. Several model scenarios were constructed, the first based on the actual estimated production of a single cohort to harvest. The second scenario examined the solids discharge based on a doubling of the estimated actual production to provide a "worst case" for potential impacts. The third model scenario assumed a maximum biomass for the entire 5-year term of the NPDES permit.

9.6.1 Solid Waste Discharge

A solids deposition model was performed using data from the production model, as well as environmental and oceanographic data on the proposed offshore location (see NCCOS technical reports in Appendix A and B). DEPOMOD and NewDEPOMOD, a particle tracking model for predicting the flux of particulate waste material (with resuspension) and associated benthic impact, was developed for net-pen fish farms. Net depositional flux of organic carbon was predicted in g m^2/yr on a two-dimensional grid overlaid on the farm footprint. The grid size of 4 km^2 was selected such that it would encompass the whole depositional footprint.

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[19] The applicant is not expected to use any drugs; however, in the unlikely circumstance that therapeutant treatment is needed, three drugs were provided to the EPA as potential candidates (hydrogen peroxide, oxytetracycline dihydrate, and florfenicol).

The results of the first depositional model show that for the estimated production values, net organic carbon accumulation would be at 3.0 g/m^2/yr or less for 99.7 percent of the test grid. The second depositional model performed at twice the estimated production, net organic carbon accumulation would be 5.0 g/m^2/yr or less for 99.0 percent of the grid.

The model also estimated a biotic index, Infaunal Tropic Index (ITI), that is used as an indicator of organic enrichment based on expected changes in benthic macroinvertebrate community feeding responses to increases in deposited organic matter. The three model simulations resulted in ITI predictions ranging from 58.67 to 58.96. The predicted ITI close to 60 suggests that the proposed Velella project will not likely have a discernable impact on the benthic infaunal community around the site. The third modeling scenario (full production for the 5-year term) showed that “Velella project will present challenges for monitoring and detecting environmental impacts on sediment chemistry or benthic communities because of the circulation around the project location and the small mass flows of materials from the net pen installation.”

9.6.2 Dissolved Wastes

The NCCOS technical reports estimated that 2,743 kg of ammonia nitrogen would be produced using the maximum biomass for the entire 280-day fish production cycle. The report suggested that daily ammonia production at levels twice as high as estimated will be undetectable within 30 meters of the cage at typical current flows regimes in the vicinity of the proposed site.

The NCCOS technical report did not provide dilution estimates for the dissolved waste discharge downstream of the cage. Modelling input parameters within the NCCOS report were used to calculate the flow-averaged ammonia concentration at the downstream edge of the cage for comparison with published water quality criteria for ammonia in saltwater (EPA, 1989). The ambient water quality criteria for ammonia in saltwater state that “saltwater aquatic organisms should not be affected unacceptably if the four-day average concentration of un-ionized ammonia does not exceed 0.035 mg/l more than once every three years on the average and if the one-hour average concentration does not exceed 0.233 mg/L more than once every three years on the average.”

A total ammonia loading of 2,743 kg, based an initial estimated 280-day fish production cycle (Table 3 within the NCCOS technical report) was averaged to 9.8 kg/ammonia/day and 113.0 milligrams per second (mg/s). The flow-averaged ammonia concentration is estimated at 0.0072 mg/l (based on an ammonia production of 9.8 kg/day loading rate).[20]

Since the NCCOS technical report, changes in estimated production parameters resulted in total ammonia loading estimates for a 365-day production cycle of 3,978 kg/day. The average daily ammonia load was calculated at 10.9 kg/d and 126.0 mg/s. The flow-averaged ammonia concentration was estimated at 0.008 mg/l (based on an ammonia production of 10.9 kg/day loading rate). Estimates of the flow-averaged ammonia concentrations at the cage edge at maximum fish production are significantly below the published ammonia aquatic life criteria values for saltwater organisms.

[20] The current velocity used for flow calculations is 13.26 cm/s, which is the total mean from Table 4 within the NCCOS technical report. A lateral two-dimensional cage surface area is 1,190,000 cm^2. The lateral flow through the cage was estimated 15,779,400 cm^3/s.

10.0 Evaluation of the Ocean Discharge Criteria

This section summarizes EPA's review of the ten factors that the EPA must consider in determining, pursuant to 40 CFR § 125.122(a), whether a discharge will cause unreasonable degradation of the marine environment, to ensure that the proposed NPDES permit complies with CWA § 403. This section discusses how conditions and limitations included in the final permit for the proposed project ensure compliance with these ODC, and the determination, under CWA § 403, that the NPDES permit will not cause unreasonable degradation of the marine environment with all NPDES permit limitations, conditions, and monitoring requirements in effect.

10.1 Evaluation of the Ten ODC Factors

10.1.1 Factor 1 - Quantities, Composition, and Potential for Bioaccumulation or Persistence of Pollutants

The quantities and composition of the discharged material were presented in Section 4 and the potential for bioaccumulation or persistence was addressed in Section 9. Due to the relatively small fish biomass production estimated for this demonstration project and limited discharges other than fish food and fecal matter, the volume and constituents of the discharged material are not considered sufficient to pose a significant environmental threat through bioaccumulation or persistence. However, to confirm the EPA's decision and as a precaution against any changes in operational practices that could change the EPA's assumptions, the NPDES Permit requires environmental monitoring and implementation of an environmental monitoring plan to meet the requirements of the CWA § 402 and CWA § 403.

10.1.2 Factor 2 - Potential for Biological, Physical, or Chemical Transport

Section 3 and 4 of this document discusses the oceanographic process characteristic of the continental shelf off the west coast of Florida responsible for the physical transport of fish wastes in the environment. Section 8 discusses the results of predicted impacts to the water column and waste deposition on the seafloor surrounding the proposed facility.

Due to the small scale of the proposed project and because the discharged wastes are largely comprised of organic and inorganic particulates and dissolved metabolic wastes, there is little potential for biological or chemical transport. Ocean currents are expected to flush the cages sufficiently to carry wastes away from cages and dilute and disperse dissolved and solid wastes over a large area. For any solid matter settling on the seafloor, bioturbation should serve to mix sediments vertically at low to moderate benthic loading rates and resuspension of sediments should further enhance the dispersion of uneaten food and fecal matter. High loading rates that would be expected to impair benthic communities and reduce the effect of bioturbation are not expected to occur. The physical transport of these waste streams is considered to be the most significant source for dispersion of the wastes and monitoring and regulation is based on the results of those investigations.

10.1.3 Factor 3 - Composition and Vulnerability of Biological Communities

The third factor used to determine no unreasonable degradation of the marine environment is an assessment of the presence of unique species or communities of species, endangered species, or species critical to the structure or function of the ecosystem. Section 4 describes the biological communities of the eastern Gulf including the presence of endangered species and Section 8 discusses the factors that make these communities or species vulnerable to the permitted activities.

High organic loading from fish farms have been shown to alter the physical structure of benthic sediment and to cause anoxic conditions which reduce diversity and abundance of infauna, meiofauna and epibenthic organisms. The area around the proposed facility is mainly comprised of soft sand sediments and their characteristic benthic communities. Results from deposition modeling (Section 8) show the potential for benthic impacts over an area in excess of 1 km^2. The potential for impacts due to toxic effects from a demonstration size fish farm discharge, however, is minimal.

10.1.4 Factor 4 - Importance of the Receiving Water to the Surrounding Biological Community

The importance of the receiving waters to the species and communities of the eastern Gulf is discussed in Section 4 and Section 5 in conjunction with the discussion of the species and biological communities. The receiving water is considered when determining the discharge rate restrictions. The dissolved nutrient estimates and deposition modeling considered concentrations of organic particulates that may have impacts on aquatic life. Permit limitations on minor discharges ensure that levels of these effluents are below levels that could have impacts on local biological communities. EPA finds that operating discharges from the proposed facility will have little adverse impacts on species migrating to coastal or inland waters for spawning or breeding.

10.1.5 Factor 5 - Existence of Special Aquatic Sites

The existence of special aquatic sites and proximity to the proposed project are discussed in Section 7. EPA has determined that the proposed area is located sufficiently far from special aquatic sites off the west Florida coast that any impacts resulting from the proposed facility will likely be limited to the surrounding area, within 300-500 meters from the perimeter of the cage array, and will therefore not impact any special aquatic sites.

10.1.6 Factor 6 - Potential Impacts on Human Health

Section 9 details the Federal and state human health criteria and standards for pollutants of concern. These criteria and standards are for marine waters based on fish consumption. These analyses compare projected pollutant concentrations with these criteria and standards, and indicate that there will be an insignificant depositional and water quality impact. In addition, the permit prohibits the discharge or use of antifouling agents or chemical fish treatments other than antibiotics allowed by the FDA animals raised for human consumption. Based on consideration of this factor, EPA finds that the proposed facility is not likely to have impacts on human health.

10.1.7 Factor 7 - Recreational or Commercial Fisheries

The commercial and recreational fisheries occurring in the eastern Gulf, mainly Alabama, Florida, and Mississippi, are assessed in Section 6. Based on the following, EPA finds that the discharges from the project will not adversely affect water quality or the health of these fisheries:

1. The modeling performed for the proposed project found that there would be minimal to insignificant impact on water quality and seafloor benthic communities.
2. EPA determined that the conditions and limitations in the permit for the proposed project are adequate to ensure that the recreational and commercial fisheries will not be adversely impacted. In addition to environmental monitoring, the NPDES permit will include a requirement that all fish stocked must obtain an Official Certificate of Veterinary Inspection prior to being stocked, and implement BMPs related to fish health management.
3. EPA evaluated that potential social, economic, and environmental impacts to commercial and recreational fisheries caused by the proposed project within the Environmental Assessment to comply with the National Environmental Policy Act (NEPA).
4. The EPA determined, in consultation with NMFS, that there the minimal short-term impacts associated with the discharge will not result in substantial adverse effects on Essential Fish Habitat (EFH), habitats of particular concern, or managed species in any life history stage, either immediate or cumulative, in the proposed project area (see EFH consultation record for more information).

10.1.8 Factor 8 - Coastal Zone Management Plans

Section 7 provides an evaluation of the coastal zone management plan for the State of Florida. On January 3, 2019, the permit applicant submitted a CZMA consistency determination to the Florida State Clearinghouse with the Florida Department of Environmental Protection. On January 15, 2019, the Florida Department of Agriculture and Consumer Services (FDACS) documented that the coastal consistency determination submitted by the applicant was consistent with all FDACS statutory responsibilities for aquaculture. On February 18, 2019, the Florida Fish and Wildlife Conservation Commission (FWC) found that the applicant's coastal consistency determination was consistent with FCMP. Therefore, the EPA has determined that the action covered by this permit is consistent with the CZMA and its implementing regulations.

10.1.9 Factor 9 - Other Factors Relating to Effects of the Discharge

Effluent Guidelines and Standards have been developed for the Concentrated Aquatic Animal Production (CAAP) Point Source Category for facilities producing 100,000 pounds or more of aquatic animals per year in floating net pens or submerged cage systems (40 CFR Part 451 Subpart B). The New Source Performance Standards effluent limitation guidelines for the CAAP industry were applied to the proposed project in the NPDES permit. The effluent limitations and standards for these facilities are non-numeric effluent limitations expressed as practices designed to control the discharge of pollutants from these types of operations. the NPDES permit will include effluent limitations expressed as best management practices (BMPs) for feed managment, waste collection and disposal, harvest discharge, carcass removal, materials storage, maintenance, record keeping, and training. Therefore, impacts to water quality will be reduced by a range of non-numeric effluent limitations through the implementation of project-specific BMPs and operational measures.

Factor 9 of the marine unreasonable degredation criteria are "such other factors relation to the effects of the discharge as may appropriate. Factor 9 was considered, along with the other 9 factors, in developing permit conditions to ensure that unreasonable degradation to the marine environment will not occur as a result of the discharges from the proposed facility. As provided in 40 CFR § 125.123(a),[21] the EPA has included permit conditions that have been determined to be necessary to ensure that unreasonable degradation of the marine environment will not occur by including necessary conditions specified in 40 CFR § 125.123(d), including the following conditions:

1. Implementation of environmental monitoring and an environmental monitoring plan will be required in the NPDES permit to meet the requirements 40 CFR § 125.123(d)(2).[22] The applicant will be required to monitor and sample certain water quality, sediment, and benthic parameters at a background (up-current) location and near the cage.
2. In accordance with 40 CFR § 125.123(d)(3),[23] the NPDES permit must include two conditions related to fish health management and the indirect discharge of pathogens:
    a. a requirement that all stocking of live aquatic organisms, regardless of life stage, must be accompanied by an Official Certificate of Veterinary Inspection signed by a licensed and accredited veterinarian attesting to the health of the organisms to be stocked; and
    b. the BMP plan shall include conditions to control or minimize the transfer of pathogens to wild

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[21] 40 CFR § 125.123(a) states that "If the director on the basis of available information including that supplied by the applicant pursuant to § 125.124 determines prior to permit issuance that the discharge will not cause unreasonable degradation of the marine environment after application of any necessary conditions specified in §125.123(d), he may issue an NPDES permit containing such conditions."

[22] 40 CFR § 125.123(d)(2) states that EPA is allowed to "specify a monitoring program, which is sufficient to assess the impact of the discharge on water, sediment, and biological quality including, where appropriate, analysis of the bioaccumulative and/or persistent impact on aquatic life of the discharge."

[23] 40 CFR § 125.123(d)(3): "Contain any other conditions, such as performance of liquid or suspended particulate phase bioaccumulation tests, seasonal restrictions on discharge, process modifications, dispersion of pollutants, or schedule of compliance for existing discharges, which are determined to be necessary because of local environmental conditions, and"

fish.

3. In accordance with CWA § 403 of the, 40 CFR § 125.123(a), and 125.123(d)(3), the NPDES permit will contain a condition that "The discharge from the facility shall not cause unreasonable degradation of the marine environment underneath the facility and in the surrounding area" under 40 CFR § 125.123(d)(3).

10.1.10 Factor 10 - Marine Water Quality Criteria

The Federal and state marine water quality criteria and standards are discussed in Section 8. The proposed facility will be located in federal waters where no federal or state criteria apply; however, the discharges from the proposed project are not expected to exceed the recommended federal water quality criteria for marine waters that were considered in this ODC Evaluation.

10.2 Conclusion

The consideration of the ten factors discussed in this ODC Evaluation were based on the available information from published literature regarding impacts that have occurred near net pen fish farms from around the world, and information in the Administrative Record for the NPDES permit action regarding the proposed facility and the potential impacts of discharges from the proposed facility. Sufficient information currently exists regarding open water marine fish farming activities and expected impacts from such activities, coupled with information regarding the proposed discharge, to allow the EPA to adequately predict likely environmental outcomes for the Proposed project.

The EPA also determined that the NPDES permit must contain necessary conditions allowed by 40 CFR § 125.123(d). First, the NPDES permit will contain a comprehensive environmental monitoring plan that will confirm EPA's determination and ensure no significant environmental impacts will occur from the proposed project. Second, the NPDES permit must include a requirement that all stocking of live aquatic organisms, must obtain an Official Certificate of Veterinary Inspection prior to being stocked, and implement BMPs related to fish health management. Finally, the NPDES permit will contain a condition that the discharge from the facility shall not cause unreasonable degradation of the marine environment. EPA finds that these conditions, along with other the other conditions in the NPDES permit (i.e. BMP plan, Facility Damage Prevention and Control Plan, etc.), will ensure that the discharges from the facility do not cause unreasonable degradation of the marine environment.

The EPA finds that "no-unreasonable degradation" will likely occur as a result of the discharges from this project based on the available scientific information concerning open ocean fish farming, the results predicted by deposition and dilution modeling, the effluent limit guidelines for the CAAP industry that are being applied to this facility, and the conditions included within the NPDES permit as allowed by the ODC implementing regulations.

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Appendix A

CASS Technical Report
Environmental Modelling to Support NPDES Permitting for Velella Epsilon Offshore Demonstration Project in the Southeastern Gulf of Mexico

CASS Technical Report

Environmental Modelling to Support NPDES Permitting for Velella Epsilon Offshore Demonstration Project in the Southeastern Gulf of Mexico

Lead Scientists: Kenneth Riley, Ph.D. and James Morris, Ph.D.
Environmental Engineer: Barry King, PE
Submitted to Jess Beck (NMFS) and Kip Tyler (EPA), July 19, 2018

This analysis uses an environmental model to simulate effluent to inform the NMFS Exempted Fishing Permit (EFP) and EPA National Pollutant Discharge Elimination System (NPDES) Permit for the Velella Epsilon Offshore Demonstration Project. Kampachi Farms, LLC (applicant) proposes to develop a temporary, small-scale demonstration net pen operation to produce two cohorts of Almaco Jack (*Seriola rivoliana*) at a fixed mooring located on the West Florida Shelf, approximately 45 miles offshore of Sarasota, Florida (Figure 1; Table 1). Scientists from the NOAA Coastal Aquaculture Siting and Sustainability (CASS) program worked with the EPA project manager and the applicant to develop estimates of effluents and sediment related impacts for the offshore demonstration fish farm.

A numerical production model for two cohorts of Almaco Jack was constructed based upon anticipated farming parameters including configuration (net pen volume and mooring configuration), fish production (species, biomass, size) and feed input (feed rate, formulation, protein content). Using industry standard equations, daily estimates of biomass, feed rates, total ammonia nitrogen production, and solids production (*see Microsoft Excel Spreadsheet – Velella Epsilon Production Model*) were developed under a production scenario to estimate the maximum biomass of 20,000 fish that would be grown to 1.8 kg in approximately 280 days. The total biomass produced with one cohort and no mortality was determined to be 36,280 kg. The density in the cage at harvest would be 28 kg/m^3. Fish will be fed a commercially available growout diet with 43% protein content. Daily feed rations range from 12 kg at stocking to a maximum total daily feed ration equivalent to 399 kg at harvest. Maximum daily excretion of total ammonia nitrogen is estimated at 16 kg and solids production is 140 kg. A total of 66,449

The **Coastal Aquaculture Siting and Sustainability (CASS)** program supports works to provide science-based decision support tools to local, state, and federal coastal managers supporting sustainable aquaculture development. The CASS program is located with the Marine Spatial Ecology Division of the National Centers for Coastal Ocean Science, National Ocean Service, NOAA. To learn more about CASS and how we are growing sustainable marine aquaculture practices at: https://coastalscience.noaa.gov/research/marine-spatial-ecology/aquaculture/ or contact Dr. Ken Riley at Ken.Riley@noaa.gov.

kg of feed will be used for production of each cohort of fish to achieve a feed conversion ratio (FCR) of 1.8. Summary statistics were developed for each cohort and the entire project (Table 2).

Table 1. Boundary locations for the Velella Epsilon Offshore Aquaculture Project.

Location	Latitude	Longitude
Northwest corner	27.072360 N	-83.234709 W
Northeast corner	27.072360 N	-83.216743 W
Southwest corner	27.056275 N	-83.216743 W
Southeast corner	27.056275 N	-83.234709 W

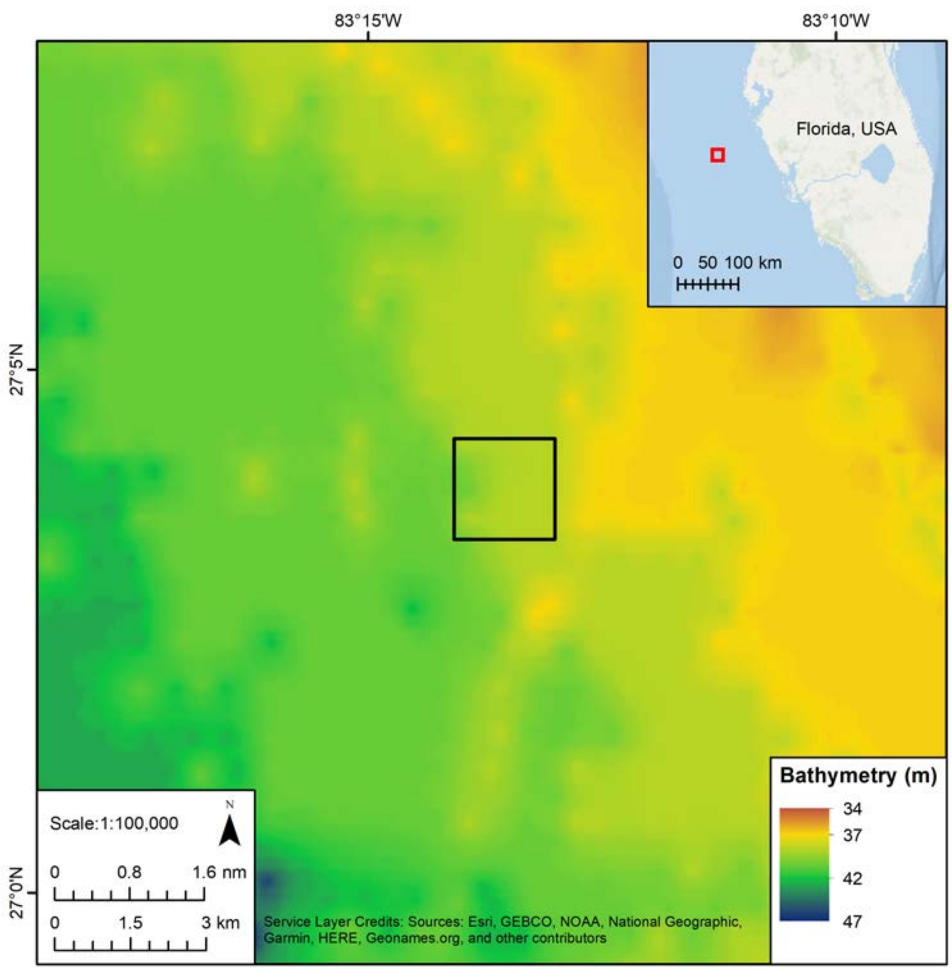

Figure 1. Bathymetric map of proposed Velella Epsilon Offshore Aquaculture Project.

Table 2. Summary statistics for the Velella Epsilon Offshore Aquaculture Project.

Farming parameter	Value
Growout duration	280 days per cohort
Total number	20,000 fish per cohort
Individual size at harvest	1.8 kg
Maximum biomass	36,280 kg
Cage density at harvest	28 kg/m^3
Maximum daily feed rate	399 kg
Total feed used	66,449 kg
Feed conversion ratio	1.8

In order to estimate sediment related impacts, a depositional model (DEPOMOD; Cromey et al 2002) was parameterized with data from the production model and environmental and oceanographic data on the proposed offshore location. DEPOMOD is the most established and widely used depositional model for estimating sediment related impact from net pen operations. DEPOMOD is a particle tracking model for predicting the flux of particulate waste material (with resuspension) and associated benthic impact of fish farms. The model has been proven in a wide range of environments and is considered through extensive peer-review to be robust and credible (Keeley et al 2013). Although this modelling platform was initially developed for salmon farming in cool-temperate waters (Scotland and Canada), it has since been applied and validated with warm-temperate and tropical net pen production systems (Magill et al. 2006; Chamberlain and Stucchi 2007; Cromey et al. 2009; Cromey et al. 2012). Coastal managers responsible for permitting aquaculture worldwide have been using this modelling platform because it produces consistent results that are field validated and comparable (Chamberlain and Stucchi 2007; Keeley et al 2013). It is routinely used in Scotland and Canada to set biomass (and thereby feed use) limits and discharge thresholds of in-feed chemotherapeutants (SEPA 2005). Further, the model output has been used to develop comprehensive and meaningful monitoring programs that ensure environmentally sustainable limits are not exceeded (ASC 2012).

Traditionally a baseline environmental survey is used to inform water quality and depositional models with site specific analysis of currents, tidal flows, sediment profiles, and benthic infaunal profiles (species richness and abundance). In the absence of a survey, data were collected from oceanographic and environmental observing systems in the vicinity of the project area. Current data were obtained from NOAA Buoy Station 42022 along the 50-m isobath and located 45 miles northwest of the project location (27.505 N, 83.741 W). Currents were recorded continuously from July 2015 through April 2018. Currents were measured at 1-meter intervals from 4.0 meters to 42.0 meters below the surface (Table 3). Bathymetric data were obtained from the

NOAA Coastal Relief Model. Bathymetry was resampled to 10 x 10 meter grid cells using a bilinear interpolation to all for use within the deposition model.

Table 3. Water column related impacts for the Velella Epsilon Offshore Aquaculture Project. Values represent summation of daily values over a 280-day production cycle.

Parameter	Value (kg)
Total solids production	23,257
Total ammonia nitrogen	2,743
Total oxygen consumption	16,612
Total carbon dioxide production	19,187

The depositional model was executed for two different production simulations that assume maximum standing biomass and maximum feed rate, which is characteristic when the fish are at pre-harvest size. The first simulation represented the maximum standing biomass for the Velella Epsilon Offshore Aquaculture Project. The model was run for 365 days assuming a net pen with a constant daily standing biomass at 36,275 kg (28 kg/m^3) and a daily feed rate of 1.1 percent of biomass or equivalent to 399 kg of feed. The second simulation doubled production to assess sediment related impacts at higher levels of biomass and feed rates. The second simulation at a higher level of production was intended to aid EPA in development of an environmental monitoring program. Under the second simulation, the model was run for 365 days assuming two net pens each with a combined constant daily standing biomass at 72,550 kg (28 kg/m3 per net pen) and a daily feed rate of 1.1 percent of biomass or equivalent to 798 kg of feed.

Waste feed and fish fecal settling rates are important determinants of distance that these particles will travel in the current flow. The model does not allow the settling velocity of particles to change through the growing cycle. The values used for feed and feces represented those that would be encountered during the period of highest standing biomass, largest feed pellet size, and highest waste output. Each simulation assumed maximum standing biomass each day of the simulation with a fecal settling velocity at 3.2 cm/s. Many marine fish have fecal settling velocities ranging from 0.5 to 2.0 cm/s, while salmonids tend to have higher settling velocities ranging from 2.5 to 4.5 cm/s. Fecal settling velocities applicable to salmon production were used because they are well studied, validated, and allow for maximum benthic impact assessment. Standard feed waste was estimated at 3% and the food settling velocity was 9.5 cm/s. Pelleted fish feed is the single largest cost of fish farming, and because of this expense, farms use best feeding practices to ensure minimal loss. Feed digestibility and water content were set at 85% and 9%, respectively, which are standards based on technical data provided by feed manufacturers. All other model parameters were consistent with existing net pen farm waste modelling methodologies (Cromey et al. 2002a,b) and regulatory farm modelling standards (SEPA 2005).

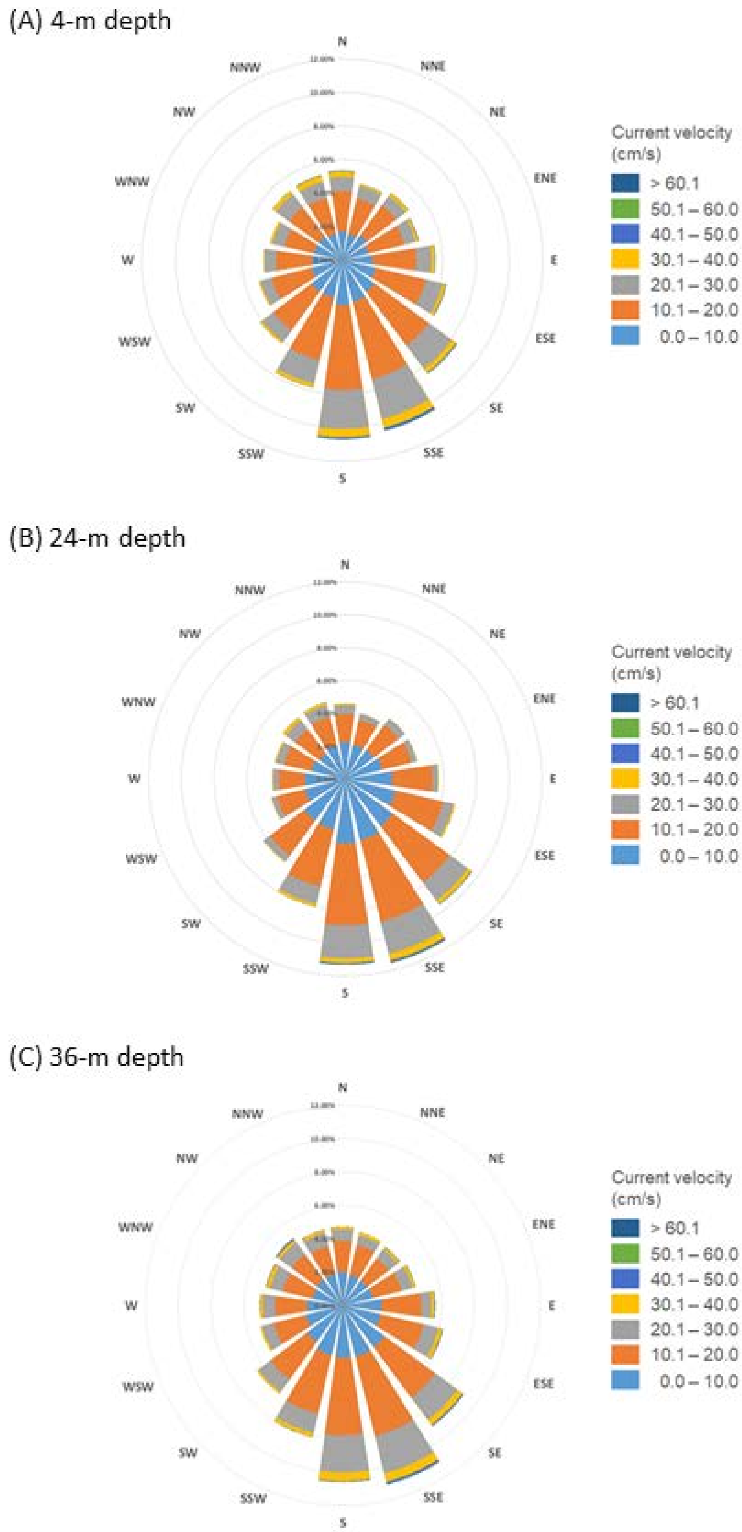

Figure 2. Distribution of current velocities (cm/s) and direction for NOAA Buoy Station 42022 located along the 50-m isobath approximately 45 miles northwest of project location. Currents are reported for water column depths of 4 m, 24 m, and 36 m.

Table 4. Current velocities (cm/s) for NOAA Buoy Station 42022 located along the 50-m isobath approximately 45 miles northwest of project location. Average current velocities are reported with standard deviation.

Depth (m)	Average current (cm/s)	Maximum current (cm/s)
4	14.6 ± 8.1	83.9
10	12.8 ± 8.0	80.3
20	12.2 ± 7.3	67.6
30	13.8 ± 8.2	70.8
40	12.9 ± 7.6	68.7

Table 5. Model settings applied for depositional simulations of an offshore fish farm in the Gulf of Mexico.

Input variable	Setting
Feed wastage	3%
Water content of feed pellet	9%
Digestibility	85%
Settling velocity of feed pellet	0.095 m/s
Settling velocity of fecal pellet	0.032 m/s

Offshore fish farms can be managed in terms of maximum allowable impacts to water quality and sediment that are based on quantifiable indicators. This project will be difficult to monitor and detect environmental change because of the relatively low level of production associated with a demonstration farm and the nature of the net pen configuration deployed and moving about on a single point mooring.

Overall, this analysis found that the proposed demonstration fish farm is not likely to cause significant adverse impacts on water quality, sediment, or the benthic infaunal community. Water quality modelling demonstrated that at the maximum farm production capacity of 36,280 kg only insignificant effects would occur in the water column. We believe that the excreted ammonia levels of 16 kg per day will be rapidly diluted to immeasurable values near (within 30 meters) of the net pen under typical flow regimes of 12.8 ± 8.0 cm s^{-1}. Dilution models could be used to estimate nearfield and farfield dilution as used in conventional ocean outfall systems.

However, based on our experience with offshore aquaculture installations and development of modeling and monitoring programs, we believe that ammonia levels will be difficult to detect beyond the zone of initial dilution.

The model does not allow the net pen or mooring configuration to move in space or time, therefore, the model was executed at a fixed location (27.064318, -83.225726) in the center of the project location (i.e., farm footprint). Net depositional flux was predicted in g m^{-2} yr^{-1} on a two-dimensional grid overlaid on the farm footprint. The grid size was selected such that it would encompass the whole depositional footprint. The distribution of deposited materials beneath the cage is a function of local bathymetry and hydrographic regime. In low current speed environments, only limited distribution of the solids footprint occurs. As current speeds increase, greater dispersion of solids occurs during settling resulting in a more distributed footprint. Greater water depth at a site results in increased settling times and result in a more distributed footprint. Solids distribution is even greater where bottom current speeds are high causing sediment erosion and particle resuspension and redistribution.

The predicted carbon deposition and magnitude of biodeposition for the single and dual cage scenarios were estimated over a 2.04 km by 2.04 km evaluation grid. The grid is partitioned into cells numbering 82 east-west by 82 north-south and identified as 1-82 in both directions. The units of the axes in both Figures 3 and 4 are these cell counts. The dimension of a single cell therefore is 2,040m/82=24.87 m. The depositional model predicted and integrated at each one-hour step, the total carbon that ended up in each cell in the model grid, of which there are 82 x 82 = 6,724 cells. At the end of an execution run the accumulated mass of carbon within each cell is reported. Predicted annual benthic carbon deposition are presented in Figures 3 and 4. Frequency histograms of the carbon deposition per cell were created to help with interpretation of results. The depositional data derived from the frequency histograms are presented in Table 6 and 7.

Table 6 shows the distribution of carbon that results from a single net pen operated for one year at maximum standing biomass. Of the 6,724 computational cells, 1,386 had no carbon from the farm. Over 88% of the cells received less than or equal to 1 gram of carbon. Only 2 cells on the farm measured more than 4 grams of carbon over the year-long simulation.

Table 7 shows the distribution of carbon that results from a two net pens operated for one year at maximum standing biomass. Similar to the depositional model with one cage, over 75% of the cells received less than or equal to 1 gram of carbon. One cell was calculated to receive more than 11 grams, but it is a minuscule mass of carbon to be assimilated by a square meter of ocean bottom.

Table 6. Frequency of carbon deposition within 6,724 cells, each measuring 619 m^2, over a 4.16-km^2 grid system. Values represent an annual sum of carbon deposition resulting from an offshore fish farm with a constant standing stock biomass of 36,275 kg.

Carbon deposition ($g/m^2/yr$)	Occurrence (N)	Frequency (%)
0	1,386	20.6
0.1 – 1.0	4,561	67.8
1.1 – 2.0	620	9.2
2.1 – 3.0	141	2.1
3.1 – 4.0	14	0.2
4.1 – 5.0	2	0.03

Table 7. Frequency of carbon deposition within 6,724 cells, each measuring 619 m^2, over a 4.16-km^2 grid system. Values represent an annual sum of carbon deposition resulting from an offshore fish farm with a constant standing stock biomass of 72,550 kg.

Carbon deposition ($g/m^2/yr$)	Occurrence (N)	Frequency (%)
0	999	14.9
0.1 – 1.0	4,086	60.8
1.1 – 2.0	903	13.4
2.1 – 3.0	390	5.8
3.1 – 4.0	200	3.0
4.1 – 5.0	75	1.1
5.1 – 6.0	40	0.6
6.1 – 7.0	20	0.3
7.1 – 7.0	7	0.1
8.1 – 9.0	3	0.04
9.1 – 10.0	0	0.0
10.1 – 11.0	0	0.0
11.1 – 12.0	1	0.01

Because of physical oceanographic nature of the site including depth and currents (>10 cm/sec), dissolved wastes will be widely dispersed and assimilated by the planktonic community (Rensel et al. 2017). The results of the depositional model show that benthic impacts and accumulation of particulate wastes would not be detectable or distinguishable from background levels through measurement of organic carbon, even when the standing stock biomass is doubled. The final component or step in the modeling process is to predict some measure of change in the benthic community as a result of increased accumulation of waste material. Deposition of nutrients may result a minor increase in infaunal invertebrate population or no measureable effect whatsoever.

As part of the model assessment, benthic community impact was predicted by an empirical relationship between depositional flux (deposition and resuspension) and the Infaunal Trophic Index (ITI). The ITI is a biotic index that has been used to quantitatively model changes in the feeding mode of benthic communities and community response to organic pollution gradients (Word 1978, 1980; Maurer et al. 1999). ITI scores are calculated based on predicted solids accumulation on the seabed (g m^{-2} yr^{-1}). ITI scores range from 0 to 100 g m^{-2} yr^{-1} and are banded in terms of impact as:

- 60 < ITI < 100 – benthic community normal
- 30 < ITI < 60 – benthic community changed
- ITI < 30 – benthic community degraded.

Correlations between predicted solids accumulation and observed ITI and total infaunal abundance have been established using data from numerous farm sites around the world. Among the findings of these studies, a completely unperturbed benthic community at equilibrium is considered to have an ITI of 60 and an ITI rating of 30 is the boundary where the redox potential of the upper sediment goes from positive to negative and sulfide production begins. A standard approach in Europe and Canada is to use an ITI of 30 as a lower limit for acceptable impacts. In the present study with the Velella Project, the two model simulations resulted in ITI predictions ranging from 58.67 to 58.81. The predicted ITI close to 60 suggests that the Velella Project, as proposed, will not likely have a discernable impact on the sediment or benthic infaunal community around the site.

In summary, the resulting model predictions covered a range of outputs representing both submitted farming parameters and a worst-case scenario (doubled standing stock biomass) for the Velella Epsilon Project. We conclude that there are minimal to no risks to water column or benthic ecology functions in the subject area from the operation of the net pen as described in Kampachi Farms, LLC applications for EFP and NPDES permits.

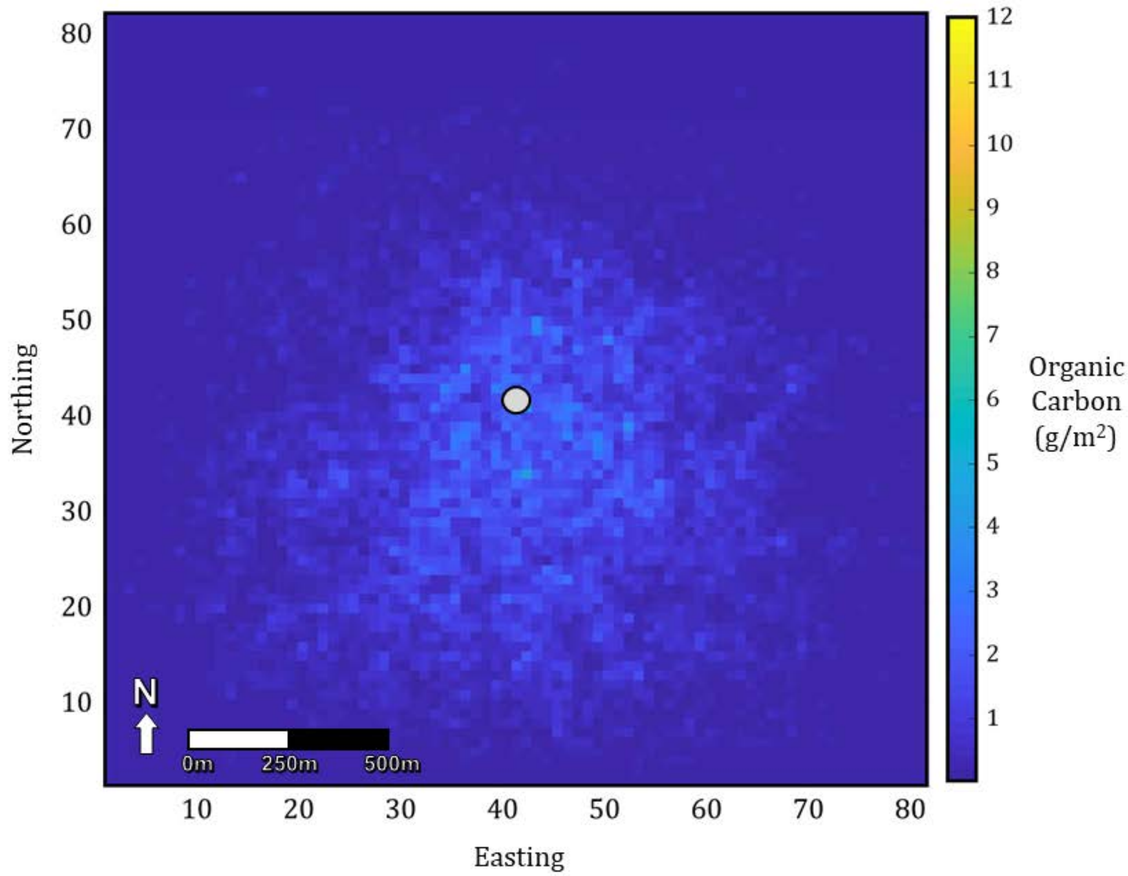

Figure 3. Predicted annual benthic carbon deposition field beneath one net pen with a standing stock biomass of 36,280 kg of Almaco Jack (*Seriola rivoliana*). Gray circle indicates center position of the net pen. Axes indicate simulation cell numbers and deposition mass is in grams.

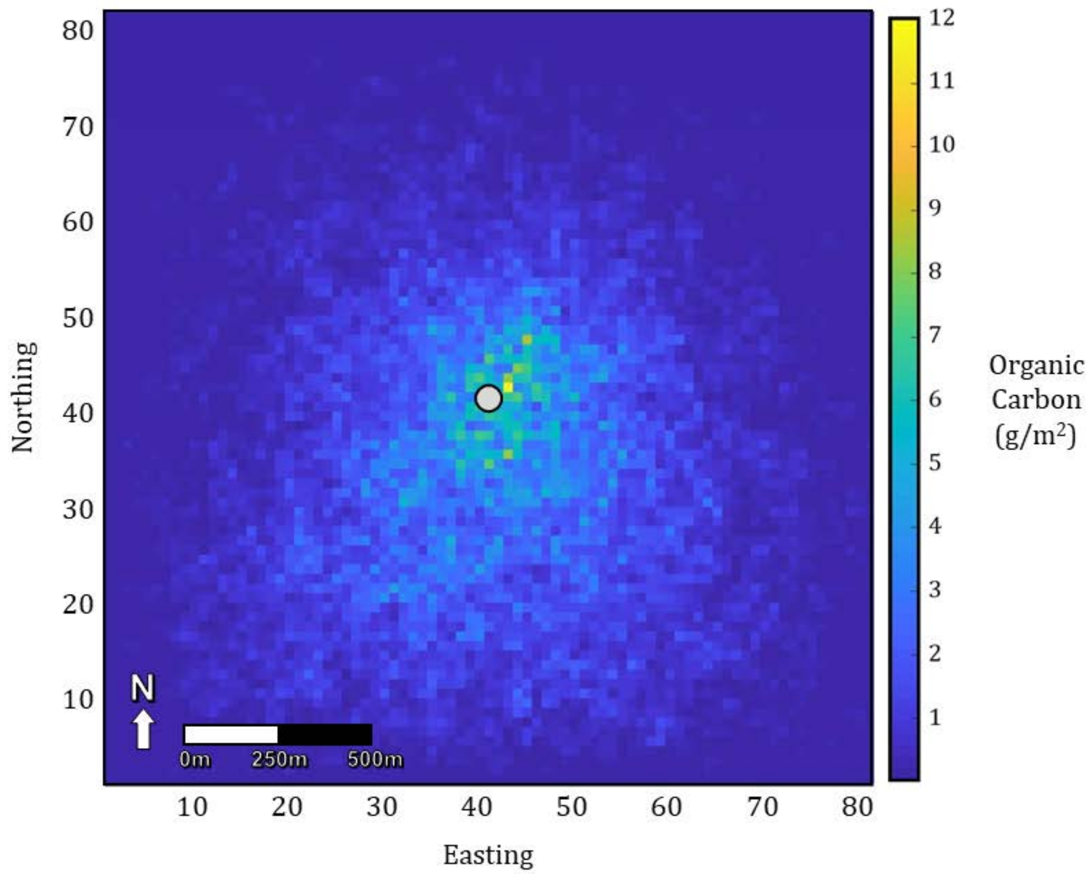

Figure 4. Predicted annual benthic carbon deposition field beneath two net pens with a standing stock biomass of 72,560 kg of Almaco Jack (*Seriola rivoliana*). Gray circle indicates center position of the net pen. Axes indicate simulation cell numbers and deposition mass is in grams. The center of the pens is located at (27.056275 N, -83.216743 W). Predicted carbon loading was derived from the 12-month time series relationship based on depositional flux with resuspension.

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Appendix B

CASS Technical Report

Addendum: Environmental Modelling to Support NPDES Permitting for Velella Epsilon Offshore Demonstration Project in the Southeastern Gulf of Mexico

CASS Technical Report

Addendum: Environmental Modelling to Support NPDES Permitting for Velella Epsilon Offshore Demonstration Project in the Southeastern Gulf of Mexico

Lead Scientists: Kenneth Riley, Ph.D. and James Morris, Ph.D.
Environmental Engineer: Barry King, PE
Submitted to Kip Tyler (EPA), September 23, 2020

This report is submitted as an addendum to the report "Environmental Modelling to Support NPDES Permitting for Velella Epsilon Offshore Demonstration Project in the Southeastern Gulf of Mexico" of August 2018. The Environmental Protection Agency (EPA) is preparing to issue an NPDES permit for the Velella Epsilon Offshore Demonstration Project. The applicant, Kampachi Farms, LLC (now Ocean Era, Inc.), proposes to develop a temporary, small-scale demonstration net pen operation to produce a single cohort of Almaco Jack (*Seriola rivoliana*) at a fixed mooring located on the West Florida Shelf, approximately 45 miles offshore of Sarasota, Florida. With this addendum, scientists from the NOAA Coastal Aquaculture Siting and Sustainability (CASS) program continued to work with the EPA NPDES permitting program to develop estimates of farm discharge deposition on the seabed and surrounding benthic community. Specifically, the farm simulation was executed for five years at the maximum stocking density, with the predicted feed and fish waste daily contributions. The most recent version of DEPOMOD modelling software (i.e., NewDEPOMOD) was used to calculate the distribution and deposition of solid materials at the project location.

Current data were obtained from NOAA Buoy Station 42022 along the West Florida Shelf at the 50-m isobath and located 45 miles northwest of the project location (27.505 N, 83.741 W). The buoy is owned and data are collected by the University of South Florida Coastal Ocean Monitoring and Prediction System with support from the U.S. Integrated Ocean Observing System. Lacking five continuous years of water column flow data at the site, a single year of current data from the original simulation was used to produce the assumed current profile at the project location. Given that single year current data was used for this model, year-to-year variability in oceanographic patterns that are associated with changing climate and weather patterns, water temperature, and storm tracks (e.g., hurricanes) are not evaluated.

As previously reported, bathymetric data were obtained from the NOAA Coastal Relief Model. Bathymetry was resampled to 25 x 25 meter grid cells using a bilinear interpolation to all, for use within the deposition model. The characterization of the site and composition of benthic surfaces were informed by U.S. Geological Survey offshore surficial sediment data (usSEABED) that describes seabed characteristics, including textural, geochemical, and compositional information for the Gulf of Mexico. The benthic surfaces for the project location were also informed by acoustic survey and sub-bottom profile data included with the applicant's Baseline Environmental Survey (BES). Sediment samples, including core or grab samples, were not collected or analyzed as part of the BES. Without knowing explicitly the hydraulic roughness of the benthic surface at the project location, the model was run (as previous) with the assumption of a smooth benthic surface characteristic of unconsolidated sediments (coarse to fine grain sand bottom) such as those common on the West Florida Shelf. Modelling with a smooth benthic surface and reduced roughness tends to lower the bed shear stress and increase resuspension.

The model does not allow the net pen or mooring configuration to move in space or time, therefore, the model was executed at a fixed location (27.064318, -83.225726) in the center of the project location (i.e., farm footprint). The model domain also remained as reported. The model domain was set to encompass the whole initial depositional footprint under average current velocities estimated at 20 cm/s and with particles settling at rates faster than 0.75 cm/s. The dimensions for the model domain are standards required by the Scottish Environmental Protection Agency for marine aquaculture operations. The domain also captures reasonable efficiency in processing large data sets or long time-series data (*i.e.*, model requires 24-36 hours to process). The predicted carbon deposition and magnitude of biodeposition were estimated over a 2.04 km by 2.04 km evaluation grid. The grid is partitioned into square cells with sides measuring 24.87 m and cells numbering 82 east-west by 82 north-south with cells identified as 1-82 in both directions. The modelling software reports the average solids and carbon within each cell as grams per square meter at the moment it is queried, typically at the end of the simulation period.

This model execution did not allow the settling velocity of particles to change through the growing cycle. The values used for feed and feces represented those that would be encountered during the period of highest standing biomass, largest feed pellet size, and highest waste output from the net pen operation. Each simulation assumed maximum standing biomass each day of the simulation with fecal settling and food settling velocities applicable to salmon production at 3.5 and 9.5 cm/s, respectively. The values for fecal settling velocity may have implications for dispersion. For this study, a conservative settling velocity (3.5 cm/s) was used to assess the maximum extent of fecal deposition on benthic surfaces. Knowledge of the physical properties of fish feces under net pen conditions is rudimentary. Most reported literature addresses the fecal stability, density, and settling velocity (3.5 cm/s) of farmed salmon (Reed et al. 2009). Data on fecal settling velocity for Amberjack (*Seriola* spp.) are scarce. Amberjack feces are shapeless and unstable in the water column (*e.g.*, lacking cohesiveness). The species has a reported fecal settling velocity of about 1.6 cm/s owing to its smaller size and density (Fernandes and Tanner 2008).

The model was run for 1,825 days assuming a net pen with a constant daily standing biomass at 36,288 kg (22.85 kg/m3) and a daily feed rate of 1.1 percent of biomass or equivalent to 399 kg of feed. Standard feed waste was estimated at 3%. The model simulates release of fecal and feed particles from a net pen at hourly increments. Multiple particles are released representing different mass percentages and different settling velocities defined in the set-up files. The particles are all tracked throughout the domain at each time step over the duration of the simulation. Particles that are transported out of the domain boundary at 1,020 m away at the closest, are lost and removed from the calculations. Only masses of material that remain in the domain at the moment a surface is queried and recorded are reported. At high current velocity sites, such as this project location where the average flow is 13 cm/s and peaking at 67 cm/s at 4 meters above the seabed (Figure 1), the bulk of settleable solids from the aquaculture operation are dispersed outside of the simulation domain. It is expected that these solids would continue to be oxygenated and transported along benthic surfaces downstream where currents allow for deposition and resuspension. This particulate organic carbon would be readily available and consumed by bacteria and benthic infauna.

SOFTWARE UPDATES

NewDEPOMOD (version 1.3, released July 2020) and previous versions of DEPOMOD are computer models that have been developed by the Scottish Association of Marine Science to inform siting, permitting, and regulation of marine fish farms. The model predicts the impact of farm deposition on the seabed in order to optimize the operation of aquaculture sites to match the environmental capacity. The Scottish Environmental Protection Agency has used the software for over a decade in direct support of their aquaculture permitting standards.

NewDEPOMOD incorporates a range of features in its newest release including:

- improved predictive abilities for offshore aquaculture projects including the capacity to use three-dimensional hydrodynamic flow field data;
- an updated and characterized resuspension process using data from an extensive set of field measurements of erosion, resuspension and transport at farm sites;
- a new model framework for sediment deposition which allows the model to include varying bathymetry; and
- a model that produces conservative estimates of the holding capacity of a proposed site that can be tuned using data collected once a farm enters production to improve predictions, also useful for planning expansion of an existing farm.

ESTIMATING DEPOSITION AND MASS FLOW TO THE BENTHOS

Mass flows of solids onto the seabed were estimated from the mass of cultured fish on the farm and the specific rate, which they are fed (Table 1). We developed a model for a 1,296-m^3 net pen[1] with a stocking density of 28 kg/m^3, which will yield a biomass of 36,288 kg. An estimated 399.17 kg of feed will be applied per day at a feeding rate of 1.1 percent of body weight. During permitting, the applicants changed the net pen design to a larger volume, however the biomass within remained the same at 36,288 kg which is the keystone value for the waste dispersion simulation.

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[1] After completion of modelling, it was noted by the EPA that minor changes occurred with submission of the Ocean Era permit application. The net pen configuration changed as did the size of fish at harvest. The discrepancy in net pen volume (1,296 m^3 vs 1,588 m^3) and fish size (1.8 kg vs. 2.0 kg), and the implications on model results are negligible.

With a feed moisture content of 9% and an estimated 3% food waste rate, the feed dry mass lost from the net pen is: [399.17 kg feed * (100%-9% kg dry feed / kg feed) * 3% kg dry feed lost/kg dry feed] = 10.89 kg dry feed lost to the environment each day, or 0.454 kg per hour.

Since the feed is measured as 49% carbon, the flux is: 10.89 kg dry feed wastage * 0.49 kg carbon/ kg dry feed = 5.34 kg carbon per day from feed.

Similarly, for the fecal mass produced with the assumed 9% feed moisture and 85% utilization: [(399.17 kg feed – 3% lost (11.97 kg)) * 15% fecal mass/mass of solid feed ingested * 91% kg solid feed / kg feed] = 52.85 kg of fecal solids per day, or 2.2022 kg per hour.

Fecal matter is measured as 30% carbon and yields: 52.85 kg of fecal solids * 0.30 kg carbon / kg of fecal solids = 15.85 kg carbon per day

Combining the flux masses for solids and carbon an estimated 63.74 kg of solids and 21.19 kg of carbon are released into the environment each day from the demonstration project.

Table 1. Summary statistics for the Velella Epsilon Offshore Aquaculture Demonstration Project.

Farming parameter	Value
Initial Total number	20,000 fish
Individual size at harvest	1.8 kg
Maximum biomass during growout	36,288 kg
Net pen density at harvest	22.85 kg/m^3
Maximum daily feed rate	399 kg
Total feed used	66,449 kg
Feed conversion ratio	1.8

Table 2 reports the mass flows of solids and carbon from the Velella Epsilon Offshore Aquaculture Demonstration Project within the simulation domain. The bulk of released solids and their carbon are lost from the domain, carried into the far-field by currents. Comparing values of solids in Table 2, the simulation predicts that 3.63% of the solids remain within the simulation domain after five years. There are periods in the water flow cycles when solids accumulation is variable in the domain, as illustrated in Figure 2. The masses on the final day approximate the average concentrations.

Table 2. Mass flows of solids and carbon from the Velella Epsilon Offshore Aquaculture Demonstration Project within the simulation domain at the end of 5 years.

Model Parameters and Simulation Results	Value
Mass of feed applied (5 years)	728,481.60 kg
Mass of feed wastage (5 years)	19,887.57 kg
Mass of feed wastage carbon (5 years)	9,744.89 kg
Mass of fecal materials (5 years)	96,454.61 kg
Mass of fecal carbon (5 years)	28,936.38 kg
Total mass dry solids released / day	63.75 kg
Total mass dry solids released / year	23,268.43 kg
Total mass dry solids released / 5 years	116,342.17 kg
Total mass carbon released / day	21.20 kg
Total mass carbon released / year	7,736.25 kg
Total mass carbon released / 5 years	38,681.27 kg
Solids balance (Total solids within domain after 5 years)	4,224.87 kg
% solids retained inside domain	3.63 %
% solids exported outside domain	96.37 %
Carbon balance (Total carbon within domain after 5 years)	1,406.13 kg
% carbon retained inside domain	3.64 %
% carbon exported outside domain	96.36 %

At the project location, water velocities are typical for currents along the West Florida Shelf. Figure 1 illustrates the water velocity at the Velella site at a depth of 36.7 meters or approximately 4.0 meters above the seafloor. Currents at this project location will likely re-suspend feed wastes and fecal materials transporting these solids across the seafloor. The simulation software calculates the movement of the released solids using the particle characteristics, the nature of the seafloor, and the velocity of the water body in the proximity of the seafloor.

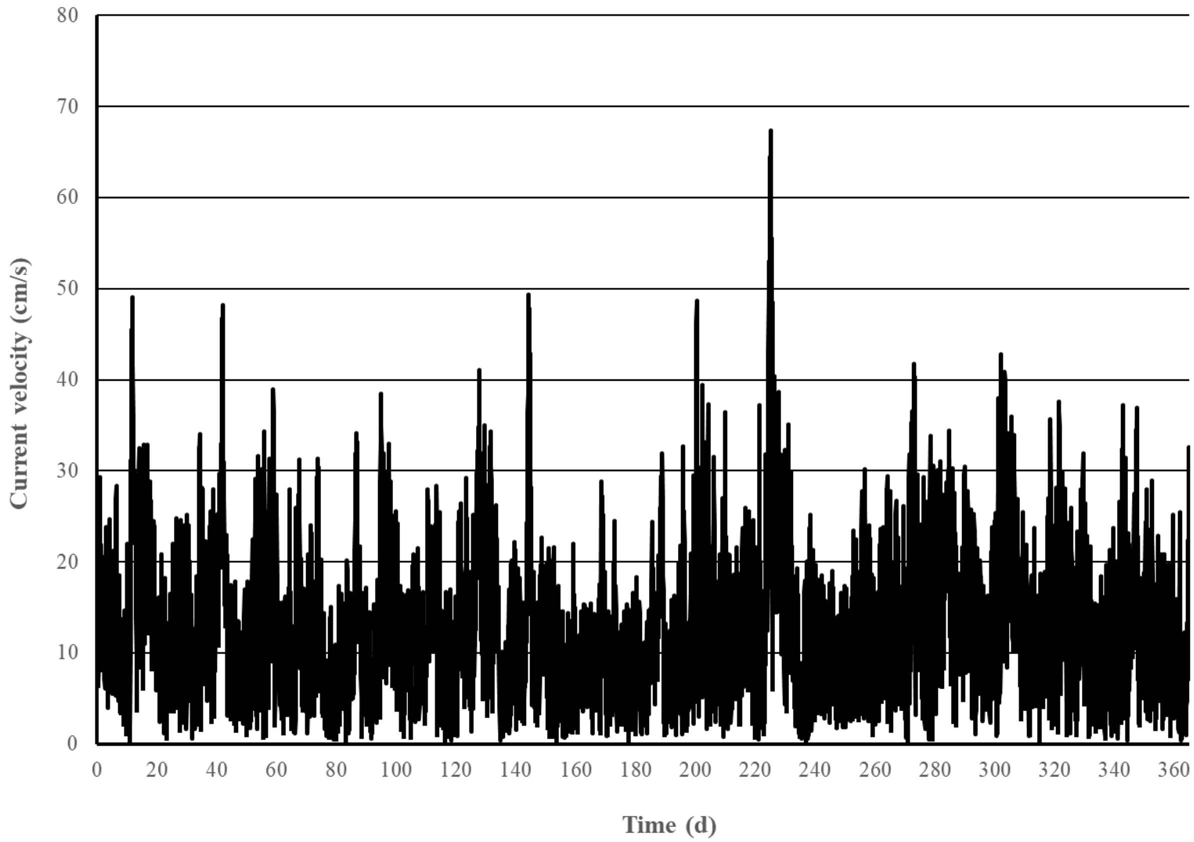


Figure 1. Water currents and flow velocity measured at 4 m above the seafloor.

Figure 2 illustrates the fate of the remaining solids within the domain over the five-year simulation, calculated from the total mass of released solids, minus the total mass of solids that are exported out of the simulation domain. The figure shows that over the five-year simulation solids on the seafloor within the domain reach an equilibrium, at an average total mass of 4,013 kg. The leading edge of the plot illustrates the point material accumulates on the seabed where it will eventually resuspend leading to more material being transported away from the depositional site as currents reach the shear force threshold. During the first days of operation little material was available for resuspension, all the while, new material was being added at a constant 63.75 kg per day.

NewDEPOMOD reports distribution of solids as surface plots of either solids or carbon, it does not distinguish between the sources of the carbon, either feed or fecal, and are combined. In Figure 3, the distribution of carbon is plotted for the final hour of the five-year simulation. Within the software, each surface plot generates its own scale to coincide with the colors on the map. The reader should use caution when comparing plots.

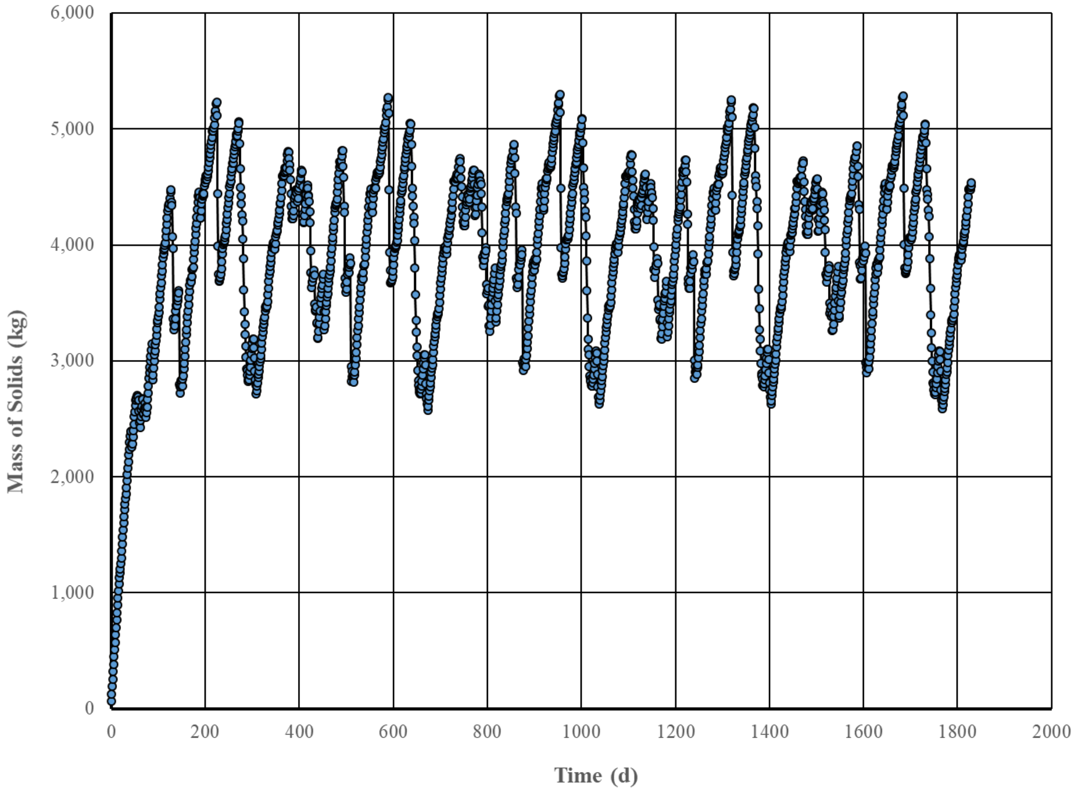


Figure 2. Predicted solids deposition beneath one net pen with a standing stock biomass of 36,288 kg of Almaco Jack (*Seriola rivoliana*) after five-year farm simulation.

Figure 3 shows the carbon distribution over the 2,040 x 2,040 meter Velella simulation domain on day number 1,830. The highest concentration of aquaculture sourced carbon on the site is 4.35 g/m^2. Most noticeable in this deposition prediction map is the wide distribution of carbon over 4 km^2 with small accumulations and no areas of excessive concentrations. Frequency histograms of the carbon deposition per cell were created to help with interpretation of results. The depositional data derived from the frequency histograms are presented in Table 3.

This wide dispersion and low concentration of carbon created the average Infaunal Trophic Index (ITI) score for this final overall benthic surface of 58.96 out of 60. As previously reported, a predicted ITI of close to 60 suggests that the Velella project will not likely have a discernable impact on benthic communities around the project location. Similar to other studies reporting ITI as a measure of benthic impacts from net pen operations, we do not expect significant impact on sediment redox potential or sulfide production. For example, Hargrave (2010) and Keeley et al. (2013) extensively documented correlations among the carbon deposition rate, redox potential, hydrogen sulfide concentration, interstitial dissolved oxygen, and ITI. We believe that the Velella project will present challenges for monitoring and detecting environmental impacts on sediment chemistry or benthic communities because of the circulation around the project location and the small mass flows of materials from the net pen installation. As the simulation illustrates, the high energy environment at the site and the mass flow of materials equilibrates at a resident total mass of waste products at approximately 4,000 kg with local masses never exceeding more than 43.4 g solids per square meter for a single sample point over the 5 year simulation.

CONCLUSION

There are minimal to no risks to sediment chemistry or benthic ecology functions in the project area from the operation of the net pen as described in the Ocean Era, LLC application for an NPDES permit.

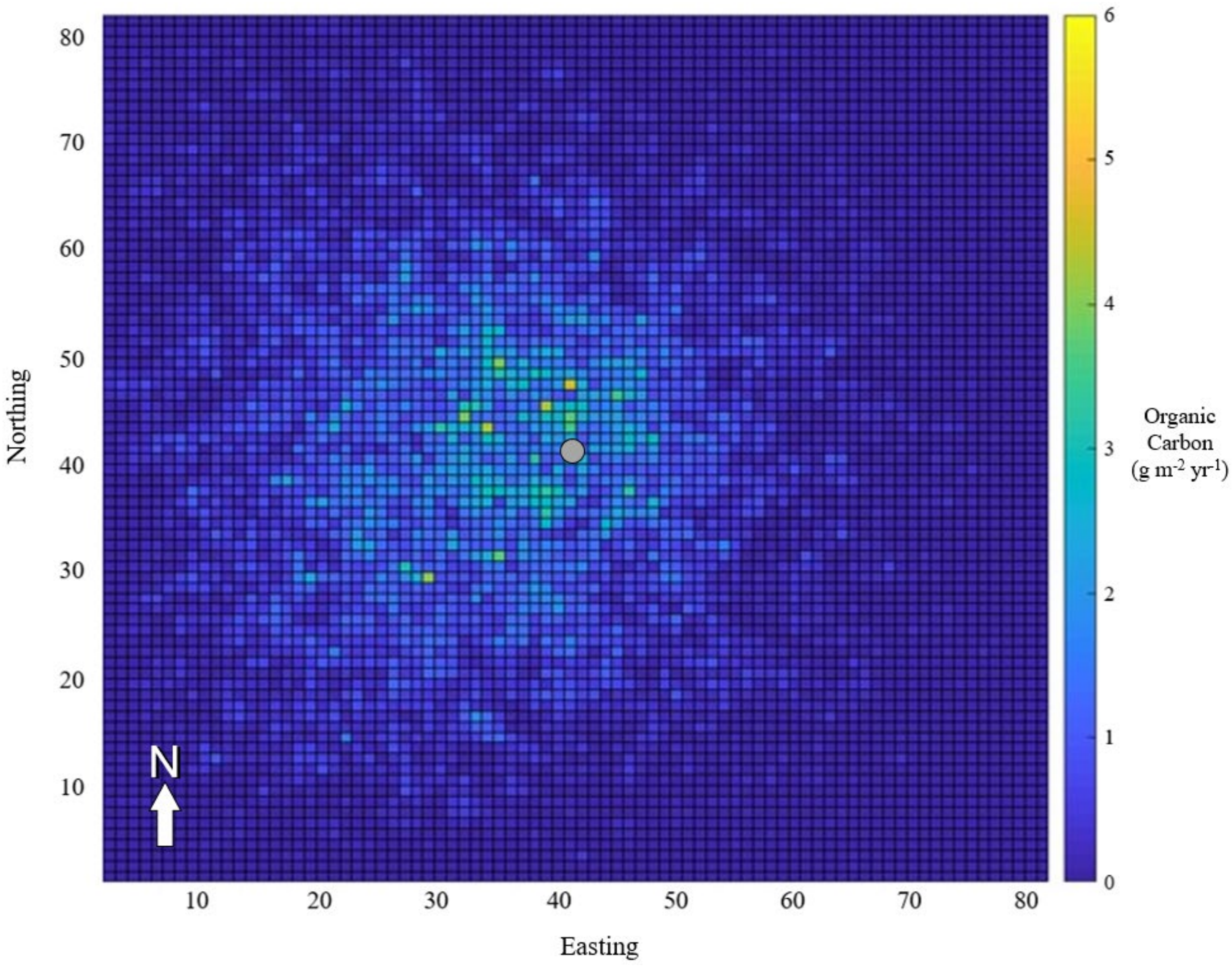


Figure 3. Predicted benthic carbon deposition field beneath one net pen with a standing stock biomass of 36,288 kg of Almaco Jack (*Seriola rivoliana*) after five years. Grey circle indicates center position of the net pen. Axes indicate simulation cell numbers and carbon deposition mass is in grams.

Table 3. Frequency of carbon deposition within 6,724 cells, each measuring 619 m^2, over a 4.16-km^2 grid system. Values represent an annual sum of carbon deposition resulting from an offshore fish farm with a constant standing stock biomass of 36,288 kg.

Carbon deposition ($g/m^2/yr$)	Occurrence (N)	Frequency (%)
0	1,508	22.43
0.1 – 1.0	4,526	67.32
1.1 – 2.0	559	0.08
2.1 – 3.0	111	1.65
3.1 – 4.0	16	< 0.01
4.1 – 5.0	4	< 0.01

REFERENCES

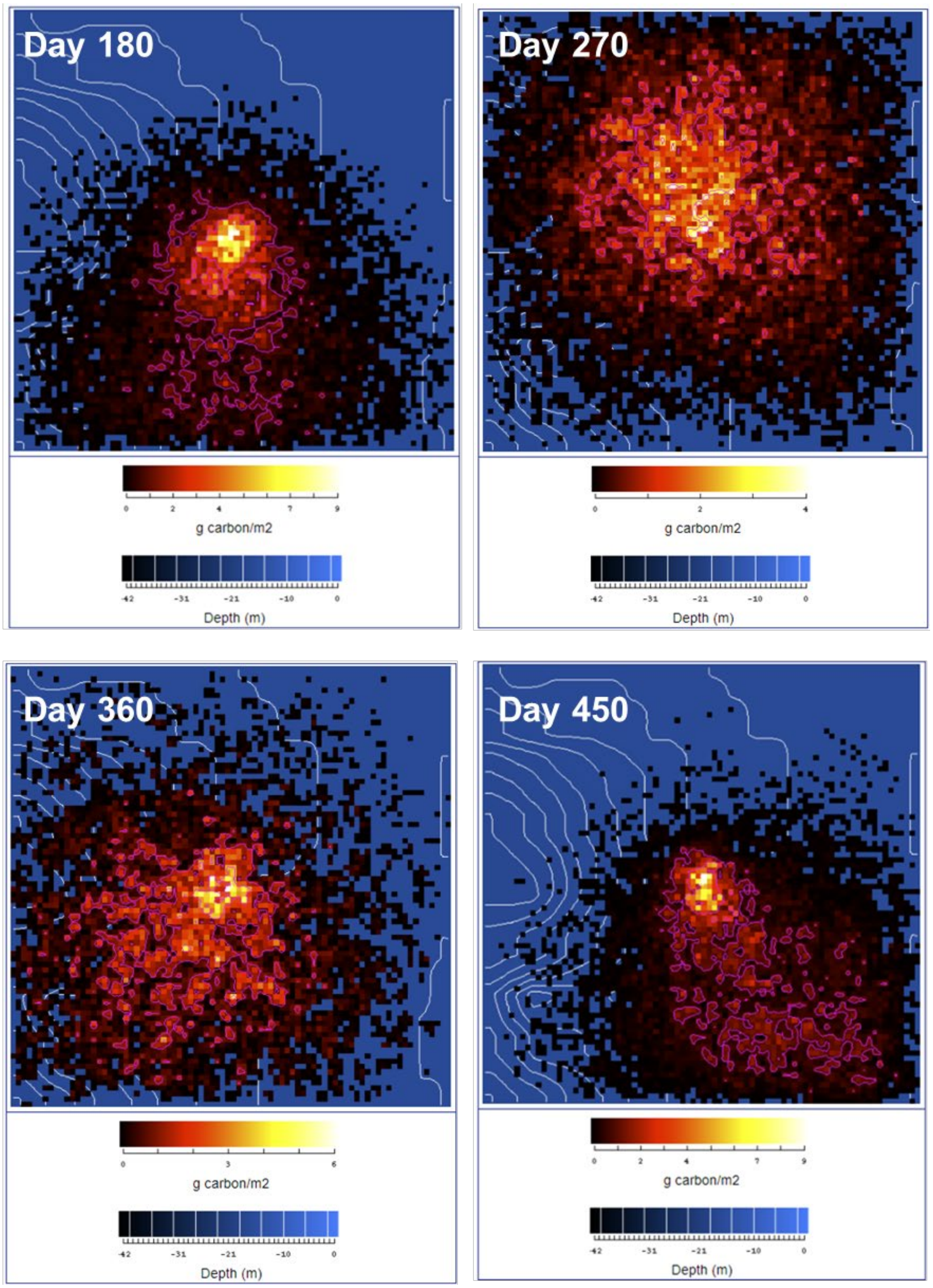
Fernandes, M. and J. Tanner. 2008. Modelling of nitrogen loads from the farming of yellowtail kingfish *Seriola lalandi* (Valenciennes, 1833). Aquac. Res. 39: 1328–1338.

Hargrave, B.T. 2010. Empirical relationships describing benthic impacts of salmon aquaculture. Aquac. Env. Inter. 1(1): 33-46.

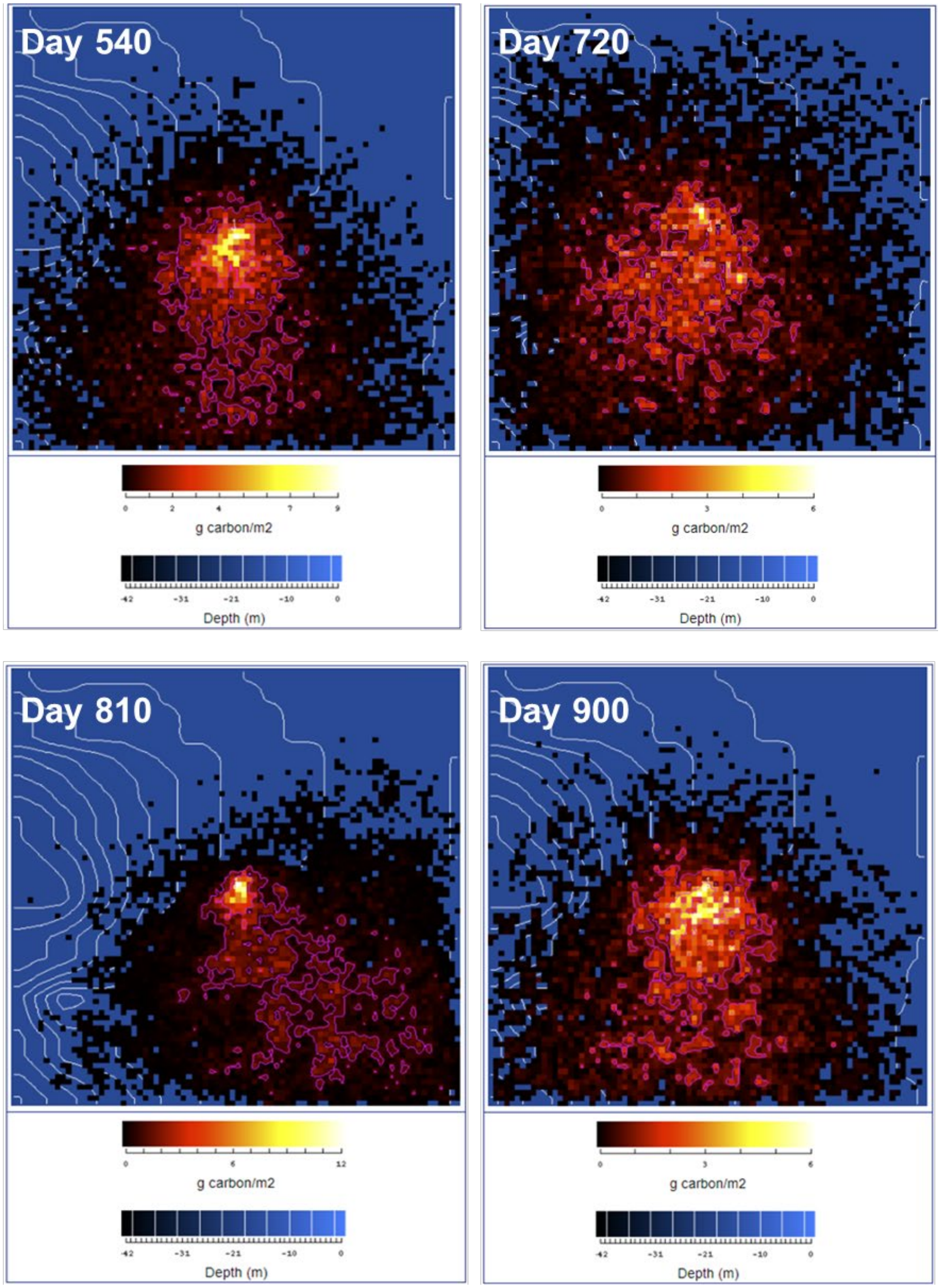
Keeley, N. B., C. J. Cromey, E. O. Goodwin, M. T. Gibbs, and C. M. Macleod. 2013. Predictive depositional modelling (DEPOMOD) of the interactive effect of current flow and resuspension on ecological impacts beneath salmon farms. Aquac. Env. Inter. 3(3): 275-291.

Reid, G. K., M. Liutkus, S. M. C. Robinson, T. R. Chopin, and others. 2009. A review of the biophysical properties of salmonid faeces:implications for aquaculture waste dispersal models and integrated multi-trophic aquaculture. Aquac. Res. 40: 257−273

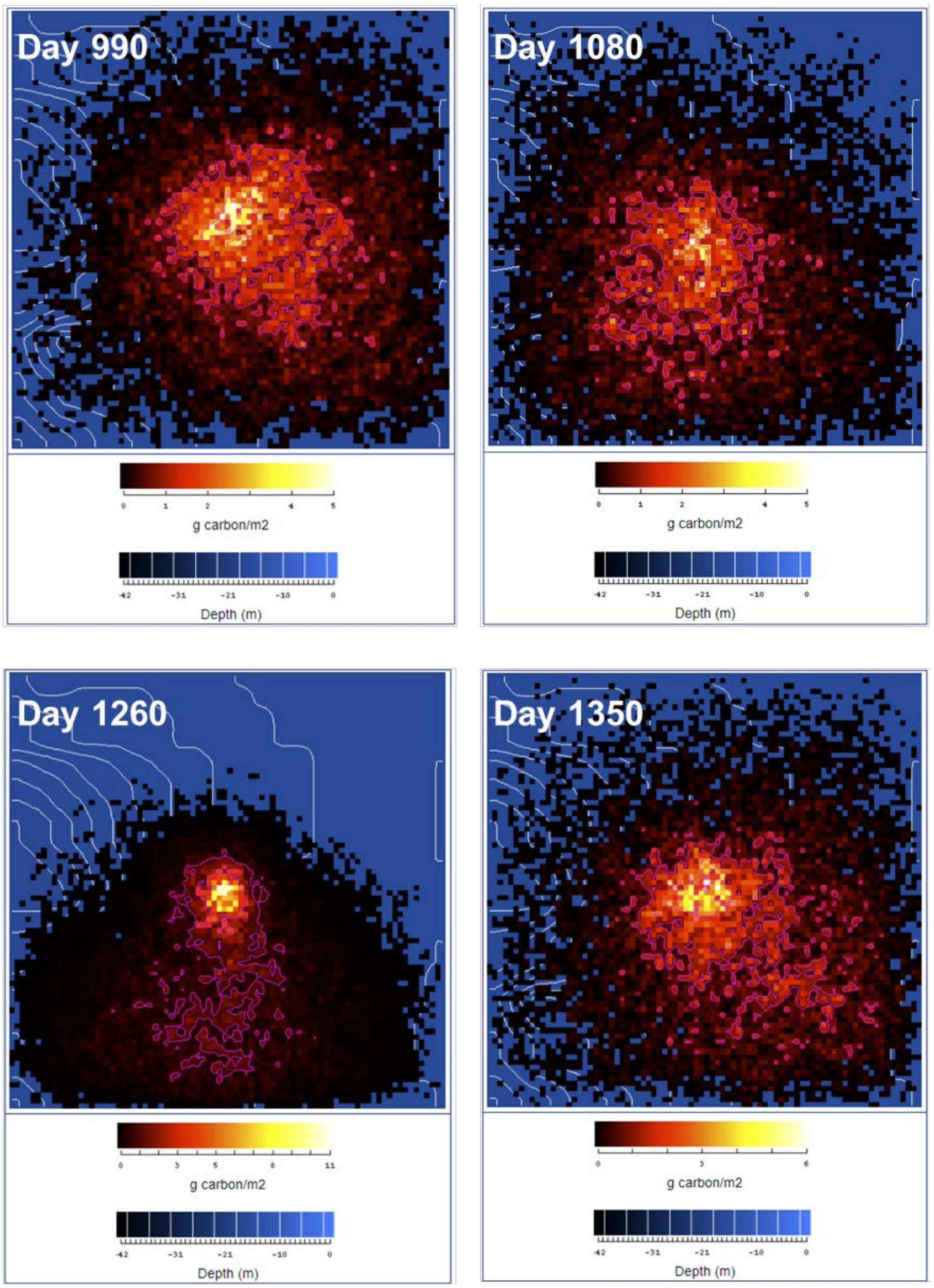
Appendix: Time-series simulation of predicted benthic carbon deposition beneath one net pen with a standing stock biomass of 36,288 kg of Almaco Jack (*Seriola rivoliana*). The reader should use caution comparing plots. The software generates a new legend for each plot in the time series. The scale and color ramp varies with each surface plot.



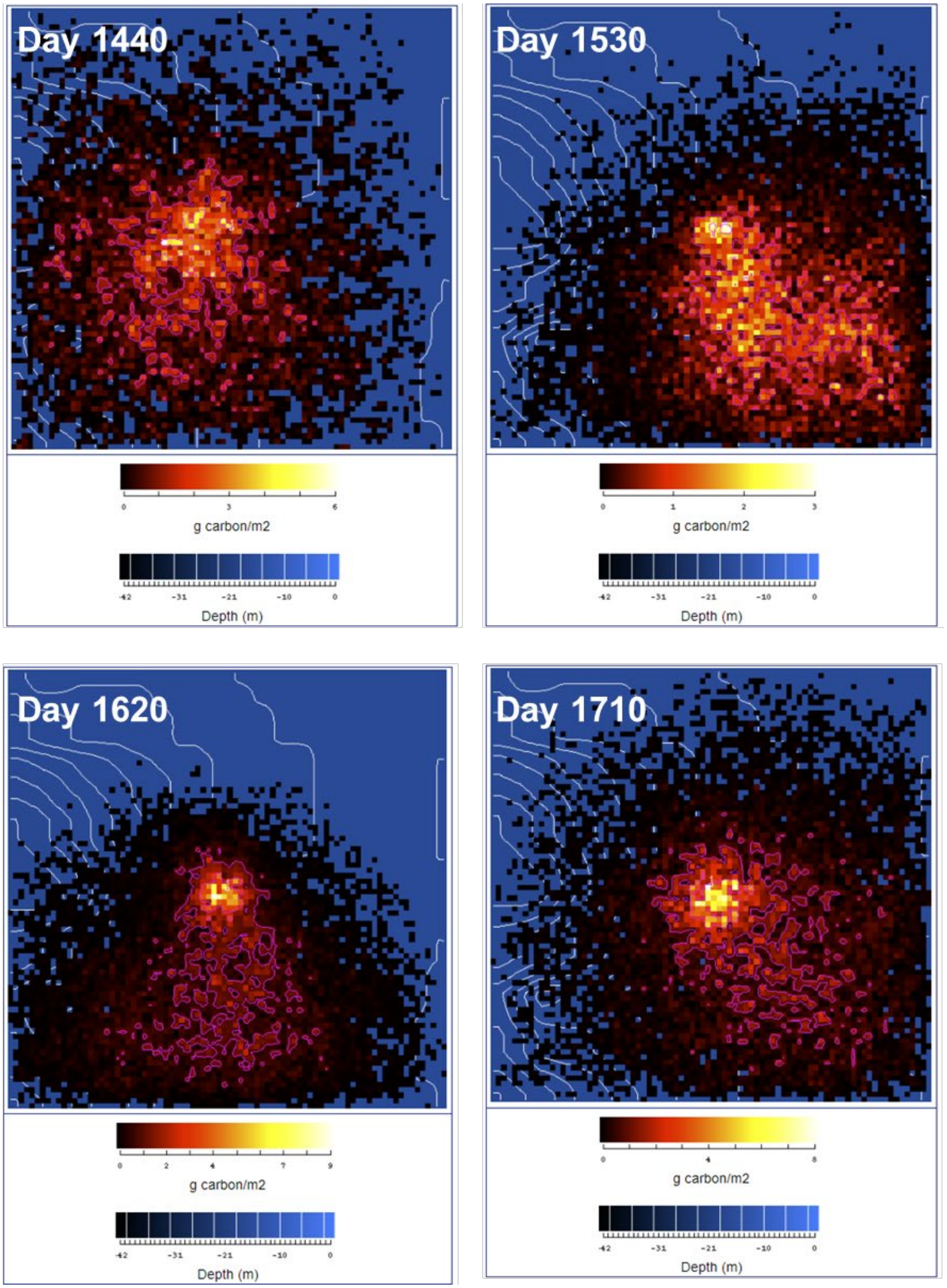
Appendix: Time-series simulation of predicted benthic carbon deposition beneath one net pen with a standing stock biomass of 36,288 kg of Almaco Jack (*Seriola rivoliana*). The reader should use caution comparing plots. The software generates a new legend for each plot in the time series. The scale and color ramp varies with each surface plot.



Appendix: Time-series simulation of predicted benthic carbon deposition beneath one net pen with a standing stock biomass of 36,288 kg of Almaco Jack (*Seriola rivoliana*). The reader should use caution comparing plots. The software generates a new legend for each plot in the time series. The scale and color ramp varies with each surface plot.



Appendix: Time-series simulation of predicted benthic carbon deposition beneath one net pen with a standing stock biomass of 36,288 kg of Almaco Jack (*Seriola rivoliana*). The reader should use caution comparing plots. The software generates a new legend for each plot in the time series. The scale and color ramp varies with each surface plot.



Appendix D

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

AUG 13 2019

Ms. Roxanna Hinzman
Field Supervisor
U.S. Fish and Wildlife Service
South Florida Ecological Services Field Office
1339 20th Street
Vero Beach, Florida 32960-3559

SUBJECT: Informal Endangered Species Act Section 7 Consultation Request
Kampachi Farms, LLC - Velella Epsilon Marine Aquaculture Facility

Dear Ms. Hinzman:

The U.S. Environmental Protection Agency Region 4 and the U.S. Army Corps of Engineers Jacksonville District (USACE) are obligated under Section 7(a)(2) of the Endangered Species Act (ESA) to ensure that any action it approves is not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of critical habitat. The purpose of this letter is to request the initiation of informal consultation with the U.S. Fish and Wildlife Service (USFWS) under ESA §7(a)(2), the ESA implementing regulations at 50 CFR §402.13, and the Memorandum of Agreement Between the EPA, National Marine Fisheries Service (NMFS), and the USFWS regarding enhanced coordination (ESA MOA).[1]

On November 9, 2018, the EPA received a complete application for a National Pollutant Discharge Elimination System (NPDES) permit from Kampachi Farms for the discharge of pollutants from a marine aquaculture facility in federal waters of the Gulf. On November 10, 2018, the USACE received a Department of Army application pursuant to Section 10 of the Rivers and Harbors Act for structures and work affecting navigable federal waters from the same marine aquaculture facility. On behalf of the two Federal Agencies responsible for permitting aquaculture operations in federal waters of the Gulf, the EPA is requesting initiation of the ESA §7 informal consultation process for the two federal permits needed to operate the proposed marine aquaculture facility. The EPA is also initiating consultation pursuant to the Fish and Wildlife Coordination Act. On August 12, 2019, the EPA sent an incorrect consultation request to the USFWS via mail. Please disregard that request and consider this to be EPA's request for informal consultation.

Given that the action of permitting the proposed project involves more than one federal agency, the EPA has elected to act as the lead agency to fulfill the consultation responsibilities pursuant to the implementing

[1] In accordance with the *Memorandum of Agreement Between the Environmental Protection Agency, Fish and Wildlife Service and National Marine Fisheries Service Regarding Enhanced Coordination Under the Clean Water Act and Endangered Species Act* (2001).

regulations of ESA §7.[2] This consultation request shall also serve as the written notice to the USFWS that the EPA is acting as the lead agency as required by 50 CFR §402.07. The USACE is a cooperating and co-federal agency for this informal consultation request. The completion of this informal consultation shall satisfy the EPA's and USACE's obligations under ESA §7.

The attached supporting Biological Evaluation (BE) was prepared by the EPA and the USACE to jointly consider the potential effects that the proposed actions may have on listed and proposed species, and designated and proposed critical habitat. Based on the information within the BE, the EPA and USACE have determined that the proposed actions will have "no effect" on any listed or proposed species as well as designated and proposed critical habitat species under the jurisdiction of the USFWS. As outlined in the ESA MOA, the EPA requests that the USFWS respond in writing within 30 days of receiving the "no effect" determination documented within the BE. The response should state whether the USFWS concurs or does not concur with the determination made by the EPA and USACE. If the USFWS does not concur, it will provide a written explanation that includes the species and/or critical habitat of concern, the perceived adverse effects, and supporting information.

The EPA and USACE are coordinating the interagency review process in accordance with the interagency *Memorandum of Understanding for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf*,[3] and conducting a comprehensive analysis of all applicable environmental requirements as allowed by the National Environmental Policy Act (NEPA); however, a consolidated cooperation process under NEPA is not being used to satisfy the requirements of ESA §7 as described in 50 CFR §402.06.[4] The NMFS is a cooperating agency for the NEPA analysis and has provided scientific expertise related to the BE and NEPA analysis for the proposed facility including information about: site selection, ESA-listed species, marine mammal protection, and essential fish habitat. While some information related to the ESA analysis is within the coordinated NEPA evaluation developed by multiple federal agencies, the attached BE is being provided as a stand-alone document to comply with the consultation process under ESA §7.

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[2] 50 CFR § 402.07 allows a lead agency: "When a particular action involves more than one Federal agency, the consultation and conference responsibilities may be fulfilled through a lead agency. Factors relevant in determining an appropriate lead agency include the time sequence in which the agencies would become involved, the magnitude of their respective involvement, and their relative expertise with respect to the environmental effects of the action. The Director shall be notified of the designation in writing by the lead agency."

[3] On February 6, 2017, the *Memorandum of Understanding for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf of Mexico* became effective for seven federal agencies with permitting or authorization responsibilities. The federal agencies included in the MOU were: EPA (Region 4 and 6), USACE (Galveston, Jacksonville, Mobile, and New Orleans Districts), NMFS (Southeast Region), USFWS (Southwest and Southeast Regions), BOEM (Gulf of Mexico Region), BSEE (Gulf of Mexico Region), and the USCG.

[4] 50 CFR § 402.06 states that "Consultation, conference, and biological assessment procedures under section 7 may be consolidated with interagency cooperation procedures required by other statutes, such as the National Environmental Policy Act (NEPA) (42 USC 4321 *et seq.*, implemented at 40 CFR Parts 1500- 1508) or the Fish and Wildlife Coordination Act (FWCA)."

If you require any further information during this consultation period or have any questions, please contact Ms. Meghan Wahlstrom-Ramler via email at wahlstrom-ramler.meghan@epa.gov or by phone at (404) 562-9672.

Sincerely,

Chris Thomas, Chief
Permitting and Grants Branch
Water Divison

cc: Ms. Katy Damico, USACE (via email)
Dr. Jess Beck-Stimpert, NMFS (via email)
Mr. Jeffrey Howe, USFWS (via email)

DRAFT
BIOLOGICAL EVALUATION

Kampachi Farms, LLC - Velella Epsilon
Marine Aquaculture Facility
Outer Continental Shelf
Federal Waters of the Gulf of Mexico

August 5, 2019

U.S. Environmental Protection Agency
Region 4
Water Protection Division
61 Forsyth Street SW
Atlanta Georgia 30303

NPDES Permit Number
FL0A00001

U.S. Army Corps of Engineers
Jacksonville District
Fort Myers Permit Section
1520 Royal Palm Square Boulevard Suite 310
Fort Myers Florida 33919-1036

Department of the Army Permit Number
SAJ-2017-03488

Table of Contents

1.0 Introduction and Federal Coordination

In accordance with the Endangered Species Act (ESA) Section 7, interagency consultation and coordination with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) is required to insure that any action authorized, funded, or carried out by an action agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of any designated critical habitat (Section 7(a)(2)); and confer with the NMFS and USFWS on any agency actions that are likely to jeopardize the continued existence of any species that is proposed for listing or result in the destruction or adverse modification of any critical habitat proposed to be designated (Section 7(a)(4)).[1]

On November 9, 2018, the U.S. Environmental Protection Agency Region 4 (EPA) received a complete application for a National Pollutant Discharge Elimination System (NPDES) permit from Kampachi Farms for the point-source discharge of pollutants from a marine aquaculture facility in federal waters of the Gulf of Mexico (Gulf). On November 10, 2018, the U.S. Army Corps of Engineers Jacksonville District (USACE) received a completed Department of Army (DA) application pursuant to Section 10 of the Rivers and Harbors Act for structures and work affecting navigable federal waters from the same marine aquaculture facility.

Given that the action of permitting the proposed project involves more than one federal agency, the EPA has elected to act as the lead agency to fulfill the consultation responsibilities pursuant to the implementing regulations of ESA Section 7.[2] The USACE is a cooperating and co-federal agency for this informal consultation request. The completion of the informal consultation shall satisfy the EPA's and USACE's obligations under ESA Section 7(a)(2).

The EPA and the USACE (action agencies) have reviewed the proposed activity and determined that a biological evaluation (BE) is appropriate. The BE was prepared by the EPA and the USACE to jointly consider the potential direct, indirect, and cumulative effects that the proposed actions may have on listed and proposed species as well as designated and proposed critical habitat, and to assist the action agencies in carrying out their activities for the proposed action pursuant to ESA Section 7(a)(2) and ESA Section 7(a)(4). The EPA and the USACE are providing this BE for consideration by the USFWS and the NMFS in compliance with the ESA Section 7.

The EPA and USACE are coordinating the interagency permitting process as required by the interagency Memorandum of Understanding (MOU) for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf,[3] and conducting a comprehensive analysis of all applicable environmental requirements required by the National Environmental Policy Act (NEPA); however, a consolidated cooperation process under NEPA is not being used to satisfy the requirements of ESA Section 7 as described in 50 CFR § 402.06.[4] The NMFS is a cooperating agency for the NEPA analysis and has provided scientific expertise related to the BE and NEPA analysis for the proposed action including information about: site selection, ESA-listed species, marine mammal protection, and essential fish habitat. While some information related to the ESA evaluation is within the coordinated NEPA document developed by multiple federal agencies, the attached BE is being provided as a stand-alone document to comply with the consultation process under ESA Section 7.

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[1] The implementing regulations for the Clean Water Act related to the ESA require the EPA to ensure, in consultation with the NMFS and USFWS, that "any action authorized the EPA is not likely to jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat" (40 CFR § 122.49(c)).

[2] 50 CFR § 402.07 allows a lead agency: "When a particular action involves more than one Federal agency, the consultation and conference responsibilities may be fulfilled through a lead agency. Factors relevant in determining an appropriate lead agency include the time sequence in which the agencies would become involved, the magnitude of their respective involvement, and their relative expertise with respect to the environmental effects of the action. The Director shall be notified of the designation in writing by the lead agency."

[3] On February 6, 2017, the Memorandum of Understanding for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf of Mexico became effective for seven federal agencies with permitting or authorization responsibilities.

[4] 50 CFR § 402.06 states that "Consultation, conference, and biological assessment procedures under section 7 may be consolidated with interagency cooperation procedures required by other statutes, such as the National Environmental Policy Act (NEPA) (implemented at 40 CFR Parts 1500 - 1508) or the Fish and Wildlife Coordination Act (FWCA)."

2.0 Proposed Action

Kampachi Farms, LLC (applicant) is proposing to operate a pilot-scale marine aquaculture facility (Velella Epsilon) in federal waters of the Gulf. The proposed action is the issuance of a permit under the respective authorities of the EPA and the USACE as required to operate the facility. The EPA's proposed action is the issuance of a NPDES permit that authorizes the discharge of pollutants from an aquatic animal production facility that is considered a point source into federal waters of the United States. The USACE's proposed action is the issuance of a DA permit pursuant to Section 10 of the Rivers and Harbors Act that authorizes anchorage to the sea floor and structures affecting navigable waters.

3.0 Proposed Project

The proposed project would allow the applicant to operate a pilot-scale marine aquaculture facility with up to 20,000 almaco jack (*Seriola rivoliana*) being reared in federal waters for a period of approximately 12 months (total deployment of the cage system is 18 months). Based on an estimated 85 percent survival rate, the operation is expected to yield approximately 17,000 fish. Final fish size is estimated to be approximately 4.4 pounds (lbs) per fish, resulting in an estimated final maximum harvest weight of 88,000 lbs (or 74,800 lbs considering the anticipated survival rate). The fingerlings will be sourced from brood stock that are located at Mote Aquaculture Research Park and were caught in the Gulf near Madeira Beach, Florida. As such, only F1 progeny will be stocked into the proposed project.

One support vessel will be used throughout the life of the project. The boat will always be present at the facility except during certain storm events or times when resupplying is necessary. The support vessel would not be operated during any time that a small craft advisory in effect for the proposed action area. The support vessel is expected to be a 70 ft long Pilothouse Trawler (20 ft beam and 5 ft draft) with a single 715 HP engine. The vessel will also carry a generator that is expected to operate approximately 12 hours per day. Following harvest, cultured fish would be landed in Florida and sold to federally-licensed dealers in accordance with state and federal laws. The exact type of harvest vessel is not known; however, it is expected to be a vessel already engaged offshore fishing activities in the Gulf.

A single CopperNet offshore strength (PolarCirkel-style) fully enclosed submersible fish pen will be deployed on an engineered multi-anchor swivel (MAS) mooring system. The engineered MAS will have up to three anchors for the mooring, with a swivel and bridle system. The design drawings provided for the engineered MAS uses three concrete deadweight anchors for the mooring; however, the final anchor design will likely utilize embedment anchors instead. The cage material for the proposed project is constructed with rigid and durable materials (copper mesh net with a diameter of 4 millimeter (mm) wire and 40 mm x 40 mm mesh square). The mooring lines for the proposed project will be constructed of steel chain (50 mm thick) and thick rope (36 mm) that are attached to a floating cage that will rotate in the prevailing current direction; the ocean currents will maintain the mooring rope and chain under tension during most times of operation. The bridle line that connects from the swivel to the cage will be encased in a rigid pipe. Structural information showing the MAS and pen, along with the tethered supporting vessel, is provided in Appendix A. The anchoring system for the proposed project is being finalized by the applicant. While the drawings in Appendix A show concrete deadweight anchors, it is likely that the final design will utilize appropriately sized embedment anchors instead. Both anchor types are included for ESA consultation purposes.

The CopperNet cage design is flexible and self-adjusts to suit the constantly changing wave and current conditions. As a result, the system can operate floating on the ocean surface or submerged within the water column of the ocean; however, the normal operating condition of the cage is below the water surface. When a storm approaches the area, the entire cage can be submerged by using a valve to flood the floatation system with water. A buoy remains on the surface, marking the net pen's position and supporting the air hose. When the pen approaches the bottom, the system can be maintained several meters above the sea floor. The cage system is sable to rotate around the MAS and adjust to the currents while it is submerged and protected from storms near the water surface. After storm events, the cage system is made buoyant, causing the system to rise to resume normal operational conditions. The proposed project cage will have at least one properly functioning global positioning system device to assist in locating the system in the event it is damaged or disconnected from the mooring system.

In cooperation with the NMFS, a protected species monitoring plan (PSMP) has been developed for the proposed action to protect all marine mammal, reptiles, sea birds, and other protected species. Monitoring will occur throughout the life of the project and represents an important minimization measure to reduce the likelihood of any unforeseen potential injury to all protected species including ESA-listed marine animals. The data collected will provide valuable insight to resource managers about potential interactions between aquaculture operations and protected species. The PSMP also contains important mitigative efforts such as suspending vessel transit activities when a protected species comes within 100 meters (m) of the activity until the animal(s) leave the area. The project staff will suspend all surface activities (including stocking fish, harvesting operations, and routine maintenance operations) in the unlikely event that any protected species comes within 100 m of the activity until the animal leaves the area. Furthermore, should there be activity that results in an injury to protected species, the on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement.[5]

The below information about chemicals, drugs, cleaning, and solid waste provides supporting details about the proposed project:

Chemicals: The proposed facility has indicated they would not be using toxic chemicals, cleaners, or solvents at the proposed project. The proposed project would use small amounts of petroleum to run the generator. Spills are unlikely to occur; however, if a spill did occur they would be small in nature.

Drugs: The applicant has indicated that FDA-approved antibiotics or other therapeutants will not likely be used (within any feed or dosing the rearing water) during the proposed project. [6] The need for drugs is minimized by the strong currents expected at the proposed action area, the low fish culture density, the cage material being used, and the constant movement of the cage.

Cleaning: The applicant does not anticipate the need to clean the cage for the short duration of the proposed project. Should the cage system need cleaning, divers would manually scrub the cage surfaces with cleaning brushes. No chemicals would be used while cleaning and any accumulated marine biological matter would be returned to sea without alteration.

Solid Wastes: The applicant will dispose of all solid waste appropriately on shore.

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[5] A PSMP has been developed by the applicant with assistance from the NMFS Protected Resources Division. The purpose of the PSMP is to provide monitoring procedures and data collection efforts for species (marine mammals, sea turtles, seabirds, or other species) protected under the MMPA or ESA that may be encountered at the proposed project.

[6] The applicant is not expected to use any drugs; however, in the unlikely circumstance that therapeutant treatment is needed, three drugs were provided to the EPA as potential candidates (hydrogen peroxide, oxytetracycline dihydrate, and florfenicol).

4.0 Proposed Action Area

The proposed project would be placed in the Gulf at an approximate water depth of 40 m (130 feet), and generally located 45 miles southwest of Sarasota, Florida. The proposed facility will be placed within an area that contains unconsolidated sediments that are 3 – 10 ft deep (see Table 1). The applicant will select the specific location within that area based on diver-assisted assessment of the sea floor when the cage and anchoring system are deployed. The proposed action area is a 1,000 m radius measured from the center of the MAS.

The facility potential locations were selected with assistance from NOAA's National Ocean Service National Centers for Coastal Ocean Science (NCCOS). The applicant and the NCCOS conducted a site screening process over several months to identify an appropriate project site. Some of the criteria considered during the site screening process included avoidance of corals, coral reefs, submerged aquatic vegetation, hard bottom habitats, and avoidance of marine protected areas, marine reserves, and habitats of particular concern. This siting assessment was conducted using the Gulf AquaMapper tool developed by NCCOS.[7]

Upon completion of the site screening process with the NCCOS, the applicant conducted a Baseline Environmental Survey (BES) in August 2018 based on guidance developed by the NMFS and EPA.[8] The BES included a geophysical investigation to characterize the sub-surface and surface geology of the sites and identify areas with a sufficient thickness of unconsolidated sediment near the surface while also clearing the area of any geohazards and structures that would impede the implementation of the aquaculture operation. The geophysical survey for the proposed project consisted of collecting single beam bathymetry, side scan sonar, sub-bottom profiler, and magnetometer data within the proposed area. The BES report noted that were no physical, biological, or archaeological features within the surveyed area that would preclude the siting of the proposed aquaculture facility within the area shown in Table 1.

Table 1: Target Area with 3' to 10' of Unconsolidated Sediments

Location	Latitude	Longitude
Upper Left Corner	27° 7.70607' N	83° 12.27012' W
Upper Right Corner	27° 7.61022' N	83° 11.65678' W
Lower Right Corner	27° 6.77773' N	83° 11.75379' W
Lower Left Corner	27° 6.87631' N	83° 12.42032' W

[7] The Gulf AquaMapper tool is available at: https://coastalscience.noaa.gov/products-explorer/

[8] The BES guidance document is available at: http://sero.nmfs.noaa.gov/sustainable_fisheries/Gulf_fisheries/aquaculture/

5.0 Federally Listed and Proposed Threatened and Endangered Species and Critical Habitat

5.1 Federally Listed Threatened and Endangered Species

The action agencies identified the ESA-listed species shown in Table 2 for consideration on whether the proposed action may affect protected species in or near the proposed action area. In summary, the action agencies considered the potential affects to threatened and endangered species from five groups of species: birds (2), fish (4), invertebrates (7), marine mammals (6), and reptiles (5). The action agencies considered the species within this Section of the BE because they may occur within the project footprint or near enough such that there are potential routes of effects. Certain ESA-listed species are not discussed because their behavior, range, habitat preferences, or known/estimated location do not overlap or expose them to the activities within the proposed action area.

Table 2: Federally Listed Species, Listed Critical Habitat, Proposed Species, and Proposed Critical Habitat Considered for the Proposed Action

Species Considered		ESA Status	Critical Habitat Status	Potential Exposure to Proposed Action Area
Birds				
1	Piping Clover	Threatened	Yes	No
2	Red Knot	Threatened	No	No
Fish				
1	Giant Manta Ray	Threatened	No	Yes
2	Nassau Grouper	Threatened	No	Yes
3	Oceanic Whitetip Shark	Threatened	No	Yes
4	Smalltooth Sawfish	Endangered	No	Yes
Invertebrates				
1	Boulder Star Coral	Threatened	No	No
2	Elkhorn Coral	Threatened	No	No
4	Mountainous Star Coral	Threatened	No	No
5	Pillar Coral	Threatened	No	No
7	Staghorn Coral	Threatened	No	No
6	Rough Cactus Coral	Threatened	No	Yes
3	Lobed Star Coral	Threatened	No	Yes
Marine Mammals				
1	Blue Whale	Endangered	No	Yes
2	Bryde's Whale	Endangered	No	Yes
3	Fin Whale	Endangered	No	Yes
4	Humpback Whale	Endangered	No	Yes
5	Sei Whale	Endangered	No	Yes
6	Sperm Whale	Endangered	No	Yes
Reptiles				
1	Green Sea Turtle	Threatened	No	Yes
2	Hawksbill Sea Turtle	Endangered	Yes	Yes
3	Kemp's Ridley Sea Turtle	Endangered	No	Yes
4	Leatherback Sea Turtle	Endangered	Yes	Yes
5	Loggerhead Sea Turtle	Threatened	Yes	Yes

5.1.1 Birds

There are 14 ESA-listed avian species identified as threatened or endangered, previously delisted, or as candidate species in the eastern Gulf. Of those species, only two listed species, the piping plover and red knot, are considered in this BE because their migratory range could expose them to activities covered under the proposed action. There are several other listed species whose range includes only inshore and coastal margin waters and are not exposed to the activities covered under the proposed action.

Piping Plover

The piping plover is a threatened shorebird that inhabits coastal sandy beaches and mudflats. Three populations of piping plover are recognized under ESA: Great Lakes (endangered); Great Plains (threatened); and Atlantic (threatened) (BOEM, 2012a). This species nests in sand depressions lined with pebbles, shells, or driftwood. Piping plovers forage on small invertebrates along ocean beaches, on intertidal flats, and along tidal pool edges; therefore, fish from the proposed action are not considered a potential source of food for the piping plover.

Possibly as high as 75% of all breeding piping plovers, regardless of population affiliation, may spend up to eight months on wintering grounds in the Gulf. They arrive from July through September, leaving in late February to migrate back to their breeding sites (BOEM, 2012b). They do not breed in the Gulf. Habitat used by wintering birds include beaches, mud flats, sand flats, algal flats, and washover passes (where breaks in sand dunes result in an inlet). The piping plover is considered a state species of conservation concern in all Gulf coast states due to wintering habitat. The piping plover is it is a migratory shorebird with no open ocean habitat.

Red Knot

The red knot, listed as threatened in 2014, is a highly migratory shorebird species that travels between nesting habitats in Arctic latitudes and southern non-breeding habitats in South America and the U.S. Atlantic and Gulf coasts (BOEM, 2012a). Red knots forage along sandy beaches, tidal mudflats, salt marshes, and peat banks for bivalves, gastropods, and crustaceans (USFWS, 2015). Horseshoe crab eggs are a critical food resource for this species, and the overharvesting and population declines of horseshoe crabs may be a major reason for the decline of red knot numbers.

Wintering red knots may be found in Florida and Texas (Würsig, 2017). They are considered a State Species of Conservation Concern in Florida and Mississippi. The numbers of wintering and staging red knots using coastal beaches in Gulf coast states other than Florida have declined dramatically (Würsig, 2017). Its population has exhibited a large decline in recent decades and is now estimated in the low ten-thousands (NatureServe, 2019). Critical habitat rules have not been published for the red knot. Within the Gulf region, wintering red knots are found primarily in Florida, but this species has been reported in coastal counties of each of the Gulf states.

5.1.2 Fish

The four species of ESA-protected fish that may occur within the action area are: giant manta ray, nassau grouper, smalltooth sawfish, and oceanic whitetip shark.

Giant Manta Ray

The giant manta ray was listed as threatened under the ESA on February 21, 2018. The giant manta ray is found worldwide in tropical, subtropical, and temperate seas. These slow-growing, migratory animals are circumglobal with fragmented populations. The giant manta ray is the largest living ray, with a wingspan reaching a width of up to 9 m. Manta species are distinguished from other rays in that they tend to be larger with a terminal mouth, and have long cephalic lobes (Evgeny, 2010), which are extensions of the pectoral fins that funnel water into the mouth. Giant manta rays feed primarily on planktonic organisms such as euphausiids, copepods, mysids, decapod larvae and shrimp, but some studies have noted their consumption of small and moderately sized fishes (Miller and Klimovich, 2017).

Within the Southeast Region of the United States, the giant manta ray is frequently sighted along the east coast and within the Gulf of Mexico. Giant manta rays are seasonal visitors along productive coastlines with regular upwelling, in oceanic island groups, and near offshore pinnacles and seamounts. Given the opportunistic sightings of the species, researchers are still unsure what drives giant manta rays to certain areas and not others (and where they go for the remainder of the time). The timing of these visits varies by region and seems to correspond with the movement of zooplankton, current circulation and tidal patterns, seasonal upwelling, seawater temperature, and possibly mating behavior. Although giant manta rays are considered oceanic and solitary, they have been observed congregating at cleaning sites at offshore reefs and feeding in shallow waters during the day at depths less than 10 m (O'Shea et al., 2010; Marshall et al., 2011; Rohner et al., 2013). The giant manta ray ranges from near shore to pelagic habitats, occurring over the continental shelf near reef habitats and offshore islands. The species can be found in estuarine waters near oceanic inlets, with use of these waters as potential nursery grounds. This species appears to exhibit a high degree of plasticity in terms of their use of depths within their habitat.

Nassau Grouper

The Nassau grouper is a reef fish typically associated with hard structure such as reefs (both natural and artificial), rocks, and ledges. It is a member of the family Serranidae, which includes groupers valued as a major fishery resource such as the gag grouper and the red grouper. These large fish are found in tropical and subtropical waters of southern coastal Florida and the Florida Keys. Nassau grouper are generally absent from the Gulf north and outside of the Florida Keys; this is well documented by the lack of records in Florida Fish and Wildlife Conservation Commission's, Fisheries Independent Monitoring data, as well as various surveys conducted by NOAA Fisheries Southeast Fisheries Science Center. There has been one verified report of the Nassau Grouper in the northwest Gulf at Flower Gardens Bank national marine sanctuary; however, the Flowers Gardens Bank is not near the proposed action area.

Oceanic Whitetip Shark

The oceanic whitetip shark is a large open ocean highly migratory apex predatory shark found in subtropical waters throughout the Gulf. It is a pelagic species usually found offshore in the open ocean, on the outer continental shelf, or around oceanic islands in deep water greater than 184 m. The oceanic whitetip shark can be found from the surface to at least 152 m depth. Occasionally, it is found close to land in waters as shallow as 37 m, mainly around mid-ocean islands or in areas where the continental shelf is narrow with access to nearby deep water. Oceanic whitetip sharks have a strong preference for the surface mixed layer in warm waters above 20°C and are therefore mainly a surface-dwelling shark.

Oceanic whitetip sharks are high trophic-level predators in open ocean ecosystems feeding mainly on teleosts and cephalopods (Backus et al., 1956; Bonfil et al., 2008); however, some studies have found that they consume sea birds, marine mammals, other sharks and rays, mollusks, crustaceans, and even garbage (Compagno, 1984; Cortés, 1999).

Smalltooth Sawfish

The smalltooth sawfish was the first marine fish to receive protection as an endangered species under the ESA in 2003. Their current range is poorly understood but believed to have significantly contracted from these historical areas. Today, smalltooth sawfish primarily occur off peninsular Florida from the Calloosahtchee River to the Florida Keys (Würsig, 2017). Historical accounts and recent encounters suggest immature individuals are most common in shallow coastal waters less than 25 m (Bigelow and Schroeder, 1953; Adams and Wilson, 1995). Smalltooth sawfish primarily live in shallow coastal waters near river mouths, estuaries, bays, or depths up to 125 m. Smalltooth sawfish feed primarily on fish. Mullet, jacks, and ladyfish are believed to be their primary food resources (Simpfendorfer, 2001). Smalltooth sawfish also prey on crustaceans (mostly shrimp and crabs) by disturbing bottom sediment with their saw (Norman and Fraser, 1938; Bigelow and Schroeder, 1953).

5.1.3 Invertebrates

The seven ESA-listed coral species in the Gulf are known to occur near the Dry Tortugas, a small group of islands located approximately 67 miles west of Key West, Florida. Four of the ESA-listed coral species in the Gulf (elkhorn, lobed star, mountainous star, and boulder star) are known to occur in the Flower Banks National

Marine Sanctuary, located 70 to 115 miles off the coast of Texas and Louisiana. The most abundant depth ranges for the ESA-listed invertebrates are provided in Table 3. Given the known geographic locations of the considered coral species and their recognized habitat preferences related to water depth, only two invertebrate species (lobed star coral and rough cactus coral) may occur in the proposed action area. Threats to coral communities throughout the Gulf include predation, hurricane damage, and loss of habitat due to algal overgrowth and sedimentation.

Table 3: ESA-listed Coral Depth Ranges

Coral Species	Most Abundant Depth (ft)
Boulder Star Coral	3 - 82 [9]
Elkhorn Coral	3 - 16 [10]
Lobed Star Coral	6 - 130 [11]
Mountainous Star Coral	3 - 30 [11]
Pillar Coral	3 - 90
Rough Cactus Coral	15 - 270 [10]
Staghorn Coral	15 - 60 [10]

5.1.4 Marine Mammals

All the ESA-listed marine mammals considered in this BE are endangered under the ESA. The six species of whales that could occur within the action area are: blue whale, fin whale, Gulf Bryde's whale, humpback whale, sperm whale, and sei whale; however, except for the Gulf Bryde's whale, each ESA-listed whale considered in this BE are not common in the Gulf (Würsig, 2017). Threats to whales from aquaculture facilities include vessel strikes, entanglement, and disturbance (ocean noise).

Blue Whales

Blue whales are found in all oceans except the Arctic Ocean. Currently, there are five recognized subspecies of blue whales. Blue whales have been sighted infrequently in the Gulf. The only record of blue whales in the Gulf are two strandings on the Louisiana and Texas coasts; however, the identifications for both strandings are questionable. In the North Atlantic blue whales are most often seen off eastern Canada where they are present year-round (NMFS, 2016). Blue whales also typically occur in deeper waters seaward of the continental shelf and are not commonly observed in the waters of the Gulf or off the U.S. East Coast (CeTAP, 1982; Wenzel et al., 1988; Waring et al., 2006). Blue whales are not expected to be within the proposed action area that is located in a water depth of approximately 40 m.

Bryde's Whale

The Gulf Bryde's whale was listed as endangered on May 15, 2019. The Gulf Bryde's whales are members of the baleen whale family and are a subspecies of the Bryde's whale. The Gulf Bryde's whales are one of the most endangered whales in the world, with likely less than 100 whales remaining. They are the only resident baleen whale in the Gulf. The Gulf Bryde's whale is one of the few types of baleen whales that do not migrate and remain in the Gulf year-round. The historical range in Gulf waters is not well known; however, scientists believe that the historical distribution of Gulf Bryde's whales once encompassed the north-central and southern Gulf. For the past 25 years, Bryde's whales in U.S. waters of the Gulf have been consistently located in the northeastern Gulf (largely south of Alabama and the western part of the Florida panhandle) along the continental shelf break between the 100 and 400 m depth (Labrecque et al., 2015). This area has been identified as a Biologically Important Area (BIA) for the Gulf Bryde's whale and encompasses over 5.8 million acres. BIAs are reproductive areas, feeding areas, migratory corridors, or areas in which small and resident populations are

[9] www.DCNANature.org, 2016
[10] NMFS, 2016
[11] www.IUCNRedList.org, 2016

concentrated. The proposed action area is not located near the areas where the Gulf Bryde's whale is known to be distributed and are not expected to occur at the water depth of the proposed project.

Fin Whales
Fin whales are found in deep, offshore waters of all the world's oceans, primarily in temperate to polar climates. The NMFS has reported that the are about 2,700 fin whales in the North Atlantic and Gulf. There are few reliable reports of fin whales in the northern Gulf. They are most commonly found in North Atlantic waters where they feed on krill, small schooling fish, and squid (NMFS, 2016). Fin whales are generally found along the 100 m isobath with sightings also spread over deeper water including canyons along the shelf break (Waring et al., 2006). Therefore, fin whales are not expected to be found near the proposed action area where the water depth is approximately 40 m.

Humpback Whales
Based on a few confirmed sightings and one stranding event, humpback whales are rare in the northern Gulf (BOEM, 2012a). Baleen whale richness in the Gulf is believed to be less than previously understood (Würsig, 2017). U.S. populations of humpback whales mainly use the western North Atlantic for feeding grounds and use the West Indies during winter and for calving (NMFS, 2016). Given that humpback whales are not a typical inhabitant of the Gulf, they are not expected to be in found near the proposed action area. Additionally, the water depth at the proposed action area (40 m) does not overlap to the habitat preference of humpback whales for deeper waters.

Sei Whales
The sei whale is rare in the northern Gulf and its occurrence is considered accidental, based on four reliable and one questionable strandings records in Louisiana and Florida (Jefferson and Schiro, 1997; Schmidley, 2004; Würsig, 2017). Sei whales are more commonly found in subtropical to subpolar waters of the continental shelf and slope of the Atlantic, with movement between the climates according to seasons (NMFS, 2016). Sei whales typically occur in deeper waters seaward of the continental shelf and are not commonly observed in the waters of the Gulf (CeTAP, 1982; Wenzel et al., 1988; Waring et al., 2006). Sei whales are not expected to be geographically located near the proposed project.

Sperm Whales
In the northern Gulf, aerial and ship surveys indicate that sperm whales are widely distributed and present in all seasons in continental slope and oceanic waters. Sperm whales are the most abundant large cetacean in the Gulf. Greatest densities of sperm whales are in the central Northern Gulf near Desoto Canyon as well as near the Dry Tortugas (Roberts et al., 2016). They are found in deep waters throughout the world's oceans, but generally in waters greater than 200 to 800 m due to the habit of feeding on deep-diving squid and fish (Hansen et al., 1996; Davis et al., 2002; Mullin and Fulling, 2003; Würsig, 2017). Research conducted since 2000 confirms that Gulf sperm whales constitute a distinct stock based on several lines of evidence (Waring et al., 2006). Sperm whales are not expected to be within the proposed action area due to their known preference for deeper water.

5.1.5 Reptiles

The five ESA-listed sea turtle species that may occur in or near the proposed action area are: green, hawksbill, leatherback, kemp's ridley, and loggerhead. Sea turtles are highly migratory and travel widely throughout the Gulf. Therefore, each sea turtle has the potential to occur throughout the entire Gulf. In general, the entire Gulf coastal and nearshore area can serve as habitat for marine turtles. Florida is the most important nesting area in the United States for loggerhead, green, and leatherback turtles. Several volumes exist that cover the biology and ecology of these species (i.e., Lutz and Musick, 1997; Lutz et al., 2003, Wynekan et al., 2013).

Green sea turtle
Green sea turtle hatchlings are thought to occupy pelagic areas of the open ocean and are often associated with *Sargassum* rafts (Carr, 1987; Walker, 1994). Pelagic stage green sea turtles are thought to be carnivorous.

Stomach samples of these animals found ctenophores and pelagic snails (Frick, 1976; Hughes, 1974). At approximately 20 to 25 centimeters (cm) carapace length, juveniles migrate from pelagic habitats to benthic foraging areas (Bjorndal, 1997). As juveniles move into benthic foraging areas a diet shift towards herbivory occurs. They consume primarily seagrasses and algae, but are also known to consume jellyfish, salps, and sponges (Bjorndal, 1980, 1997; Paredes, 1969; Mortimer, 1981, 1982). The diving abilities of all sea turtle species vary by their life stages. The maximum diving range of green sea turtles is estimated at 110 m (Frick, 1976), but they are most frequently making dives of less than 20 m (Walker, 1994). The time of these dives also varies by life stage.

The NMFS and USFWS removed the range-wide and breeding population ESA listings of the green sea turtle and listed eight distinct population segments (DPSs) as threatened and three DPSs as endangered, effective May 6, 2016. Two of the green sea turtle DPSs, the North Atlantic DPS and the South Atlantic DPS, occur in the Gulf. The proposed action area is within the North Atlantic NPS where the green sea turtle is listed as threatened.

Hawksbill sea turtle

The hawksbill sea turtle's pelagic stage lasts from the time they leave the nesting beach as hatchlings until they are approximately 22 to 25 cm in straight carapace length (Meylan, 1988; Meylan and Donnelly, 1999). The pelagic stage is followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Little is known about the diet of pelagic stage hawksbills. Adult foraging typically occurs over coral reefs, although other hard-bottom communities and mangrove-fringed areas are occupied occasionally. Hawksbills show fidelity to their foraging areas over several years (van Dam and Diéz, 1998). The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan, 1988). Gravid females have been noted ingesting coralline substrate (Meylan, 1984) and calcareous algae (Anderes, Alvarez, and Uchida, 1994), which are believed to be possible sources of calcium to aid in eggshell production. The maximum diving depths of these animals are unknown, but the maximum length of dives is estimated at 73.5 minutes, more routinely dives last about 56 minutes (Hughes, 1974). Hawksbill sea turtles are not known to regularly nest in Florida but do occur occasionally.

Kemp's Ridley sea turtle

Kemp's ridley sea turtle hatchlings are also pelagic during the early stages of life and feed in surface waters (Carr, 1987; Ogren, 1989). After the juveniles reach approximately 20 cm carapace length they move to relatively shallow (less than 50 m) benthic foraging habitat over unconsolidated substrates (Márquez-M., 1994). They have also been observed transiting long distances between foraging habitats (Ogren, 1989). Kemp's ridleys feeding in these nearshore areas primarily prey on crabs, though they are also known to ingest mollusks, fish, marine vegetation, and shrimp (Shaver, 1991). The fish and shrimp Kemp's ridleys ingest are not thought to be a primary prey item but instead may be scavenged opportunistically from bycatch discards or discarded bait (Shaver, 1991). Given their predilection for shallower water, Kemp's ridleys most routinely make dives of 50 m or less (Soma, 1985; Byles, 1988). Their maximum diving range is unknown. Depending on the life stage, a Kemp's ridley may be able to stay submerged anywhere from 167 minutes to 300 minutes, though dives of 12.7 minutes to 16.7 minutes are much more common (Soma, 1985; Mendonca and Pritchard, 1986; Byles, 1988). Kemp's ridley turtles may also spend as much as 96 percent of their time underwater (Soma, 1985; Byles, 1988). In the United States, Kemp's ridley turtles inhabit the Gulf and northwest Atlantic Ocean; nesting occurs primarily in Texas, and occasionally in Florida, Alabama, Georgia, South Carolina, and North Carolina.

Leatherback sea turtle

Leatherback sea turtles are the most pelagic of all ESA-listed sea turtles and spend most of their time in the open ocean. They will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these species regardless of life stage (Bjorndal, 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that these species can dive more than 1,000 m (Eckert et al., 1989) but more frequently dive to depths of 50 m to 84 m (Eckert et al. 1986). Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Standora et al., 1984; Eckert et al., 1986; Eckert et al., 1989; Keinath and Musick, 1993).

Loggerhead sea turtle

Loggerhead sea turtle hatchlings forage in the open ocean and are often associated with Sargassum rafts (Hughes, 1974; Carr 1987; Walker, 1994; Bolten and Balazs, 1995). The pelagic stage of these sea turtles are known to eat a wide range of things including salps, jellyfish, amphipods, crabs, syngnathid fish, squid, and pelagic snails (Brongersma, 1972). Stranding records indicate that when pelagic immature loggerheads reach 40 to 60 cm straight-line carapace length, they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic (Witzell, 2002). Loggerhead sea turtles forage over hard-bottom and soft-bottom habitats (Carr, 1986).

Benthic foraging loggerheads eat a variety of invertebrates with crabs and mollusks being an important prey source (Burke et al., 1993). Estimates of the maximum diving depths of loggerheads range from 211 m to 233 m (Thayer et al., 1984; Limpus and Nichols, 1988). The lengths of loggerhead dives are frequently between 17 and 30 minutes (Thayer et al., 1984; Limpus and Nichols, 1988; Limpus and Nichols, 1994; Lanyon et al., 1989) and they may spend anywhere from 80 to 94 percent of their time submerged (Limpus and Nichols, 1994; Lanyon et al., 1989). Loggerhead sea turtles are a long-lived, slow-growing species, vulnerable to various threats including alterations to beaches, vessel strikes, and bycatch in fishing nets.

5.2 Federally Listed Critical Habitat In or Near the Action Area

5.2.1 Birds

Onshore critical habitat has been designated for the piping plover including designations for coastal wintering habitat areas in Alabama, Mississippi, and Florida.[12] The proposed project is not expected to impact any onshore habitats.

5.2.2 Reptiles

The only critical habitat designated near the proposed action area is the Northwest Atlantic DPS of loggerhead sea turtles. Specific areas of designated habitat include: nearshore reproductive habitat, winter area, breeding areas, migratory corridors, and Sargassum habitat. The northwest Atlantic loggerhead DPS designated critical habitat portion that occurs in federal waters (*i.e.*, a Sargasso habitat unit) consists of the western Gulf to the eastern edge of the loop current, through the Straits of Florida and along the Atlantic coast from the western edge of the Gulf Stream eastward. Sargassum habitat is home to most juvenile sea turtles in the western Gulf.

5.3 Federal Proposed Species and Proposed Critical Habitat

The action agencies did not identify any Federally-listed proposed species or proposed critical habitat in the proposed action area.

[12] Critical habitat locations for the piping plover are available at: https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B079

6.0 Potential Stressors to Listed and Proposed Species and Critical Habitat

The action agencies evaluated the potential impacts of the proposed project on ESA-listed species that were identified in Section 5.0 and that may occur in or near the proposed action area. Potential effects considered in this analysis may occur because of a potential overlap between the proposed aquaculture facility location with the species habitat (socialization, feeding, resting, breeding, etc.) or migratory route. Section 6.0 broadly describes the most likely stressors, directly and indirectly, that were considered to potentially impact the species near the proposed facility. The action agencies identified four categories of risks from the proposed project: disturbance; entanglement; vessel collisions; and impacts from water quality. The specific analysis of potential impacts to each species from the proposed project is provided in Section 7.0.

6.1 Disturbance

Disturbance in the context of this BE includes ocean noise (low-frequency underwater noises) and breakage (invertebrates). Underwater noises can interrupt the normal behavior of whales, which rely on sound to communicate. As ocean noise increases from human sources, communication space decreases and whales cannot hear each other, or discern other signals in their environment as they used to in an undisturbed ocean. Different levels of sound can disturb important activities, such as feeding, migrating, and socializing. Mounting evidence from scientific research has documented that ocean noise also causes marine mammals to change the frequency or amplitude of calls, decrease foraging behavior, become displaced from preferred habitat, or increase the level of stress hormones in their bodies. Loud noise can cause permanent or temporary hearing loss. Underwater noise threatens whale populations, interrupting their normal behavior and driving them away from areas important to their survival. Increasing evidence suggests that exposure to intense underwater sound in some settings may cause some whales to strand and ultimately die.

ESA-listed sea turtles, whales, and fish may experience stress due to a startled reaction should they encounter vessels, or vessel noise, at the proposed location or in transit to the proposed project site. The reaction could range from the animal approaching and investigating the activity, to the opposite reaction of flight, where the animal could injure itself while attempting to flee. The most likely source of disturbance from the proposed aquaculture activity would be noise from the vessel engines and barge generator.

6.2 Entanglements

Entanglement, for the purposes of this BE, refers to the wrapping of lines, netting, or other man-made materials around the body of a listed species. Entanglement can result in restrainment and/or capture to the point where harassment, injury, or death occurs. The cage, mooring lines, and bridles from the proposed project may pose an entanglement risk to listed species in the project area; however, entanglement risks to ESA-listed species at any aquaculture operation are mitigated by using rigid and durable cage materials, and by keeping all facility lines taut as slack lines are the primary source of entanglements (Nash et al., 2005).

Past protected species reviews by the NMFS for a similar scale aquaculture project determined that cetacean and sea turtle entanglement is not expected when facility mooring and tether lines are kept under near-constant tension and free of loops (NMFS, 2016). Additionally, the NMFS determined that a similar aquaculture project had the potential to result in interactions with marine mammals; however, the NMFS found that the most likely effect of the project on marine mammals was behavioral interactions (e.g., individuals engaging in investigative behavior around the array or that prey on wild fish accumulated near the facility) as opposed to causing injury or mortality from entanglement.

6.3 Vessel Strike

A vessel strike is a collision between any type of boat and a marine animal in the ocean. All sizes and types of vessels have the potential to collide with nearly any marine species. Strikes can result in death or injury to the

marine animal and may go unnoticed by the vessel operator. Some marine species spend short durations "rafting" at the ocean's water surface between dives which makes them more vulnerable to vessel strikes.

The NMFS estimates collisions between some cetaceans and vessels are relatively rare events based on data from Marine Mammal Stock Assessments for the Atlantic and Gulf (NMFS, 2017). Collisions between marine mammals and vessels can be further minimized when vessels travel at less than 10 knots based on general guidance from the NMFS for vessels transiting areas where there are known populations of whales (HIHWNMS, 2011). Detection of sea turtles by vessel operators may be more difficult because most vessel operators usually sight protected species and avoid them. In past biological opinions in support of similar aquaculture activities, the NMFS has determined that the rate of collisions between sea turtles and vessels was negligible and did not expect sea turtle vessel strikes to occur (NMFS, 2016).

The support vessel used for the proposed project is expected to be vigilant against the possibility of protected species collisions. Piloting of all vessels associated with the proposed project will be done in a manner that will prevent vessel collisions or serious injuries to protected species. Operators and crew will operate vessels at low speeds when performing work within and around the proposed project area and operate only when there are no small craft advisories in effect. All vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS.[13] These operating conditions are expected to allow vessel operators the ability to detect and avoid striking ESA-listed species.

6.4 Water Quality

Although offshore marine cage systems do not generate a waste stream like other aquaculture systems, effluent from the proposed action area can adversely affect water quality, sea floor sediment composition, and benthic fauna though the additions of uneaten feed, ammonia excretions, and fish feces from the increased fish biomass. Water quality in aquaculture is primarily assessed through measures of nitrogen (N), phosphorus (P), solids (total suspended solids, settleable solids, and turbidity), dissolved oxygen (DO), and pH. The increased amount of organic material has the potential to increase N, P, and solids levels in the surrounding waters. The concentration of N (such as total nitrogen, ammonia, nitrate, nitrite) and P (as total phosphorus or orthophosphate) are indicators of nutrient enrichment and are commonly used to assess the impact of aquaculture on water quality. The release of nutrients, reductions in concentrations of DO, and the accumulation of sediments under certain aquaculture operations can affect the local environment by boosting overall productivity in phytoplankton and macroalgal production in marine ecosystems through eutrophication and degradation of benthic communities (Stickney, 2002).

According to *Marine Cage Culture and The Environment* (Price and Morris, 2013), "there are usually no measurable effects 30 meters beyond the cages when the farms are sited in well-flushed water. Nutrient spikes and declines in dissolved oxygen sometimes are seen following feeding events, but there are few reports of long-term risk to water quality from marine aquaculture." Price and Morris (2013) also considered the benthic effects of Marine Cage Culture and found that "well-managed farms may exhibit little perturbation and, where chemical changes are measured, impacts are typically confined to within 100 meters of the cages. Benthic chemical recovery is often rapid following harvest". Conversely, poorly managed farms or heavily farmed areas, can see anaerobic conditions persisting and extending hundreds of meters beyond the aquaculture facility. Changes in water quality associated with commercial scale marine aquaculture facilities can be measurable downstream for approximately 205 m (Nash et al., 2005).

The NCCOS reviewed global siting data to identify aquaculture site characteristics that are best suited for water quality protection, concluding that, "Protection of water quality will be best achieved by siting farms in well-

[13] The NMFS has determined that collisions with any vessel can injure or kill protected species (e.g., endangered and threatened species, and marine mammals). The vessel strike avoidance guidelines developed by the NMFS are the standard measures that should be implemented to reduce the risk associated with vessel strikes or disturbance of these protected species to discountable levels. NMFS Southeast Region Vessel Strike Avoidance Measures and Reporting for Mariners; revised February 2008.

flushed waters." (Price, 2013). The hydrology near the proposed action area has powerful and mixing ocean currents that would constantly flush and dilute particulate and dissolved wastes. In addition, the proposed action has other attributes cited in this study that contributes to decrease water quality impacts, including deep waters and a sand bottom type. Neither particulates nor dissolved metabolites are expected to accumulate due to a low fish production levels and the near constant flushing of the cage by strong offshore currents that dissipate wastes.

The EPA evaluated the proposed action's potential impacts to water quality, impacts of organic enrichment to the seafloor, and impacts to benthic communities from organic enrichment as required by the Sections 402 and 403 of the CWA. The EPA determined that discharges from the proposed facility are not expected to exceed federally recommended water quality criteria; that the discharged material is not sufficient to pose a environmental threat through seafloor bioaccumulation; and the potential for benthic impacts from the proposed project are minimal.[14] Additionally, the EPA considered recent environmental modeling performed by the NMFS for a similar small scale aquaculture facility (Velella Delta).[15] NCCOS concluded that there are minimal risks to water column or benthic ecology functions in the subject area from the operation of the fish cage as described in the applicant's proposal. Furthermore, EPA reviewed the previous and current environmental monitoring data collected from a commercial-scale marine aquaculture facility, Blue Ocean Mariculture (BOM), in Hawaii raising the same fish species.[16] While the size of the proposed project is significantly smaller than the BOM commercial-scale facility and BOM is in slightly deeper waters, the results show that soluble and particulate nutrients from the BOM facility do not substantially affect the marine environment. Based on EPA's analysis, as well as a review and comparison of representative water quality information, the proposed action would not likely raise particulate and dissolved nutrient concentrations in the proposed action area.

The proposed facility will be covered by a NPDES permit as an aquatic animal production facility with protective conditions required by the Clean Water Act. The NPDES permit will contain conditions that will confirm EPA's determination and ensure no significant environmental impacts will occur from the proposed project. The aquaculture-specific water quality conditions placed in the NPDES permit will generally include a comprehensive environmental monitoring plan. The applicant will be required to monitor and sample certain water quality, sediment, and benthic parameters at a background (up-current) location and near the cage. Additionally, the NPDES permit will include effluent limitations expressed as best management practices (BMPs) for feed managment, waste collection and disposal, harvest discharge, carcass removal, materials storage, maintenance, record keeping, and training. Impacts to water quality will be reduced by a range of operational measures through the implementation of project-specific BMPs. For example, feeding will always be monitored to ensure fish are fed at levels just below satiation to limit overfeeding and decrease the amount of organic material that is introduced into the marine environment. Moreover, the Essential Fish Habitat assessment requires certain mitigation measures within the NPDES and Section 10 permits.[17]

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[14] Further information about EPA's analysis and determination for impacts to water quality, seafloor, and benthic habitat can be found in the final NPDES permit and the Ocean Discharge Criteria (ODC) Evaluation, as well as other supporting documents for the NPDES permit such as the Essential Fish Habitat Assessment and the NEPA evaluation.

[15] The NCCOS previously produced models to assess the potential environmental effects on water quality and benthic communities for the applicant's Velella Delta project that is similar Velella Epsilon in terms of fish production (approximately 120,000 lbs), operation duration, and cultured species; however, the water depth was dissimilar between the two projects (6,000 ft vs. 130 ft). At maximum capacity, NCCOS determined there were no risks to water quality from the Velella Delta project, and only insignificant effects would occur in the water column down to 100 feet. Because of the great depth, strong currents, and physical oceanographic nature of the Velella Delta site, dissolved wastes would be widely dispersed and assimilated by the planktonic community. Furthermore, the model results showed that benthic impacts and accumulation of particulate wastes would not be detectable through measurement of organic carbon or infaunal community biodiversity.

[16] Water quality information from a Blue Ocean Mariculture (BOM) facility in Hawaii was reviewed as representative data and compared to the proposed project. The BOM farm previously produced approximately 950,000 lbs/yr prior to 2014 and has produced up to 2,400,000 lbs/yr after 2014. The BOM facility is in a similar depth of water as the proposed project with an average depth of 60 m. Over eight years of comprehensive water quality and benthic monitoring, the BOM facility has not adversely impacted water quality outside of the mixing zone at the facility (BOM, 2014).

[17] The EPA and the USACE will require mitigation measures to be incorporated into the NPDES permit to avoid or limit organic enrichment and physical impacts to habitat that may support associated hardbottom biological communities. The NPDES permit will require facility to be positioned at least 500 meters from any hardbottom habitat; the DA permit will not authorize the anchor system to be placed on vegetated and/or hardbottom habitat.

The EPA also considered the potential water quality impacts from chemical spills, drugs, cleaning, and solid wastes.

Chemical Spills: Spills are unlikely to occur; however, if a spill did occur they would be small in nature and dissipate rapidly due to strong currents in the project area. The terms and conditions of the NPDES permit would require the applicant to follow operational procedures (i.e. BMPs) that minimize the risk of wastes and discharges that may affect any ESA-listed species or habitat. The risk of accidental fuel or oil spills into the marine environment is minimized by the support vessel not being operated during any time that a small craft advisory is in effect at the proposed facility.

Drugs: The applicant indicated that FDA-approved antibiotics or other therapeutants will not likely be used during the proposed project due to the strong currents expected at the proposed action area, the low fish culture density, and the cage material being used. In the unlikely event that drugs/therapeutants are used, administration of drugs will be performed under the control of a licensed veterinarian and only FDA-approved therapeutants for aquaculture would be used as required by federal law. In addition, the NPDES permit will require that the use of any medicinal products be reported to the EPA, including therapeutics, antibiotics, and other treatments. The report will include types and amounts of medicinal product used and the duration they were used. The EPA does not expect the project to a cause a measurable degradation in water quality from drugs that may affect any ESA-listed species.

Cleaning: Another potential source of water quality impacts would be from the cleaning of the cage system. The applicant does not anticipate the need to clean the cage for the short duration of the proposed project. Experience from previous trials by the applicant demonstrated that copper alloy mesh material used for the cage is resistant to fouling. Should the cage system need cleaning, divers would manually scrub the cage surfaces with cleaning brushes. No chemicals would be used while cleaning and any accumulated marine biological matter would be returned to sea without alteration.

Solid Wastes: Multiple federal laws and regulations strictly regulate the discharge of oil, garbage, waste, plastics, and hazardous substances into ocean waters. The NPDES permit prohibits the discharge of any solid material not in compliance with the permit.

7.0 Potential Effects of Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR § 402.02). The NMFS and USFWS standard for making a "no effect" finding is appropriate when an action agency determines its proposed action will not affect that ESA-listed species or critical habitat, directly or indirectly (USFWS and NMFS, 1998). Generally, a "no effect" determination means that ESA-listed species or critical habitats will not be exposed to any potentially harmful/beneficial elements of the action (NMFS, 2014).

The applicable standard to find that a proposed action "may affect, but not likely to adversely affect" (NLAA) listed species or critical habitat is that all the effects of the action are expected to be discountable, insignificant, or completely beneficial. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat.

A summary of the potential effects considered and the determination of impact for each listed species and critical habitat is provided in Table 4. Overall, potential impacts to the ESA-listed species considered in this BE are expected to be extremely unlikely and insignificant due to the small size of the facility, the short deployment period, unique operational characteristics, lack of geographic overlap with habitat or known migratory routes, or other factors that are described in the below sections for each species. The federal action agencies used multiple sources to support the determinations described within this section including the analysis of potential impacts that the NMFS used as the basis for its ESA determination for up to 20 commercial scale offshore marine aquaculture facilities in the Gulf (EPA, 2016; NMFS, 2009; NMFS, 2013; NMFS, 2015; NMFS, 2016).

7.1 Federally Listed Threatened and Endangered Species

7.1.1 Birds

The action agencies did not consider any potential threats to ESA-protected birds from the proposed project. The two species of birds considered are not expected to interact with the proposed project due to the distance between the proposed project from shore (approximately 45 miles) to their onshore habitat preferences. The piping plover and red knot are migratory shorebirds. Known migratory routes do not overlap with the proposed project. Both birds primarily inhabit coastal sandy beaches and mudflats of the Gulf; migration and wintering habitat are in intertidal marine habitats such as coastal inlets, estuaries, and bays (USFWS, 2015). Additionally, the normal operating condition of the cage is expected to be below the water surface which will further decrease the likelihood of any bird interaction with the proposed project.

The ESA-listed bird species will not be exposed to any potentially harmful impacts of the proposed action. The action agencies have determined that the activities under the proposed project will have no effect on the threatened species of birds.

7.1.2 Fish

The action agencies considered disturbance, entanglement (for smalltooth sawfish only), and water quality as potential impacts to endangered or threatened fish from the proposed project in the rare event that interaction occurs.

Impacts from disturbance, entanglement, and water quality are highly unlikely for each ESA-listed fish species that was considered given their unique habitat preferences and known proximity to the proposed action area. The oceanic whitetip shark is not likely to occur near the proposed project given its preference for deeper waters. The action agencies believe that the Nassau grouper will not be present given that it is absent from the Gulf outside of the Florida Keys. Interactions with smalltooth sawfish with the proposed project is extremely unlikely because they primarily occur in the Gulf off peninsular Florida and are most common off Southwest Florida. The giant manta ray may encounter the facility given its migratory patterns; however, disturbance is not expected because the facility is small and will have a short deployment period of approximately 18 months.

Entanglement impacts were considered for smalltooth sawfish because it is the only listed fish species large enough to become entangled within the proposed facility's mooring lines. Entanglement risks to the smalltooth sawfish from the proposed project are minimized by using rigid and durable cage materials and by keeping all lines taut (as described in Section 3.0). The ocean currents will maintain the floating cage, mooring lines, and chain under tension during most times of operation. Additionally, the limited number of vertical mooring lines reduce the risk of potential entanglement by this listed fish species. Furthermore, interactions are anticipated to be highly unlikely given their current range in southwest Florida between Ft Myers and the Florida Keys. Because of the proposed project operations and lack of proximity to the known habitat for the smalltooth sawfish, the action agencies expect that the effects of this entanglement interaction would be discountable.

For water quality impacts, the EPA is proposing NPDES permit conditions required by the Clean Water Act. These permit provisions will contain environmental monitoring (water quality, sediment, and benthic infauna) and conditions that minimize potential adverse impacts to fish from the discharge of effluent from the proposed facility, and prohibit the discharge of certain pollutants (e.g., oil, foam, floating solids, trash, debris, and toxic pollutants). Due to the pilot-scale size of the facility, water quality and benthic effects are not expected to occur outside of 10 meters. The discharges authorized by the proposed NPDES permit represent a small incremental contribution of pollutants that are not expected to affect any ESA-listed fish species in or near the proposed action area.

Any potential effects from the proposed action on ESA-listed fish are discountable and insignificant. The action agencies have determined that the activities under the proposed project is NLAA the threatened and endangered species of fish.

7.1.3 Invertebrates

Potential routes of effects to coral from the proposed project include disturbance (breakage of coral structures) and water quality impacts (e.g., increased sedimentation, increased nutrient loading, and the introduction of pollutants).

Regarding disturbance, anthropogenic breakage is extremely unlikely and discountable because the proposed facility will not be in areas where listed corals may occur. Most of the ESA-listed invertebrate species are associated with coral reefs that occur in shallower areas of the Gulf and along the west Florida shelf. Only five species of the invertebrates considered (boulder star, elkhorn, mountainous star, pillar, and staghorn) are not known to occur near the proposed project location or at depths where the proposed facility is located. Only two invertebrate species (lobed star coral and rough cactus coral) may occur in the proposed action area. Moreover, the anchoring system and cage will be placed in an area consisting of unconsolidated sediments, away from potential hardbottom which may contain corals according to the facility's seafloor survey. Given the known geographic locations of the considered coral species and their recognized habitat preferences related to water depth, the disturbance effects of the proposed action is anticipated to be minimal and extremely unlikely.

Regarding impacts from water quality, the discharge from the proposed facility will be covered by a NPDES permit with water quality conditions required by the Clean Water Act. The aquaculture-specific water quality conditions contained in the NPDES permit will generally include an environmental monitoring plan (water quality, sediment, and benthic monitoring) and effluent limitations expressed as BMPs. Water quality effects are not expected to occur outside of 30 m due to the small size of the facility and low production levels. Sedimentation from the facility is not expected to occur outside of 1,000 m (assuming a maximum production for the entire duration of the project) with impacts resulting from the proposed facility likely limited to within 300-500 meters from the cage. The NPDES permit will prohibit discharges within 500 m of areas of biological concern, including live bottoms or coral reefs. The impacts from water quality and sedimentation are expected to be minimal or insignificant, and the likelihood that deleterious water quality will contribute to any adverse effects to listed coral species is extremely unlikely.

Any adverse effects from the proposed project on ESA-listed corals are discountable and insignificant. The action agencies have concluded that the proposed project will NLAA on the ESA-listed invertebrate species.

7.1.4 Marine Mammals

Generally, endangered whales are not likely to be adversely affected by any of the threats considered by the action agencies at or near the proposed facility because they are unlikely to overlap geographically with the small footprint of the proposed action area. All whales considered in this BE prefer habitat in waters deeper than the proposed action (40 m) as described in Section 5.1.4. The expected absence of the ESA-listed marine mammals in or near the proposed action area is an important factor in the analysis of whether impacts from the proposed project will have any effect on ESA-listed whales; however, the action agencies have still considered potential threats (disturbance, entanglement, vessel strikes, and water quality) to the six species of marine mammals considered in this BE.

Disturbance to marine mammals from ocean noise generated by the proposed facility is expected to be extremely low given the duration of the project, minimal vessel trips, and scale of the operation. The production cage will be deployed for a duration of approximately 18 months. Opportunities for disturbance from the vessel participating in the proposed project are minimal due to the limited trips to the site. The most likely source of disturbance from the proposed aquaculture activity would be noise from the vessel engines and barge generator. The noise emitted from the engines and generator would not significantly add to the frequency or intensity of ambient sound levels in the proposed action area, and are not expected to be different from other vessels operating in federal waters. The action agencies believe that the underwater noise produced by operating a vessel and cage will not interfere with the ability of marine mammals to communicate, choose mates, find food, avoid predators, or navigate. The limited amount of noise from the proposed project would have negligible effect on ESA-listed whales.

Entanglement risks to marine mammals at any aquaculture operation is minimized by using rigid and durable cage materials and by keeping all lines taut. As described in Section 3.0, the cage material for the proposed project is constructed with rigid and durable materials that will significantly decrease the likelihood that ESA-listed species will become entangled. The limited number of vertical mooring lines (3) and the duration of cage deployment (approximately 18 months) will reduce the risk of potential entanglement by marine mammals. When the currents change, the lines would likely remain taut even as the currents shift because of the weight of chain and rope create a negative buoyancy on the facility anchorage lines. While it is highly unlikely that ESA-listed whales would become entangled in the mooring lines; if incidental line contact occurs, serious harm to the listed whales or sea turtles is not likely due to the tension in the mooring lines. The cage will be constructed of semi-rigid copper alloy mesh with small openings that will further prevent entanglements.

Additionally, there have been no recorded incidents of entanglement from ESA-listed marine mammal species interacting with a permitted commercial-scale marine aquaculture facility in Hawaii (BOM, 2014). The depth of water and line length used at the proposed project would provide adequate spaces for most marine mammals to pass through. The proposed action would not likely entangle marine mammals as they are likely to detect the presence of the facility and would be able to avoid the gear; however, should entanglement occur, on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement. Furthermore, because of the proposed project operations and location of marine mammal habitat, the action agencies expect that the effects of this entanglement interaction would be interactions are anticipated to be highly unlikely.

Regarding vessel strikes, facility staff will be stationed on one vessel for the duration of the project except during unsafe weather conditions. The probability that collisions with the vessel associated with the proposed project would kill or injure marine mammals is discountable as the vessel will not be operated at speeds known to injure or kill marine mammals. Given the limited trips to the facility with only one vessel, and the high visibility of whales to small vessels, opportunities for strikes from the vessel participating in the proposed project are expected to be insignificant. Strikes from other vessels not operated by the facility are anticipated to be improbable due to the proximity to shore (~45 miles). Additionally, all vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS. Moreover, should there be any vessel strike that results in an injury to an ESA-protected marine mammal, the on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement.

Regarding potential impacts from water quality, each ESA-listed whale species considered in this BE is not expected to be affected given their unique habitat preferences and known proximity to the proposed action area. The discharge from the proposed facility will be covered by a NPDES permit with project-specific conditions that includes water quality monitoring and implementation of practices to protect the environment near the proposed action area. The discharge of wastewater from the proposed project are expected to have a minor impact on water quality due to factors concerning the low fish biomass produced; the relatively small amounts of pollutants discharged; depth of the sea floor; and current velocities at the proposed action area. It is anticipated that the proposed activity would add relatively small amounts of nutrient wastes (nitrogen, phosphorus, particulate organic carbon, and solids) to the ocean in the immediate vicinity of the proposed action area. The facility's effluent is expected to undergo rapid dilution from the prevailing current; constituents will be difficult to detect within short distances from the cage. The impacts from water quality are expected to be insignificant, and the likelihood of water quality impacts contributing to any adverse effects to ESA-listed marine mammals is extremely unlikely (see Section 6.4 for more information).

The action agencies believe that any adverse effects from the potential threats considered to ESA-listed marine mammals are extremely unlikely to occur and are discountable. The action agencies have determined that the activities authorized under the proposed permits will NLAA any marine mammals considered in this BE.

7.1.5 Reptiles

The action agencies considered disturbance, entanglement, vessel strike, and water quality as the only potential threats to reptiles within the proposed action area.

Sea turtles may experience disturbance by stress due to a startled reaction should they encounter vessels in transit to the proposed project site. Given the limited trips to the site, opportunities for disturbance from vessels participating in the proposed project are minimal. ESA-listed sea turtles may be attracted to aquaculture facilities as potential sources of food, shelter, and rest, but behavioral effects from disturbance are expected to be insignificant. Additionally, all vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS.[7] Furthermore, there has been a lack of documented observations and records of ESA-listed sea turtles interacting with a permitted commercial-scale marine aquaculture facility in Hawaii (BOM, 2014); we anticipate that such interactions would be unlikely. As a result, disturbance from human activities and equipment operation resulting from the proposed action is expected to have insignificant effects on ESA-listed reptiles.

The risk of sea turtles being entangled in offshore aquaculture operation is greatly reduced by using rigid cage materials and by keeping all lines taut. Section 3 describes how the cage and mooring material for the proposed project is constructed with rigid and durable materials, and how the mooring lines will be constructed of steel chain and thick rope that will be maintained under tension by the ocean currents during most times of operation. Additionally, the bridle line that connects from the swivel to the cage will be encased in a rigid pipe. Moreover, the limited number of vertical mooring lines (three) and the duration of cage deployment (less than 18 months) will reduce the risk of potential entanglement by sea turtles. Because of the proposed project operations and duration, the action agencies expect that the effects of this entanglement interaction would be discountable; however, should entanglement occur, on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement.

In regard to vessel strikes, facility staff will use only one vessel for the duration of the project. The vessel will be operated at low speeds that are not known to injure or kill sea turtles; therefore, the probability that collisions with the vessel associated with the proposed project would kill or injure sea turtles is discountable. Opportunities for strikes to reptiles from the vessel participating in the proposed project are expected to be insignificant given the limited number of trips to the facility with one vessel. Strikes from other vessels not operated by the facility are anticipated to be improbable due to the proximity to shore. Additionally, all vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS.

The proposed activity would not add significantly to the volume of maritime traffic in the proposed action area. The number of trips associated with deploying and retrieving the facility components, routine maintenance, stocking, and harvest operations would minimally increase vessel traffic in the proposed action area. The project activities are not expected to result in collisions between protected species and any vessels. Collisions with ESA-listed species during the proposed activity would be extremely unlikely to occur.

Commercial and recreational fishermen are expected to visit the proposed project because it could act as a fish attraction device. While fishermen would be attracted to the project area from other locations, overall fishing effort by these fishermen in federal fisheries would not increase as these fishermen would have fished elsewhere if the project was not in place. The action agencies do not expect that any increased fishing activity in the project area since there were no reports or observations of interactions between fishermen and ESA-listed species in previous Velella trials (Velella Beta and Velella Gamma) in Hawaii (NMFS, 2016).

The impacts from water quality are expected to be insignificant, and the likelihood of water quality impacts contributing to any adverse effects to ESA-listed reptiles in or near the proposed action area is extremely unlikely (see Section 6.4 for more information related to water quality impacts). The discharge from the proposed facility will be covered by a NPDES permit with project-specific conditions that includes water quality monitoring and implementation of practices to protect the environment. Water quality effects are not expected to occur outside of 10 m due to the low fish production levels and fast ocean currents.

Any adverse effects from the proposed project on ESA-listed reptiles are extremely unlikely to occur and are discountable. The action agencies have determined that the activities under the proposed permit will NLAA the sea turtles considered in this BE.

7.2 Federally Listed Critical Habitat

7.2.1 Reptiles

The action agencies identified vessel strike and water quality as the only potential routes of impacts to the loggerhead turtle DPS critical habitat of the Northwest Atlantic. In the Gulf, designated critical habitat consists of either nearshore reproductive habitat or Sargassum habitat. The proposed project is roughly 45 miles from shore and will not affect nearshore reproductive habitat. Therefore, the essential features of loggerhead turtle critical habitat that the proposed action may affect are foraging habitat for hatchlings and association of hatchlings around Sargassum mats.

Sargassum mats may be impacted by vessel traffic; however, the PSMP that was developed for the proposed project area includes a provision that trained observers will look for Sargassum mats and will inform vessel operators as to their location to avoid the mats to the maximum extent practicable. The proposed project will be sited in the open ocean environment, and Sargassum mats may infrequently drift into the project area; however, it is highly unlikely the proposed facility would impact Sargassum habitat further offshore where the facility will be located. Additionally, the facility will only bring the submerged aquaculture cage to the surface for brief periods to conduct maintenance, feeding, or harvest activities due to the high energy open-ocean environment where the proposed facility will be located.

Sargassum mats are not anticipated to be negatively impacted by water quality due to the conditions in the NPDES permit. Potential impacts on loggerhead critical habitat is expected to be discountable because of active monitoring for Sargassum mats and the extremely low likelihood of impacts from water quality.

The action agencies believe that the adverse effects from the proposed action will have insignificant effect on the Northwest Atlantic loggerhead DPS critical habitat due to location of the facility and operational methods used while the cage is deployed. The action agencies have determined that the activities under the proposed permit will NLAA the listed sea turtle critical habitat.

7.2.2 Birds

Critical habitat has been designated in for the piping plover for coastal wintering habitat areas in Florida; however, the proposed action does not interfere with any nearshore areas. Therefore, critical habitat for the piping plover will not be exposed to any potentially harmful elements of the proposed action. The action agencies have determined that the activities under the proposed project will have no effect to the piping plover's critical habitat.

7.3 Federal Proposed Species and Proposed Critical Habitat

The action agencies did not perform an analysis of impacts because no federally-listed proposed species or proposed critical habitat in or near the proposed action area were identified.

Table 4: Summary of potential impacts considered and ESA determination

Group and Species	Potential Impacts Considered	Potential Effect	Determination
Birds			
1 Piping Plover 2 Red Knot	None	None	No effect
Fish			
1 Giant Manta Ray 2 Nassau Grouper 3 Oceanic Whitetip Shark 4 Smalltooth Sawfish	Disturbance, entanglement, and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
Invertebrates			
1 Boulder Star Coral 2 Elkhorn Coral 3 Mountainous Star Coral 4 Pillar Coral 5 Staghorn Coral 6 Rough Cactus Coral 7 Lobed Star Coral	Disturbance and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
Marine Mammals			
1 Blue Whale 2 Fin Whale 3 Humpback Whale 4 Sei Whale 5 Sperm Whale 6 Bryde's Whale	Disturbance, entanglement, vessel strike, and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
Reptiles			
1 Green Sea Turtle 2 Hawksbill Sea Turtle 3 Kemp's Ridley Sea Turtle 4 Leatherback Sea Turtle 5 Loggerhead Sea Turtle	Disturbance, entanglement, vessel strike, and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
Critical Habitat			
1 Hawksbill Sea Turtle 2 Leatherback Sea Turtle 3 Loggerhead Sea Turtle	Vessel strike and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
4 Piping Plover	None	None	No effect

8.0 Conclusion

The EPA and USACE conclude that the proposed project's potential threats (disturbance, entanglement, vessel strike, water quality) to ESA-listed species and critical habitat are highly unlikely to occur or extremely minor in severity; therefore, the potential effects to ESA protected species and critical habitats are discountable or insignificant.

The EPA and USACE have determined that the proposed project will have "no effect" on the listed species and critical habitat under the jurisdiction of the USFWS that may occur in the proposed action area and that may be affected. This determination includes the piping plover and the red knot and critical habitat for the piping plover. No other listed species, proposed species, critical habitats, or proposed critical habitats were considered under the authority of the USFWS because there is no evidence to support that a potential effect from the proposed project may occur. The EPA and USACE request concurrence from the USFWS for this determination under ESA Section 7.

The EPA and USACE have determined that the proposed project "may affect, but is not likely to adversely affect" the listed species and critical habitat or designated critical habitat under the jurisdiction of the NMFS. This determination includes: four species of fish, seven species of invertebrates, six species of whales, reptiles from five species, and critical habitat for reptiles. No other listed species, proposed species, critical habitats, or proposed critical habitats were considered under the authority of the NMFS because there is no evidence to support that a potential effect from the proposed project may occur. The EPA and USACE request concurrence from the NMFS for this determination under ESA Section 7.

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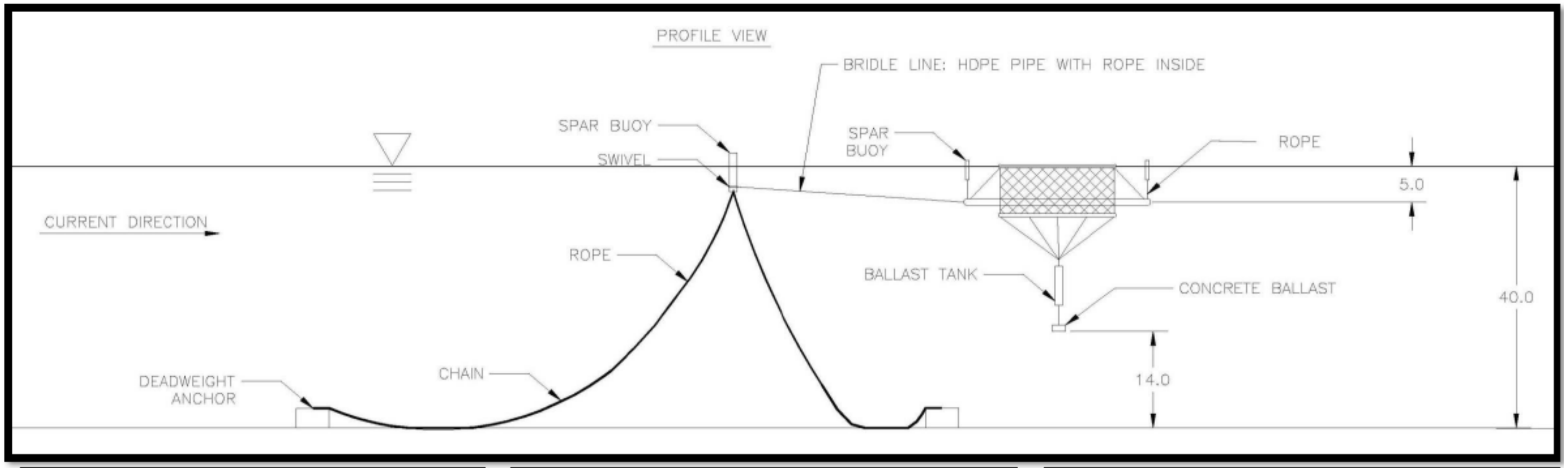
Appendix A – Cage and Mooring Detail



1) Deadweight Anchors (concrete):
- Three (3) anchors equally spaced @:
  - 120m from mooring centerline
  - 120 degrees from each other
- Each @ 4.5m x 4.5m x 4.5m (91 m3)
- Concrete friction factor = 0.5 on wet sand
- Each has an effective weight of 217 MT

2) Mooring Chain (Grade 2 steel):
- 80m length on each anchor
- 50mm (2") thick links
- No load = 70m length of each on seafloor
- Design load = some entirely off seafloor/ others completely on seafloor

3) Mooring Lines (rope):
- 40m length on each chain
- AMSTEEL®-BLUE
- 36mm (1 1/2") thick lines

4) Spar Buoy w/ Swivel (steel):

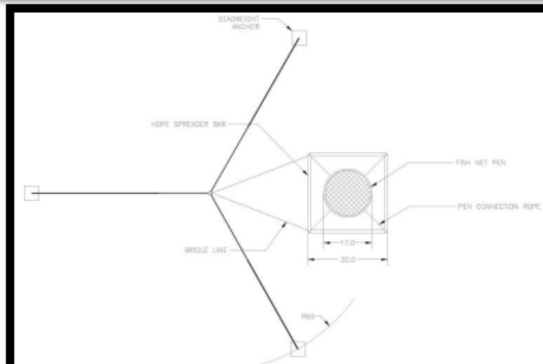
5) Bridle Lines (rope inside HDPE pipe):
- Three (3) ~30m bridle lines (rope) from swivel to spreader bar
- AMSTEEL®-BLUE
- 33.3mm (1 5/16") lines inside HDPE pipe

6) Spreader Bar (HDPE):
- Header Bar (load bearing) connected to Bridle Lines
  - 30m in length
  - 0.36m OD DR 11 HDPE pipe
- Side and Rear Bars (smaller load bearing)
  - 30m in length
  - 0.36m OD DR 17 HDPE pipe
- Four (4) corner spar buoys

7) Net Pen Connection Lines (rope):
- Four (4) ~13m connection lines (rope)
- Connected from Spreader Bar to Net Pen Float Rings
- AMSTEEL®-BLUE
- 33.3mm (1 5/16") lines

8) Net Pen Frame Structure (HDPE):
- Top Frame Structure
  - 18m in diameter
  - One (1) HDPE side-by-side Float Rings
    - On the sea surface
    - ~ 0.36m OD DR 11 HDPE pipe
  - One (1) HDPE net ring (railing)
    - Connected ~ 1.0m above Float Rings
    - Connected to Net Pen Mesh
    - ~ 0.15m OD DR 17 HDPE pipe
- Bottom Frame Structure
  - 18m in diameter
  - One (1) HDPE sinker ring
    - 7.0m below Float Rings
    - Connected to Net Ring
    - ~ 0.36m OD DR 11 HDPE pipe
  - One (1) HDPE net ring
    - 7.0m below float rings
    - Connected to copper alloy mesh
    - ~ 0.15m OD DR 17 HDPE pipe

9) Net Pen Mesh (copper alloy):
- 17m diameter x 7m depth
- Top connected to top net ring (railing)
- Bottom connected to bottom net ring
  - 4mm wire diameter
  - 40mm x 40mm mesh square
- Effective volume of 1,600m^3

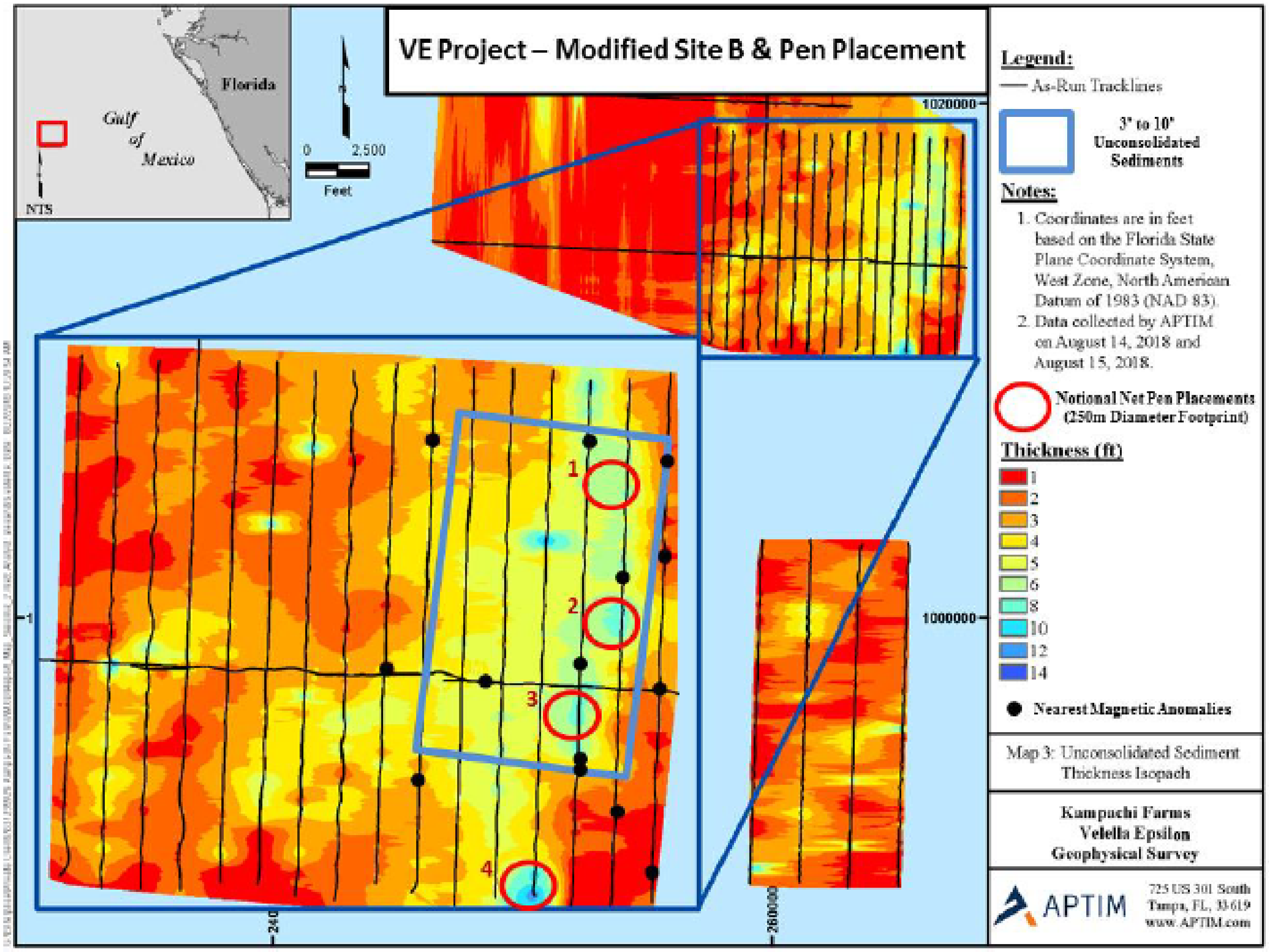


10) Shackle Point Connection (steel):
- One (1) ~0.13m^2 shackle plate
- Four (4) connection lines
  - 12 mm in diameter x 10m in length
  - Connected from shackle plate to HDPE sinker ring
- ~1m Grade 2 steel chain (32mm) connected to Floatation Capsule

11) Floatation Capsule (steel):
- ~ 1.5m in diameter x ~3.45m in length
- Effective floatation volume = 6m^3
- ~3m Grade 2 steel chain (32mm) connected to Counter Weight

12) Counter Weight (concrete):
- ~ 1.1m in diameter x ~2.2m in length
- Effective weight of 5 MT

Appendix B – Location Area



Position	° Decimal ' Latitude	° Decimal ' Longitude	Decimal ° Latitude	Decimal ° Longitude	Perimeter (km)	Area (km²)
Modified Site B from BES Report						
Upper Left	27° 7.86863' N	83° 13.45827' W	27.131143° N	83.224303° W		
Upper Right	27° 7.83079' N	83° 11.63237' W	27.130512° N	83.193872° W		
Lower Right	27° 6.43381' N	83° 11.69349' W	27.107230° N	83.194890° W		
Lower Left	27° 6.50261' N	83° 13.52658' W	27.108377° N	83.225442° W		
Center	27° 7.11266' N	83° 12.58604' W	27.118543° N	83.209767° W	11.1571	7.7237
Targeted Subset Area of Modified Site B from BES Report (3' to 10' Unconsolidated Sediments)						
Upper Left	27° 7.70607' N	83° 12.27012' W	27.128445° N	83.204502° W		
Upper Right	27° 7.61022' N	83° 11.65678' W	27.126837° N	83.194278° W		
Lower Right	27° 6.77773' N	83° 11.75379' W	27.112962° N	83.195897° W		
Lower Left	27° 6.87631' N	83° 12.42032' W	27.114605° N	83.207005° W		
Center	27° 7.34185' N	83° 12.02291' W	27.122365° N	83.200382° W	5.2273	1.6435
Notional Net Pen Placements within Modified Site B from BES Report						
1	27° 7.54724' N	83° 11.85393' W	27.125787° N	83.197565° W		
2	27° 7.17481' N	83° 11.82576' W	27.119580° N	83.197095° W		
3	27° 6.93930' N	83° 11.94780' W	27.115655° N	83.199130° W		
4	27° 6.52579' N	83° 12.09175' W	27.108763° N	83.201530° W	0.7854	0.0491

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

AUG 1 2 2019

CERTIFIED MAIL 7018 2290 0000 9993 5415
RETURN RECEIPT REQUESTED

Mr. David Bernhart
Assistant Regional Administrator
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Regional Office
Protected Resources Division
263 13th Avenue South
St. Petersburg, Florida 33701-5505

SUBJECT: Informal Endangered Species Act Section 7 Consultation Request
Kampachi Farms, LLC – Velella Epsilon Marine Aquaculture Facility

Dear Mr. Bernhart:

The U.S. Environmental Protection Agency Region 4 (EPA) and the U.S. Army Corps of Engineers Jacksonville District (USACE) are obligated under Section 7(a)(2) of the Endangered Species Act (ESA) to ensure that any action it approves is not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of critical habitat. The purpose of this letter is to request the initiation of informal consultation with the National Marine Fisheries Service (NMFS) under ESA § 7(a)(2), the ESA implementing regulations at 50 CFR § 402.13, and the Memorandum of Agreement (MOA) Between the EPA, NMFS, and U.S Fish and Wildlife Service (USFWS) regarding enhanced coordination (ESA MOA).[1]

On November 9, 2018, the EPA received a complete application for a National Pollutant Discharge Elimination System (NPDES) permit from Kampachi Farms for the discharge of pollutants from Velella Epsilon Marine Aquaculture Facility in federal waters of the Gulf. On November 10, 2018, the USACE received a Department of Army application pursuant to Section 10 of the Rivers and Harbors Act for structures and work affecting navigable federal waters from the same marine aquaculture facility. On behalf of the two federal agencies responsible for permitting aquaculture operations in federal waters of the Gulf, the EPA is requesting initiation of the ESA § 7 informal consultation process for the two federal permits needed to operate the proposed marine aquaculture facility. The EPA is also initiating consultation pursuant to the Fish and Wildlife Coordination Act.

[1] In accordance with the *Memorandum of Agreement Between the Environmental Protection Agency, Fish and Wildlife Service and National Marine Fisheries Service Regarding Enhanced Coordination Under the Clean Water Act and Endangered Species Act* (2001).

Given that the action of permitting the proposed project involves more than one federal agency, the EPA has elected to act as the lead agency to fulfill the consultation responsibilities pursuant to the implementing regulations of ESA § 7.[2] This consultation request shall also serve as the written notice to the NMFS that the EPA is acting as the lead agency as required by 50 CFR § 402.07. The USACE is a cooperating and co-federal agency for this informal consultation request. The completion of this informal consultation shall satisfy the EPA's and USACE's obligations under ESA § 7.

The attached supporting Biological Evaluation (BE) was prepared by the EPA and the USACE to jointly consider the potential effects that the proposed actions may have on listed and proposed species and on designated and proposed critical habitat. Based on the information within the BE, the EPA and USACE have determined that the proposed actions are not likely to adversely affect any listed or proposed species as well as designated and proposed critical habitat species under the jurisdiction of the NMFS. As outlined in the ESA MOA, the EPA requests that the NMFS respond in writing within 30 days of receiving the not likely to adversely affect determination documented within the BE. The response should state whether the NMFS concurs or does not concur with the determination made by the EPA and USACE. If the NMFS does not concur, it will provide a written explanation that includes the species and/or critical habitat of concern, the perceived adverse effects, and supporting information.

The EPA and USACE are coordinating the interagency review process in accordance with the interagency *Memorandum of Understanding for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf*,[3] and conducting a comprehensive analysis of all applicable environmental requirements as allowed by the National Environmental Policy Act (NEPA); however, a consolidated cooperation process under NEPA is not being used to satisfy the requirements of ESA § 7 as described in 50 CFR § 402.06.[4] The NMFS is a cooperating agency for the NEPA analysis and has provided scientific expertise related to the BE and NEPA analysis for the Velella Epsilon facility including information about: site selection, ESA-listed species, marine mammal protection, and essential fish habitat. While some information related to the ESA analysis is within the coordinated NEPA evaluation developed by multiple federal agencies, the attached BE is being provided as a stand-alone document to comply with the consultation process under ESA § 7.

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[2] 50 CFR § 402.07 allows a lead agency: "When a particular action involves more than one Federal agency, the consultation and conference responsibilities may be fulfilled through a lead agency. Factors relevant in determining an appropriate lead agency include the time sequence in which the agencies would become involved, the magnitude of their respective involvement, and their relative expertise with respect to the environmental effects of the action. The Director shall be notified of the designation in writing by the lead agency."

[3] On February 6, 2017, the Memorandum of Understanding for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf of Mexico became effective for seven federal agencies with permitting or authorization responsibilities.

[4] 50 CFR § 402.06 states that "Consultation, conference, and biological assessment procedures under section 7 may be consolidated with interagency cooperation procedures required by other statutes, such as the National Environmental Policy Act (NEPA) (42 USC 4321 *et seq.*, implemented at 40 CFR Parts 1500- 1508) or the Fish and Wildlife Coordination Act (FWCA)."

If you require any further information during this consultation period or have any questions, please contact Ms. Meghan Wahlstrom-Ramler via email at wahlstrom-ramler.meghan@epa.gov or by phone at (404) 562-9672.

Sincerely,

Christopher B. Thomas, Chief
Permitting and Grants Branch

cc: Ms. Katy Damico, USACE (via email)
Dr. Jess Beck-Stimpert, NMFS (via email)
Ms. Jennifer Lee, NMFS (via email)
Mr. Jeffrey Howe, USFWS (via email)

DRAFT
BIOLOGICAL EVALUATION

Kampachi Farms, LLC - Velella Epsilon
Marine Aquaculture Facility
Outer Continental Shelf
Federal Waters of the Gulf of Mexico

August 5, 2019

U.S. Environmental Protection Agency
Region 4
Water Protection Division
61 Forsyth Street SW
Atlanta Georgia 30303

NPDES Permit Number
FL0A00001

U.S. Army Corps of Engineers
Jacksonville District
Fort Myers Permit Section
1520 Royal Palm Square Boulevard Suite 310
Fort Myers Florida 33919-1036

Department of the Army Permit Number
SAJ-2017-03488

Table of Contents

1.0 Introduction and Federal Coordination

In accordance with the Endangered Species Act (ESA) Section 7, interagency consultation and coordination with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) is required to insure that any action authorized, funded, or carried out by an action agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of any designated critical habitat (Section 7(a)(2)); and confer with the NMFS and USFWS on any agency actions that are likely to jeopardize the continued existence of any species that is proposed for listing or result in the destruction or adverse modification of any critical habitat proposed to be designated (Section 7(a)(4)).[1]

On November 9, 2018, the U.S. Environmental Protection Agency Region 4 (EPA) received a complete application for a National Pollutant Discharge Elimination System (NPDES) permit from Kampachi Farms for the point-source discharge of pollutants from a marine aquaculture facility in federal waters of the Gulf of Mexico (Gulf). On November 10, 2018, the U.S. Army Corps of Engineers Jacksonville District (USACE) received a completed Department of Army (DA) application pursuant to Section 10 of the Rivers and Harbors Act for structures and work affecting navigable federal waters from the same marine aquaculture facility.

Given that the action of permitting the proposed project involves more than one federal agency, the EPA has elected to act as the lead agency to fulfill the consultation responsibilities pursuant to the implementing regulations of ESA Section 7.[2] The USACE is a cooperating and co-federal agency for this informal consultation request. The completion of the informal consultation shall satisfy the EPA's and USACE's obligations under ESA Section 7(a)(2).

The EPA and the USACE (action agencies) have reviewed the proposed activity and determined that a biological evaluation (BE) is appropriate. The BE was prepared by the EPA and the USACE to jointly consider the potential direct, indirect, and cumulative effects that the proposed actions may have on listed and proposed species as well as designated and proposed critical habitat, and to assist the action agencies in carrying out their activities for the proposed action pursuant to ESA Section 7(a)(2) and ESA Section 7(a)(4). The EPA and the USACE are providing this BE for consideration by the USFWS and the NMFS in compliance with the ESA Section 7.

The EPA and USACE are coordinating the interagency permitting process as required by the interagency Memorandum of Understanding (MOU) for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf,[3] and conducting a comprehensive analysis of all applicable environmental requirements required by the National Environmental Policy Act (NEPA); however, a consolidated cooperation process under NEPA is not being used to satisfy the requirements of ESA Section 7 as described in 50 CFR § 402.06.[4] The NMFS is a cooperating agency for the NEPA analysis and has provided scientific expertise related to the BE and NEPA analysis for the proposed action including information about: site selection, ESA-listed species, marine mammal protection, and essential fish habitat. While some information related to the ESA evaluation is within the coordinated NEPA document developed by multiple federal agencies, the attached BE is being provided as a stand-alone document to comply with the consultation process under ESA Section 7.

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[1] The implementing regulations for the Clean Water Act related to the ESA require the EPA to ensure, in consultation with the NMFS and USFWS, that "any action authorized the EPA is not likely to jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat" (40 CFR § 122.49(c)).

[2] 50 CFR § 402.07 allows a lead agency: "When a particular action involves more than one Federal agency, the consultation and conference responsibilities may be fulfilled through a lead agency. Factors relevant in determining an appropriate lead agency include the time sequence in which the agencies would become involved, the magnitude of their respective involvement, and their relative expertise with respect to the environmental effects of the action. The Director shall be notified of the designation in writing by the lead agency."

[3] On February 6, 2017, the Memorandum of Understanding for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf of Mexico became effective for seven federal agencies with permitting or authorization responsibilities.

[4] 50 CFR § 402.06 states that "Consultation, conference, and biological assessment procedures under section 7 may be consolidated with interagency cooperation procedures required by other statutes, such as the National Environmental Policy Act (NEPA) (implemented at 40 CFR Parts 1500 - 1508) or the Fish and Wildlife Coordination Act (FWCA)."

2.0 Proposed Action

Kampachi Farms, LLC (applicant) is proposing to operate a pilot-scale marine aquaculture facility (Velella Epsilon) in federal waters of the Gulf. The proposed action is the issuance of a permit under the respective authorities of the EPA and the USACE as required to operate the facility. The EPA's proposed action is the issuance of a NPDES permit that authorizes the discharge of pollutants from an aquatic animal production facility that is considered a point source into federal waters of the United States. The USACE's proposed action is the issuance of a DA permit pursuant to Section 10 of the Rivers and Harbors Act that authorizes anchorage to the sea floor and structures affecting navigable waters.

3.0 Proposed Project

The proposed project would allow the applicant to operate a pilot-scale marine aquaculture facility with up to 20,000 almaco jack (*Seriola rivoliana*) being reared in federal waters for a period of approximately 12 months (total deployment of the cage system is 18 months). Based on an estimated 85 percent survival rate, the operation is expected to yield approximately 17,000 fish. Final fish size is estimated to be approximately 4.4 pounds (lbs) per fish, resulting in an estimated final maximum harvest weight of 88,000 lbs (or 74,800 lbs considering the anticipated survival rate). The fingerlings will be sourced from brood stock that are located at Mote Aquaculture Research Park and were caught in the Gulf near Madeira Beach, Florida. As such, only F1 progeny will be stocked into the proposed project.

One support vessel will be used throughout the life of the project. The boat will always be present at the facility except during certain storm events or times when resupplying is necessary. The support vessel would not be operated during any time that a small craft advisory in effect for the proposed action area. The support vessel is expected to be a 70 ft long Pilothouse Trawler (20 ft beam and 5 ft draft) with a single 715 HP engine. The vessel will also carry a generator that is expected to operate approximately 12 hours per day. Following harvest, cultured fish would be landed in Florida and sold to federally-licensed dealers in accordance with state and federal laws. The exact type of harvest vessel is not known; however, it is expected to be a vessel already engaged offshore fishing activities in the Gulf.

A single CopperNet offshore strength (PolarCirkel-style) fully enclosed submersible fish pen will be deployed on an engineered multi-anchor swivel (MAS) mooring system. The engineered MAS will have up to three anchors for the mooring, with a swivel and bridle system. The design drawings provided for the engineered MAS uses three concrete deadweight anchors for the mooring; however, the final anchor design will likely utilize embedment anchors instead. The cage material for the proposed project is constructed with rigid and durable materials (copper mesh net with a diameter of 4 millimeter (mm) wire and 40 mm x 40 mm mesh square). The mooring lines for the proposed project will be constructed of steel chain (50 mm thick) and thick rope (36 mm) that are attached to a floating cage that will rotate in the prevailing current direction; the ocean currents will maintain the mooring rope and chain under tension during most times of operation. The bridle line that connects from the swivel to the cage will be encased in a rigid pipe. Structural information showing the MAS and pen, along with the tethered supporting vessel, is provided in Appendix A. The anchoring system for the proposed project is being finalized by the applicant. While the drawings in Appendix A show concrete deadweight anchors, it is likely that the final design will utilize appropriately sized embedment anchors instead. Both anchor types are included for ESA consultation purposes.

The CopperNet cage design is flexible and self-adjusts to suit the constantly changing wave and current conditions. As a result, the system can operate floating on the ocean surface or submerged within the water column of the ocean; however, the normal operating condition of the cage is below the water surface. When a storm approaches the area, the entire cage can be submerged by using a valve to flood the floatation system with water. A buoy remains on the surface, marking the net pen's position and supporting the air hose. When the pen approaches the bottom, the system can be maintained several meters above the sea floor. The cage system is sable to rotate around the MAS and adjust to the currents while it is submerged and protected from storms near the water surface. After storm events, the cage system is made buoyant, causing the system to rise to resume normal operational conditions. The proposed project cage will have at least one properly functioning global positioning system device to assist in locating the system in the event it is damaged or disconnected from the mooring system.

In cooperation with the NMFS, a protected species monitoring plan (PSMP) has been developed for the proposed action to protect all marine mammal, reptiles, sea birds, and other protected species. Monitoring will occur throughout the life of the project and represents an important minimization measure to reduce the likelihood of any unforeseen potential injury to all protected species including ESA-listed marine animals. The data collected will provide valuable insight to resource managers about potential interactions between aquaculture operations and protected species. The PSMP also contains important mitigative efforts such as suspending vessel transit activities when a protected species comes within 100 meters (m) of the activity until the animal(s) leave the area. The project staff will suspend all surface activities (including stocking fish, harvesting operations, and routine maintenance operations) in the unlikely event that any protected species comes within 100 m of the activity until the animal leaves the area. Furthermore, should there be activity that results in an injury to protected species, the on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement.[5]

The below information about chemicals, drugs, cleaning, and solid waste provides supporting details about the proposed project:

Chemicals: The proposed facility has indicated they would not be using toxic chemicals, cleaners, or solvents at the proposed project. The proposed project would use small amounts of petroleum to run the generator. Spills are unlikely to occur; however, if a spill did occur they would be small in nature.

Drugs: The applicant has indicated that FDA-approved antibiotics or other therapeutants will not likely be used (within any feed or dosing the rearing water) during the proposed project. [6] The need for drugs is minimized by the strong currents expected at the proposed action area, the low fish culture density, the cage material being used, and the constant movement of the cage.

Cleaning: The applicant does not anticipate the need to clean the cage for the short duration of the proposed project. Should the cage system need cleaning, divers would manually scrub the cage surfaces with cleaning brushes. No chemicals would be used while cleaning and any accumulated marine biological matter would be returned to sea without alteration.

Solid Wastes: The applicant will dispose of all solid waste appropriately on shore.

[5] A PSMP has been developed by the applicant with assistance from the NMFS Protected Resources Division. The purpose of the PSMP is to provide monitoring procedures and data collection efforts for species (marine mammals, sea turtles, seabirds, or other species) protected under the MMPA or ESA that may be encountered at the proposed project.

[6] The applicant is not expected to use any drugs; however, in the unlikely circumstance that therapeutant treatment is needed, three drugs were provided to the EPA as potential candidates (hydrogen peroxide, oxytetracycline dihydrate, and florfenicol).

4.0 Proposed Action Area

The proposed project would be placed in the Gulf at an approximate water depth of 40 m (130 feet), and generally located 45 miles southwest of Sarasota, Florida. The proposed facility will be placed within an area that contains unconsolidated sediments that are 3 – 10 ft deep (see Table 1). The applicant will select the specific location within that area based on diver-assisted assessment of the sea floor when the cage and anchoring system are deployed. The proposed action area is a 1,000 m radius measured from the center of the MAS.

The facility potential locations were selected with assistance from NOAA's National Ocean Service National Centers for Coastal Ocean Science (NCCOS). The applicant and the NCCOS conducted a site screening process over several months to identify an appropriate project site. Some of the criteria considered during the site screening process included avoidance of corals, coral reefs, submerged aquatic vegetation, hard bottom habitats, and avoidance of marine protected areas, marine reserves, and habitats of particular concern. This siting assessment was conducted using the Gulf AquaMapper tool developed by NCCOS.[7]

Upon completion of the site screening process with the NCCOS, the applicant conducted a Baseline Environmental Survey (BES) in August 2018 based on guidance developed by the NMFS and EPA.[8] The BES included a geophysical investigation to characterize the sub-surface and surface geology of the sites and identify areas with a sufficient thickness of unconsolidated sediment near the surface while also clearing the area of any geohazards and structures that would impede the implementation of the aquaculture operation. The geophysical survey for the proposed project consisted of collecting single beam bathymetry, side scan sonar, sub-bottom profiler, and magnetometer data within the proposed area. The BES report noted that were no physical, biological, or archaeological features within the surveyed area that would preclude the siting of the proposed aquaculture facility within the area shown in Table 1.

Table 1: Target Area with 3' to 10' of Unconsolidated Sediments

Location	Latitude	Longitude
Upper Left Corner	27° 7.70607' N	83° 12.27012' W
Upper Right Corner	27° 7.61022' N	83° 11.65678' W
Lower Right Corner	27° 6.77773' N	83° 11.75379' W
Lower Left Corner	27° 6.87631' N	83° 12.42032' W

[7] The Gulf AquaMapper tool is available at: https://coastalscience.noaa.gov/products-explorer/

[8] The BES guidance document is available at: http://sero.nmfs.noaa.gov/sustainable_fisheries/Gulf_fisheries/aquaculture/

5.0 Federally Listed and Proposed Threatened and Endangered Species and Critical Habitat

5.1 Federally Listed Threatened and Endangered Species

The action agencies identified the ESA-listed species shown in Table 2 for consideration on whether the proposed action may affect protected species in or near the proposed action area. In summary, the action agencies considered the potential affects to threatened and endangered species from five groups of species: birds (2), fish (4), invertebrates (7), marine mammals (6), and reptiles (5). The action agencies considered the species within this Section of the BE because they may occur within the project footprint or near enough such that there are potential routes of effects. Certain ESA-listed species are not discussed because their behavior, range, habitat preferences, or known/estimated location do not overlap or expose them to the activities within the proposed action area.

Table 2: Federally Listed Species, Listed Critical Habitat, Proposed Species, and Proposed Critical Habitat Considered for the Proposed Action

Species Considered	ESA Status	Critical Habitat Status	Potential Exposure to Proposed Action Area
Birds			
1 Piping Clover	Threatened	Yes	No
2 Red Knot	Threatened	No	No
Fish			
1 Giant Manta Ray	Threatened	No	Yes
2 Nassau Grouper	Threatened	No	Yes
3 Oceanic Whitetip Shark	Threatened	No	Yes
4 Smalltooth Sawfish	Endangered	No	Yes
Invertebrates			
1 Boulder Star Coral	Threatened	No	No
2 Elkhorn Coral	Threatened	No	No
4 Mountainous Star Coral	Threatened	No	No
5 Pillar Coral	Threatened	No	No
7 Staghorn Coral	Threatened	No	No
6 Rough Cactus Coral	Threatened	No	Yes
3 Lobed Star Coral	Threatened	No	Yes
Marine Mammals			
1 Blue Whale	Endangered	No	Yes
2 Bryde's Whale	Endangered	No	Yes
3 Fin Whale	Endangered	No	Yes
4 Humpback Whale	Endangered	No	Yes
5 Sei Whale	Endangered	No	Yes
6 Sperm Whale	Endangered	No	Yes
Reptiles			
1 Green Sea Turtle	Threatened	No	Yes
2 Hawksbill Sea Turtle	Endangered	Yes	Yes
3 Kemp's Ridley Sea Turtle	Endangered	No	Yes
4 Leatherback Sea Turtle	Endangered	Yes	Yes
5 Loggerhead Sea Turtle	Threatened	Yes	Yes

5.1.1 Birds

There are 14 ESA-listed avian species identified as threatened or endangered, previously delisted, or as candidate species in the eastern Gulf. Of those species, only two listed species, the piping plover and red knot, are considered in this BE because their migratory range could expose them to activities covered under the proposed action. There are several other listed species whose range includes only inshore and coastal margin waters and are not exposed to the activities covered under the proposed action.

Piping Plover

The piping plover is a threatened shorebird that inhabits coastal sandy beaches and mudflats. Three populations of piping plover are recognized under ESA: Great Lakes (endangered); Great Plains (threatened); and Atlantic (threatened) (BOEM, 2012a). This species nests in sand depressions lined with pebbles, shells, or driftwood. Piping plovers forage on small invertebrates along ocean beaches, on intertidal flats, and along tidal pool edges; therefore, fish from the proposed action are not considered a potential source of food for the piping plover.

Possibly as high as 75% of all breeding piping plovers, regardless of population affiliation, may spend up to eight months on wintering grounds in the Gulf. They arrive from July through September, leaving in late February to migrate back to their breeding sites (BOEM, 2012b). They do not breed in the Gulf. Habitat used by wintering birds include beaches, mud flats, sand flats, algal flats, and washover passes (where breaks in sand dunes result in an inlet). The piping plover is considered a state species of conservation concern in all Gulf coast states due to wintering habitat. The piping plover is it is a migratory shorebird with no open ocean habitat.

Red Knot

The red knot, listed as threatened in 2014, is a highly migratory shorebird species that travels between nesting habitats in Arctic latitudes and southern non-breeding habitats in South America and the U.S. Atlantic and Gulf coasts (BOEM, 2012a). Red knots forage along sandy beaches, tidal mudflats, salt marshes, and peat banks for bivalves, gastropods, and crustaceans (USFWS, 2015). Horseshoe crab eggs are a critical food resource for this species, and the overharvesting and population declines of horseshoe crabs may be a major reason for the decline of red knot numbers.

Wintering red knots may be found in Florida and Texas (Würsig, 2017). They are considered a State Species of Conservation Concern in Florida and Mississippi. The numbers of wintering and staging red knots using coastal beaches in Gulf coast states other than Florida have declined dramatically (Würsig, 2017). Its population has exhibited a large decline in recent decades and is now estimated in the low ten-thousands (NatureServe, 2019). Critical habitat rules have not been published for the red knot. Within the Gulf region, wintering red knots are found primarily in Florida, but this species has been reported in coastal counties of each of the Gulf states.

5.1.2 Fish

The four species of ESA-protected fish that may occur within the action area are: giant manta ray, nassau grouper, smalltooth sawfish, and oceanic whitetip shark.

Giant Manta Ray

The giant manta ray was listed as threatened under the ESA on February 21, 2018. The giant manta ray is found worldwide in tropical, subtropical, and temperate seas. These slow-growing, migratory animals are circumglobal with fragmented populations. The giant manta ray is the largest living ray, with a wingspan reaching a width of up to 9 m. Manta species are distinguished from other rays in that they tend to be larger with a terminal mouth, and have long cephalic lobes (Evgeny, 2010), which are extensions of the pectoral fins that funnel water into the mouth. Giant manta rays feed primarily on planktonic organisms such as euphausiids, copepods, mysids, decapod larvae and shrimp, but some studies have noted their consumption of small and moderately sized fishes (Miller and Klimovich, 2017).

Within the Southeast Region of the United States, the giant manta ray is frequently sighted along the east coast and within the Gulf of Mexico. Giant manta rays are seasonal visitors along productive coastlines with regular upwelling, in oceanic island groups, and near offshore pinnacles and seamounts. Given the opportunistic sightings of the species, researchers are still unsure what drives giant manta rays to certain areas and not others (and where they go for the remainder of the time). The timing of these visits varies by region and seems to correspond with the movement of zooplankton, current circulation and tidal patterns, seasonal upwelling, seawater temperature, and possibly mating behavior. Although giant manta rays are considered oceanic and solitary, they have been observed congregating at cleaning sites at offshore reefs and feeding in shallow waters during the day at depths less than 10 m (O'Shea et al., 2010; Marshall et al., 2011; Rohner et al., 2013). The giant manta ray ranges from near shore to pelagic habitats, occurring over the continental shelf near reef habitats and offshore islands. The species can be found in estuarine waters near oceanic inlets, with use of these waters as potential nursery grounds. This species appears to exhibit a high degree of plasticity in terms of their use of depths within their habitat.

Nassau Grouper

The Nassau grouper is a reef fish typically associated with hard structure such as reefs (both natural and artificial), rocks, and ledges. It is a member of the family Serranidae, which includes groupers valued as a major fishery resource such as the gag grouper and the red grouper. These large fish are found in tropical and subtropical waters of southern coastal Florida and the Florida Keys. Nassau grouper are generally absent from the Gulf north and outside of the Florida Keys; this is well documented by the lack of records in Florida Fish and Wildlife Conservation Commission's, Fisheries Independent Monitoring data, as well as various surveys conducted by NOAA Fisheries Southeast Fisheries Science Center. There has been one verified report of the Nassau Grouper in the northwest Gulf at Flower Gardens Bank national marine sanctuary; however, the Flowers Gardens Bank is not near the proposed action area.

Oceanic Whitetip Shark

The oceanic whitetip shark is a large open ocean highly migratory apex predatory shark found in subtropical waters throughout the Gulf. It is a pelagic species usually found offshore in the open ocean, on the outer continental shelf, or around oceanic islands in deep water greater than 184 m. The oceanic whitetip shark can be found from the surface to at least 152 m depth. Occasionally, it is found close to land in waters as shallow as 37 m, mainly around mid-ocean islands or in areas where the continental shelf is narrow with access to nearby deep water. Oceanic whitetip sharks have a strong preference for the surface mixed layer in warm waters above 20°C and are therefore mainly a surface-dwelling shark.

Oceanic whitetip sharks are high trophic-level predators in open ocean ecosystems feeding mainly on teleosts and cephalopods (Backus et al., 1956; Bonfil et al., 2008); however, some studies have found that they consume sea birds, marine mammals, other sharks and rays, mollusks, crustaceans, and even garbage (Compagno, 1984; Cortés, 1999).

Smalltooth Sawfish

The smalltooth sawfish was the first marine fish to receive protection as an endangered species under the ESA in 2003. Their current range is poorly understood but believed to have significantly contracted from these historical areas. Today, smalltooth sawfish primarily occur off peninsular Florida from the Calloosahtchee River to the Florida Keys (Würsig, 2017). Historical accounts and recent encounters suggest immature individuals are most common in shallow coastal waters less than 25 m (Bigelow and Schroeder, 1953; Adams and Wilson, 1995). Smalltooth sawfish primarily live in shallow coastal waters near river mouths, estuaries, bays, or depths up to 125 m. Smalltooth sawfish feed primarily on fish. Mullet, jacks, and ladyfish are believed to be their primary food resources (Simpfendorfer, 2001). Smalltooth sawfish also prey on crustaceans (mostly shrimp and crabs) by disturbing bottom sediment with their saw (Norman and Fraser, 1938; Bigelow and Schroeder, 1953).

5.1.3 Invertebrates

The seven ESA-listed coral species in the Gulf are known to occur near the Dry Tortugas, a small group of islands located approximately 67 miles west of Key West, Florida. Four of the ESA-listed coral species in the Gulf (elkhorn, lobed star, mountainous star, and boulder star) are known to occur in the Flower Banks National

Marine Sanctuary, located 70 to 115 miles off the coast of Texas and Louisiana. The most abundant depth ranges for the ESA-listed invertebrates are provided in Table 3. Given the known geographic locations of the considered coral species and their recognized habitat preferences related to water depth, only two invertebrate species (lobed star coral and rough cactus coral) may occur in the proposed action area. Threats to coral communities throughout the Gulf include predation, hurricane damage, and loss of habitat due to algal overgrowth and sedimentation.

Table 3: ESA-listed Coral Depth Ranges

Coral Species	Most Abundant Depth (ft)
Boulder Star Coral	3 - 82 [9]
Elkhorn Coral	3 - 16 [10]
Lobed Star Coral	6 - 130 [11]
Mountainous Star Coral	3 - 30 [11]
Pillar Coral	3 - 90
Rough Cactus Coral	15 - 270 [10]
Staghorn Coral	15 - 60 [10]

5.1.4 Marine Mammals

All the ESA-listed marine mammals considered in this BE are endangered under the ESA. The six species of whales that could occur within the action area are: blue whale, fin whale, Gulf Bryde's whale, humpback whale, sperm whale, and sei whale; however, except for the Gulf Bryde's whale, each ESA-listed whale considered in this BE are not common in the Gulf (Würsig, 2017). Threats to whales from aquaculture facilities include vessel strikes, entanglement, and disturbance (ocean noise).

Blue Whales

Blue whales are found in all oceans except the Arctic Ocean. Currently, there are five recognized subspecies of blue whales. Blue whales have been sighted infrequently in the Gulf. The only record of blue whales in the Gulf are two strandings on the Louisiana and Texas coasts; however, the identifications for both strandings are questionable. In the North Atlantic blue whales are most often seen off eastern Canada where they are present year-round (NMFS, 2016). Blue whales also typically occur in deeper waters seaward of the continental shelf and are not commonly observed in the waters of the Gulf or off the U.S. East Coast (CeTAP, 1982; Wenzel et al., 1988; Waring et al., 2006). Blue whales are not expected to be within the proposed action area that is located in a water depth of approximately 40 m.

Bryde's Whale

The Gulf Bryde's whale was listed as endangered on May 15, 2019. The Gulf Bryde's whales are members of the baleen whale family and are a subspecies of the Bryde's whale. The Gulf Bryde's whales are one of the most endangered whales in the world, with likely less than 100 whales remaining. They are the only resident baleen whale in the Gulf. The Gulf Bryde's whale is one of the few types of baleen whales that do not migrate and remain in the Gulf year-round. The historical range in Gulf waters is not well known; however, scientists believe that the historical distribution of Gulf Bryde's whales once encompassed the north-central and southern Gulf. For the past 25 years, Bryde's whales in U.S. waters of the Gulf have been consistently located in the northeastern Gulf (largely south of Alabama and the western part of the Florida panhandle) along the continental shelf break between the 100 and 400 m depth (Labrecque et al., 2015). This area has been identified as a Biologically Important Area (BIA) for the Gulf Bryde's whale and encompasses over 5.8 million acres. BIAs are reproductive areas, feeding areas, migratory corridors, or areas in which small and resident populations are

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[9] www.DCNANature.org, 2016

[10] NMFS, 2016

[11] www.IUCNRedList.org, 2016

concentrated. The proposed action area is not located near the areas where the Gulf Bryde's whale is known to be distributed and are not expected to occur at the water depth of the proposed project.

Fin Whales

Fin whales are found in deep, offshore waters of all the world's oceans, primarily in temperate to polar climates. The NMFS has reported that the are about 2,700 fin whales in the North Atlantic and Gulf. There are few reliable reports of fin whales in the northern Gulf. They are most commonly found in North Atlantic waters where they feed on krill, small schooling fish, and squid (NMFS, 2016). Fin whales are generally found along the 100 m isobath with sightings also spread over deeper water including canyons along the shelf break (Waring et al., 2006). Therefore, fin whales are not expected to be found near the proposed action area where the water depth is approximately 40 m.

Humpback Whales

Based on a few confirmed sightings and one stranding event, humpback whales are rare in the northern Gulf (BOEM, 2012a). Baleen whale richness in the Gulf is believed to be less than previously understood (Würsig, 2017). U.S. populations of humpback whales mainly use the western North Atlantic for feeding grounds and use the West Indies during winter and for calving (NMFS, 2016). Given that humpback whales are not a typical inhabitant of the Gulf, they are not expected to be in found near the proposed action area. Additionally, the water depth at the proposed action area (40 m) does not overlap to the habitat preference of humpback whales for deeper waters.

Sei Whales

The sei whale is rare in the northern Gulf and its occurrence is considered accidental, based on four reliable and one questionable strandings records in Louisiana and Florida (Jefferson and Schiro, 1997; Schmidley, 2004; Würsig, 2017). Sei whales are more commonly found in subtropical to subpolar waters of the continental shelf and slope of the Atlantic, with movement between the climates according to seasons (NMFS, 2016). Sei whales typically occur in deeper waters seaward of the continental shelf and are not commonly observed in the waters of the Gulf (CeTAP, 1982; Wenzel et al., 1988; Waring et al., 2006). Sei whales are not expected to be geographically located near the proposed project.

Sperm Whales

In the northern Gulf, aerial and ship surveys indicate that sperm whales are widely distributed and present in all seasons in continental slope and oceanic waters. Sperm whales are the most abundant large cetacean in the Gulf. Greatest densities of sperm whales are in the central Northern Gulf near Desoto Canyon as well as near the Dry Tortugas (Roberts et al., 2016). They are found in deep waters throughout the world's oceans, but generally in waters greater than 200 to 800 m due to the habit of feeding on deep-diving squid and fish (Hansen et al., 1996; Davis et al., 2002; Mullin and Fulling, 2003; Würsig, 2017). Research conducted since 2000 confirms that Gulf sperm whales constitute a distinct stock based on several lines of evidence (Waring et al., 2006). Sperm whales are not expected to be within the proposed action area due to their known preference for deeper water.

5.1.5 Reptiles

The five ESA-listed sea turtle species that may occur in or near the proposed action area are: green, hawksbill, leatherback, kemp's ridley, and loggerhead. Sea turtles are highly migratory and travel widely throughout the Gulf. Therefore, each sea turtle has the potential to occur throughout the entire Gulf. In general, the entire Gulf coastal and nearshore area can serve as habitat for marine turtles. Florida is the most important nesting area in the United States for loggerhead, green, and leatherback turtles. Several volumes exist that cover the biology and ecology of these species (i.e., Lutz and Musick, 1997; Lutz et al., 2003, Wynekan et al., 2013).

Green sea turtle

Green sea turtle hatchlings are thought to occupy pelagic areas of the open ocean and are often associated with *Sargassum* rafts (Carr, 1987; Walker, 1994). Pelagic stage green sea turtles are thought to be carnivorous.

Stomach samples of these animals found ctenophores and pelagic snails (Frick, 1976; Hughes, 1974). At approximately 20 to 25 centimeters (cm) carapace length, juveniles migrate from pelagic habitats to benthic foraging areas (Bjorndal, 1997). As juveniles move into benthic foraging areas a diet shift towards herbivory occurs. They consume primarily seagrasses and algae, but are also known to consume jellyfish, salps, and sponges (Bjorndal, 1980, 1997; Paredes, 1969; Mortimer, 1981, 1982). The diving abilities of all sea turtle species vary by their life stages. The maximum diving range of green sea turtles is estimated at 110 m (Frick, 1976), but they are most frequently making dives of less than 20 m (Walker, 1994). The time of these dives also varies by life stage.

The NMFS and USFWS removed the range-wide and breeding population ESA listings of the green sea turtle and listed eight distinct population segments (DPSs) as threatened and three DPSs as endangered, effective May 6, 2016. Two of the green sea turtle DPSs, the North Atlantic DPS and the South Atlantic DPS, occur in the Gulf. The proposed action area is within the North Atlantic NPS where the green sea turtle is listed as threatened.

Hawksbill sea turtle

The hawksbill sea turtle's pelagic stage lasts from the time they leave the nesting beach as hatchlings until they are approximately 22 to 25 cm in straight carapace length (Meylan, 1988; Meylan and Donnelly, 1999). The pelagic stage is followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Little is known about the diet of pelagic stage hawksbills. Adult foraging typically occurs over coral reefs, although other hard-bottom communities and mangrove-fringed areas are occupied occasionally. Hawksbills show fidelity to their foraging areas over several years (van Dam and Diéz, 1998). The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan, 1988). Gravid females have been noted ingesting coralline substrate (Meylan, 1984) and calcareous algae (Anderes, Alvarez, and Uchida, 1994), which are believed to be possible sources of calcium to aid in eggshell production. The maximum diving depths of these animals are unknown, but the maximum length of dives is estimated at 73.5 minutes, more routinely dives last about 56 minutes (Hughes, 1974). Hawksbill sea turtles are not known to regularly nest in Florida but do occur occasionally.

Kemp's Ridley sea turtle

Kemp's ridley sea turtle hatchlings are also pelagic during the early stages of life and feed in surface waters (Carr, 1987; Ogren, 1989). After the juveniles reach approximately 20 cm carapace length they move to relatively shallow (less than 50 m) benthic foraging habitat over unconsolidated substrates (Márquez-M., 1994). They have also been observed transiting long distances between foraging habitats (Ogren, 1989). Kemp's ridleys feeding in these nearshore areas primarily prey on crabs, though they are also known to ingest mollusks, fish, marine vegetation, and shrimp (Shaver, 1991). The fish and shrimp Kemp's ridleys ingest are not thought to be a primary prey item but instead may be scavenged opportunistically from bycatch discards or discarded bait (Shaver, 1991). Given their predilection for shallower water, Kemp's ridleys most routinely make dives of 50 m or less (Soma, 1985; Byles, 1988). Their maximum diving range is unknown. Depending on the life stage, a Kemp's ridley may be able to stay submerged anywhere from 167 minutes to 300 minutes, though dives of 12.7 minutes to 16.7 minutes are much more common (Soma, 1985; Mendonca and Pritchard, 1986; Byles, 1988). Kemp's ridley turtles may also spend as much as 96 percent of their time underwater (Soma, 1985; Byles, 1988). In the United States, Kemp's ridley turtles inhabit the Gulf and northwest Atlantic Ocean; nesting occurs primarily in Texas, and occasionally in Florida, Alabama, Georgia, South Carolina, and North Carolina.

Leatherback sea turtle

Leatherback sea turtles are the most pelagic of all ESA-listed sea turtles and spend most of their time in the open ocean. They will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these species regardless of life stage (Bjorndal, 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that these species can dive more than 1,000 m (Eckert et al., 1989) but more frequently dive to depths of 50 m to 84 m (Eckert et al. 1986). Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Standora et al., 1984; Eckert et al., 1986; Eckert et al., 1989; Keinath and Musick, 1993).

Loggerhead sea turtle

Loggerhead sea turtle hatchlings forage in the open ocean and are often associated with Sargassum rafts (Hughes, 1974; Carr 1987; Walker, 1994; Bolten and Balazs, 1995). The pelagic stage of these sea turtles are known to eat a wide range of things including salps, jellyfish, amphipods, crabs, syngnathid fish, squid, and pelagic snails (Brongersma, 1972). Stranding records indicate that when pelagic immature loggerheads reach 40 to 60 cm straight-line carapace length, they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic (Witzell, 2002). Loggerhead sea turtles forage over hard-bottom and soft-bottom habitats (Carr, 1986).

Benthic foraging loggerheads eat a variety of invertebrates with crabs and mollusks being an important prey source (Burke et al., 1993). Estimates of the maximum diving depths of loggerheads range from 211 m to 233 m (Thayer et al., 1984; Limpus and Nichols, 1988). The lengths of loggerhead dives are frequently between 17 and 30 minutes (Thayer et al., 1984; Limpus and Nichols, 1988; Limpus and Nichols, 1994; Lanyon et al., 1989) and they may spend anywhere from 80 to 94 percent of their time submerged (Limpus and Nichols, 1994; Lanyon et al., 1989). Loggerhead sea turtles are a long-lived, slow-growing species, vulnerable to various threats including alterations to beaches, vessel strikes, and bycatch in fishing nets.

5.2 Federally Listed Critical Habitat In or Near the Action Area

5.2.1 Birds

Onshore critical habitat has been designated for the piping plover including designations for coastal wintering habitat areas in Alabama, Mississippi, and Florida.[12] The proposed project is not expected to impact any onshore habitats.

5.2.2 Reptiles

The only critical habitat designated near the proposed action area is the Northwest Atlantic DPS of loggerhead sea turtles. Specific areas of designated habitat include: nearshore reproductive habitat, winter area, breeding areas, migratory corridors, and Sargassum habitat. The northwest Atlantic loggerhead DPS designated critical habitat portion that occurs in federal waters (*i.e.*, a Sargasso habitat unit) consists of the western Gulf to the eastern edge of the loop current, through the Straits of Florida and along the Atlantic coast from the western edge of the Gulf Stream eastward. Sargassum habitat is home to most juvenile sea turtles in the western Gulf.

5.3 Federal Proposed Species and Proposed Critical Habitat

The action agencies did not identify any Federally-listed proposed species or proposed critical habitat in the proposed action area.

[12] Critical habitat locations for the piping plover are available at: https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B079

6.0 Potential Stressors to Listed and Proposed Species and Critical Habitat

The action agencies evaluated the potential impacts of the proposed project on ESA-listed species that were identified in Section 5.0 and that may occur in or near the proposed action area. Potential effects considered in this analysis may occur because of a potential overlap between the proposed aquaculture facility location with the species habitat (socialization, feeding, resting, breeding, etc.) or migratory route. Section 6.0 broadly describes the most likely stressors, directly and indirectly, that were considered to potentially impact the species near the proposed facility. The action agencies identified four categories of risks from the proposed project: disturbance; entanglement; vessel collisions; and impacts from water quality. The specific analysis of potential impacts to each species from the proposed project is provided in Section 7.0.

6.1 Disturbance

Disturbance in the context of this BE includes ocean noise (low-frequency underwater noises) and breakage (invertebrates). Underwater noises can interrupt the normal behavior of whales, which rely on sound to communicate. As ocean noise increases from human sources, communication space decreases and whales cannot hear each other, or discern other signals in their environment as they used to in an undisturbed ocean. Different levels of sound can disturb important activities, such as feeding, migrating, and socializing. Mounting evidence from scientific research has documented that ocean noise also causes marine mammals to change the frequency or amplitude of calls, decrease foraging behavior, become displaced from preferred habitat, or increase the level of stress hormones in their bodies. Loud noise can cause permanent or temporary hearing loss. Underwater noise threatens whale populations, interrupting their normal behavior and driving them away from areas important to their survival. Increasing evidence suggests that exposure to intense underwater sound in some settings may cause some whales to strand and ultimately die.

ESA-listed sea turtles, whales, and fish may experience stress due to a startled reaction should they encounter vessels, or vessel noise, at the proposed location or in transit to the proposed project site. The reaction could range from the animal approaching and investigating the activity, to the opposite reaction of flight, where the animal could injure itself while attempting to flee. The most likely source of disturbance from the proposed aquaculture activity would be noise from the vessel engines and barge generator.

6.2 Entanglements

Entanglement, for the purposes of this BE, refers to the wrapping of lines, netting, or other man-made materials around the body of a listed species. Entanglement can result in restrainment and/or capture to the point where harassment, injury, or death occurs. The cage, mooring lines, and bridles from the proposed project may pose an entanglement risk to listed species in the project area; however, entanglement risks to ESA-listed species at any aquaculture operation are mitigated by using rigid and durable cage materials, and by keeping all facility lines taut as slack lines are the primary source of entanglements (Nash et al., 2005).

Past protected species reviews by the NMFS for a similar scale aquaculture project determined that cetacean and sea turtle entanglement is not expected when facility mooring and tether lines are kept under near-constant tension and free of loops (NMFS, 2016). Additionally, the NMFS determined that a similar aquaculture project had the potential to result in interactions with marine mammals; however, the NMFS found that the most likely effect of the project on marine mammals was behavioral interactions (e.g., individuals engaging in investigative behavior around the array or that prey on wild fish accumulated near the facility) as opposed to causing injury or mortality from entanglement.

6.3 Vessel Strike

A vessel strike is a collision between any type of boat and a marine animal in the ocean. All sizes and types of vessels have the potential to collide with nearly any marine species. Strikes can result in death or injury to the

marine animal and may go unnoticed by the vessel operator. Some marine species spend short durations "rafting" at the ocean's water surface between dives which makes them more vulnerable to vessel strikes.

The NMFS estimates collisions between some cetaceans and vessels are relatively rare events based on data from Marine Mammal Stock Assessments for the Atlantic and Gulf (NMFS, 2017). Collisions between marine mammals and vessels can be further minimized when vessels travel at less than 10 knots based on general guidance from the NMFS for vessels transiting areas where there are known populations of whales (HIHWNMS, 2011). Detection of sea turtles by vessel operators may be more difficult because most vessel operators usually sight protected species and avoid them. In past biological opinions in support of similar aquaculture activities, the NMFS has determined that the rate of collisions between sea turtles and vessels was negligible and did not expect sea turtle vessel strikes to occur (NMFS, 2016).

The support vessel used for the proposed project is expected to be vigilant against the possibility of protected species collisions. Piloting of all vessels associated with the proposed project will be done in a manner that will prevent vessel collisions or serious injuries to protected species. Operators and crew will operate vessels at low speeds when performing work within and around the proposed project area and operate only when there are no small craft advisories in effect. All vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS.[13] These operating conditions are expected to allow vessel operators the ability to detect and avoid striking ESA-listed species.

6.4 Water Quality

Although offshore marine cage systems do not generate a waste stream like other aquaculture systems, effluent from the proposed action area can adversely affect water quality, sea floor sediment composition, and benthic fauna though the additions of uneaten feed, ammonia excretions, and fish feces from the increased fish biomass. Water quality in aquaculture is primarily assessed through measures of nitrogen (N), phosphorus (P), solids (total suspended solids, settleable solids, and turbidity), dissolved oxygen (DO), and pH. The increased amount of organic material has the potential to increase N, P, and solids levels in the surrounding waters. The concentration of N (such as total nitrogen, ammonia, nitrate, nitrite) and P (as total phosphorus or orthophosphate) are indicators of nutrient enrichment and are commonly used to assess the impact of aquaculture on water quality. The release of nutrients, reductions in concentrations of DO, and the accumulation of sediments under certain aquaculture operations can affect the local environment by boosting overall productivity in phytoplankton and macroalgal production in marine ecosystems through eutrophication and degradation of benthic communities (Stickney, 2002).

According to *Marine Cage Culture and The Environment* (Price and Morris, 2013), "there are usually no measurable effects 30 meters beyond the cages when the farms are sited in well-flushed water. Nutrient spikes and declines in dissolved oxygen sometimes are seen following feeding events, but there are few reports of long-term risk to water quality from marine aquaculture." Price and Morris (2013) also considered the benthic effects of Marine Cage Culture and found that "well-managed farms may exhibit little perturbation and, where chemical changes are measured, impacts are typically confined to within 100 meters of the cages. Benthic chemical recovery is often rapid following harvest". Conversely, poorly managed farms or heavily farmed areas, can see anaerobic conditions persisting and extending hundreds of meters beyond the aquaculture facility. Changes in water quality associated with commercial scale marine aquaculture facilities can be measurable downstream for approximately 205 m (Nash et al., 2005).

The NCCOS reviewed global siting data to identify aquaculture site characteristics that are best suited for water quality protection, concluding that, "Protection of water quality will be best achieved by siting farms in well-

[13] The NMFS has determined that collisions with any vessel can injure or kill protected species (e.g., endangered and threatened species, and marine mammals). The vessel strike avoidance guidelines developed by the NMFS are the standard measures that should be implemented to reduce the risk associated with vessel strikes or disturbance of these protected species to discountable levels. NMFS Southeast Region Vessel Strike Avoidance Measures and Reporting for Mariners; revised February 2008.

flushed waters." (Price, 2013). The hydrology near the proposed action area has powerful and mixing ocean currents that would constantly flush and dilute particulate and dissolved wastes. In addition, the proposed action has other attributes cited in this study that contributes to decrease water quality impacts, including deep waters and a sand bottom type. Neither particulates nor dissolved metabolites are expected to accumulate due to a low fish production levels and the near constant flushing of the cage by strong offshore currents that dissipate wastes.

The EPA evaluated the proposed action's potential impacts to water quality, impacts of organic enrichment to the seafloor, and impacts to benthic communities from organic enrichment as required by the Sections 402 and 403 of the CWA. The EPA determined that discharges from the proposed facility are not expected to exceed federally recommended water quality criteria; that the discharged material is not sufficient to pose a environmental threat through seafloor bioaccumulation; and the potential for benthic impacts from the proposed project are minimal.[14] Additionally, the EPA considered recent environmental modeling performed by the NMFS for a similar small scale aquaculture facility (Velella Delta).[15] NCCOS concluded that there are minimal risks to water column or benthic ecology functions in the subject area from the operation of the fish cage as described in the applicant's proposal. Furthermore, EPA reviewed the previous and current environmental monitoring data collected from a commercial-scale marine aquaculture facility, Blue Ocean Mariculture (BOM), in Hawaii raising the same fish species.[16] While the size of the proposed project is significantly smaller than the BOM commercial-scale facility and BOM is in slightly deeper waters, the results show that soluble and particulate nutrients from the BOM facility do not substantially affect the marine environment. Based on EPA's analysis, as well as a review and comparison of representative water quality information, the proposed action would not likely raise particulate and dissolved nutrient concentrations in the proposed action area.

The proposed facility will be covered by a NPDES permit as an aquatic animal production facility with protective conditions required by the Clean Water Act. The NPDES permit will contain conditions that will confirm EPA's determination and ensure no significant environmental impacts will occur from the proposed project. The aquaculture-specific water quality conditions placed in the NPDES permit will generally include a comprehensive environmental monitoring plan. The applicant will be required to monitor and sample certain water quality, sediment, and benthic parameters at a background (up-current) location and near the cage. Additionally, the NPDES permit will include effluent limitations expressed as best management practices (BMPs) for feed managment, waste collection and disposal, harvest discharge, carcass removal, materials storage, maintenance, record keeping, and training. Impacts to water quality will be reduced by a range of operational measures through the implementation of project-specific BMPs. For example, feeding will always be monitored to ensure fish are fed at levels just below satiation to limit overfeeding and decrease the amount of organic material that is introduced into the marine environment. Moreover, the Essential Fish Habitat assessment requires certain mitigation measures within the NPDES and Section 10 permits.[17]

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[14] Further information about EPA's analysis and determination for impacts to water quality, seafloor, and benthic habitat can be found in the final NPDES permit and the Ocean Discharge Criteria (ODC) Evaluation, as well as other supporting documents for the NPDES permit such as the Essential Fish Habitat Assessment and the NEPA evaluation.

[15] The NCCOS previously produced models to assess the potential environmental effects on water quality and benthic communities for the applicant's Velella Delta project that is similar Velella Epsilon in terms of fish production (approximately 120,000 lbs), operation duration, and cultured species; however, the water depth was dissimilar between the two projects (6,000 ft vs. 130 ft). At maximum capacity, NCCOS determined there were no risks to water quality from the Velella Delta project, and only insignificant effects would occur in the water column down to 100 feet. Because of the great depth, strong currents, and physical oceanographic nature of the Velella Delta site, dissolved wastes would be widely dispersed and assimilated by the planktonic community. Furthermore, the model results showed that benthic impacts and accumulation of particulate wastes would not be detectable through measurement of organic carbon or infaunal community biodiversity.

[16] Water quality information from a Blue Ocean Mariculture (BOM) facility in Hawaii was reviewed as representative data and compared to the proposed project. The BOM farm previously produced approximately 950,000 lbs/yr prior to 2014 and has produced up to 2,400,000 lbs/yr after 2014. The BOM facility is in a similar depth of water as the proposed project with an average depth of 60 m. Over eight years of comprehensive water quality and benthic monitoring, the BOM facility has not adversely impacted water quality outside of the mixing zone at the facility (BOM, 2014).

[17] The EPA and the USACE will require mitigation measures to be incorporated into the NPDES permit to avoid or limit organic enrichment and physical impacts to habitat that may support associated hardbottom biological communities. The NPDES permit will require facility to be positioned at least 500 meters from any hardbottom habitat; the DA permit will not authorize the anchor system to be placed on vegetated and/or hardbottom habitat.

The EPA also considered the potential water quality impacts from chemical spills, drugs, cleaning, and solid wastes.

Chemical Spills: Spills are unlikely to occur; however, if a spill did occur they would be small in nature and dissipate rapidly due to strong currents in the project area. The terms and conditions of the NPDES permit would require the applicant to follow operational procedures (i.e. BMPs) that minimize the risk of wastes and discharges that may affect any ESA-listed species or habitat. The risk of accidental fuel or oil spills into the marine environment is minimized by the support vessel not being operated during any time that a small craft advisory is in effect at the proposed facility.

Drugs: The applicant indicated that FDA-approved antibiotics or other therapeutants will not likely be used during the proposed project due to the strong currents expected at the proposed action area, the low fish culture density, and the cage material being used. In the unlikely event that drugs/therapeutants are used, administration of drugs will be performed under the control of a licensed veterinarian and only FDA-approved therapeutants for aquaculture would be used as required by federal law. In addition, the NPDES permit will require that the use of any medicinal products be reported to the EPA, including therapeutics, antibiotics, and other treatments. The report will include types and amounts of medicinal product used and the duration they were used. The EPA does not expect the project to a cause a measurable degradation in water quality from drugs that may affect any ESA-listed species.

Cleaning: Another potential source of water quality impacts would be from the cleaning of the cage system. The applicant does not anticipate the need to clean the cage for the short duration of the proposed project. Experience from previous trials by the applicant demonstrated that copper alloy mesh material used for the cage is resistant to fouling. Should the cage system need cleaning, divers would manually scrub the cage surfaces with cleaning brushes. No chemicals would be used while cleaning and any accumulated marine biological matter would be returned to sea without alteration.

Solid Wastes: Multiple federal laws and regulations strictly regulate the discharge of oil, garbage, waste, plastics, and hazardous substances into ocean waters. The NPDES permit prohibits the discharge of any solid material not in compliance with the permit.

7.0 Potential Effects of Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR § 402.02). The NMFS and USFWS standard for making a "no effect" finding is appropriate when an action agency determines its proposed action will not affect that ESA-listed species or critical habitat, directly or indirectly (USFWS and NMFS, 1998). Generally, a "no effect" determination means that ESA-listed species or critical habitats will not be exposed to any potentially harmful/beneficial elements of the action (NMFS, 2014).

The applicable standard to find that a proposed action "may affect, but not likely to adversely affect" (NLAA) listed species or critical habitat is that all the effects of the action are expected to be discountable, insignificant, or completely beneficial. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat.

A summary of the potential effects considered and the determination of impact for each listed species and critical habitat is provided in Table 4. Overall, potential impacts to the ESA-listed species considered in this BE are expected to be extremely unlikely and insignificant due to the small size of the facility, the short deployment period, unique operational characteristics, lack of geographic overlap with habitat or known migratory routes, or other factors that are described in the below sections for each species. The federal action agencies used multiple sources to support the determinations described within this section including the analysis of potential impacts that the NMFS used as the basis for its ESA determination for up to 20 commercial scale offshore marine aquaculture facilities in the Gulf (EPA, 2016; NMFS, 2009; NMFS, 2013; NMFS, 2015; NMFS, 2016).

7.1 Federally Listed Threatened and Endangered Species

7.1.1 Birds

The action agencies did not consider any potential threats to ESA-protected birds from the proposed project. The two species of birds considered are not expected to interact with the proposed project due to the distance between the proposed project from shore (approximately 45 miles) to their onshore habitat preferences. The piping plover and red knot are migratory shorebirds. Known migratory routes do not overlap with the proposed project. Both birds primarily inhabit coastal sandy beaches and mudflats of the Gulf; migration and wintering habitat are in intertidal marine habitats such as coastal inlets, estuaries, and bays (USFWS, 2015). Additionally, the normal operating condition of the cage is expected to be below the water surface which will further decrease the likelihood of any bird interaction with the proposed project.

The ESA-listed bird species will not be exposed to any potentially harmful impacts of the proposed action. The action agencies have determined that the activities under the proposed project will have no effect on the threatened species of birds.

7.1.2 Fish

The action agencies considered disturbance, entanglement (for smalltooth sawfish only), and water quality as potential impacts to endangered or threatened fish from the proposed project in the rare event that interaction occurs.

Impacts from disturbance, entanglement, and water quality are highly unlikely for each ESA-listed fish species that was considered given their unique habitat preferences and known proximity to the proposed action area. The oceanic whitetip shark is not likely to occur near the proposed project given its preference for deeper waters. The action agencies believe that the Nassau grouper will not be present given that it is absent from the Gulf outside of the Florida Keys. Interactions with smalltooth sawfish with the proposed project is extremely unlikely because they primarily occur in the Gulf off peninsular Florida and are most common off Southwest Florida. The giant manta ray may encounter the facility given its migratory patterns; however, disturbance is not expected because the facility is small and will have a short deployment period of approximately 18 months.

Entanglement impacts were considered for smalltooth sawfish because it is the only listed fish species large enough to become entangled within the proposed facility's mooring lines. Entanglement risks to the smalltooth sawfish from the proposed project are minimized by using rigid and durable cage materials and by keeping all lines taut (as described in Section 3.0). The ocean currents will maintain the floating cage, mooring lines, and chain under tension during most times of operation. Additionally, the limited number of vertical mooring lines reduce the risk of potential entanglement by this listed fish species. Furthermore, interactions are anticipated to be highly unlikely given their current range in southwest Florida between Ft Myers and the Florida Keys. Because of the proposed project operations and lack of proximity to the known habitat for the smalltooth sawfish, the action agencies expect that the effects of this entanglement interaction would be discountable.

For water quality impacts, the EPA is proposing NPDES permit conditions required by the Clean Water Act. These permit provisions will contain environmental monitoring (water quality, sediment, and benthic infauna) and conditions that minimize potential adverse impacts to fish from the discharge of effluent from the proposed facility, and prohibit the discharge of certain pollutants (e.g., oil, foam, floating solids, trash, debris, and toxic pollutants). Due to the pilot-scale size of the facility, water quality and benthic effects are not expected to occur outside of 10 meters. The discharges authorized by the proposed NPDES permit represent a small incremental contribution of pollutants that are not expected to affect any ESA-listed fish species in or near the proposed action area.

Any potential effects from the proposed action on ESA-listed fish are discountable and insignificant. The action agencies have determined that the activities under the proposed project is NLAA the threatened and endangered species of fish.

7.1.3 Invertebrates

Potential routes of effects to coral from the proposed project include disturbance (breakage of coral structures) and water quality impacts (e.g., increased sedimentation, increased nutrient loading, and the introduction of pollutants).

Regarding disturbance, anthropogenic breakage is extremely unlikely and discountable because the proposed facility will not be in areas where listed corals may occur. Most of the ESA-listed invertebrate species are associated with coral reefs that occur in shallower areas of the Gulf and along the west Florida shelf. Only five species of the invertebrates considered (boulder star, elkhorn, mountainous star, pillar, and staghorn) are not known to occur near the proposed project location or at depths where the proposed facility is located. Only two invertebrate species (lobed star coral and rough cactus coral) may occur in the proposed action area. Moreover, the anchoring system and cage will be placed in an area consisting of unconsolidated sediments, away from potential hardbottom which may contain corals according to the facility's seafloor survey. Given the known geographic locations of the considered coral species and their recognized habitat preferences related to water depth, the disturbance effects of the proposed action is anticipated to be minimal and extremely unlikely.

Regarding impacts from water quality, the discharge from the proposed facility will be covered by a NPDES permit with water quality conditions required by the Clean Water Act. The aquaculture-specific water quality conditions contained in the NPDES permit will generally include an environmental monitoring plan (water quality, sediment, and benthic monitoring) and effluent limitations expressed as BMPs. Water quality effects are not expected to occur outside of 30 m due to the small size of the facility and low production levels. Sedimentation from the facility is not expected to occur outside of 1,000 m (assuming a maximum production for the entire duration of the project) with impacts resulting from the proposed facility likely limited to within 300-500 meters from the cage. The NPDES permit will prohibit discharges within 500 m of areas of biological concern, including live bottoms or coral reefs. The impacts from water quality and sedimentation are expected to be minimal or insignificant, and the likelihood that deleterious water quality will contribute to any adverse effects to listed coral species is extremely unlikely.

Any adverse effects from the proposed project on ESA-listed corals are discountable and insignificant. The action agencies have concluded that the proposed project will NLAA on the ESA-listed invertebrate species.

7.1.4 Marine Mammals

Generally, endangered whales are not likely to be adversely affected by any of the threats considered by the action agencies at or near the proposed facility because they are unlikely to overlap geographically with the small footprint of the proposed action area. All whales considered in this BE prefer habitat in waters deeper than the proposed action (40 m) as described in Section 5.1.4. The expected absence of the ESA-listed marine mammals in or near the proposed action area is an important factor in the analysis of whether impacts from the proposed project will have any effect on ESA-listed whales; however, the action agencies have still considered potential threats (disturbance, entanglement, vessel strikes, and water quality) to the six species of marine mammals considered in this BE.

Disturbance to marine mammals from ocean noise generated by the proposed facility is expected to be extremely low given the duration of the project, minimal vessel trips, and scale of the operation. The production cage will be deployed for a duration of approximately 18 months. Opportunities for disturbance from the vessel participating in the proposed project are minimal due to the limited trips to the site. The most likely source of disturbance from the proposed aquaculture activity would be noise from the vessel engines and barge generator. The noise emitted from the engines and generator would not significantly add to the frequency or intensity of ambient sound levels in the proposed action area, and are not expected to be different from other vessels operating in federal waters. The action agencies believe that the underwater noise produced by operating a vessel and cage will not interfere with the ability of marine mammals to communicate, choose mates, find food, avoid predators, or navigate. The limited amount of noise from the proposed project would have negligible effect on ESA-listed whales.

Entanglement risks to marine mammals at any aquaculture operation is minimized by using rigid and durable cage materials and by keeping all lines taut. As described in Section 3.0, the cage material for the proposed project is constructed with rigid and durable materials that will significantly decrease the likelihood that ESA-listed species will become entangled. The limited number of vertical mooring lines (3) and the duration of cage deployment (approximately 18 months) will reduce the risk of potential entanglement by marine mammals. When the currents change, the lines would likely remain taut even as the currents shift because of the weight of chain and rope create a negative buoyancy on the facility anchorage lines. While it is highly unlikely that ESA-listed whales would become entangled in the mooring lines; if incidental line contact occurs, serious harm to the listed whales or sea turtles is not likely due to the tension in the mooring lines. The cage will be constructed of semi-rigid copper alloy mesh with small openings that will further prevent entanglements.

Additionally, there have been no recorded incidents of entanglement from ESA-listed marine mammal species interacting with a permitted commercial-scale marine aquaculture facility in Hawaii (BOM, 2014). The depth of water and line length used at the proposed project would provide adequate spaces for most marine mammals to pass through. The proposed action would not likely entangle marine mammals as they are likely to detect the presence of the facility and would be able to avoid the gear; however, should entanglement occur, on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement. Furthermore, because of the proposed project operations and location of marine mammal habitat, the action agencies expect that the effects of this entanglement interaction would be interactions are anticipated to be highly unlikely.

Regarding vessel strikes, facility staff will be stationed on one vessel for the duration of the project except during unsafe weather conditions. The probability that collisions with the vessel associated with the proposed project would kill or injure marine mammals is discountable as the vessel will not be operated at speeds known to injure or kill marine mammals. Given the limited trips to the facility with only one vessel, and the high visibility of whales to small vessels, opportunities for strikes from the vessel participating in the proposed project are expected to be insignificant. Strikes from other vessels not operated by the facility are anticipated to be improbable due to the proximity to shore (~45 miles). Additionally, all vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS. Moreover, should there be any vessel strike that results in an injury to an ESA-protected marine mammal, the on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement.

Regarding potential impacts from water quality, each ESA-listed whale species considered in this BE is not expected to be affected given their unique habitat preferences and known proximity to the proposed action area. The discharge from the proposed facility will be covered by a NPDES permit with project-specific conditions that includes water quality monitoring and implementation of practices to protect the environment near the proposed action area. The discharge of wastewater from the proposed project are expected to have a minor impact on water quality due to factors concerning the low fish biomass produced; the relatively small amounts of pollutants discharged; depth of the sea floor; and current velocities at the proposed action area. It is anticipated that the proposed activity would add relatively small amounts of nutrient wastes (nitrogen, phosphorus, particulate organic carbon, and solids) to the ocean in the immediate vicinity of the proposed action area. The facility's effluent is expected to undergo rapid dilution from the prevailing current; constituents will be difficult to detect within short distances from the cage. The impacts from water quality are expected to be insignificant, and the likelihood of water quality impacts contributing to any adverse effects to ESA-listed marine mammals is extremely unlikely (see Section 6.4 for more information).

The action agencies believe that any adverse effects from the potential threats considered to ESA-listed marine mammals are extremely unlikely to occur and are discountable. The action agencies have determined that the activities authorized under the proposed permits will NLAA any marine mammals considered in this BE.

7.1.5 Reptiles

The action agencies considered disturbance, entanglement, vessel strike, and water quality as the only potential threats to reptiles within the proposed action area.

Sea turtles may experience disturbance by stress due to a startled reaction should they encounter vessels in transit to the proposed project site. Given the limited trips to the site, opportunities for disturbance from vessels participating in the proposed project are minimal. ESA-listed sea turtles may be attracted to aquaculture facilities as potential sources of food, shelter, and rest, but behavioral effects from disturbance are expected to be insignificant. Additionally, all vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS.[7] Furthermore, there has been a lack of documented observations and records of ESA-listed sea turtles interacting with a permitted commercial-scale marine aquaculture facility in Hawaii (BOM, 2014); we anticipate that such interactions would be unlikely. As a result, disturbance from human activities and equipment operation resulting from the proposed action is expected to have insignificant effects on ESA-listed reptiles.

The risk of sea turtles being entangled in offshore aquaculture operation is greatly reduced by using rigid cage materials and by keeping all lines taut. Section 3 describes how the cage and mooring material for the proposed project is constructed with rigid and durable materials, and how the mooring lines will be constructed of steel chain and thick rope that will be maintained under tension by the ocean currents during most times of operation. Additionally, the bridle line that connects from the swivel to the cage will be encased in a rigid pipe. Moreover, the limited number of vertical mooring lines (three) and the duration of cage deployment (less than 18 months) will reduce the risk of potential entanglement by sea turtles. Because of the proposed project operations and duration, the action agencies expect that the effects of this entanglement interaction would be discountable; however, should entanglement occur, on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement.

In regard to vessel strikes, facility staff will use only one vessel for the duration of the project. The vessel will be operated at low speeds that are not known to injure or kill sea turtles; therefore, the probability that collisions with the vessel associated with the proposed project would kill or injure sea turtles is discountable. Opportunities for strikes to reptiles from the vessel participating in the proposed project are expected to be insignificant given the limited number of trips to the facility with one vessel. Strikes from other vessels not operated by the facility are anticipated to be improbable due to the proximity to shore. Additionally, all vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS.

The proposed activity would not add significantly to the volume of maritime traffic in the proposed action area. The number of trips associated with deploying and retrieving the facility components, routine maintenance, stocking, and harvest operations would minimally increase vessel traffic in the proposed action area. The project activities are not expected to result in collisions between protected species and any vessels. Collisions with ESA-listed species during the proposed activity would be extremely unlikely to occur.

Commercial and recreational fishermen are expected to visit the proposed project because it could act as a fish attraction device. While fishermen would be attracted to the project area from other locations, overall fishing effort by these fishermen in federal fisheries would not increase as these fishermen would have fished elsewhere if the project was not in place. The action agencies do not expect that any increased fishing activity in the project area since there were no reports or observations of interactions between fishermen and ESA-listed species in previous Velella trials (Velella Beta and Velella Gamma) in Hawaii (NMFS, 2016).

The impacts from water quality are expected to be insignificant, and the likelihood of water quality impacts contributing to any adverse effects to ESA-listed reptiles in or near the proposed action area is extremely unlikely (see Section 6.4 for more information related to water quality impacts). The discharge from the proposed facility will be covered by a NPDES permit with project-specific conditions that includes water quality monitoring and implementation of practices to protect the environment. Water quality effects are not expected to occur outside of 10 m due to the low fish production levels and fast ocean currents.

Any adverse effects from the proposed project on ESA-listed reptiles are extremely unlikely to occur and are discountable. The action agencies have determined that the activities under the proposed permit will NLAA the sea turtles considered in this BE.

7.2 Federally Listed Critical Habitat

7.2.1 Reptiles

The action agencies identified vessel strike and water quality as the only potential routes of impacts to the loggerhead turtle DPS critical habitat of the Northwest Atlantic. In the Gulf, designated critical habitat consists of either nearshore reproductive habitat or Sargassum habitat. The proposed project is roughly 45 miles from shore and will not affect nearshore reproductive habitat. Therefore, the essential features of loggerhead turtle critical habitat that the proposed action may affect are foraging habitat for hatchlings and association of hatchlings around Sargassum mats.

Sargassum mats may be impacted by vessel traffic; however, the PSMP that was developed for the proposed project area includes a provision that trained observers will look for Sargassum mats and will inform vessel operators as to their location to avoid the mats to the maximum extent practicable. The proposed project will be sited in the open ocean environment, and Sargassum mats may infrequently drift into the project area; however, it is highly unlikely the proposed facility would impact Sargassum habitat further offshore where the facility will be located. Additionally, the facility will only bring the submerged aquaculture cage to the surface for brief periods to conduct maintenance, feeding, or harvest activities due to the high energy open-ocean environment where the proposed facility will be located.

Sargassum mats are not anticipated to be negatively impacted by water quality due to the conditions in the NPDES permit. Potential impacts on loggerhead critical habitat is expected to be discountable because of active monitoring for Sargassum mats and the extremely low likelihood of impacts from water quality.

The action agencies believe that the adverse effects from the proposed action will have insignificant effect on the Northwest Atlantic loggerhead DPS critical habitat due to location of the facility and operational methods used while the cage is deployed. The action agencies have determined that the activities under the proposed permit will NLAA the listed sea turtle critical habitat.

7.2.2 Birds

Critical habitat has been designated in for the piping plover for coastal wintering habitat areas in Florida; however, the proposed action does not interfere with any nearshore areas. Therefore, critical habitat for the piping plover will not be exposed to any potentially harmful elements of the proposed action. The action agencies have determined that the activities under the proposed project will have no effect to the piping plover's critical habitat.

7.3 Federal Proposed Species and Proposed Critical Habitat

The action agencies did not perform an analysis of impacts because no federally-listed proposed species or proposed critical habitat in or near the proposed action area were identified.

Table 4: Summary of potential impacts considered and ESA determination

Group and Species	Potential Impacts Considered	Potential Effect	Determination
Birds			
1 Piping Plover 2 Red Knot	None	None	No effect
Fish			
1 Giant Manta Ray 2 Nassau Grouper 3 Oceanic Whitetip Shark 4 Smalltooth Sawfish	Disturbance, entanglement, and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
Invertebrates			
1 Boulder Star Coral 2 Elkhorn Coral 3 Mountainous Star Coral 4 Pillar Coral 5 Staghorn Coral 6 Rough Cactus Coral 7 Lobed Star Coral	Disturbance and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
Marine Mammals			
1 Blue Whale 2 Fin Whale 3 Humpback Whale 4 Sei Whale 5 Sperm Whale 6 Bryde's Whale	Disturbance, entanglement, vessel strike, and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
Reptiles			
1 Green Sea Turtle 2 Hawksbill Sea Turtle 3 Kemp's Ridley Sea Turtle 4 Leatherback Sea Turtle 5 Loggerhead Sea Turtle	Disturbance, entanglement, vessel strike, and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
Critical Habitat			
1 Hawksbill Sea Turtle 2 Leatherback Sea Turtle 3 Loggerhead Sea Turtle	Vessel strike and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
4 Piping Plover	None	None	No effect

8.0 Conclusion

The EPA and USACE conclude that the proposed project's potential threats (disturbance, entanglement, vessel strike, water quality) to ESA-listed species and critical habitat are highly unlikely to occur or extremely minor in severity; therefore, the potential effects to ESA protected species and critical habitats are discountable or insignificant.

The EPA and USACE have determined that the proposed project will have "no effect" on the listed species and critical habitat under the jurisdiction of the USFWS that may occur in the proposed action area and that may be affected. This determination includes the piping plover and the red knot and critical habitat for the piping plover. No other listed species, proposed species, critical habitats, or proposed critical habitats were considered under the authority of the USFWS because there is no evidence to support that a potential effect from the proposed project may occur. The EPA and USACE request concurrence from the USFWS for this determination under ESA Section 7.

The EPA and USACE have determined that the proposed project "may affect, but is not likely to adversely affect" the listed species and critical habitat or designated critical habitat under the jurisdiction of the NMFS. This determination includes: four species of fish, seven species of invertebrates, six species of whales, reptiles from five species, and critical habitat for reptiles. No other listed species, proposed species, critical habitats, or proposed critical habitats were considered under the authority of the NMFS because there is no evidence to support that a potential effect from the proposed project may occur. The EPA and USACE request concurrence from the NMFS for this determination under ESA Section 7.

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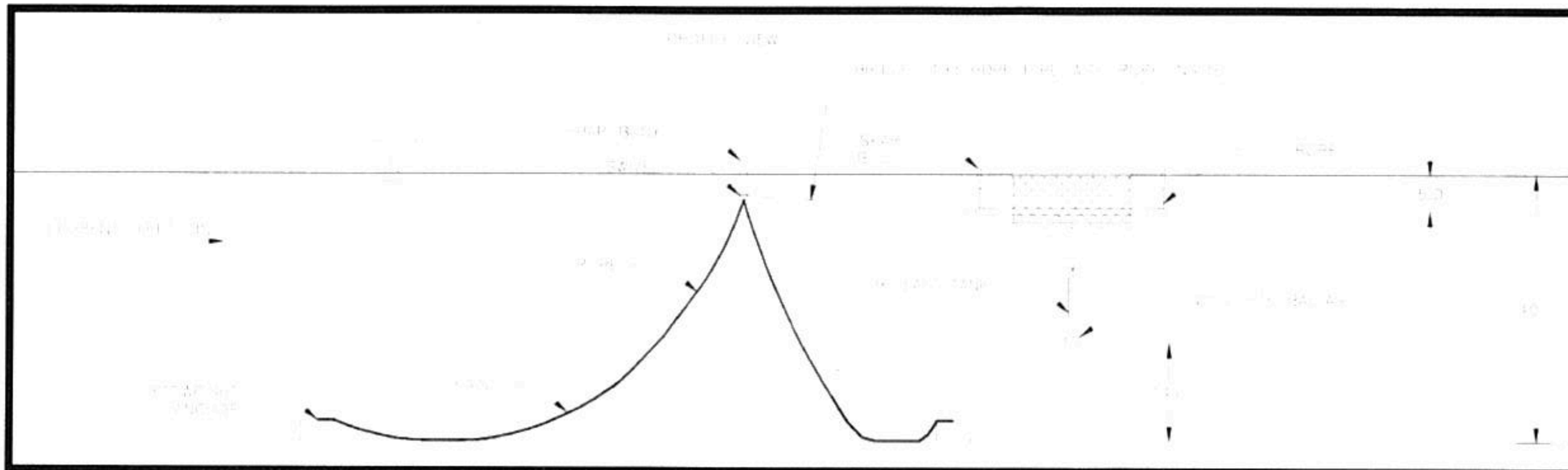
Appendix A – Cage and Mooring Detail



1) Deadweight Anchors (concrete):
- Three (3) anchors equally spaced @
  - 120m from mooring centerline
  - 120 degrees from each other
- Each @ 4.5m x 4.5m x 4.5m (91 m3)
- Concrete friction factor = 0.5 on wet sand
- Each has an effective weight of 217 MT

2) Mooring Chain (Grade 2 steel):
- 80m length on each anchor
- 50mm (2") thick links
- No load = 70m length of each on seafloor
- Design load = some entirely off seafloor/ others completely on seafloor

3) Mooring Lines (rope):
- 40m length on each chain
- AMSTEEL®-BLUE
- 36mm (1 1/2") thick lines

4) Spar Buoy w/ Swivel (steel):

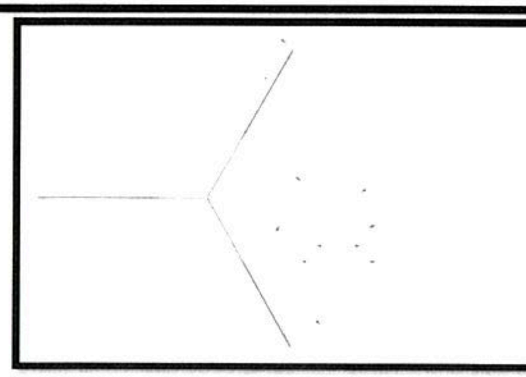
5) Bridle Lines (rope inside HDPE pipe):
- Three (3) ~30m bridle lines (rope) from swivel to spreader bar
- AMSTEEL®-BLUE
- 33.3mm (1 5/16") lines inside HDPE pipe

6) Spreader Bar (HDPE):
- Header Bar (load bearing) connected to Bridle Lines
  - 30m in length
  - 0.36m OD DR 11 HDPE pipe
- Side and Rear Bars (smaller load bearing)
  - 30m in length
  - 0.36m OD DR 17 HDPE pipe
- Four (4) corner spar buoys

7) Net Pen Connection Lines (rope):
- Four (4) ~13m connection lines (rope)
- Connected from Spreader Bar to Net Pen Float Rings
- AMSTEEL®-BLUE
- 33.3mm (1 5/16") lines

8) Net Pen Frame Structure (HDPE):
- Top Frame Structure
  - 18m in diameter
  - One (1) HDPE side-by-side Float Rings
    - On the sea surface
    - ~0.36m OD DR 11 HDPE pipe
  - One (1) HDPE net ring (railing)
    - Connected ~1.0m above Float Rings
    - Connected to Net Pen Mesh
    - ~0.15m OD DR 17 HDPE pipe
- Bottom Frame Structure
  - 18m in diameter
  - One (1) HDPE sinker ring
    - 7.0m below Float Rings
    - Connected to Net Ring
    - ~0.36m OD DR 11 HDPE pipe
  - One (1) HDPE net ring
    - 7.0m below float rings
    - Connected to copper alloy mesh
    - ~0.15m OD DR 17 HDPE pipe

9) Net Pen Mesh (copper alloy):
- 17m diameter x 7m depth
- Top connected to top net ring (railing)
- Bottom connected to bottom net ring
  - 4mm wire diameter
  - 40mm x 40mm mesh square
- Effective volume of 1,600m^3

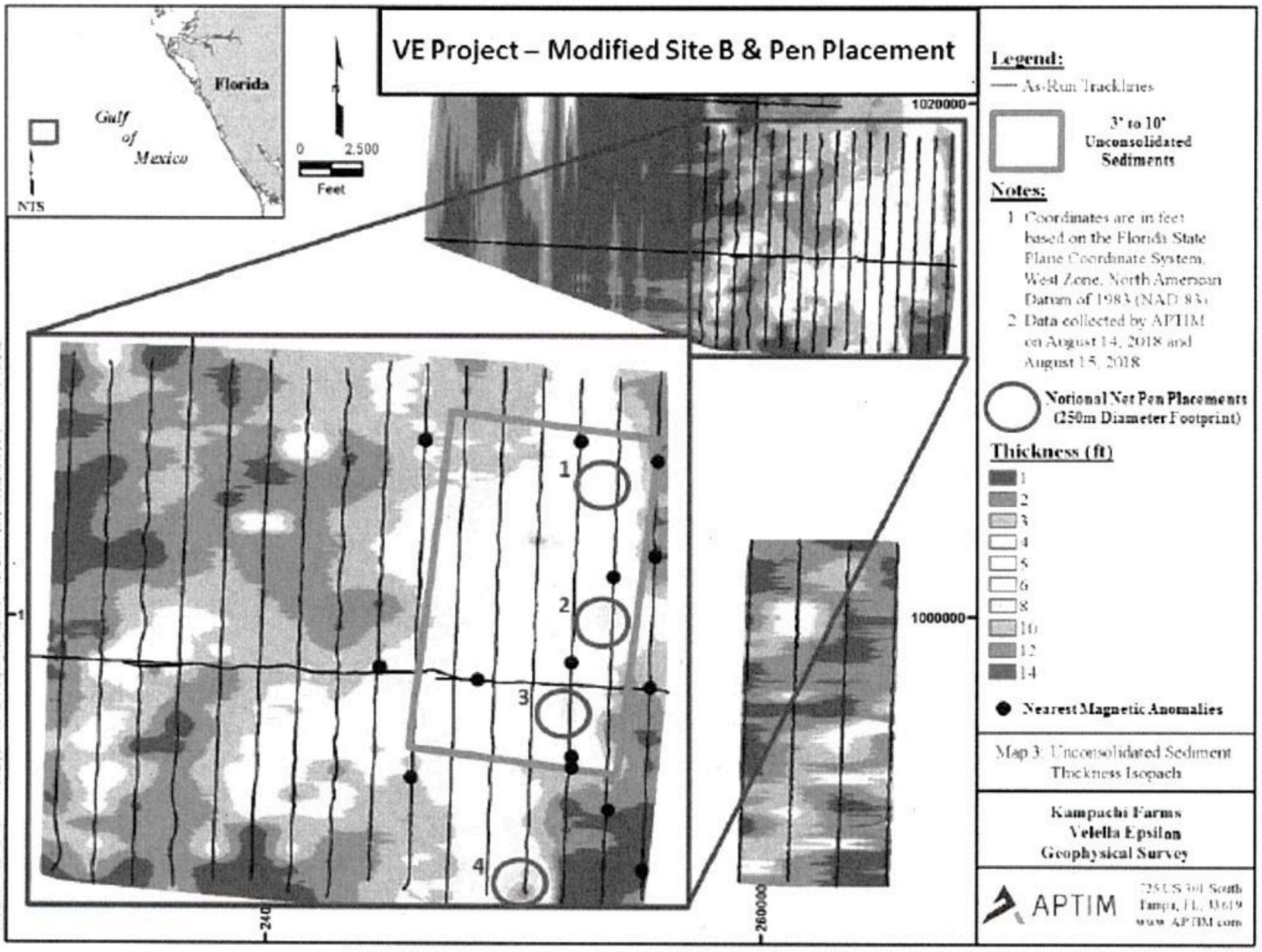


10) Shackle Point Connection (steel):
- One (1) ~0.13m^2 shackle plate
- Four (4) connection lines
  - 12 mm in diameter x 10m in length
  - Connected from shackle plate to HDPE sinker ring
- ~1m Grade 2 steel chain (32mm) connected to Floatation Capsule

11) Floatation Capsule (steel):
- ~1.5m in diameter x ~3.45m in length
- Effective floatation volume = 6m^3
- ~3m Grade 2 steel chain (32mm) connected to Counter Weight

12) Counter Weight (concrete):
- ~1.1m in diameter x ~2.2m in length
- Effective weight of 5 MT

Appendix B – Location Area



Position	° Decimal ' Latitude	° Decimal ' Longitude	Decimal ° Latitude	Decimal ° Longitude	Perimeter (km)	Area (km²)
Modified Site B from BES Report						
Upper Left	27° 7.86863' N	83° 13.45827' W	27.131143° N	83.224303° W		
Upper Right	27° 7.83079' N	83° 11.63237' W	27.130512° N	83.193872° W		
Lower Right	27° 6.43381' N	83° 11.69349' W	27.107230° N	83.194890° W		
Lower Left	27° 6.50261' N	83° 13.52658' W	27.108377° N	83.225442° W		
Center	27° 7.11266' N	83° 12.58604' W	27.118543° N	83.209767° W	11.1571	7.7237
Targeted Subset Area of Modified Site B from BES Report (3' to 10' Unconsolidated Sediments)						
Upper Left	27° 7.70607' N	83° 12.27012' W	27.128445° N	83.204502° W		
Upper Right	27° 7.61022' N	83° 11.65678' W	27.126837° N	83.194278° W		
Lower Right	27° 6.77773' N	83° 11.75379' W	27.112962° N	83.195897° W		
Lower Left	27° 6.87631' N	83° 12.42032' W	27.114605° N	83.207005° W		
Center	27° 7.34185' N	83° 12.02291' W	27.122365° N	83.200382° W	5.2273	1.6435
Notional Net Pen Placements within Modified Site B from BES Report						
1	27° 7.54724' N	83° 11.85393' W	27.125787° N	83.197565° W		
2	27° 7.17481' N	83° 11.82576' W	27.119580° N	83.197095° W		
3	27° 6.93930' N	83° 11.94780' W	27.115655° N	83.199130° W		
4	27° 6.52579' N	83° 12.09175' W	27.108763° N	83.201530° W	0.7854	0.0491

Final
BIOLOGICAL EVALUATION

Ocean Era, Inc. - Velella Epsilon
Marine Aquaculture Facility
Outer Continental Shelf
Federal Waters of the Gulf of Mexico

September 30, 2020

U.S. Environmental Protection Agency
Region 4
Water Protection Division
61 Forsyth Street SW
Atlanta Georgia 30303

NPDES Permit Number
FL0A00001

U.S. Army Corps of Engineers
Jacksonville District
Fort Myers Permit Section
1520 Royal Palm Square Boulevard Suite 310
Fort Myers Florida 33919-1036

Department of the Army Permit Number
SAJ-2017-03488

Table of Contents

1.0 Introduction and Federal Coordination

In accordance with the Endangered Species Act (ESA) Section 7, interagency consultation and coordination with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) is required to insure that any action authorized, funded, or carried out by an action agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of any designated critical habitat (Section 7(a)(2)); and confer with the NMFS and USFWS on any agency actions that are likely to jeopardize the continued existence of any species that is proposed for listing or result in the destruction or adverse modification of any critical habitat proposed to be designated (Section 7(a)(4)).[1]

On November 9, 2018, the U.S. Environmental Protection Agency Region 4 (EPA) received a complete application for a National Pollutant Discharge Elimination System (NPDES) permit from Ocean Era (formerly Kampachi Farms) for the point-source discharge of pollutants from a marine aquaculture facility in federal waters of the Gulf of Mexico (Gulf). On November 10, 2018, the U.S. Army Corps of Engineers Jacksonville District (USACE) received a completed Department of Army (DA) application pursuant to Section 10 of the Rivers and Harbors Act for structures and work affecting navigable federal waters from the same marine aquaculture facility.

Given that the action of permitting the proposed project involves more than one federal agency, the EPA has elected to act as the lead agency to fulfill the consultation responsibilities pursuant to the implementing regulations of ESA Section 7.[2] The USACE is a cooperating and co-federal agency for this informal consultation request. The completion of the informal consultation shall satisfy the EPA's and USACE's obligations under ESA Section 7(a)(2).

The EPA and the USACE (action agencies) have reviewed the proposed activity and determined that a biological evaluation (BE) is appropriate. The BE was prepared by the EPA and the USACE to jointly consider the potential direct, indirect, and cumulative effects that the proposed actions may have on listed and proposed species as well as designated and proposed critical habitat, and to assist the action agencies in carrying out their activities for the proposed action pursuant to ESA Section 7(a)(2) and ESA Section 7(a)(4). The EPA and the USACE have provided this BE for consideration by the USFWS and the NMFS in compliance with the ESA Section 7.

The EPA and USACE coordinated the interagency permitting process as required by the interagency Memorandum of Understanding (MOU) for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf,[3] and conducted a comprehensive analysis of all applicable environmental requirements required by the National Environmental Policy Act (NEPA); however, a consolidated cooperation process under NEPA was not used to satisfy the requirements of ESA Section 7 as described in 50 CFR § 402.06.[4] The NMFS was a cooperating agency for the NEPA analysis and has provided scientific expertise related to the BE and NEPA analysis for the proposed action including information about: site selection, ESA-listed species, marine

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[1] The implementing regulations for the Clean Water Act related to the ESA require the EPA to ensure, in consultation with the NMFS and USFWS, that "any action authorized the EPA is not likely to jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat" (40 CFR § 122.49(c)).

[2] 50 CFR § 402.07 allows a lead agency: "When a particular action involves more than one Federal agency, the consultation and conference responsibilities may be fulfilled through a lead agency. Factors relevant in determining an appropriate lead agency include the time sequence in which the agencies would become involved, the magnitude of their respective involvement, and their relative expertise with respect to the environmental effects of the action. The Director shall be notified of the designation in writing by the lead agency."

[3] On February 6, 2017, the Memorandum of Understanding for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf of Mexico became effective for seven federal agencies with permitting or authorization responsibilities.

[4] 50 CFR § 402.06 states that "Consultation, conference, and biological assessment procedures under section 7 may be consolidated with interagency cooperation procedures required by other statutes, such as the National Environmental Policy Act (NEPA) (implemented at 40 CFR Parts 1500 - 1508) or the Fish and Wildlife Coordination Act (FWCA)."

mammal protection, and essential fish habitat. While some information related to the ESA evaluation is within the coordinated NEPA document developed by multiple federal agencies, the attached BE is provided as a stand-alone document to comply with the consultation process under ESA Section 7.

2.0 Proposed Action

Ocean Era, Inc. (applicant) is proposing to operate a pilot-scale marine aquaculture facility (Velella Epsilon) in federal waters of the Gulf. The proposed action is the issuance of permits under the respective authorities of the EPA and the USACE as required to operate the facility. The EPA's proposed action is the issuance of a NPDES permit that authorizes the discharge of pollutants from an aquatic animal production facilityinto federal waters of the United States. The USACE's proposed action is the issuance of a DA permit pursuant to Section 10 of the Rivers and Harbors Act that authorizes anchorage to the sea floor and structures affecting navigable waters.

3.0 Proposed Project

The proposed project would allow the applicant to operate a pilot-scale marine aquaculture facility with up to 20,000 almaco jack (*Seriola rivoliana*) being reared in federal waters for a period of approximately 12 months (total deployment of the cage system is 18 months). Based on an estimated 85 percent survival rate, the operation is expected to yield approximately 17,000 fish. Final fish size is estimated to be approximately 4.4 pounds (lbs) per fish, resulting in an estimated final harvest weight of 80,000 lbs considering a 10% mortality rate. The fingerlings will be sourced from brood stock that are located at Mote Aquaculture Research Park, in Sarasota, Florida, and were caught in the Gulf near Madeira Beach, Florida. As such, only F1 progeny will be stocked into the proposed project.

One support vessel will be used throughout the life of the project. The vessel will always be present at the facility except during certain storm events or times when resupplying is necessary. The support vessel would not be operated during any time that a small craft advisory is in effect for the proposed action area. The support vessel is expected to be a 70 ft long Pilothouse Trawler (20 ft beam and 5 ft draft) with a single 715 HP engine. The vessel will also carry a generator that is expected to operate approximately 12 hours per day. Following harvest, cultured fish would be landed in Florida and sold to federally licensed dealers in accordance with state and federal laws. The exact type of harvest vessel is not known; however, it is expected to be a vessel already engaged in offshore fishing activities in the Gulf.

A fully enclosed and submersible single copper pen that is offshore strength (PolarCirkel-style) will be deployed on an engineered multi-anchor swivel (MAS) mooring system. The engineered MAS will have up to three anchors for the mooring, with a swivel and bridle system. The design drawings provided for the engineered MAS uses three concrete deadweight anchors for the mooring; however, the final anchor design will likely utilize embedment anchors instead. The cage material for the proposed project is constructed with rigid and durable materials (copper mesh net with a diameter of 4-millimeter (mm) wire and 40 mm x 40 mm mesh square). The mooring lines for the proposed project will be constructed of steel chain (50 mm thick) and thick rope (36 mm) that are attached to a floating cage that will rotate in the prevailing current direction; the ocean currents will maintain the mooring rope and chain under tension during most times of operation. The bridle line that connects from the swivel to the cage will be encased in a rigid pipe. Structural information showing the MAS and pen, along with the tethered supporting vessel, is provided in Appendix A. The anchoring system for the proposed project is being finalized by the applicant. While the drawings in Appendix A show concrete deadweight anchors, it is likely that the final design will utilize appropriately sized embedment anchors instead. Both anchor types are included for ESA consultation purposes.

The cage design is flexible and self-adjusts to suit the constantly changing wave and current conditions. As a result, the system can operate floating on the ocean surface or submerged within the water column of the ocean; however, the normal operating condition of the cage is below the water surface. When a storm approaches the area, the entire cage can be submerged by using a valve to flood the flotation system with water. A buoy remains on the surface, marking the net pen's position and supporting the air hose. When the pen approaches the bottom, the system can be maintained several meters above the sea floor. The cage system is able to rotate around the MAS and adjust to currents while it is submerged and protected from storms. After storm events, the cage system is made buoyant again by pumping air back into the flotation system, causing the system to rise to resume normal operational conditions. The proposed project cage will have at least one properly functioning global positioning system device to assist in locating the system in the event it is damaged or disconnected from the mooring system.

In cooperation with the NMFS, a protected species monitoring plan (PSMP) has been developed for the proposed action to protect all marine mammal, reptiles, sea birds, and other protected species. Monitoring will occur throughout the life of the project and represents an important minimization measure to reduce the likelihood of any unforeseen potential injury to all protected species including ESA-listed marine animals. The data collected will provide valuable insight to resource managers about potential interactions between aquaculture operations and protected species. The PSMP also contains important mitigative efforts such as suspending vessel transit activities when a protected species is observed to come within 100 meters (m) of the activity until the animal(s) leave the area. The project staff will suspend all surface activities (including stocking fish, harvesting operations, and routine maintenance operations) in the unlikely event that any protected species is observed to come within 100 m of the activity until the animal leaves the area. Furthermore, should there be activity that results in an injury to protected species, the on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement.[5]

The below information about chemicals, drugs, cleaning, and solid waste provides supporting details about the proposed project:

Chemicals: The proposed facility has indicated they would not be using toxic chemicals, cleaners, or solvents at the proposed project. The proposed project would use small amounts of petroleum to run the generator. Spills are unlikely to occur; however, if spills did occur, they would be small in nature.

Drugs: The applicant has indicated that FDA-approved antibiotics or other therapeutants will not likely be used (within any feed or dosing the rearing water) during the proposed project. [6] The need for drugs is minimized by the strong currents expected at the proposed action area, the low fish culture density, the cage material being used, and the constant movement of the cage.

Cleaning: The applicant does not anticipate the need to clean the cage for the short duration of the proposed project. Should the cage system need cleaning, divers would manually scrub the cage surfaces with cleaning brushes. No chemicals would be used while cleaning and any accumulated marine biological matter would be returned to sea without alteration.

Solid Wastes: The applicant will dispose of all solid waste appropriately on shore.

[5] A PSMP has been developed by the applicant with assistance from the NMFS Protected Resources Division. The purpose of the PSMP is to provide monitoring procedures and data collection efforts for species (marine mammals, sea turtles, seabirds, or other species) protected under the MMPA or ESA that may be encountered at the proposed project.

[6] The applicant is not expected to use any drugs; however, in the unlikely circumstance that therapeutant treatment is needed, three drugs were provided to the EPA as potential candidates (hydrogen peroxide, oxytetracycline dihydrate, and florfenicol).

4.0 Proposed Action Area

The proposed project will be placed in the Gulf at an approximate water depth of 40 m (130 feet), and generally located 45 miles southwest of Sarasota, Florida. The proposed facility will be placed within an area that contains unconsolidated sediments that are 3 – 10 ft deep (see Table 1). The applicant will select the specific location within that area based on diver-assisted assessment of the sea floor when the cage and anchoring system are deployed. The proposed action area is a 1,000 m radius measured from the center of the MAS.

The facility potential locations were selected with assistance from NOAA's National Ocean Service National Centers for Coastal Ocean Science (NCCOS). The applicant and the NCCOS conducted a site screening process over several months to identify an appropriate project site. Some of the criteria considered during the site screening process included avoidance of corals, coral reefs, submerged aquatic vegetation, hard bottom habitats, and avoidance of marine protected areas, marine reserves, and habitats of particular concern. This siting assessment was conducted using the Gulf AquaMapper tool developed by NCCOS.[7]

Upon completion of the site screening process with the NCCOS, the applicant conducted a Baseline Environmental Survey (BES) in August 2018 based on guidance developed by the NMFS and EPA.[8] The BES included a geophysical investigation to characterize the sub-surface and surface geology of the sites and identify areas with a sufficient thickness of unconsolidated sediment near the surface while also clearing the area of any geohazards and structures that would impede the implementation of the aquaculture operation. The geophysical survey for the proposed project consisted of collecting single beam bathymetry, side scan sonar, sub-bottom profiler, and magnetometer data within the proposed area. The BES report noted that there were no physical, biological, or archaeological features within the surveyed area that would preclude the siting of the proposed aquaculture facility within the area shown in Table 1.

Table 1: Target Area with 3' to 10' of Unconsolidated Sediments

Location	Latitude	Longitude
Upper Left Corner	27° 7.70607' N	83° 12.27012' W
Upper Right Corner	27° 7.61022' N	83° 11.65678' W
Lower Right Corner	27° 6.77773' N	83° 11.75379' W
Lower Left Corner	27° 6.87631' N	83° 12.42032' W

[7] The Gulf AquaMapper tool is available at: https://coastalscience.noaa.gov/products-explorer/

[8] The BES guidance document is available at: http://sero.nmfs.noaa.gov/sustainable_fisheries/Gulf_fisheries/aquaculture/

5.0 Federally Listed and Proposed Threatened and Endangered Species and Critical Habitat

5.1 Federally Listed Threatened and Endangered Species

The action agencies identified the ESA-listed species shown in Table 2 for consideration on whether the proposed action may affect protected species in or near the proposed action area. In summary, the action agencies considered the potential affects to threatened and endangered species from five groups of species: birds (2), fish (4), invertebrates (7), marine mammals (6), and reptiles (5). The action agencies considered the species within this Section of the BE because they may occur within the project footprint or near enough such that there are potential routes of effects. Certain ESA-listed species are not discussed because their behavior, range, habitat preferences, or known/estimated location do not overlap or expose them to the activities within the proposed action area.

Table 2: Federally Listed Species, Listed Critical Habitat, Proposed Species, and Proposed Critical Habitat Considered for the Proposed Action

	Species Considered	ESA Status	Critical Habitat Status	Potential Exposure to Proposed Action Area
Birds				
1	Piping Plover	Threatened	Yes	No
2	Red Knot	Threatened	No	No
Fish				
1	Giant Manta Ray	Threatened	No	Yes
2	Nassau Grouper	Threatened	No	Yes
3	Oceanic Whitetip Shark	Threatened	No	Yes
4	Smalltooth Sawfish	Endangered	No	Yes
Invertebrates				
1	Boulder Star Coral	Threatened	No	No
2	Elkhorn Coral	Threatened	No	No
4	Mountainous Star Coral	Threatened	No	No
5	Pillar Coral	Threatened	No	No
7	Staghorn Coral	Threatened	No	No
6	Rough Cactus Coral	Threatened	No	Yes
3	Lobed Star Coral	Threatened	No	Yes
Marine Mammals				
1	Blue Whale	Endangered	No	Yes
2	Bryde's Whale	Endangered	No	Yes
3	Fin Whale	Endangered	No	Yes
4	Humpback Whale	Endangered	No	Yes
5	Sei Whale	Endangered	No	Yes
6	Sperm Whale	Endangered	No	Yes
Reptiles				
1	Green Sea Turtle	Threatened	No	Yes
2	Hawksbill Sea Turtle	Endangered	Yes	Yes
3	Kemp's Ridley Sea Turtle	Endangered	No	Yes
4	Leatherback Sea Turtle	Endangered	Yes	Yes
5	Loggerhead Sea Turtle	Threatened	Yes	Yes

5.1.1 Birds

There are 14 ESA-listed avian species identified as threatened or endangered, previously delisted, or candidate species in the eastern Gulf. Of those species, only two listed species, the piping plover and red knot, are considered in this BE because their migratory range could expose them to activities covered under the proposed action. There are several other listed species whose range includes only inshore and coastal margin waters and are not exposed to the activities covered under the proposed action.

Piping Plover

The piping plover is a threatened shorebird that inhabits coastal sandy beaches and mudflats. Three populations of piping plover are recognized under ESA: Great Lakes (endangered); Great Plains (threatened); and Atlantic (threatened) (BOEM, 2012a). This species nests in sand depressions lined with pebbles, shells, or driftwood. Piping plovers forage on small invertebrates along ocean beaches, on intertidal flats, and along tidal pool edges; therefore, fish from the proposed action are not considered a potential source of food for the piping plover.

Possibly as high as 75% of all breeding piping plovers, regardless of population affiliation, may spend up to eight months on wintering grounds in the Gulf. They arrive from July through September, leaving in late February to migrate back to their breeding sites (BOEM, 2012b). They do not breed in the Gulf. Habitat used by wintering birds include beaches, mud flats, sand flats, algal flats, and washover passes (where breaks in sand dunes result in an inlet). The piping plover is considered a state species of conservation concern in all Gulf coast states due to wintering habitat. The piping plover is a migratory shorebird with no open ocean habitat.

Red Knot

The red knot, listed as threatened in 2014, is a highly migratory shorebird species that travels between nesting habitats in Arctic latitudes and southern non-breeding habitats in South America and the U.S. Atlantic and Gulf coasts (BOEM, 2012a). Red knots forage along sandy beaches, tidal mudflats, salt marshes, and peat banks for bivalves, gastropods, and crustaceans (USFWS, 2015). Horseshoe crab eggs are a critical food resource for this species, and the overharvesting and population declines of horseshoe crabs may be a major reason for the decline of red knot numbers.

Wintering red knots may be found in Florida and Texas (Würsig, 2017). They are considered a State Species of Conservation Concern in Florida and Mississippi. The numbers of wintering and staging red knots using coastal beaches in Gulf coast states other than Florida have declined dramatically (Würsig, 2017). Its population has exhibited a large decline in recent decades and is now estimated in the low ten-thousands (NatureServe, 2019). Critical habitat rules have not been published for the red knot. Within the Gulf region, wintering red knots are found primarily in Florida, but this species has been reported in coastal counties of each of the Gulf states.

5.1.2 Fish

The four species of ESA-protected fish that may occur within the action area are: giant manta ray, nassau grouper, smalltooth sawfish, and oceanic whitetip shark.

Giant Manta Ray

The giant manta ray was listed as threatened under the ESA on February 21, 2018. The giant manta ray is found worldwide in tropical, subtropical, and temperate seas. These slow-growing, migratory animals are circumglobal with fragmented populations. The giant manta ray is the largest living ray, with a wingspan reaching a width of up to 9 m. Manta species are distinguished from other rays in that they tend to be larger with a terminal mouth, and have long cephalic lobes (Evgeny, 2010), which are extensions of the pectoral fins that funnel water into the mouth. Giant manta rays feed primarily on planktonic organisms such as euphausiids, copepods, mysids, decapod larvae and shrimp, but some studies have noted their consumption of small and moderately sized fishes (Miller and Klimovich, 2017).

Within the Southeast Region of the United States, the giant manta ray is frequently sighted along the east coast and within the Gulf of Mexico. Giant manta rays are seasonal visitors along productive coastlines with regular upwelling, in oceanic island groups, and near offshore pinnacles and seamounts. Given the opportunistic sightings of the species, researchers are still unsure what drives giant manta rays to certain areas and not others (and where they go for the remainder of the time). The timing of these visits varies by region and seems to correspond with the movement of zooplankton, current circulation and tidal patterns, seasonal upwelling, seawater temperature, and possibly mating behavior. Although giant manta rays are considered oceanic and solitary, they have been observed congregating at cleaning sites at offshore reefs and feeding in shallow waters during the day at depths less than 10 m (O'Shea et al., 2010; Marshall et al., 2011; Rohner et al., 2013). The giant manta ray ranges from near shore to pelagic habitats, occurring over the continental shelf near reef habitats and offshore islands. The species can be found in estuarine waters near oceanic inlets, with use of these waters as potential nursery grounds. This species appears to exhibit a high degree of plasticity in terms of their use of depths within their habitat.

Nassau Grouper

The Nassau grouper is a reef fish typically associated with hard structure such as reefs (both natural and artificial), rocks, and ledges. It is a member of the family Serranidae, which includes groupers valued as a major fishery resource such as the gag grouper and the red grouper. These large fish are found in tropical and subtropical waters of southern coastal Florida and the Florida Keys. Nassau grouper are generally absent from the Gulf north and outside of the Florida Keys; this is well documented by the lack of records in Florida Fish and Wildlife Conservation Commission’s, Fisheries Independent Monitoring data, as well as various surveys conducted by NOAA Fisheries Southeast Fisheries Science Center. There has been one verified report of the Nassau Grouper in the northwest Gulf at Flower Gardens Bank national marine sanctuary; however, the Flower Gardens Bank is not near the proposed action area.

Oceanic Whitetip Shark

The oceanic whitetip shark is a large, open ocean, highly migratory, apex predatory shark found in subtropical waters throughout the Gulf. It is a pelagic species usually found offshore in the open ocean, on the outer continental shelf, or around oceanic islands in deep water greater than 184 m. The oceanic whitetip shark can be found from the surface to at least 152 m depth. Occasionally, it is found close to land in waters as shallow as 37 m, mainly around mid-ocean islands or in areas where the continental shelf is narrow with access to nearby deep water. Oceanic whitetip sharks have a strong preference for the surface mixed layer in warm waters above 20°C and are therefore mainly a surface-dwelling shark.

Oceanic whitetip sharks are high trophic-level predators in open ocean ecosystems feeding mainly on teleosts and cephalopods (Backus et al., 1956; Bonfil et al., 2008); however, some studies have found that they consume sea birds, marine mammals, other sharks and rays, mollusks, crustaceans, and even garbage (Compagno, 1984; Cortés, 1999).

Smalltooth Sawfish

The smalltooth sawfish was the first marine fish to receive protection as an endangered species under the ESA in 2003. Their current range is poorly understood but believed to have significantly contracted from these historical areas. Today, smalltooth sawfish primarily occur off peninsular Florida from the Caloosahatchee River to the Florida Keys (Würsig, 2017). Historical accounts and recent encounters suggest immature individuals are most common in shallow coastal waters less than 25 m (Bigelow and Schroeder, 1953; Adams and Wilson, 1995). Smalltooth sawfish primarily live in shallow coastal waters near river mouths, estuaries, bays, or depths up to 125 m. Smalltooth sawfish feed primarily on fish. Mullet, jacks, and ladyfish are believed to be their primary food resources (Simpfendorfer, 2001). Smalltooth sawfish also prey on crustaceans (mostly shrimp and crabs) by disturbing bottom sediment with their saw (Norman and Fraser, 1938; Bigelow and Schroeder, 1953).

5.1.3 Invertebrates

The seven ESA-listed coral species in the Gulf are known to occur near the Dry Tortugas, a small group of islands located approximately 67 miles west of Key West, Florida. Four of the ESA-listed coral species in the Gulf (elkhorn, lobed star, mountainous star, and boulder star) are known to occur in the Flower Banks National Marine Sanctuary, located 70 to 115 miles off the coast of Texas and Louisiana. The most abundant depth ranges for the ESA-listed invertebrates are provided in Table 3. Given the known geographic locations of the considered coral species and their recognized habitat preferences related to water depth, only two invertebrate species (lobed star coral and rough cactus coral) may occur in the proposed action area. Threats to coral communities throughout the Gulf include predation, hurricane damage, and loss of habitat due to algal overgrowth and sedimentation.

Table 3: ESA-listed Coral Depth Ranges

Coral Species	Most Abundant Depth (ft)
Boulder Star Coral	3 - 82 [9]
Elkhorn Coral	3 - 16 [10]
Lobed Star Coral	6 - 130 [11]
Mountainous Star Coral	3 - 30 [11]
Pillar Coral	3 - 90
Rough Cactus Coral	15 - 270 [10]
Staghorn Coral	15 - 60 [10]

5.1.4 Marine Mammals

All the ESA-listed marine mammals considered in this BE are endangered under the ESA. The six species of whales that could occur within the action area are: blue whale, fin whale, Gulf Bryde’s whale, humpback whale, sperm whale, and sei whale; however, except for the Gulf Bryde’s whale, each ESA-listed whale considered in this BE are not common in the Gulf (Würsig, 2017). Threats to whales from aquaculture facilities include vessel strikes, entanglement, and disturbance (ocean noise).

Blue Whales

Blue whales are found in all oceans except the Arctic Ocean. Currently, there are five recognized subspecies of blue whales. Blue whales have been sighted infrequently in the Gulf. The only record of blue whales in the Gulf are two strandings on the Louisiana and Texas coasts; however, the identifications for both strandings are questionable. In the North Atlantic blue whales are most often seen off eastern Canada where they are present year-round (NMFS, 2016). Blue whales also typically occur in deeper waters seaward of the continental shelf and are not commonly observed in the waters of the Gulf or off the U.S. East Coast (CeTAP, 1982; Wenzel et al., 1988; Waring et al., 2006). Blue whales are not expected to be within the proposed action area that is located in a water depth of approximately 40 m.

[9] www.DCNANature.org, 2016
[10] NMFS, 2016
[11] www.IUCNRedList.org, 2016

Bryde's Whale

The Gulf Bryde's whale was listed as endangered on May 15, 2019. The Gulf Bryde's whales are members of the baleen whale family and are a subspecies of the Bryde's whale. The Gulf Bryde's whales are one of the most endangered whales in the world, with likely less than 100 whales remaining. They are the only resident baleen whale in the Gulf. The Gulf Bryde's whale is one of the few types of baleen whales that do not migrate and remain in the Gulf year-round. The historical range in Gulf waters is not well known; however, scientists believe that the historical distribution of Gulf Bryde's whales once encompassed the north-central and southern Gulf. For the past 25 years, Bryde's whales in U.S. waters of the Gulf have been consistently located in the northeastern Gulf (largely south of Alabama and the western part of the Florida panhandle) along the continental shelf break between the 100 and 400 m depth (Labrecque et al., 2015). This area has been identified as a Biologically Important Area (BIA) for the Gulf Bryde's whale and encompasses over 5.8 million acres. BIAs are reproductive areas, feeding areas, migratory corridors, or areas in which small and resident populations are concentrated. The proposed action area is not located near the areas where the Gulf Bryde's whale is known to be distributed and are not expected to occur at the water depth of the proposed project.

Fin Whales

Fin whales are found in deep, offshore waters of all the world's oceans, primarily in temperate to polar climates. The NMFS has reported that there are about 2,700 fin whales in the North Atlantic and Gulf. There are few reliable reports of fin whales in the northern Gulf. They are most commonly found in North Atlantic waters where they feed on krill, small schooling fish, and squid (NMFS, 2016). Fin whales are generally found along the 100 m isobath with sightings also spread over deeper water including canyons along the shelf break (Waring et al., 2006). Therefore, fin whales are not expected to be found near the proposed action area where the water depth is approximately 40 m.

Humpback Whales

Based on a few confirmed sightings and one stranding event, humpback whales are rare in the northern Gulf (BOEM, 2012a). Baleen whale richness in the Gulf is believed to be less than previously understood (Würsig, 2017). U.S. populations of humpback whales mainly use the western North Atlantic for feeding grounds and use the West Indies during winter and for calving (NMFS, 2016). Given that humpback whales are not a typical inhabitant of the Gulf, they are not expected to be found near the proposed action area. Additionally, the water depth at the proposed action area (40 m) does not overlap the habitat preference of humpback whales for deeper waters.

Sei Whales

The sei whale is rare in the northern Gulf and its occurrence is considered accidental, based on four reliable and one questionable strandings records in Louisiana and Florida (Jefferson and Schiro, 1997; Schmidley, 2004; Würsig, 2017). Sei whales are more commonly found in subtropical to subpolar waters of the continental shelf and slope of the Atlantic, with movement between the climates according to seasons (NMFS, 2016). Sei whales typically occur in deeper waters seaward of the continental shelf and are not commonly observed in the waters of the Gulf (CeTAP, 1982; Wenzel et al., 1988; Waring et al., 2006). Sei whales are not expected to be geographically located near the proposed project.

Sperm Whales

In the northern Gulf, aerial and ship surveys indicate that sperm whales are widely distributed and present in all seasons in continental slope and oceanic waters. Sperm whales are the most abundant large cetacean in the Gulf. Greatest densities of sperm whales are in the central Northern Gulf near Desoto Canyon as well as near the Dry Tortugas (Roberts et al., 2016). They are found in deep waters throughout the world's oceans, but generally in waters greater than 200 to 800 m due to the habit of feeding on deep-diving squid and fish (Hansen et al., 1996; Davis et al., 2002; Mullin and Fulling, 2003; Würsig, 2017). Research conducted since 2000 confirms that Gulf sperm whales constitute a distinct stock based on several lines of evidence (Waring et al., 2006). Sperm whales are not expected to be within the proposed action area due to their known preference for deeper water.

5.1.5 Reptiles

The five ESA-listed sea turtle species that may occur in or near the proposed action area are: green, hawksbill, leatherback, kemp's ridley, and loggerhead. Sea turtles are highly migratory and travel widely throughout the Gulf. Therefore, each sea turtle has the potential to occur throughout the entire Gulf. In general, the entire Gulf coastal and nearshore area can serve as habitat for marine turtles. Florida is the most important nesting area in the United States for loggerhead, green, and leatherback turtles. Several volumes exist that cover the biology and ecology of these species (i.e., Lutz and Musick, 1997; Lutz et al., 2003, Wynekan et al., 2013).

Green sea turtle

Green sea turtle hatchlings are thought to occupy pelagic areas of the open ocean and are often associated with *Sargassum* rafts (Carr, 1987; Walker, 1994). Pelagic stage green sea turtles are thought to be carnivorous. Stomach samples of these animals found ctenophores and pelagic snails (Frick, 1976; Hughes, 1974). At approximately 20 to 25 centimeters (cm) carapace length, juveniles migrate from pelagic habitats to benthic foraging areas (Bjorndal, 1997). As juveniles move into benthic foraging areas, a diet shift towards herbivory occurs. They consume primarily seagrasses and algae, but are also known to consume jellyfish, salps, and sponges (Bjorndal, 1980, 1997; Paredes, 1969; Mortimer, 1981, 1982). The diving abilities of all sea turtle species vary by their life stages. The maximum diving range of green sea turtles is estimated at 110 m (Frick, 1976), but they are most frequently making dives of less than 20 m (Walker, 1994). The time of these dives also varies by life stage.

The NMFS and USFWS removed the range-wide and breeding population ESA listings of the green sea turtle and listed eight distinct population segments (DPSs) as threatened and three DPSs as endangered, effective May 6, 2016. Two of the green sea turtle DPSs, the North Atlantic DPS and the South Atlantic DPS, occur in the Gulf. The proposed action area is within the North Atlantic NPS where the green sea turtle is listed as threatened.

Hawksbill sea turtle

The hawksbill sea turtle's pelagic stage lasts from the time they leave the nesting beach as hatchlings until they are approximately 22 to 25 cm in straight carapace length (Meylan, 1988; Meylan and Donnelly, 1999). The pelagic stage is followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Little is known about the diet of pelagic stage hawksbills. Adult foraging typically occurs over coral reefs, although other hard-bottom communities and mangrove-fringed areas are occupied occasionally. Hawksbills show fidelity to their foraging areas over several years (van Dam and Diéz, 1998). The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan, 1988). Gravid females have been noted ingesting coralline substrate (Meylan, 1984) and calcareous algae (Anderes, Alvarez, and Uchida, 1994), which are believed to be possible sources of calcium to aid in eggshell production. The maximum diving depths of these animals are unknown, but the maximum length of dives is estimated at 73.5 minutes, more routinely dives last about 56 minutes (Hughes, 1974). Hawksbill sea turtles are not known to regularly nest in Florida but do occur occasionally.

Kemp's Ridley sea turtle

Kemp's ridley sea turtle hatchlings are also pelagic during the early stages of life and feed in surface waters (Carr, 1987; Ogren, 1989). After the juveniles reach approximately 20 cm carapace length they move to relatively shallow (less than 50 m) benthic foraging habitat over unconsolidated substrates (Márquez-M., 1994). They have also been observed transiting long distances between foraging habitats (Ogren, 1989). Kemp's ridleys feeding in these nearshore areas primarily prey on crabs, though they are also known to ingest mollusks, fish, marine vegetation, and shrimp (Shaver, 1991). The fish and shrimp Kemp's ridleys ingest are not thought to be a primary prey item but instead may be scavenged opportunistically from bycatch discards or discarded bait (Shaver, 1991). Given their predilection for shallower water, Kemp's ridleys most routinely make dives of 50 m or less (Soma, 1985; Byles, 1988). Their maximum diving range is unknown. Depending on the life stage, a Kemp's ridley may be able to stay submerged anywhere from 167 minutes to 300 minutes, though dives of 12.7 minutes to 16.7 minutes are much more common (Soma, 1985; Mendonca and Pritchard, 1986; Byles, 1988). Kemp's ridley turtles may also spend as much as 96 percent of their time underwater (Soma, 1985; Byles, 1988). In the United States, Kemp's ridley turtles inhabit the Gulf and northwest Atlantic Ocean; nesting occurs primarily in Texas, and occasionally in Florida, Alabama, Georgia, South Carolina, and North Carolina.

Leatherback sea turtle

Leatherback sea turtles are the most pelagic of all ESA-listed sea turtles and spend most of their time in the open ocean. They will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these species regardless of life stage (Bjorndal, 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that these species can dive more than 1,000 m (Eckert et al., 1989) but more frequently dive to depths of 50 m to 84 m (Eckert et al. 1986). Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Standora et al., 1984; Eckert et al., 1986; Eckert et al., 1989; Keinath and Musick, 1993).

Loggerhead sea turtle

Loggerhead sea turtle hatchlings forage in the open ocean and are often associated with Sargassum rafts (Hughes, 1974; Carr 1987; Walker, 1994; Bolten and Balazs, 1995). The pelagic stage of these sea turtles are known to eat a wide range of things including salps, jellyfish, amphipods, crabs, syngnathid fish, squid, and pelagic snails (Brongersma, 1972). Stranding records indicate that when pelagic immature loggerheads reach 40 to 60 cm straight-line carapace length, they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic (Witzell, 2002). Loggerhead sea turtles forage over hard-bottom and soft-bottom habitats (Carr, 1986).

Benthic foraging loggerheads eat a variety of invertebrates with crabs and mollusks being an important prey source (Burke et al., 1993). Estimates of the maximum diving depths of loggerheads range from 211 m to 233 m (Thayer et al., 1984; Limpus and Nichols, 1988). The lengths of loggerhead dives are frequently between 17 and 30 minutes (Thayer et al., 1984; Limpus and Nichols, 1988; Limpus and Nichols, 1994; Lanyon et al., 1989) and they may spend anywhere from 80 to 94 percent of their time submerged (Limpus and Nichols, 1994; Lanyon et al., 1989). Loggerhead sea turtles are a long-lived, slow-growing species, vulnerable to various threats including alterations to beaches, vessel strikes, and bycatch in fishing nets.

5.2 Federally Listed Critical Habitat In or Near the Action Area

5.2.1 Birds

Onshore critical habitat has been designated for the piping plover including designations for coastal wintering habitat areas in Alabama, Mississippi, and Florida.[12] The proposed project is not expected to impact any onshore habitats.

5.2.2 Reptiles

The only critical habitat designated near the proposed action area is the Northwest Atlantic DPS of loggerhead sea turtles. Specific areas of designated habitat include: nearshore reproductive habitat, winter area, breeding areas, migratory corridors, and Sargassum habitat. The northwest Atlantic loggerhead DPS designated critical habitat portion that occurs in federal waters (*i.e.*, a Sargasso habitat unit) consists of the western Gulf to the eastern edge of the loop current, through the Straits of Florida and along the Atlantic coast from the western edge of the Gulf Stream eastward. Sargassum habitat is home to most juvenile sea turtles in the western Gulf.

5.3 Federal Proposed Species and Proposed Critical Habitat

The action agencies did not identify any Federally-listed proposed species or proposed critical habitat in the proposed action area.

[12] Critical habitat locations for the piping plover are available at: https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B079

6.0 Potential Stressors to Listed and Proposed Species and Critical Habitat

The action agencies evaluated the potential impacts of the proposed project on ESA-listed species that were identified in Section 5.0 and that may occur in or near the proposed action area. Potential effects considered in this analysis may occur because of a potential overlap between the proposed aquaculture facility location with the species habitat (socialization, feeding, resting, breeding, etc.) or migratory route. Section 6.0 broadly describes the most likely stressors, directly and indirectly, that were considered to potentially impact the species near the proposed facility. The action agencies identified four categories of risks from the proposed project: disturbance; entanglement; vessel collisions; and impacts from water quality. The specific analysis of potential impacts to each species from the proposed project is provided in Section 7.0.

6.1 Disturbance

Disturbance in the context of this BE includes ocean noise (low-frequency underwater noises) and breakage (invertebrates). Underwater noises can interrupt the normal behavior of whales, which rely on sound to communicate. As ocean noise increases from human sources, communication space decreases and whales cannot hear each other, or discern other signals in their environment as they used to in an undisturbed ocean. Different levels of sound can disturb important activities, such as feeding, migrating, and socializing. Mounting evidence from scientific research has documented that ocean noise also causes marine mammals to change the frequency or amplitude of calls, decrease foraging behavior, become displaced from preferred habitat, or increase the level of stress hormones in their bodies. Loud noise can cause permanent or temporary hearing loss. Underwater noise threatens whale populations, interrupting their normal behavior and driving them away from areas important to their survival. Increasing evidence suggests that exposure to intense underwater sound in some settings may cause some whales to strand and ultimately die.

ESA-listed sea turtles, whales, and fish may experience stress due to a startled reaction should they encounter vessels, or vessel noise, at the proposed location or in transit to the proposed project site. The reaction could range from the animal approaching and investigating the activity, to the opposite reaction of flight, where the animal could injure itself while attempting to flee. The most likely source of disturbance from the proposed aquaculture activity would be noise from the vessel engines and barge generator.

6.2 Entanglements

Entanglement, for the purposes of this BE, refers to the wrapping of lines, netting, or other man-made materials around the body of a listed species. Entanglement can result in restrainment and/or capture to the point where harassment, injury, or death occurs. The cage, mooring lines, and bridles from the proposed project may pose an entanglement risk to listed species in the project area; however, entanglement risks to ESA-listed species at any aquaculture operation are mitigated by using rigid and durable cage materials, and by keeping all facility lines taut as slack lines are the primary source of entanglements (Nash et al., 2005).

Past protected species reviews by the NMFS for a similar scale aquaculture project determined that cetacean and sea turtle entanglement is not expected when facility mooring and tether lines are kept under near-constant tension and free of loops (NMFS, 2016). Additionally, the NMFS determined that a similar aquaculture project had the potential to result in interactions with marine mammals; however, the NMFS found that the most likely effect of the project on marine mammals was behavioral interactions (e.g., individuals engaging in investigative behavior around the array or that prey on wild fish accumulated near the facility) as opposed to causing injury or mortality from entanglement.

6.3 Vessel Strike

A vessel strike is a collision between any type of boat and a marine animal in the ocean. All sizes and types of vessels have the potential to collide with nearly any marine species. Strikes can result in death or injury to the

marine animal and may go unnoticed by the vessel operator. Some marine species spend short durations "rafting" at the ocean's water surface between dives which makes them more vulnerable to vessel strikes.

The NMFS estimates collisions between some cetaceans and vessels are relatively rare events based on data from Marine Mammal Stock Assessments for the Atlantic and Gulf (NMFS, 2017). Collisions between marine mammals and vessels can be further minimized when vessels travel at less than 10 knots based on general guidance from the NMFS for vessels transiting areas where there are known populations of whales (HIHWNMS, 2011). Detection of sea turtles by vessel operators may be more difficult because most vessel operators usually sight protected species and avoid them. In past biological opinions in support of similar aquaculture activities, the NMFS has determined that the rate of collisions between sea turtles and vessels was negligible and did not expect sea turtle vessel strikes to occur (NMFS, 2016).

The support vessel used for the proposed project is expected to be vigilant against the possibility of protected species collisions. Piloting of all vessels associated with the proposed project will be done in a manner that will prevent vessel collisions or serious injuries to protected species. Operators and crew will operate vessels at low speeds when performing work within and around the proposed project area and operate only when there are no small craft advisories in effect. All vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS.[13] These operating conditions are expected to allow vessel operators the ability to detect and avoid striking ESA-listed species.

6.4 Water Quality

Although offshore marine cage systems do not generate a waste stream like other aquaculture systems, effluent from the proposed action area can adversely affect water quality, sea floor sediment composition, and benthic fauna though the additions of uneaten feed, ammonia excretions, and fish feces from the increased fish biomass. Water quality in aquaculture is primarily assessed through measures of nitrogen (N), phosphorus (P), solids (total suspended solids, settleable solids, and turbidity), dissolved oxygen (DO), and pH. The increased amount of organic material has the potential to increase N, P, and solids levels in the surrounding waters. The concentration of N (such as total nitrogen, ammonia, nitrate, nitrite) and P (as total phosphorus or orthophosphate) are indicators of nutrient enrichment and are commonly used to assess the impact of aquaculture on water quality. The release of nutrients, reductions in concentrations of DO, and the accumulation of sediments under certain aquaculture operations can affect the local environment by boosting overall productivity in phytoplankton and macroalgal production in marine ecosystems through eutrophication and degradation of benthic communities (Stickney, 2002).

According to *Marine Cage Culture and The Environment* (Price and Morris, 2013), "there are usually no measurable effects 30 meters beyond the cages when the farms are sited in well-flushed water. Nutrient spikes and declines in dissolved oxygen sometimes are seen following feeding events, but there are few reports of long-term risk to water quality from marine aquaculture." Price and Morris (2013) also considered the benthic effects of Marine Cage Culture and found that "well-managed farms may exhibit little perturbation and, where chemical changes are measured, impacts are typically confined to within 100 meters of the cages. Benthic chemical recovery is often rapid following harvest". Conversely, poorly managed farms or heavily farmed areas, can see anaerobic conditions persisting and extending hundreds of meters beyond the aquaculture facility. Changes in water quality associated with commercial scale marine aquaculture facilities can be measurable downstream for approximately 205 m (Nash et al., 2005).

[13] The NMFS has determined that collisions with any vessel can injure or kill protected species (e.g., endangered and threatened species, and marine mammals). The vessel strike avoidance guidelines developed by the NMFS are the standard measures that should be implemented to reduce the risk associated with vessel strikes or disturbance of these protected species to discountable levels. NMFS Southeast Region Vessel Strike Avoidance Measures and Reporting for Mariners; revised February 2008.

The NCCOS reviewed global siting data to identify aquaculture site characteristics that are best suited for water quality protection, concluding that, "Protection of water quality will be best achieved by siting farms in well-flushed waters." (Price, 2013). The hydrology near the proposed action area has powerful and mixing ocean currents that would constantly flush and dilute particulate and dissolved wastes. In addition, the proposed action has other attributes cited in this study that contributes to decreased water quality impacts, including deep waters and a sand bottom type. Neither particulates nor dissolved metabolites are expected to accumulate due to low fish production levels and the near constant flushing of the cage by strong offshore currents that dissipate wastes.

The EPA evaluated the proposed action's potential impacts to water quality, impacts of organic enrichment to the seafloor, and impacts to benthic communities from organic enrichment as required by Sections 402 and 403 of the CWA. The EPA determined that discharges from the proposed facility are not expected to exceed federally recommended water quality criteria; that the discharged material is not sufficient to pose an environmental threat through seafloor bioaccumulation; and the potential for benthic impacts from the proposed project are minimal.[14] Additionally, the EPA considered recent environmental modeling performed by the NMFS for a similar small scale aquaculture facility (Velella Delta).[15] NCCOS concluded that there are minimal risks to water column or benthic ecology functions in the subject area from the operation of the fish cage as described in the applicant's proposal. Furthermore, EPA reviewed the previous and current environmental monitoring data collected from a commercial-scale marine aquaculture facility, Blue Ocean Mariculture (BOM) in Hawaii, raising the same fish species.[16] While the size of the proposed project is significantly smaller than the BOM commercial-scale facility and BOM is in slightly deeper waters, the results show that soluble and particulate nutrients from the BOM facility do not substantially affect the marine environment. Based on EPA's analysis, as well as a review and comparison of representative water quality information, the proposed action would not likely raise particulate and dissolved nutrient concentrations in the proposed action area.

The proposed facility will be covered by a NPDES permit as an aquatic animal production facility with protective conditions required by the Clean Water Act. The NPDES permit will contain conditions that will confirm EPA's determination and ensure no significant environmental impacts will occur from the proposed project. The aquaculture-specific water quality conditions placed in the NPDES permit will generally include a comprehensive environmental monitoring plan. The applicant will be required to monitor and sample certain water quality, sediment, and benthic parameters at a background (up-current) location and near the cage. Additionally, the NPDES permit will include effluent limitations expressed as best management practices (BMPs) for feed management, waste collection and disposal, harvest discharge, carcass removal, materials storage, maintenance, record keeping, and training. Impacts to water quality will be reduced by a range of operational measures through the implementation of project-specific BMPs. For example, feeding will always

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[14] Further information about EPA's analysis and determination for impacts to water quality, seafloor, and benthic habitat can be found in the final NPDES permit and the Ocean Discharge Criteria (ODC) Evaluation, as well as other supporting documents for the NPDES permit such as the Essential Fish Habitat Assessment and the NEPA evaluation.

[15] The NCCOS previously produced models to assess the potential environmental effects on water quality and benthic communities for the applicant's Velella Delta project that is similar Velella Epsilon in terms of fish production (approximately 120,000 lbs), operation duration, and cultured species; however, the water depth was dissimilar between the two projects (6,000 ft vs. 130 ft). At maximum capacity, NCCOS determined there were no risks to water quality from the Velella Delta project, and only insignificant effects would occur in the water column down to 100 feet. Because of the great depth, strong currents, and physical oceanographic nature of the Velella Delta site, dissolved wastes would be widely dispersed and assimilated by the planktonic community. Furthermore, the model results showed that benthic impacts and accumulation of particulate wastes would not be detectable through measurement of organic carbon or infaunal community biodiversity.

[16] Water quality information from a Blue Ocean Mariculture (BOM) facility in Hawaii was reviewed as representative data and compared to the proposed project. The BOM farm previously produced approximately 950,000 lbs/yr prior to 2014 and has produced up to 2,400,000 lbs/yr after 2014. The BOM facility is in a similar depth of water as the proposed project with an average depth of 60 m. Over eight years of comprehensive water quality and benthic monitoring, the BOM facility has not adversely impacted water quality outside of the mixing zone at the facility (BOM, 2014).

be monitored to ensure fish are fed at levels just below satiation to limit overfeeding and decrease the amount of organic material that is introduced into the marine environment. Moreover, the Essential Fish Habitat assessment requires certain mitigation measures within the NPDES and Section 10 permits.[17]

The EPA also considered the potential water quality impacts from chemical spills, drugs, cleaning, and solid wastes.

Chemical Spills: Spills are unlikely to occur; however, if spills do occur they are expected to be small in nature and dissipate rapidly due to strong currents in the project area. The terms and conditions of the NPDES permit would require the applicant to follow operational procedures (i.e. BMPs) that minimize the risk of wastes and discharges that may affect any ESA-listed species or habitat. The risk of accidental fuel or oil spills into the marine environment is minimized by the support vessel not being operated during any time that a small craft advisory is in effect at the proposed facility.

Drugs: The applicant indicated that FDA-approved antibiotics or other therapeutants will not likely be used during the proposed project due to the strong currents expected at the proposed action area, the low fish culture density, and the cage material being used. In the unlikely event that drugs/therapeutants are used, administration of drugs will be performed under the control of a licensed veterinarian and only FDA-approved therapeutants for aquaculture would be used as required by federal law. In addition, the NPDES permit will require that the use of any medicinal products be reported to the EPA, including therapeutics, antibiotics, and other treatments. The report will include types and amounts of medicinal product used and the duration they were used. The EPA does not expect the project to a cause a measurable degradation in water quality from drugs that may affect any ESA-listed species.

Cleaning: Another potential source of water quality impacts would be from the cleaning of the cage system. The applicant does not anticipate the need to clean the cage for the short duration of the proposed project. Experience from previous trials by the applicant demonstrated that copper alloy mesh material used for the cage is resistant to fouling. Should the cage system need cleaning, divers would manually scrub the cage surfaces with cleaning brushes. No chemicals would be used while cleaning and any accumulated marine biological matter would be returned to sea without alteration.

Solid Wastes: Multiple federal laws and regulations strictly regulate the discharge of oil, garbage, waste, plastics, and hazardous substances into ocean waters. The NPDES permit prohibits the discharge of any solid material not in compliance with the permit.

[17] The EPA and the USACE will require mitigation measures to be incorporated into the NPDES permit to avoid or limit organic enrichment and physical impacts to habitat that may support associated hardbottom biological communities. The NPDES permit will require facility to be positioned at least 500 meters from any hardbottom habitat; the DA permit will not authorize the anchor system to be placed on vegetated and/or hardbottom habitat.

7.0 Potential Effects of Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR § 402.02). The NMFS and USFWS standard for making a "no effect" finding is appropriate when an action agency determines its proposed action will not affect that ESA-listed species or critical habitat, directly or indirectly (USFWS and NMFS, 1998). Generally, a "no effect" determination means that ESA-listed species or critical habitats will not be exposed to any potentially harmful/beneficial elements of the action (NMFS, 2014).

The applicable standard to find that a proposed action "may affect, but not likely to adversely affect" (NLAA) listed species or critical habitat is that all the effects of the action are expected to be discountable, insignificant, or completely beneficial. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat.

A summary of the potential effects considered and the determination of impact for each listed species and critical habitat is provided in Table 4. Overall, potential impacts to the ESA-listed species considered in this BE are expected to be extremely unlikely and insignificant due to the small size of the facility, the short deployment period, unique operational characteristics, lack of geographic overlap with habitat or known migratory routes, or other factors that are described in the below sections for each species. The federal action agencies used multiple sources to support the determinations described within this section including the analysis of potential impacts that the NMFS used as the basis for its ESA determination for up to 20 commercial scale offshore marine aquaculture facilities in the Gulf (EPA, 2016; NMFS, 2009; NMFS, 2013; NMFS, 2015; NMFS, 2016).

7.1 Federally Listed Threatened and Endangered Species

7.1.1 Birds

The action agencies did not consider any potential threats to ESA-protected birds from the proposed project. The two species of birds considered are not expected to interact with the proposed project due to the distance between the proposed project from shore (approximately 45 miles) to their onshore habitat preferences. The piping plover and red knot are migratory shorebirds. Known migratory routes do not overlap with the proposed project. Both birds primarily inhabit coastal sandy beaches and mudflats of the Gulf; migration and wintering habitat are in intertidal marine habitats such as coastal inlets, estuaries, and bays (USFWS, 2015). Additionally, the normal operating condition of the cage is expected to be below the water surface which will further decrease the likelihood of any bird interaction with the proposed project.

The ESA-listed bird species will not be exposed to any potentially harmful impacts of the proposed action. The action agencies have determined that the activities under the proposed project will have no effect on the threatened species of birds.

7.1.2 Fish

The action agencies considered disturbance, entanglement (for smalltooth sawfish only), and water quality as potential impacts to endangered or threatened fish from the proposed project in the rare event that interaction occurs.

Impacts from disturbance, entanglement, and water quality are highly unlikely for each ESA-listed fish species that was considered given their unique habitat preferences and known proximity to the proposed action area.

The oceanic whitetip shark is not likely to occur near the proposed project given its preference for deeper waters. The action agencies believe that the Nassau grouper will not be present given that it is absent from the Gulf outside of the Florida Keys. Interactions with smalltooth sawfish with the proposed project is extremely unlikely because they primarily occur in the Gulf off peninsular Florida and are most common off Southwest Florida. The giant manta ray may encounter the facility given its migratory patterns; however, disturbance is not expected because the facility is small and will have a short deployment period of approximately 18 months.

Entanglement impacts were considered for smalltooth sawfish because it is the only listed fish species large enough to become entangled within the proposed facility's mooring lines. Entanglement risks to the smalltooth sawfish from the proposed project are minimized by using rigid and durable cage materials and by keeping all lines taut (as described in Section 3.0). The ocean currents will maintain the floating cage, mooring lines, and chain under tension during most times of operation. Additionally, the limited number of vertical mooring lines reduce the risk of potential entanglement by this listed fish species. Furthermore, interactions are anticipated to be highly unlikely given their current range in southwest Florida between Ft Myers and the Florida Keys. Because of the proposed project operations and lack of proximity to the known habitat for the smalltooth sawfish, the action agencies expect that the effects of this entanglement interaction would be discountable.

For water quality impacts, the EPA is proposing NPDES permit conditions required by the Clean Water Act. These permit provisions will contain environmental monitoring (water quality, sediment, and benthic infauna) and conditions that minimize potential adverse impacts to fish from the discharge of effluent from the proposed facility, and prohibit the discharge of certain pollutants (e.g., oil, foam, floating solids, trash, debris, and toxic pollutants). Due to the pilot-scale size of the facility, water quality and benthic effects are not expected to occur outside of 5-10 meters. The discharges authorized by the proposed NPDES permit represent a small incremental contribution of pollutants that are not expected to affect any ESA-listed fish species in or near the proposed action area.

Any potential effects from the proposed action on ESA-listed fish are discountable and insignificant. The action agencies have determined that the activities under the proposed project is NLAA the threatened and endangered species of fish.

7.1.3 Invertebrates

Potential routes of effects to coral from the proposed project include disturbance (breakage of coral structures) and water quality impacts (e.g., increased sedimentation, increased nutrient loading, and the introduction of pollutants).

Regarding disturbance, anthropogenic breakage is extremely unlikely and discountable because the proposed facility will not be in areas where listed corals may occur. Most of the ESA-listed invertebrate species are associated with coral reefs that occur in shallower areas of the Gulf and along the west Florida shelf. Only five species of the invertebrates considered (boulder star, elkhorn, mountainous star, pillar, and staghorn) are not known to occur near the proposed project location or at depths where the proposed facility is located. Only two invertebrate species (lobed star coral and rough cactus coral) may occur in the proposed action area. Moreover, the anchoring system and cage will be placed in an area consisting of unconsolidated sediments, away from potential hardbottom which may contain corals according to the facility's seafloor survey. Given the known geographic locations of the considered coral species and their recognized habitat preferences related to water depth, the disturbance effects of the proposed action is anticipated to be minimal and extremely unlikely.

Regarding impacts from water quality, the discharge from the proposed facility will be covered by a NPDES permit with water quality conditions required by the Clean Water Act. The aquaculture-specific water quality conditions contained in the NPDES permit will generally include an environmental monitoring plan (water quality, sediment, and benthic monitoring) and effluent limitations expressed as BMPs. Water quality effects are not expected to occur outside of 5-10 m due to the small size of the facility and low production levels. Sedimentation from the facility is not expected to occur outside of 1,000 m (assuming a maximum production for the entire duration of the project) with impacts resulting from the proposed facility likely limited to within 300-500 meters from the cage. The NPDES permit will prohibit discharges within 500 m of areas of biological concern, including live bottoms or coral reefs. The impacts from water quality and sedimentation are expected to be minimal or insignificant, and the likelihood that deleterious water quality will contribute to any adverse effects to listed coral species is extremely unlikely.

Any adverse effects from the proposed project on ESA-listed corals are discountable and insignificant. The action agencies have concluded that the proposed project will NLAA on the ESA-listed invertebrate species.

7.1.4 Marine Mammals

Generally, endangered whales are not likely to be adversely affected by any of the threats considered by the action agencies at or near the proposed facility because they are unlikely to overlap geographically with the small footprint of the proposed action area. All whales considered in this BE prefer habitat in waters deeper than the proposed action (40 m) as described in Section 5.1.4. The expected absence of the ESA-listed marine mammals in or near the proposed action area is an important factor in the analysis of whether impacts from the proposed project will have any effect on ESA-listed whales; however, the action agencies have still considered potential threats (disturbance, entanglement, vessel strikes, and water quality) to the six species of marine mammals considered in this BE.

Disturbance to marine mammals from ocean noise generated by the proposed facility is expected to be extremely low given the duration of the project, minimal vessel trips, and scale of the operation. The production cage will be deployed for a duration of approximately 18 months. Opportunities for disturbance from the vessel participating in the proposed project are minimal due to the limited trips to the site. The most likely source of disturbance from the proposed aquaculture activity would be noise from the vessel engines and barge generator. The noise emitted from the engines and generator would not significantly add to the frequency or intensity of ambient sound levels in the proposed action area and are not expected to be different from other vessels operating in federal waters. The action agencies believe that the underwater noise produced by operating a vessel and cage will not interfere with the ability of marine mammals to communicate, choose mates, find food, avoid predators, or navigate. The limited amount of noise from the proposed project would have negligible effect on ESA-listed whales.

Entanglement risks to marine mammals at any aquaculture operation are minimized by using rigid and durable cage materials and by keeping all lines taut. As described in Section 3.0, the cage material for the proposed project is constructed with rigid and durable materials that will significantly decrease the likelihood that ESA-listed species will become entangled. The limited number of vertical mooring lines (3) and the duration of cage deployment (approximately 18 months) will reduce the risk of potential entanglement by marine mammals. When the currents change, the lines would likely remain taut even as the currents shift because the weight of chain and rope create a negative buoyancy on the facility anchorage lines. While it is highly unlikely that ESA-listed whales would become entangled in the mooring lines; if incidental line contact occurs, serious harm to the listed whales or sea turtles is not likely due to the tension in the mooring lines. The cage will be constructed of semi-rigid copper alloy mesh with small openings that will further prevent entanglements.

Additionally, there have been no recorded incidents of entanglement from ESA-listed marine mammal species interacting with a permitted commercial-scale marine aquaculture facility in Hawaii (BOM, 2014). The depth of water and line length used at the proposed project would provide adequate spaces for most marine mammals to pass through. The proposed action would not likely entangle marine mammals as they are likely to detect the presence of the facility and would be able to avoid the gear; however, should entanglement occur, on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement. Furthermore, because of the location of the proposed project relative to marine mammal habitat, the action agencies anticipate the effects of entanglement are highly unlikely..

Regarding vessel strikes, facility staff will be stationed on one vessel for the duration of the project except during unsafe weather conditions. The probability that collisions with the vessel associated with the proposed project would kill or injure marine mammals is discountable, as the vessel will not be operated at speeds known to injure or kill marine mammals. Given the limited trips to the facility with only one vessel, and the high visibility of whales to small vessels, opportunities for strikes from the vessel participating in the proposed project are expected to be insignificant. Strikes from other vessels not operated by the facility are anticipated to be improbable due to the proximity to shore (~45 miles). Additionally, all vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS. Moreover, should there be any vessel strike that results in an injury to an ESA-protected marine mammal, the on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement.

Regarding potential impacts from water quality, each ESA-listed whale species considered in this BE is not expected to be affected given their unique habitat preferences and known proximity to the proposed action area. The discharge from the proposed facility will be covered by a NPDES permit with project-specific conditions that includes water quality monitoring and implementation of practices to protect the environment near the proposed action area. The discharge of wastewater from the proposed project are expected to have a minor impact on water quality due to factors concerning the low fish biomass produced; the relatively small amounts of pollutants discharged; depth of the sea floor; and current velocities at the proposed action area. It is anticipated that the proposed activity would add relatively small amounts of nutrient wastes (nitrogen, phosphorus, particulate organic carbon, and solids) to the ocean in the immediate vicinity of the proposed action area. The facility's effluent is expected to undergo rapid dilution from the prevailing current; constituents will be difficult to detect within short distances from the cage. The impacts from water quality are expected to be insignificant, and the likelihood of water quality impacts contributing to any adverse effects to ESA-listed marine mammals is extremely unlikely (see Section 6.4 for more information).

The action agencies believe that any adverse effects from the potential threats considered to ESA-listed marine mammals are extremely unlikely to occur and are discountable. The action agencies have determined that the activities authorized under the proposed permits will NLAA any marine mammals considered in this BE.

7.1.5 Reptiles

The action agencies considered disturbance, entanglement, vessel strike, and water quality as the only potential threats to reptiles within the proposed action area.

Sea turtles may experience disturbance by stress due to a startled reaction should they encounter vessels in transit to the proposed project site. Given the limited trips to the site, opportunities for disturbance from vessels participating in the proposed project are minimal. ESA-listed sea turtles may be attracted to aquaculture facilities as potential sources of food, shelter, and rest, but behavioral effects from disturbance are expected to be insignificant. Additionally, all vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS.[7] Furthermore, there has been a lack of documented observations and records of ESA-listed sea turtles interacting with a permitted commercial-scale marine aquaculture facility in Hawaii (BOM, 2014); we anticipate that such interactions would be unlikely. As a result, disturbance effects from human activities and equipment operation associated with the proposed action are expected to be insignificant on ESA-listed species.

The risk of sea turtles being entangled in an offshore aquaculture operation is greatly reduced by using rigid cage materials and by keeping all lines taut. Section 3 describes how the cage and mooring material for the proposed project is constructed with rigid and durable materials, and how the mooring lines will be constructed of steel chain and thick rope that will be maintained under tension by the ocean currents during most times of operation. Additionally, the bridle line that connects from the swivel to the cage will be encased in a rigid pipe. Moreover, the limited number of vertical mooring lines (three) and the duration of cage deployment (less than 18 months) will reduce the risk of potential entanglement by sea turtles. Because of the proposed project operations and duration, the action agencies expect that the effects of this entanglement interaction would be discountable; however, should entanglement occur, on-site staff would follow the steps outlined in the PSMP and alert the appropriate experts for an active entanglement.

In regard to vessel strikes, facility staff will use only one vessel for the duration of the project. The vessel will be operated at low speeds that are not known to injure or kill sea turtles; therefore, the probability that collisions with the vessel associated with the proposed project would kill or injure sea turtles is discountable. Opportunities for strikes to reptiles from the vessel participating in the proposed project are expected to be insignificant given the limited number of trips to the facility with one vessel. Strikes from other vessels not operated by the facility are anticipated to be improbable due to the proximity to shore. Additionally, all vessels are expected to follow the vessel strike and avoidance measures that have been developed by the NMFS.

The proposed activity would not add significantly to the volume of maritime traffic in the proposed action area. The number of trips associated with deploying and retrieving the facility components, routine maintenance, stocking, and harvest operations would minimally increase vessel traffic in the proposed action area. The project activities are not expected to result in collisions between protected species and any vessels. Collisions with ESA-listed species during the proposed activity would be extremely unlikely to occur.

Commercial and recreational fishermen are expected to visit the proposed project because it could act as a fish attraction device. While fishermen would be attracted to the project area from other locations, overall fishing efforts by these fishermen in federal fisheries would not increase as these fishermen would have fished elsewhere if the project was not in place. The action agencies do not expect increased fishing activity in the project area since there were no reports or observations of interactions between fishermen and ESA-listed species in previous Velella trials (Velella Beta and Velella Gamma) in Hawaii (NMFS, 2016).

The impacts from water quality are expected to be insignificant, and the likelihood of water quality impacts contributing to any adverse effects to ESA-listed reptiles in or near the proposed action area is extremely unlikely (see Section 6.4 for more information related to water quality impacts). The discharge from the proposed facility will be covered by a NPDES permit with project-specific conditions that includes water quality monitoring and implementation of practices to protect the environment. Water quality effects are not expected to occur outside of 5-10 m due to the low fish production levels and fast ocean currents.

Any adverse effects from the proposed project on ESA-listed reptiles are extremely unlikely to occur and are discountable. The action agencies have determined that the activities under the proposed permit will NLAA the sea turtles considered in this BE.

7.2 Federally Listed Critical Habitat

7.2.1 Reptiles

The action agencies identified vessel strike and water quality as the only potential routes of impacts to the loggerhead turtle DPS critical habitat of the Northwest Atlantic. In the Gulf, designated critical habitat consists of either nearshore reproductive habitat or Sargassum habitat. The proposed project is roughly 45 miles from shore and will not affect nearshore reproductive habitat. Therefore, the essential features of loggerhead turtle critical habitat that the proposed action may affect are foraging habitat for hatchlings and association of hatchlings around Sargassum mats.

Sargassum mats may be impacted by vessel traffic; however, the PSMP that was developed for the proposed project area includes a provision that trained observers will look for Sargassum mats and will inform vessel operators as to their location to avoid the mats to the maximum extent practicable. The proposed project will be sited in the open ocean environment, and Sargassum mats may infrequently drift into the project area; however, it is highly unlikely the proposed facility would impact Sargassum habitat further offshore where the facility will be located. Additionally, the facility will only bring the submerged aquaculture cage to the surface for brief periods to conduct maintenance, feeding, or harvest activities due to the high energy open-ocean environment where the proposed facility will be located.

Sargassum mats are not anticipated to be negatively impacted by water quality due to the conditions in the NPDES permit. Potential impacts on loggerhead critical habitat is expected to be discountable because of active monitoring for Sargassum mats and the extremely low likelihood of impacts from water quality.

The action agencies believe that the adverse effects from the proposed action on the Northwest Atlantic loggerhead DPS critical habitat will be insignificant due to location of the facility and operational methods used while the cage is deployed. The action agencies have determined that the activities under the proposed permit will NLAA the listed sea turtle critical habitat.

7.2.2 Birds

Critical habitat has been designated for the piping plover for coastal wintering habitat areas in Florida; however, the proposed action does not interfere with any nearshore areas. Therefore, critical habitat for the piping plover will not be exposed to any potentially harmful elements of the proposed action. The action agencies have determined that the activities under the proposed project will have no effect to the piping plover’s critical habitat.

7.3 Federal Proposed Species and Proposed Critical Habitat

The action agencies did not perform an analysis of impacts because no federally-listed proposed species or proposed critical habitat in or near the proposed action area were identified.

Table 4: Summary of potential impacts considered and ESA determination

Group and Species	Potential Impacts Considered	Potential Effect	Determination
Birds			
1 Piping Plover 2 Red Knot	None	None	No effect
Fish			
1 Giant Manta Ray 2 Nassau Grouper 3 Oceanic Whitetip Shark 4 Smalltooth Sawfish	Disturbance, entanglement, and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
Invertebrates			
1 Boulder Star Coral 2 Elkhorn Coral 3 Mountainous Star Coral 4 Pillar Coral 5 Staghorn Coral 6 Rough Cactus Coral 7 Lobed Star Coral	Disturbance and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
Marine Mammals			
1 Blue Whale 2 Fin Whale 3 Humpback Whale 4 Sei Whale 5 Sperm Whale 6 Bryde's Whale	Disturbance, entanglement, vessel strike, and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
Reptiles			
1 Green Sea Turtle 2 Hawksbill Sea Turtle 3 Kemp's Ridley Sea Turtle 4 Leatherback Sea Turtle 5 Loggerhead Sea Turtle	Disturbance, entanglement, vessel strike, and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
Critical Habitat			
1 Hawksbill Sea Turtle 2 Leatherback Sea Turtle 3 Loggerhead Sea Turtle	Vessel strike and water quality	Discountable and insignificant	May affect, but not likely to adversely affect
4 Piping Plover	None	None	No effect

8.0 Conclusion

The EPA and USACE conclude that the proposed project's potential threats (disturbance, entanglement, vessel strike, water quality) to ESA-listed species and critical habitat are highly unlikely to occur or extremely minor in severity; therefore, the potential effects to ESA protected species and critical habitats are discountable or insignificant.

8.1 Consultation with USFWS

The EPA and USACE have determined that the proposed project will have "no effect" on the listed species and critical habitat under the jurisdiction of the USFWS that may occur in the proposed action area and that may be affected. This determination includes the piping plover and the red knot and critical habitat for the piping plover. No other listed species, proposed species, critical habitats, or proposed critical habitats were considered under the authority of the USFWS because there is no evidence to support that a potential effect from the proposed project may occur. The EPA and USACE request concurrence from the USFWS for this determination under ESA § 7.

On August 13, 2019, EPA and USACE provided the jointly developed BE to USFWS and initiated consultation with USFWS. EPA and USACE determined that the discharges and structures authorized by the NPDES or RHA Section 10 permit will have "no effect" on any federally listed species, proposed species, or critical habitat for sea birds that are under the jurisdiction of the USFWS and within the proposed action area. On August 27, 2019, a USFWS provided notification that the USFWS does not object to the permit issuance for the proposed project and had no additional comments. Completion of the informal consultation with the USFWS satisfies EPA's obligations under ESA § 7(a)(2).

8.2 Consultation with NMFS

The EPA and USACE have determined that the proposed project "may affect, but is not likely to adversely affect" the listed species and critical habitat or designated critical habitat under the jurisdiction of the NMFS. This determination includes: four species of fish, seven species of invertebrates, six species of whales, reptiles from five species, and critical habitat for reptiles. No other listed species, proposed species, critical habitats, or proposed critical habitats were considered under the authority of the NMFS because there is no evidence to support that a potential effect from the proposed project may occur. The EPA and USACE request concurrence from the NMFS for this determination under ESA § 7.

On August 13, 2019, EPA and USACE provided the jointly developed BE to NMFS and initiated consultation with the NMFS. Regarding federally listed species, proposed species, or critical habitat under the jurisdiction of the NMFS, EPA and USACE determined that the proposed project "may affect, but not likely to adversely affect" certain fish, invertebrates, marine mammals, and reptiles within the proposed action area. On September 30, 2019, NMFS concluded "that the proposed action is not likely to adversely affect listed species under NMFS's purview." Completion of the informal consultation with the NMFS satisfies EPA's obligations under ESA § 7(a)(2).

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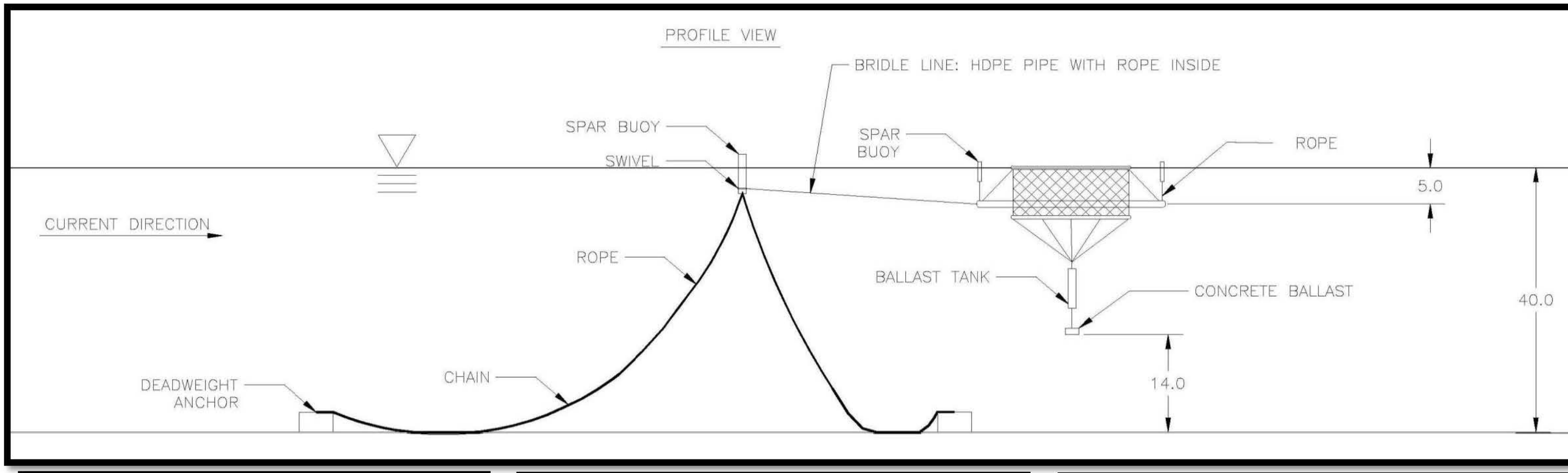
Appendix A – Cage and Mooring Detail



1) Deadweight Anchors (concrete):
- Three (3) anchors equally spaced @:
  - 120m from mooring centerline
  - 120 degrees from each other
- Each @ 3 ton Stevpris Mk-5 drag embedment anchor

2) Mooring Chain (Grade 2 steel):
- 80m length on each anchor
- 50mm (2") thick links
- No load = 70m length of each on seafloor
- Design load = some entirely off seafloor/ others completely on seafloor

3) Mooring Lines (rope):
- 40m length on each chain
- AMSTEEL®-BLUE
- 36mm (1 1/2") thick lines

4) Spar Buoy w/ Swivel (steel):

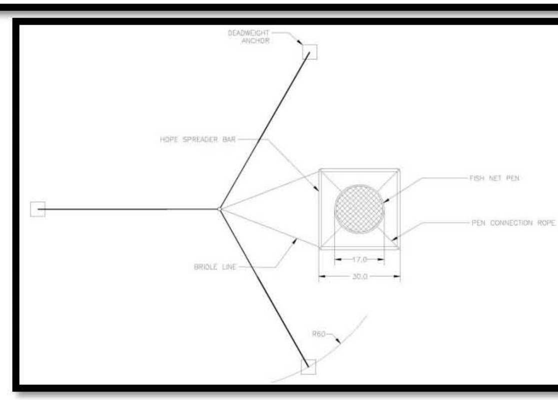
5) Bridle Lines (rope inside HDPE pipe):
- Three (3) ~30m bridle lines (rope) from swivel to spreader bar
- AMSTEEL®-BLUE
- 33.3mm (1 5/16") lines inside HDPE pipe

6) Spreader Bar (HDPE):
- Header Bar (load bearing) connected to Bridle Lines
  - 30m in length
  - 0.36m OD DR 11 HDPE pipe
- Side and Rear Bars (smaller load bearing)
  - 30m in length
  - 0.36m OD DR 17 HDPE pipe
- Four (4) corner spar buoys

7) Net Pen Connection Lines (rope):
- Four (4) ~13m connection lines (rope)
- Connected from Spreader Bar to Net Pen Float Rings
- AMSTEEL®-BLUE
- 33.3mm (1 5/16") lines

8) Net Pen Frame Structure (HDPE):
- Top Frame Structure
  - 18m in diameter
  - One (1) HDPE side-by-side Float Rings
    - On the sea surface
    - ~ 0.36m OD DR 11 HDPE pipe
  - One (1) HDPE net ring (railing)
    - Connected ~ 1.0m above Float Rings
    - Connected to Net Pen Mesh
    - ~ 0.15m OD DR 17 HDPE pipe
- Bottom Frame Structure
  - 18m in diameter
  - One (1) HDPE sinker ring
    - 7.0m below Float Rings
    - Connected to Net Ring
    - ~ 0.36m OD DR 11 HDPE pipe
  - One (1) HDPE net ring
    - 7.0m below float rings
    - Connected to copper alloy mesh
    - ~ 0.15m OD DR 17 HDPE pipe

9) Net Pen Mesh (copper alloy):
- 17m diameter x 7m depth
- Top connected to top net ring (railing)
- Bottom connected to bottom net ring
  - 4mm wire diameter
  - 40mm x 40mm mesh square
- Effective volume of 1,600m^3

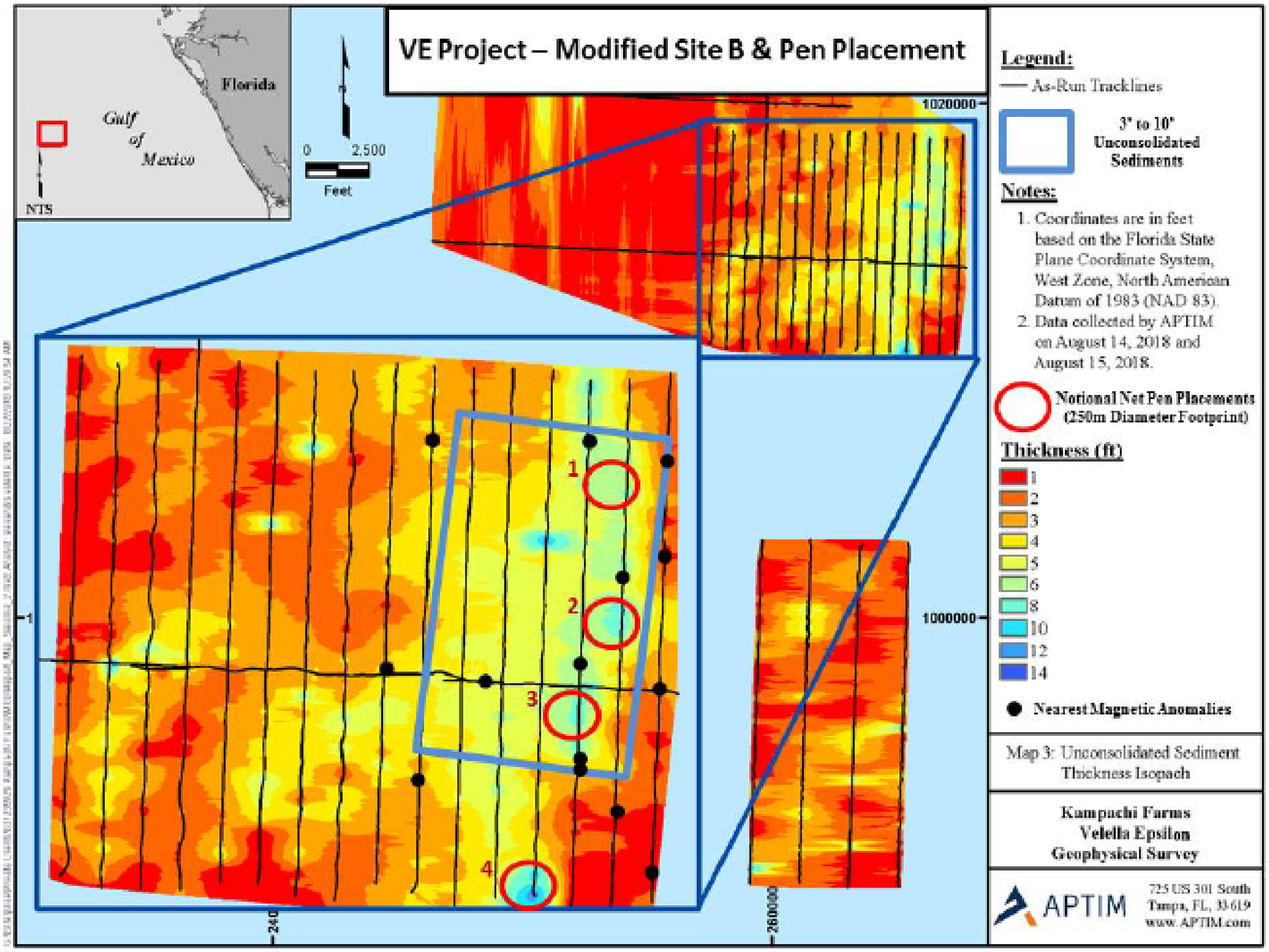


10) Shackle Point Connection (steel):
- One (1) ~0.13m^2 shackle plate
- Four (4) connection lines
  - 12 mm in diameter x 10m in length
  - Connected from shackle plate to HDPE sinker ring
- ~1m Grade 2 steel chain (32mm) connected to Floatation Capsule

11) Floatation Capsule (steel):
- ~ 1.5m in diameter x ~3.45m in length
- Effective floatation volume = 6m^3
- ~3m Grade 2 steel chain (32mm) connected to Counter Weight

12) Counter Weight (concrete):
- ~ 1.1m in diameter x ~2.2m in length
- Effective weight of 5 MT

Appendix B – Location Area



Position	° Decimal ' Latitude	° Decimal ' Longitude	Decimal ° Latitude	Decimal ° Longitude	Perimeter (km)	Area (km^2)
Modified Site B from BES Report						
Upper Left	27° 7.86863' N	83° 13.45827' W	27.131143° N	83.224303° W		
Upper Right	27° 7.83079' N	83° 11.63237' W	27.130512° N	83.193872° W		
Lower Right	27° 6.43381' N	83° 11.69349' W	27.107230° N	83.194890° W		
Lower Left	27° 6.50261' N	83° 13.52658' W	27.108377° N	83.225442° W		
Center	27° 7.11266' N	83° 12.58604' W	27.118543° N	83.209767° W	11.1571	7.7237
Targeted Subset Area of Modified Site B from BES Report (3' to 10' Unconsolidated Sediments)						
Upper Left	27° 7.70607' N	83° 12.27012' W	27.128445° N	83.204502° W		
Upper Right	27° 7.61022' N	83° 11.65678' W	27.126837° N	83.194278° W		
Lower Right	27° 6.77773' N	83° 11.75379' W	27.112962° N	83.195897° W		
Lower Left	27° 6.87631' N	83° 12.42032' W	27.114605° N	83.207005° W		
Center	27° 7.34185' N	83° 12.02291' W	27.122365° N	83.200382° W	5.2273	1.6435
Notional Net Pen Placements within Modified Site B from BES Report						
1	27° 7.54724' N	83° 11.85393' W	27.125787° N	83.197565° W		
2	27° 7.17481' N	83° 11.82576' W	27.119580° N	83.197095° W		
3	27° 6.93930' N	83° 11.94780' W	27.115655° N	83.199130° W		
4	27° 6.52579' N	83° 12.09175' W	27.108763° N	83.201530° W	0.7854	0.0491

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
https://www.fisheries.noaa.gov/region/southeast

09/30/2019

F/SER31:JLL
SER-2019-02205

Christopher B. Thomas
Chief, Permitting and Grants Branch
U.S. Environmental Protection Agency
Region 4
Atlanta Federal Center
61 Forsyth Street
Atlanta, Georgia, 30303-8960

Dear Mr. Thomas:

This letter responds to your request for consultation with us, the National Marine Fisheries Service (NMFS), pursuant to Section 7 of the Endangered Species Act (ESA) and the Fish and Wildlife Coordination Act (FWCA) for the following action.

Project Name	Applicant(s)	SER Number	Project Type
Velella Epsilon Marine Aquaculture Facility	Kampachi Farms, LLC	SER0-2019-02205	Offshore Cage Aquaculture, NPDES permit, Section 10 permits

Your request is on behalf of the U.S. Environmental Protection Agency (EPA) and U.S. Army Corps of Engineers Jacksonville District (USACE), the two federal agencies responsible for permitting aquaculture operations in federal waters of the Gulf of Mexico. The EPA is proposing to issue a National Pollutant Discharge Elimination System (NPDES) permit to Kampachi Farms, LLC for the point-source discharge of pollutants from their proposed Velella Epsilon marine aquaculture facility. The USACE is proposing to issue a Department of Army permit pursuant to Section 10 of the Rivers and Harbors Act for structures and work affecting navigable federal waters from the same aquaculture facility. The EPA has elected to act as the lead action agency and the USACE is a cooperating and co-federal agency. The EPA and USACE have determined that their proposed actions are not likely to adversely affect any listed or proposed species or designated or proposed critical habitat.

Consultation History

We received your letter requesting consultation and Biological Evaluation on August 13, 2019 and initiated consultation that day.

Project Location

The proposed aquaculture facility will be located in the Gulf of Mexico in an approximate water depth of 130 feet (ft) (40 meters [m]), 45 miles (mi) southwest of Sarasota, Florida. The applicant has submitted four potential locations to place the cage and multi-anchor swivel

(MAS) mooring system. The applicant will select one of these four potential locations based on diver-assisted assessments of the sea floor when the cage and the MAS are deployed.

Proposed Potential Project Locations

Address	**Location Option**	**Latitude/Longitude** (North American Datum 1983)	**Water body**
Approximately 45 mi off Sarasota, Florida	1	27.125787ºN, 83.197565ºW	Gulf of Mexico
	2	27.119580ºN, 83.197096ºW	
	3	27.115655ºN, 83.19913ºW	
	4	27.108763ºN, 83.201529ºW	

Pursuant to 50 C.F.R. § 402.02, the term action area is defined as “all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. The EPA defined the proposed action area as a 1,000 m radius measured from the center of the MAS, based on the result of their water quality analysis.

Existing Site Conditions

The proposed facility will be placed within an area that contains unconsolidated sediments that are 3-10 ft deep. The facility’s potential locations were selected with assistance from NOAA’s National Ocean Service National Centers for Coastal Ocean Science (NCCOS). The applicant and the NCCOS conducted a site screening process over several months to identify an appropriate project site. Some of the criteria considered during the site screening process included avoidance of corals, coral reefs, submerged aquatic vegetation, hard bottom habitats, marine protected areas, marine reserves, and habitats of particular concern. This siting assessment was conducted using the Gulf AquaMapper tool developed by NCCOS.[1]

Upon completion of the site screening process with the NCCOS, the applicant conducted a Baseline Environmental Survey (BES) in August 2018 based on guidance developed by the NMFS and EPA.[2] The BES report noted that were no physical, biological, or archaeological features that would preclude the siting of the proposed aquaculture facility at one of the four potential locations

Project Description

The project applicant, Kampachi Farms, LLC, is proposing to operate a pilot-scale marine aquaculture facility, rearing up to 20,000 almaco jack (*Seriola rivoliana*) for approximately 12 months (with total deployment of the cage system 18 months) in federal waters of the Gulf of Mexico in 130 ft of water.

A single CopperNet offshore strength (PolarCirkel-style) fully-closed submersible fish pen will be deployed on an MAS mooring system. The engineered MAS will have up to three anchors (concrete deadweight or embedment anchors) for the mooring, with a swivel and bridle system. The cage material for the proposed project is constructed with rigid and durable materials

[1] The Gulf AquaMapper tool is available at: https://coastalscience.noaa.gov/products-explorer/

[2] The BES guidance document is available at: https://www.fisheries.noaa.gov/content/fishery-management-plan-regulating-offshore-marine-aquaculture-gulf-mexico

(copper mesh net with a diameter of 4 millimeter [mm] wire and 40mm x 40 mm mesh square). The mooring lines for the proposed project will be constructed of steel chain (50 mm thick) and thick rope (36 mm) that are attached to a floating cage that will rotate in the prevailing current direction; this will maintain the mooring rope and chain under tension during most times of operation. The bridle line that connects from the swivel to the cage will be encased in a rigid pipe.

The CopperNet cage design is flexible and self-adjusts to suit the constantly changing wave and current conditions. Consequently, the system can operate floating on the ocean surface or submerged within the water column of the ocean. Normal operating condition of the cage is below the water surface. The cage will be submerged and only brought to the surface for brief periods to conduct maintenance, feeding, or harvest activities due to the high-energy open ocean environment.

When a storm approaches the area, the operating team uses a valve to flood the floatation system with water, causing the entire cage array to submerge. A buoy remains on the surface, marking the net pen's position and supporting the air hose. When the pen approaches the bottom, the system will maintain the cage several meters above the sea floor. Submerged and protected from the storm above, the system is still able to rotate around the MAS and adjust to the currents. After storm events, facility staff makes the cage system buoyant, causing the system to rise back to the surface or near surface position to resume normal operational conditions. The proposed project cage will have at least one properly functioning global positioning system device to assist in locating the system in the event it is damaged or disconnected from the mooring system.

One support vessel, expected to be a 70-ft-long Pilothouse Trawler (20 ft beam and 5 ft draft) with a single 715 horsepower engine, will be tethered to the facility. Another vessel would be used for harvest and transport of the fish. The exact harvest vessel is not known; however, it is expected to be a vessel already engaged in offshore fishing activities in the Gulf.

Construction Conditions

The applicant has agreed to follow a protected species monitoring plan (PSMP), which they developed with assistance from the NMFS Protected Resources Division. The purpose of the PSMP is to provide monitoring procedures and data collection efforts for species protected under the MMPA or ESA that may be encountered at the proposed project. The PSMP also contains precautionary measures including suspending vessel transit and all surface activities (including stocking fish, harvesting operations, and routine maintenance operations) when a protected species comes within 100 m of the activity until the animal(s) leave the area. The applicant also commits to following vessel strike avoidance guidelines developed by the NMFS. (i.e., NMFS Southeast Region Vessel Strike Avoidance Measures and Reporting for Mariners; revised February 2008).

Effects Determination(s) for Species the Action Agency or NMFS Believes May Be Affected by the Proposed Action

Species	ESA Listing Status[3]	Action Agency Effect Determination	NMFS Effect Determination
Sea Turtles			
Green (North Atlantic [NA] distinct population segment [DPS])	T	NLAA	NLAA
Green (South Atlantic [SA] DPS)	T	NLAA	NLAA
Kemp's ridley	E	NLAA	NLAA
Leatherback	E	NLAA	NLAA
Loggerhead (Northwest Atlantic [NWA] DPS)	T	NLAA	NLAA
Hawksbill	E	NLAA	NE
Fish			
Smalltooth sawfish (U.S. DPS)	E	NLAA	NLAA
Nassau grouper	T	NLAA	NE
Giant manta ray	T	NLAA	NLAA
Oceanic whitetip shark	T	NLAA	NLAA
Invertebrates and Marine Plants			
Elkhorn coral (*Acropora palmata*)	T	NLAA	NE
Staghorn coral (*Acropora cervicornis*)	T	NLAA	NE
Boulder star coral (*Orbicella franksi*)	T	NLAA	NE
Mountainous star coral (*Orbicella faveolata*)	T	NLAA	NE
Lobed star coral (*Orbicella annularis*)	T	NLAA	NE
Rough cactus coral (*Mycetophyllia ferox*)	T	NLAA	NE
Pillar coral (*Dendrogyra cylindrus*)	T	NLAA	NE
Marine Mammals			
Bryde's whales	E	NLAA	NE
Blue whale	E	NLAA	NE
Fin whale	E	NLAA	NE
Sei whale	E	NLAA	NE
Sperm whale	E	NLAA	NE

There are listed species for which you made NLAA determinations for the proposed project but for which we believe there are no effects. Our rationale for that determination for each of these species is as follows:

1. Hawksbill sea turtles have very specific life history strategies, which are not supported at the project site. Hawksbill sea turtles typically inhabit inshore reef and hard bottom areas where they forage primarily on encrusting sponges. The proposed facility is located in an offshore area that contains 3 to 10-ft deep unconsolidated sediments and not near any

[3] E = endangered; T = threatened; NLAA = may affect, not likely to adversely affect; NE = no effect; NP = not present

hardbottom habitat. Consequently, we believe that Hawksbill sea turtles will not be present, and that there are no potential rotes of effects on this this species.

2. The absence of Nassau grouper in the Gulf of Mexico (excluding around the Florida Keys and Dry Tortugas) is well-documented by the lack of records in Florida Fish and Wildlife Conservation Commission, Fisheries Independent Monitoring data as well as in various surveys conducted by NMFS, Southeast Fisheries Science Center. Nassau grouper are not found in or close enough to the action area for there to be any potential routes of effects to this species.
3. The proposed project will be placed in an area consisting of unconsolidated sediments and not near any hardbottom. In your analysis, you concluded that water quality effects are not expected to occur outside of 30 m (0.02 mi) due to the small size of the facility. You also concluded that sedimentation from the Velella Epsilon facility is not expected outside of 1,000 m (0.62 mi), and impacts resulting from the proposed facility are likely limited to within 300 to 500 m (0.12 to 0.31 mi) from the cage. Listed corals generally occur in the Gulf only near the Florida Keys and Dry Tortugas and in the Flower Banks National Marine Sanctuary, located off the coast of Texas and Louisiana. Listed corals do not occur in or close enough to the action area for there to be any potential routes of effects on these species.
4. Two strandings on the Louisiana and Texas coast comprise the only possible record of blue whales in the Gulf of Mexico and identifications for both strandings are questionable, thus we do not believe blue whales live in the Gulf of Mexico.
5. Water depth at the project site is only 40 m deep, and the site is approximately 80+ mi from Bryde's whale biological important areas, the 100-m depth contour, and the shelf break. Sperm whales are the most abundant large cetacean in the Gulf of Mexico, found year-round in waters greater than 200 m. Sei whales also typically occur in these deeper waters. Sei whales are generally found in oceans along the 100-meter depth contour with with sightings also spread over deeper water including canyons along the shelf break. Fin and sei whale do occasionally strand in the Gulf indicating they may occur, but neither is commonly observed in the waters of the Gulf of Mexico. We do not believe any of these species will occur in the action area for this project or close enough for there to be any potential routes of effects to these species.

Critical Habitat

We do not concur with your determination that the proposed action may affect hawksbill, leatherback, and loggerhead sea turtle critical habitat. The project is not located in or near designated critical habitat of these or any other species. The nearest critical habitat to the project is loggerhead nearshore nesting habitat (Units 29 and 30), more than 40 mi away from the action area.

Analysis of Potential Routes of Effects to Species

Potential routes of effects to the listed species that may occur in the action area (i.e., sea turtles [green NA and SA DPSs, loggerhead, leatherbacks, and Kemp's ridleys] and ESA-listed fish [i.e., smalltooth sawfish, giant manta rays, and oceanic whitetip sharks][4]) include disturbance, vessel strike, entanglement, and water quality changes.

[4] Hereafter, sea turtles and ESA-listed fish refer to these specific species.

Vessel strike
A vessel strike is a collision between any type of boat and a marine animal in the ocean. Collision with the hull, outboard motor, or propeller of a vessel can kill or injure marine animals including air-breathing whales and sea turtles as well as any other marine species when feeding, basking or even just swimming close to the surface (e.g., giant manta rays and oceanic whitetip sharks). Collisions may occur anywhere a vessel cross paths of a species. However, we have determined that the potential for a vessel strike on any listed species to result from this proposed action is discountable. The proposed project involves only two vessels. A support vessel will be present at the facility throughout the life of the project except during certain storm events or times when resupplying is necessary; a harvest vessel (expected to be a vessel already engaged in offshore fishing in the Gulf) will be used to transport the fish, once grown, to land. Vessels are expected to follow the vessel strike and avoidance measures that have been developed by NMFS[5]. A collision between any specific vessel and marine animal is extremely unlikely to occur. For example, when using the conservative mean estimate of a sea turtle strike every 193 years (range of 135-250 years) per vessel, it would require a moderately-sized marina project (*e.g.*, ~200 new vessels introduced to an area) to potentially result in a sea turtle take in any single year (Barnette 2018[6]). Given the limited vessel activity and duration of the project, a vessel strike is extremely unlikely.

Disturbance
ESA-listed fish and sea turtles may experience disturbance by stress via a startled reaction should they encounter the proposed facility, including the cage associated and the support vessel and/or harvest vessel or associated noise (e.g., vessel engine or barge generator), when moving through the area. A behavioral reaction could range from the animal approaching and investigating the facility to avoidance and moving away from the area. A potential source of disturbance from the proposed aquaculture facility would be vessel engine and barge generator noise. ESA-listed fish and sea turtles may also be attracted to aquaculture facilities as potential sources of food, shelter, and/or rest. However, any stress and behavioral effects on ESA-listed fish and sea turtles from disturbance are expected to be insignificant. The facility is not in an area known to be a hot spot or high-use area for any important activities (e.g., feeding, reproducing) of the sea turtle or ESA-listed fish species. Also, because this is a pilot study with only one cage in the open ocean, the proposed project site is small (each potential site <8 square kilometers) and will in no way limit movement or ability of a species to avoid the area or navigate through the area. As a result, disturbance from human activities and equipment and vessel operation resulting from the proposed action is expected to have only insignificant effects on ESA-listed fish and sea turtles.

Entanglement/Entrapment
The cage, mooring lines, and bridle line from the proposed project may pose an entanglement and an entrapment risk to ESA listed fish and sea turtles. Entanglements occur when lines, netting, or other man-made materials become wrapped around the body (e.g., flipper, fin) of the

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[5] NMFS. Vessel Strike Avoidance Measures and Reporting for Mariners NOAA Fisheries Service, Southeast Region, February 2008. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, Saint Petersburg, Florida. https://www.fisheries.noaa.gov/southeast/consultations/regulations-policies-and-guidance
[6] Barnette, M. C. 2018. Threats and Effects Analysis for Protected Resources on Vessel Traffic Associated with Dock and Marina Construction. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Saint Petersburg, Florida.

animal. Entrapment can occur when an animal becomes restrained or stuck in man-made structure and cannot escape. However, we believe the effects to sea turtles or ESA listed fish from entanglement will be discountable because of how the cage will be constructed and deployed. The risk of sea turtles and ESA listed fish being entangled or entrapped is greatly reduced by using rigid cage materials and by keeping all lines taut. The cage and moorings for the proposed project are constructed with rigid and durable materials, and the mooring lines will be constructed of steel chain and thick rope that will be maintained under tension by the ocean currents during most times of operation. For example, the lines would likely remain taut even as the currents shift because of the weight of the chain and rope creating a negative buoyancy on the facility anchorage lines. The cage, even in storm conditions, will be at least several meters from the sea floor, allowing safe passage under the cage. Additionally, the bridle line that connects from the swivel to the cage will be encased in a rigid pipe. The limited number of vertical mooring lines (3) and the duration of cage deployment (less than 18 months) will also reduce the risk of potential entanglement. Because of the proposed project operations and duration, we expect that the effects of possible entanglement to be discountable.

Water quality

Sea turtles and ESA-listed fish species may be affected by water quality/habitat degradation if it leads to reduced habitat quality. However, we believe any potential water quality effects on ESA-listed fish and sea turtles from the proposed action will be insignificant. Effluent from the proposed action can adversely affect water quality, sea floor sediment composition, and benthic fauna through the additions of uneaten feed, ammonia excretions, and fish feces from the increased fish biomass. The release of nutrients, reductions of dissolved oxygen, and the accumulation of sediments under certain aquaculture operations lead to eutrophication and degradation of benthic communities. The EPA evaluated the proposed action's potential impacts to water quality and impacts of organic enrichment to the seafloor and benthic communities. The EPA also considered the potential water quality impacts from chemical spills, drugs, cleaning, and solid wastes. The discharge of wastewater from the proposed project are expected to have a minor impact on water quality due to factors concerning the low fish biomass produced; the relatively small amounts of pollutants discharged; depth of the sea floor; and current velocities at the proposed action area. The EPA anticipates that the proposed activity would add relatively small amounts of nutrient wastes (nitrogen, phosphorus, particulate organic carbon, and solids) to the ocean in the immediate vicinity of the proposed action area. The facility's effluent is expected to undergo rapid dilution from the prevailing current; constituents will be difficult to detect within short distances from the cage. Per EPA's analysis, (1) water quality effects are not expected to occur more than 30 m (0.02 mi) away from the cage site due to the small size of the facility, and (2) sedimentation from the Velella Epsilon facility is not expected to go more than 1,000 m (0.62 mi) from the cage, and impacts resulting from the proposed facility are likely limited to within 300 to 500 m (0.12 to 0.31 mi) from the cage. The discharges authorized by the proposed NPDES permit represent a small incremental contribution of pollutants and will have an insignificant affect any on the ESA-listed fish or sea turtles in the action area.

Conclusion

Because all potential project effects to listed species were found to be discountable, insignificant, or beneficial, we conclude that the proposed action is not likely to adversely affect listed species under NMFS's purview. This concludes your consultation responsibilities under the ESA for species under NMFS's purview. Consultation must be reinitiated if a take occurs or new information reveals effects of the action not previously considered, or if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action. NMFS's findings on the project's potential effects are based on the project description in this response. Any changes to the proposed action may negate the findings of this consultation and may require reinitiation of consultation with NMFS.

In your letter to us, you also initiated consultation pursuant to the Fish and Wildlife Coordination Act (FWCA). NMFS's Southeast Regional Office, Habitat Conservation Division reviewed the information in the Draft Biological Evaluation pursuant to the FWCA, and based on that review, we anticipate any adverse effects that might occur on marine and anadromous fishery resources would be minimal. Therefore, we do not object to issuance of the permit per the FWCA.

We look forward to further cooperation with you on other projects to ensure the conservation of our threatened and endangered marine species and designated critical habitat. If you have any questions on this consultation, please contact Jennifer Lee, Fishery Biologist, at (727) 551-5778 or by email at Jennifer.lee@noaa.gov.

Sincerely,

David Bernhart
Assistant Regional Administrator
for Protected Resources

cc: F/SER – J. Beck
F/SER31 – J. Lee

File: 1514-22.k

Appendix E

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

MAR 8 2019

Ms. Virginia Fay
Assistant Regional Administrator
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Regional Office
Habitat Conservation Division
263 13th Avenue South
St. Petersburg, Florida 33701-5505

SUBJECT: Essential Fish Habitat Consultation Request
Kampachi Farms, LLC – Velella Epsilon Marine Aquaculture Facility

Dear Ms. Fay:

The U.S. Environmental Protection Agency Region 4 (EPA) and the U.S. Army Corps of Engineers Jacksonville District (USACE) are obligated under Section 305(b)(2) of the Magnuson-Stevens Act (MSA) to consult with the National Marine Fisheries Service (NMFS) to ensure that any action it authorizes will not adversely affect essential fish habitat (EFH). The purpose of this letter is to request the initiation of an abbreviated consultation with the NMFS under MSA Section 305(b)(2).

On November 9, 2018, the EPA received a complete application for a National Pollutant Discharge Elimination System (NPDES) permit from Kampachi Farms for the discharge of pollutants from a marine aquaculture facility in federal waters of the Gulf of Mexico (Gulf). On November 10, 2018, the USACE received a Department of Army (DA) application pursuant to the Rivers and Harbors Act, 1899 (Section 10) for structures and work affecting navigable federal waters from the same marine aquaculture facility. On behalf of the two federal agencies responsible for permitting aquaculture operations in federal waters of the Gulf, the EPA is requesting initiation of the abbreviated EFH consultation process for the two federal permits needed to operate the proposed marine aquaculture facility pursuant to the MSA implementing regulations at 50 CFR § 600.920(h).

Given that the action of permitting the proposed project involves more than one federal agency, the EPA has elected to act as the lead agency to fulfill the consultation responsibilities as allowed by 50 CFR § 600.920(b).[1] This consultation request shall also serve as the written notice to the NMFS that the EPA is acting as the lead agency as required by 50 CFR § 600.920(b). The USACE is a cooperating and co-federal agency for this abbreviated consultation request. The completion of this consultation shall satisfy the EPA's and USACE's obligations under MSA Section 305(b)(2).

The attached EFH Assessment was prepared by the EPA and the USACE to jointly consider the potential effects that the proposed actions may have on EFH under the jurisdiction of the NMFS as required by 50 CFR § 600.920(e)(1). In the attached EFH assessment, the EPA and the USACE have determined that the

[1] 50 CFR § 600.920(b) allows a lead agency: "If more than one Federal agency is responsible for a Federal action, the consultation requirements of sections 305(b)(2) through (4) of the Magnuson-Stevens Act may be fulfilled through a lead agency. The lead agency should notify NMFS in writing that it is representing one or more additional agencies."

proposed actions will not result in substantial adverse effects on EFH and have further determined that the permits being issued by the EPA and the USACE will include conditions to mitigate the minor impacts that may occur as a result of the proposed actions. We would like to request that the NMFS respond in writing within 30 days of receiving the EFH Assessment. The response should state whether the NMFS concurs or does not concur with the determination made by the EPA and USACE. If the NMFS does not concur with the assessment determination made by the EPA and USACE, please provide any conservation recommendations and/or indicate whether expanded consultation is needed to review the proposed project's impacts on EFH.

The EPA and USACE are coordinating the interagency permitting process in accordance with the interagency Memorandum of Understanding (Aquaculture MOU) for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf,[2] and conducting a comprehensive analysis of all applicable environmental requirements required by the National Environmental Policy Act (NEPA); however, a consolidated process under NEPA is not being used to satisfy the requirements of MSA as described in 50 CFR § 600.920(e)(1).[3] The NMFS is a cooperating agency for the NEPA analysis and has provided scientific expertise related to the EFH Assessment and NEPA analysis for the proposed facility, including information about: site selection, marine mammal protection, and the Endangered Species Act. While some information related to the EFH Assessment is within the coordinated NEPA evaluation developed by multiple federal agencies, the attached EFH Assessment is being provided as a stand-alone document to comply with the consultation process under the MSA. The EPA and USACE will use the EFH consultation concurrence from the NMFS to support the NEPA analysis for each federal agency action and, if appropriate, a finding of no significant impacts.

If you have any questions about the EFH assessment or consultation, please contact Ms. Molly Davis (Davis.Molly@epa.gov or 404-562-9236).

Sincerely,

Daniel J. O'Lone for

Mary Jo Bragan, Chief
NPDES Permitting and Enforcement Branch
Water Protection Divison

cc: Ms. Katy Damico, USACE (via email)
Dr. Jess Beck-Stimpert, NMFS (via email)

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[2] On February 6, 2017, the Memorandum of Understanding for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf of Mexico became effective for seven federal agencies with permitting or authorization responsibilities.

[3] 50 CFR § 600.920(e)(1) states that "Federal agencies may incorporate an EFH Assessment into documents prepared for other purposes such as Endangered Species Act (ESA) Biological Assessments pursuant to 50 CFR part 402 or National Environmental Policy Act (NEPA) documents and public notices pursuant to 40 CFR Part 1500."

ESSENTIAL FISH HABITAT ASSESSMENT

Kampachi Farms, LLC - Velella Epsilon
Marine Aquaculture Facility
Outer Continental Shelf
Federal Waters of the Gulf of Mexico

August 2, 2019

U.S. Environmental Protection Agency
Region 4
Water Protection Division
61 Forsyth Street SW
Atlanta Georgia 30303

NPDES Permit Number
FL0A00001

U.S. Army Corps of Engineers
Jacksonville District
Fort Myers Permit Section
1520 Royal Palm Square Boulevard Suite 310
Fort Myers Florida 33919-1036

RHA Section 10 Permit
SAJ-2017-03488

Table of Contents

1.0 Introduction and Federal Coordination

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) sets forth a mandate for NOAA's National Marine Fisheries Service (NMFS), regional fishery management councils (FMC), and other federal agencies to identify and protect important marine fish habitat. The essential fish habitat (EFH) provisions of the MSA support one of the nation's overall marine resource management goals of maintaining sustainable fisheries. Essential to achieving this goal is the maintenance of suitable marine fishery habitat quality and quantity. The FMCs, with assistance from NMFS, have delineated EFH for federally managed species. Federal action agencies which fund, permit, or carry out activities that may adversely affect EFH are required to consult with NMFS regarding the potential impacts of their actions on EFH and respond in writing to NMFS or FMC with any recommendations.

The MSA, administered by the NMFS and regional FMCs, requires collaboration to stop or reverse the continued loss of fish habitats. Congress mandated the identification of habitats essential to managed species and measures to conserve and enhance this habitat. Under the MSA, Congress directs NMFS and the eight regional FMCs, under the authority of the Secretary of Commerce, to describe and identify EFH in Fishery Management Plans (FMPs); minimize, to the extent practicable, the adverse impacts on EFH; and identify other actions to encourage the conservation and enhancement of EFH.

On November 9, 2018, the U.S. Environmental Protection Agency Region 4 (EPA) received a complete application for a Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES) permit from Kampachi Farms for the point-source discharge of pollutants from a marine aquaculture facility in federal waters of the Gulf of Mexico (Gulf). On November 10, 2018, the U.S. Army Corps of Engineers Jacksonville District (USACE) received a complete application for Department of Army (DA) permit pursuant to Section 10 of the River and Harbors Act (RHA), 1899 (Section 10), for structures and work affecting navigable waters from Kampachi Farms.

Given that the action of permitting the proposed project involves more than one federal agency, the EPA has elected to act as the lead agency to fulfill the consultation responsibilities as allowed by 50 CFR § 600.920(b).[1] In the consultation request, the EPA has also notified the NMFS that the EPA is acting as the lead agency as required by 50 CFR § 600.920(b). The USACE is a cooperating and co-federal agency for the EFH consultation request. The completion of this abbreviated consultation shall satisfy the EPA's and USACE's obligations under MSA Section 305(b)(2).

This EFH assessment was prepared by the EPA and the USACE to jointly consider the potential effects that the proposed actions may have on EFH under the jurisdiction of the NMFS as required by 50 CFR § 600.920(e)(1). The EPA and the USACE (action agencies) have reviewed the proposed activity and determined that the level of detail provided in this EFH assessment is commensurate with the complexity and magnitude of the potential adverse effects of the proposed action as allowed by 50 CFR 600.920(e)(2), and meets the information requirements that all EFH assessments must include according to 50 CFR § 600.920(e)(3). The EPA and the USACE are providing this EFH assessment for consideration by the NMFS in compliance with the MSA Section 305(b)(2).

The EPA and USACE are coordinating the interagency review process as required by the interagency Memorandum of Understanding for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf of Mexico (Aquaculture MOU),[2] and conducting a comprehensive analysis of all applicable environmental

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[1] 50 CFR § 600.920(b) allows a lead agency: "If more than one Federal agency is responsible for a Federal action, the consultation requirements of sections 305(b)(2) through (4) of the Magnuson-Stevens Act may be fulfilled through a lead agency. The lead agency should notify NMFS in writing that it is representing one or more additional agencies."

[2] On February 6, 2017, the Memorandum of Understanding for Permitting Offshore Aquaculture Activities in Federal Waters of the Gulf of Mexico became effective for seven federal agencies with permitting or authorization responsibilities.

requirements under the National Environmental Policy Act (NEPA); however, a consolidated cooperation process under NEPA is not being used to satisfy the EFH assessment requirements as described in 50 CFR § 600.920(e)(1).[3] The NMFS is a cooperating agency for the NEPA analysis and has provided scientific expertise related to the NEPA analysis for the proposed action including information about: site selection, Endangered Species Act (ESA) listed species, and marine mammal protection. While some information related to the EFH Assessment is within the coordinated NEPA evaluation developed by multiple federal agencies, this EFH Assessment is being provided as a stand-alone document to comply with the consultation process under the MSA.

2.0 Proposed Action

Kampachi Farms, LLC (applicant) is proposing to operate a pilot-scale marine aquaculture facility (Velella Epsilon) in federal waters of the Gulf. The proposed action is the issuance of the CWA and RHA permits under the respective authorities of the EPA and the USACE as required to operate the facility. The EPA's proposed action is the issuance of a NPDES permit that authorizes the discharge of pollutants from an aquatic animal production facility that is considered a point source into waters of the United States. The USACE's proposed action is the issuance of a DA permit pursuant to Section 10 of the RHA that authorizes anchorage to the sea floor, structures and work in, over, under, and affecting navigable waters.

3.0 Proposed Project

The proposed project would allow the applicant to operate a pilot-scale marine aquaculture facility with up to 20,000 almaco jack (*Seriola rivoliana*) being reared in federal waters for a period of approximately 12 months. Based on an estimated 85 percent survival rate, the operation is expected to yield approximately 17,000 fish. Final fish size is estimated to be approximately 4.4 lbs/fish, resulting in an estimated final maximum harvest weight of 88,000 lbs (or 74,800 lbs considering the survival rate).

The fingerlings will be sourced from brood stock that are located at Mote Aquaculture Research Park and were caught in the Gulf near Madeira Beach, Florida. As such, only filial 1 (F1) progeny will be stocked into the offshore net pen. Following harvest, cultured fish would be landed in Florida and sold to federally-licensed dealers in accordance with state and federal laws.

A single CopperNet offshore strength (PolarCirkel-style) manufactured submersible fish pen will be deployed on an engineered multi-anchor swivel (MAS) mooring system. The design provided for the engineered MAS uses three concrete deadweight anchors for the mooring; however, the final anchor design is likely to utilize embedment anchors instead. The cage material for the proposed project is constructed with rigid and durable materials (copper mesh net with a diameter of 4 mm wire and 40 x 40 mm mesh square). The mooring lines for the proposed project will be constructed of steel chain (50 mm diameter) and rope (36 mm diameter) that are attached to a floating cage that will rotate in the prevailing current direction; the floating cage position that is influenced by the ocean currents will maintain the mooring rope and chain under tension during most times of operation. The bridle line that connects from the swivel to the cage will be encased in a rigid pipe. Structural information showing the current MAS with deadweight anchors and net-pen array is provided in the Appendix A.[4]

The CopperNet cage design is flexible and self-adjusts to suit the constantly changing wave and current

[3] 50 CFR § 600.920(e)(1) states that "Federal agencies may incorporate an EFH Assessment into documents prepared for other purposes such as Endangered Species Act (ESA) Biological Assessments pursuant to 50 CFR part 402 or National Environmental Policy Act (NEPA) documents and public notices pursuant to 40 CFR Part 1500."

[4] The anchoring system for the proposed project is being finalized by the applicant. The proposed project will utilize appropriately sized deadweight or, more likely, embedment anchors. Both anchor types are considered within the EFH assessment and are included for EFH consultation purposes. The selected final anchor design will be available in the administrative record for the NPDES or USACE permit.

conditions. As a result, the system can operate floating on the ocean surface or submerged within the water column of the ocean. When a storm approaches the area, the operating team simply opens a valve to flood the floatation system with water, causing the entire net pen array to submerge. A buoy remains on the surface, marking the net pen's position and supporting the air hose. When the net pen approaches the bottom, the system will maintain the cage several m above the sea floor. Submerged and protected from the storm above, the system is still able to rotate around the MAS and adjust to the currents. After storm events, the operating team pumps air back into the floatation system via a hose, making the net pen array buoyant, causing the system to rise back to or near the surface position to resume operational conditions. The proposed project cage will have at least one properly functioning global positioning system device to assist in locating the system in the event it is damaged or disconnected from the mooring system.

4.0 Proposed Action Area

The proposed project would be placed in the Gulf at an approximate water depth of 130 feet (40 m), generally located 45 miles southwest of Sarasota, Florida. The proposed facility will be placed within an area that contains unconsolidated sediments that are 3 – 10 ft deep (see Table 1). The applicant will select the specific location within that area based on diver-assisted assessment of the sea floor when the cage and anchoring system are deployed. More information about the proposed project area boundaries are shown in Appendix B.

Table 1: Target Area with 3' to 10' of Unconsolidated Sediments

Location	Latitude	Longitude
Upper Left Corner	27° 7.70607' N	83° 12.27012' W
Upper Right Corner	27° 7.61022' N	83° 11.65678' W
Lower Right Corner	27° 6.77773' N	83° 11.75379' W
Lower Left Corner	27° 6.87631' N	83° 12.42032' W

The proposed facility location was selected with assistance from NOAA's National Ocean Service, National Ocean Service National Centers for Coastal Ocean Science (NCCOS). The applicant and the NCCOS conducted an exhaustive site screening process to identify an appropriate project site. Some of the criteria considered during the site screening process included avoidance of corals, coral reefs, submerged aquatic vegetation, and hard bottom habitats; and avoidance of marine protected areas, marine reserves, and habitats areas of particular concern (HAPC). This siting assessment was conducted using the Gulf AquaMapper tool developed by NCCOS.[5]

Upon completion of the site screening process with the NCCOS, the applicant conducted a Baseline Environmental Survey (BES) based on guidance developed by the NMFS and EPA.[6] The BES included a geophysical investigation to characterize the sub-surface and surface geology of the sites and identify areas with a sufficient thickness of unconsolidated sediment near the surface while also clearing the area of any geohazards and structures that would impede the implementation of the aquaculture operation.[7] The geophysical survey for the proposed project consisted of collecting single beam bathymetry, side scan sonar, sub-bottom profiler, and magnetometer data within the proposed area. The BES report noted that were no physical, biological, or archaeological features that would preclude the siting of the proposed aquaculture facility at one of the four potential locations shown in Table 1.

[5] The Gulf AquaMapper tool is available at: https://coastalscience.noaa.gov/products-explorer/

[6] The BES guidance document is available at: http://sero.nmfs.noaa.gov/sustainable_fisheries/Gulf_fisheries/aquaculture/

[7] The BES constitutes additional results to support the evaluation of habitat and site-specific effects that the proposed project may have on EFH within the proposed action area in accordance with 50 CFR § 600.920(e)(4)(i). The BES was provided to the NMFS by the applicant.

5.0 Assessment and Ecological Notes on the EFH Fisheries and Species

5.1 EFH Overview

According to the NEPA documentation and the Ocean Discharge Criteria Evaluation prepared in support of the NPDES permit for the proposed project, which discuss the habitat in the eastern portion of the Gulf, and the portion of the west Florida shelf, the area specific to the proposed project is known to support commercially important invertebrates and fishes. The proposed area consists of a wide variety of marine habitats including unconsolidated sediments (sand and gravel) and low-relief hard bottom habitat, providing critical support for commercially and recreationally important fishes and invertebrates in the eastern Gulf.

The seasonal and year-round locations of designated EFH for the managed fisheries are depicted on figures available from the NMFS.[8] The NMFS selected 27 species from seven existing Fisheries Management Units (FMUs). Table 2 lists the 27 species (plus various coral reef fish assemblages) which are known to reside in Gulf waters and which are managed under the MSA. The listed species are considered ecologically significant to their respective FMU, and their collective habitat types occur throughout marine and estuarine waters in the Gulf.

The MSA defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (MSA § 3(10)). EFH must be designated for the fishery (16 USC § 1853(a)(7)). The final rule clarifies that every FMP must describe and identify EFH for each life stage of each managed species. The EFH assessment is based on species distribution maps and habitat association tables. In offshore areas, EFH consists of those areas depicted as “adult areas”, “spawning areas”, and “nursery areas”.

5.2 Shrimp Fishery

The brown, white and pink shrimp yields in the Gulf are highly dependent upon the abundance and health of estuarine marshes and seagrass beds. The prey species (food source) for these shrimp depend on similar vegetated coastal marshes and seagrass beds.

Brown Shrimp

Brown shrimp are generally more abundant in the central and western Gulf and found in the estuaries and offshore waters to depths of 120 m. Postlarve and juveniles typically occur within estuaries while adults occur outside of bay areas. In estuaries, brown shrimp postlarve and juveniles are associated with shallow vegetated habitats, but also are found over silty sand and non-vegetated mud bottoms. In Florida, adult areas are primarily seaward of Tampa Bay, and associated with silt, muddy sand, and sandy substrates.

Spawning area: Florida waters to edge of continental shelf; year round
Nursery area: Tampa Bay

White Shrimp

White shrimp are offshore and estuarine dwellers and are pelagic or demersal depending on their life stage. The eggs are demersal and larval stages are planktonic, and both occur in nearshore marine waters. Adult white shrimp are demersal and generally inhabit nearshore Gulf waters in depths less than 33 m on soft mud or silty bottoms. In Florida, white shrimp are not common east or south of Apalachee Bay and are not expected to be impacted by the discharges.

Spawning area: off Mississippi and Alabama; March to October
Nursery area: Mississippi Sound

[8] Designated EFH for managed fisheries are available at: http://sero.nmfs.noaa.gov/maps_gis_data/habitat_conservation/efh_Gulf/

Pink Shrimp

Juvenile pink shrimp inhabit most estuaries in the Gulf but are most abundant in Florida. Juveniles are commonly found in estuarine areas with seagrass. Postlarve, juvenile, and subadults may prefer coarse sand/shell/mud mixtures. Adults inhabit offshore marine waters, with the highest concentration in depths of 10 to 48 m. According to the NMFS species distribution map, pink shrimp use Tampa Bay from the larval stage until the species matures to the late juvenile stage.

Spawning area: Mississippi, Alabama, and Florida offshore; year round
Nursery area: major nursery areas in Tampa Bay and Florida west coast state waters; summer and fall in the northern Gulf

Table 2: EFH Species within the Central and Eastern Gulf

Species	EFH
Shrimp (Brown, White, Pink, Royal Red)	All estuaries; the US/Mexico border to Fort Walton Beach, Florida, from estuarine waters out to depths of 100 fathoms; Grand Isle, Louisiana, to Pensacola Bay, Florida, between depths of 100 and 325 fathoms; Pensacola Bay, Florida, to the boundary between the areas covered by the Gulf of Mexico (GMFMC) and the South Atlantic FMC (SAFMC) out to depths of 35 fathoms, Crystal River, Florida, to Naples, Florida, to 25 fathoms and in Florida Bay to 10 fathoms. Marsh, seagrass, mangrove and open water habitats.
Coastal Migratory Pelagics	All estuaries; the US/Mexico border to Florida from estuarine waters out to depths of 100 fathoms.
Red Drum	All estuaries; Vermilion Bay, Louisiana, to the eastern edge of Mobile Bay, Alabama, out to depths of 25 fathoms; Crystal River, Florida, to Naples, Florida, between depths of 5 and 10 fathoms; and Cape Sable, Florida, to the boundary between the areas covered by the GMFMC and the SAFMC between depths of 5 and 10 fathoms.
Reef Fish	All estuaries; the US/Mexico border to the boundary between the areas covered by the GMFMC and the SAFMC from estuarine waters out to depths of 100 fathoms. Reef, seagrass, and mangrove habitat.
Spiny Lobster	From Tarpon Springs, Florida, to Naples, Florida, out to 10 fathoms; and Cape Sable, Florida, to the boundary between the areas covered by the GMFMC and the SAFMC out to depths of 15 fathoms. Hardbottom habitats with macroalgae, seagrass and mangrove habitats.
Coral	Distributed throughout the Gulf including: the North and South Tortugas Ecological Reserves, East and West Flower Garden Banks, McGrail Bank, and the southern portion of Pulley Ridge; the pinnacles and banks from Texas to Mississippi, at the shelf edge and at the Florida Middle Grounds, the southwest tip of the Florida reef tract, and predominant patchy hard bottom offshore of Florida from approximately Crystal River south to the Florida Keys.
Deepwater Coral	The Viosca Knoll Lease Area south of Mississippi and the Green Canyon Lease Area south of central Louisiana. The Twin Ridges area south of Cape San Blas, Florida. Alderdice, McGrail, and Sonnier Banks off Louisiana.

Royal Red Shrimp

Royal red shrimp are most abundant in the northeastern Gulf in water depths between 270 and 550 m. Little is known about the larvae. Distribution maps were not available by the NMFS for the royal red shrimp due to the limited knowledge and information available for the species. The permitted discharges will take place at or near the surface, thus there should be no impact on the primary EFH.

Spawning area: unknown
Nursery area: unknown

5.3 Red Drum Fishery

Red Drum
In the Gulf, red drum occur in a variety of habitats, ranging from depths of about 43 m offshore to very shallow estuarine waters. They commonly occur in all the Gulf's estuaries where they are associated with a variety of substrate types including sand, mud, and oyster reefs. Estuaries are important to red drum for both habitat requirements and for dependence on prey species which include shrimp, blue crab, striped mullet and pinfish. The GMFMC considers all estuaries to be EFH for the red drum. Schools of large red drum are common in the deep Gulf waters with spawning occurring in deeper water near the mouths of bays and inlets, and on the Gulf side of the barrier islands. The Tampa Bay EFH estuarine map shows red drum juveniles to be abundant or highly abundant in the fall and winter and common in the spring and summer.

Spawning area: Gulfwide from nearshore to just outside state waters, fall and winter
Nursery area: major bays and estuaries including Mobile Bay and Tampa Bay, year round

5.4 Reef Fish

Many species of snapper and grouper (mutton, dog, lane, gray and yellowtail snapper- and red, gag and yellowfin groupers) occupy inshore areas during juvenile stages where they feed on estuarine-dependent prey. As these species mature they generally move to offshore waters and change their feeding habits. However, reef fish species still depend on estuarine species for prey.

Red Grouper
The red grouper is demersal and occurs throughout the Gulf at depths from 3 to about 200 m, preferring 30 to 130-m depths. Juveniles are associated with inshore hard bottom habitat, and grass beds, rock formations, while shallow reefs are preferred for nursery areas. Species distribution maps show that spawning for the red grouper occurs throughout much of the Gulf waters off Florida, including the Florida Middle Grounds. Nursery areas occur within and around the selected site.

Spawning area: Florida continental shelf, well offshore, extending from south of Apalachicola Bay all the way to west of the Florida Keys; April to May
Nursery area: extensively throughout the continental shelf off Florida and along the northern Gulf, year round

Black Grouper
The black grouper occurs in the eastern half of the Gulf. The species is demersal and is found from shore to depths of 170 m. Adults occur over wrecks and rocky coral reefs. Juveniles travel into estuaries occasionally. Species distribution maps for the black grouper indicate that the range of the species occurs within the Gulf, outside of state waters.

Spawning area: throughout eastern Gulf to 170-m depth, spring and summer
Nursery area: probably the same as the red grouper

Gag Grouper
The gag grouper is demersal and is most common in the eastern Gulf, especially the west Florida shelf. Post

larvae and pelagic juveniles move through inlets, coastal lagoons and high salinity estuaries in April-May where they settle into grass flats and oyster beds. Late juveniles move offshore in the fall. Adults prefer hard bottom areas, offshore reefs and wrecks, coral and live bottom. The species EFH distribution maps indicate presence throughout the Gulf including estuarine areas.

Spawning area: spawning areas are not specified on EFH maps
Nursery area: pelagic waters until post larvae or juvenile

Scamp
Scamp are demersal and widely distributed in the shelf areas of the Gulf, especially off Florida. Juveniles prefer inshore hard bottoms and reefs in depths of 13 to 36 m. Adults prefer high relief hard bottom areas. The species EFH distribution maps indicate presence throughout the Gulf including estuarine areas. Presence in these areas is based only on records for adults.

Spawning area: spawning area not specified in the EFH maps
Nursery area: nurseries not specified in the EFH maps

Red Snapper
Red snapper is demersal and found over sandy and rocky bottoms, around reefs, and underwater objects in depths to 218 m. Juveniles are associated with structures, objects or small burrows, or barren sand and mud bottoms in shelf waters ranging from 20 to 200 m. Adults favor deeper water in the northern gulf preferring submarine gullies and depressions, and over coral reefs, rock outcroppings, and gravel bottoms. Spawning occurs in offshore waters over fine sand bottoms away from reefs. Gulf distribution map show red snapper nursery areas within the estuarine waters of the Mississippi Sound, and Tampa Bay offshore of state waters

Spawning area: spawning occurs throughout the Gulf, June to October
Nursery area: extensive throughout the Gulf, year-round**,** including Mississippi Sound and Tampa Bay

Vermillion Snapper
Vermillion snapper are found over reefs and rocky bottom from depths of 2 to 220 m in the shelf areas of the Gulf spawning occurs in offshore areas, with juveniles occupying the same areas as the adults.

Spawning area: EFH maps not available, not specified in literature reviewed
Nursery area: EFH maps not available, not specified in literature reviewed

Gray Snapper
The gray snapper generally occurs in the shelf waters of the Gulf and is particularly abundant in south and southwest Florida. Gray snapper occurs in almost all the Gulf's estuaries but are most common in Florida. Adults are demersal and mid-water dwellers, occurring in marine, estuarine, and riverine habitats. They are found among mangroves, sandy grass beds, and coral reefs, and over sandy muddy bottoms. Spawning occurs offshore, with post larvae moving into estuarine habitat over dense beads of Halodule and Syringodium grasses. Juveniles are marine, estuarine, and riverine found in most types of habitats. They appear to most prefer Thalassia grass flats, marl bottoms, seagrass meadows and mangrove roots. Species distribution maps indicate that nursery areas exist within estuarine areas including the Mississippi Sound and Tampa Bay. Major adult areas are encountered from the Mississippi Sound across Gulf waters to west of Tampa Bay, where year-round adult areas occur within Florida state waters and into the southern half of Tampa Bay.

Spawning area: spawning areas probably exist in the Gulf off many of the nursery areas, but have not been positively identified
Nursery area: found in coastal waters throughout the Gulf, including Mississippi Sound and Tampa Bay

Yellowtail Snapper

Juvenile yellowtail snapper are found in nearshore nursery areas over vegetated sandy substrate and in muddy shallow bays. Thalassia beds and mangrove roots are preferred habitat of the gray snapper. Late Juvenile and adults prefer shallow reef areas. According to the Gulf distribution map, this species has nursery areas within the 3 League Line and Tampa Bay. Spawning and adult areas occur in Gulf waters outside of the 3 League Line through the Florida Middle Ground and southern Apalachicola areas. EFH is not designated in the state waters of Mississippi or Alabama.

Spawning area: west and north of Tampa Bay; spring and summer
Nursery area: throughout the western and southern coast of Florida, including Tampa Bay

Lane Snappers

The snappers seem to prefer mangrove roots and grassy estuarine areas as well as sandy and muddy bottoms. Juveniles favor grass flats, reefs and soft bottom areas, to offshore depths of 33 m. Adults occur offshore at sand bottoms, natural channels, banks, and manmade reef and structures. Gulf distribution maps indicate that the lane snapper use shallow coastal waters including the Mississippi Sound and Tampa Bay and areas outside of state waters as nursery areas.

Spawning area: throughout the adult areas, summer
nursery areas: shallow coastal areas throughout the Gulf including Mississippi Sound and Tampa Bay.

Greater Amberjack

Greater amberjack seems to prefer habitats that are marine but not estuarine. Based on the Gulf distribution maps, greater amberjack occur outside the barrier islands across Gulf waters, and usually over reefs, wrecks and around buoys. Spawning and nursery areas are similar.

Spawning area: throughout the adult areas in most of the Gulf; year round
Nursery area: throughout the adult areas; year round

Lesser Amberjack

Juvenile lesser amberjack are found offshore in the late summer and fall in the northern Gulf, along with smaller juveniles, in areas associated with sargassum. Adults and spawning areas are found offshore year-round in the northern gulf where they are associated with oil and gas rigs and irregular bottom. The Gulf distribution map shows the range of the species throughout much of the Gulf and into the Atlantic coastline.

Spawning area: in adult areas, offshore, in the northern Gulf; year-round
Nursery area: probably similar to adult areas year-round; EFH map not available

Tilefish

Tilefish occur throughout the continental shelf in the Gulf, usually at depths from 50-200 m.

Spawning area: throughout the adult area from March to September
Nursery area: throughout the adult area; year round

Triggerfish

Larval and juvenile gray triggerfish are associated with grass beds, Sargassum and mangrove estuaries. Adults seem to prefer offshore waters associated with reefs. A general species distribution map was not available, however a map showing catches per hour by trolling methods within the Gulf was available from the National

Oceanic and Atmospheric Administration (NOAA).[9] This map indicated that there is a record of occupancy for gray triggerfish in state waters of Mississippi/Alabama and Florida.

Spawning area: EFH map not available; assumed to be adult preferred areas offshore
Nursery area: EFH map not available; assumed to be estuarine areas throughout the Gulf

5.5 Coastal Migratory Pelagic Fishery

Collectively, these species are commonly distributed from the estuaries throughout the marine waters of the entire Gulf. However, estuaries are very important, since they contain the major prey base for these species.

King Mackerel

King mackerel are found throughout the Gulf and seldom venture into brackish waters. Juveniles occasionally use estuaries but are not estuarine dependent, and nursery areas occur in marine environments. According to the species distribution map, adult areas are also used for nurseries and spawning (May to November). These areas occur outside of the Mississippi Sound, across state waters, throughout the Gulf and into Tampa Bay.

Spawning area: throughout the Gulf, estuaries and coastal waters in adult areas; May to November
Nursery area: adult areas; year-round**,** marine waters, estuaries used occasionally

Spanish Mackerel

Adult Spanish mackerel tolerate brackish to oceanic waters and often inhabit estuaries. Estuarine and coastal waters also offer year-round nursery habitat. Juveniles appear to prefer marine salinities and sandy bottoms. Adults and spawning areas typically occur in offshore areas. According to the species distribution map, EFH for adult and nursery areas occurs throughout the selected site. Spawning areas occur in Gulf waters off the coast of Florida.

Spawning area: waters off the coast on the western (Summer and Fall) and eastern Gulf (Spring and Summer)
Nursery area: coastal waters throughout the Gulf

Cobia

Cobia only occasionally inhabit estuaries. Spawning occurs in nearshore areas and larvae are found in estuarine and offshore waters. Nursery areas are the same as the adult areas which include coastal areas, bays and river mouths. The range of cobia extends throughout the Gulf nearshore areas, with the summer adult areas and year-round nursery areas from the Mississippi Sound into Gulf waters and to the adult area (spring, summer, and fall) and year-round nursery area that extends from just inside Gulf water, halfway into Tampa Bay.

Spawning area: occurs throughout the adult areas except in bays and estuaries in the northern Gulf, Spring and Summer
Nursery area: coastal areas, bays and river mouths

Dolphin (Mahi-Mahi)

Dolphin are primarily an oceanic species, but occasionally enter coastal waters with high enough salinity. They are common in coastal waters of the northern Gulf mainly during the summer months. It is an epipelagic species known for aggregating underneath or near floating objects, especially Sargassum. Spawning occurs throughout the adult areas of the open Gulf year-round, with peaks in early spring and fall. Larvae are usually found over depths of greater than 50 m and are most abundant at depths over 180 m. Adults occur over depths up to 1,800 m, but are most common in waters at 40 to 200 m in depth. Nursery areas are year-round in oceanic and coastal

[9] The map is available at: http://christensenmac.nos.noaa.gov/Gulf-efli/gtrigger.gif

waters where salinity is high.

Spawning: throughout the adult areas in open waters of the Gulf; year-round
Nursery area: throughout the adult areas in open waters of the Gulf; year-round

Bluefish
Bluefish can be found in Gulf estuaries but are more common in estuaries and waters of the Atlantic Ocean. Spawning grounds are located on the outer half of the continental shelf Nursery areas occur inshore along beaches and in estuaries, inlets and rivers. Gulf distribution maps were not available for this species and therefore EFH could not be identified, but may be assumed to include nursery areas within the Mississippi Sound and Tampa Bay.

Spawning area: not specified in literature reviewed, EFH map not available
Nursery area: not specified in literature reviewed; EFH map not available, but probably exists within the Mississippi Sound and Tampa Bay

5.6 Spiny Lobster Fishery

The principal habitat for the spiny lobster is offshore reefs and seagrass. Spiny lobsters spawn in offshore waters along the deeper reef fringes. Adults are known to inhabit bays, lagoons, estuaries, and shallow banks. According to the species distribution map, spiny lobsters use the lower half of Tampa Bay for nursery areas. According to the GMFMC, Tampa Bay seems to be the upper limit for spiny lobster abundance due to the higher salinities found south of the Bay. The Tampa Bay-specific distribution map indicates that spiny lobster in the Bay are rare. However, the Gulf distribution maps indicate that Tampa Bay is used as an adult area year-round, and as a nursery area.

Spawning area: throughout the adult area, particularly north and south of Tampa Bay; March to July
Nursery area: lower half of Tampa Bay used as nursery; year-round

5.7 Coral and Coral Reefs

The three primary areas in the Gulf where hermatypic corals are concentrated are the East and West Flower Garden Banks, the Florida Middle Grounds, and the extreme southwestern tip of the Florida Reef Tract, the Tortugas Ecological Reserve HAPC and the Pulley Ridge HAPC. A number of other identified areas along the west Florida Shelf, i.e., Long Mound, Many Mounds, North Reed Site, and the West Florida Wall are all on the west Florida shelf in depths of 200-1000 m and contain deep water (low light) coral communities. Results from recent research expeditions indicate that the west Florida shelf may have more deep-water coral coverage than other areas in the Gulf.

5.8 Highly Migratory Species

In addition to the managed fish species described in the previous section, another group of fish with highly migratory habits have also been examined. This group includes billfish (blue marlin, white marlin and sailfish), swordfish, tunas (yellow fin, bluefin and skipjack), and of sharks (black tip, bull, dusky, silky, mako, Atlantic sharpnose, tiger and longfin mako). Most are found beyond the 50, 100 and 200 m contours.

6.0 Assessment of EFH and HAPC in the Gulf

The categories of EFH and HAPC for managed species which were identified in FMP Amendments of the Gulf FMC and which may occur in marine waters of the Gulf are shown in Table 3. These habitats require special consideration to promote their viability and sustainability. Some of the habitat categories presented in

Table 3 are not present in the area affected by the proposed project. Impacts on habitats present or potentially present are discussed in the following paragraphs. Descriptions of the habitats were mostly excerpted from the *Generic Amendments for Addressing EFH Requirements, HAPC, and Adverse Effects of Fishing in the Following Fishery Management Plans for the Gulf of Mexico* (GMFMC, 1998; GMFMC, 2005).

Table 3: EFH and HAPC Identified in Fishery Plan Amendments of the Gulf and Presence in Area Affected by the Proposed Action

EFH	Presence
Water Column	Yes
Vegetated Bottoms	Yes
Non-vegetated Bottoms	Yes
Live Bottoms	Yes
Coral Reefs	No: solitary specimens may exist in action area
Geologic Features	Yes
Continental shelf fisheries	Yes
West Florida Shelf	Yes
Habitat Areas of Particular Concern	**Presence**
Florida Middle Grounds	No: located outside of action area
Florida Keys National Marine Sanctuary	No: located outside of action area
Florida Bay	No: located outside of action area
Dry Tortugas	No: located outside of action area
Pulley Ridge	No: located outside of action area
Madison-Swanson and Steamboat Lumps Marine Reserves	No: located outside of action area

6.1 Water Column EFH

The flow-averaged total ammonia concentration was calculated using the loading and current velocity information from the NCCOS modelling report for the proposed project. It was estimated that the total ammonia discharged from the cage at the maximum fish biomass will be 9.8 kg/day and the biochemical oxygen demand (BOD) at 59.3 kg/day. The flow-averaged ammonia concentration was estimated at about 4.7 x 10^{-3} mg/l at the cage. EPA's published ammonia criteria for saltwater is 4-day average is equal to 3.5 x 10^{-2} mg/L, and the 1-hr average is equal to 2.33 x 10^{-1} mg/l. BOD is estimated at 6.8 x 10^{-4} mg/l. At the maximum biomass of 36,367 kg, the max feeding rate is estimated at 399 kg/day. The maximum solid waste production is estimated at 83 kg/day. Due to factors concerning the small size of the project and relatively small amounts of pollutants discharged, location, over bottom depth, and average current velocity, the discharges of wastes from the proposed project are expected to have a minor impact to water column EFH. It is expected that the effluent will undergo rapid dilution and constituents will be difficult to detect within short distances from the cage. [10]

The proposed facility will be covered by a NPDES permit as an aquatic animal production facility with protective conditions required by the Clean Water Act. The NPDES permit will contain conditions that will confirm EPA's determination and ensure no significant environmental impacts will occur from the proposed

[10] Further information about EPA's analysis and determination for impacts to water quality, seafloor, and benthic habitat can be found in the final NPDES permit and the Ocean Discharge Criteria (ODC) Evaluation, as well as other supporting documents developed for the NPDES and Section 10 permits such as the Biological Evaluation that was created to comply with the ESA and the Environmental Assessment that was developed to comply with NEPA.

project. The aquaculture-specific water quality conditions placed in the NPDES permit will generally include a comprehensive environmental monitoring plan. The applicant will be required to monitor and sample certain water quality, sediment, and benthic parameters at a background (upstream) location and near the cage occuring at a frequency that is correlated to fish production levels. Additionally, the NPDES permit will include effluent limitations expressed as best management practices (BMPs) for feed managment, waste collection and disposal, harvest discharge, carcass removal, materials storage, maintenance, record keeping, and training. Moreover, the NPDES permit will also require a quality assurance plan to ensure appropriate standards are met when sampling and emergency management plan to establish operational procedures during disaster events such as hurricanes.

6.2 Benthic EFH

Discharges from net-pen aquaculture can impact benthic habitat due to the deposition of solid wastes, comprised of fish feces and uneaten food, onto the seafloor. Due to factors concerning the small size of the project and relatively small amounts of pollutants discharged, location, over bottom depth, and average current velocity, the discharges of solid wastes from the cage are expected to have only minor impacts on benthic habitat and the supported communities.

Modeling of the project estimates the total solids discharge occurring at maximum fish biomass to be about 83 kg/day and organic carbon at 28 kg/day. The slow settling velocities of fecal and food pellets, 0.032 m/s and 0.095 m/s respectively, and variability in current directionality, should cause solids deposition to be distributed over a large area of the seafloor. Assuming a direct relationship between waste loading and fish biomass, based on several estimates from large scale fish farms, it’s roughly estimated that the maximum solids load to the seafloor will range from 1.0-4.0 g/m^2/day with about 35% of that as organic carbon.

6.2.1 Vegetated Bottoms

Seagrasses and macroalgae have long been recognized as important primary producers in marine habitats. Due to the depths of the area affected by the proposed draft permit, seagrasses are unlikely to be present. The distribution of benthic algae is ubiquitous throughout the Gulf from bays and estuaries out to depths of 200 m. It is a significant source of food for fish and invertebrates. The wide gently sloping continental shelf, particularly in the eastern Gulf, provides a vast area where benthic species of algae can become established and drift along the bottom and continue to grow even when detached from the substrate. Benthic algae also form large mats that drift along the bottom. The cage employed will be anchored within an expanse of unconsolidated sediments unlikely to have attached algal communities. Nutrient loading from the small amounts of deposited solid wastes are not likely to effect marine plants.

6.2.2 Unconsolidated Sediments

Unconsolidated sediments provide habitat for a diverse invertebrate community consisting of several hundred of burrowing species and well as benthic fish and macro-invertebrate communities living directly on the sea floor. These habitats also provide foraging for fishes associated with nearby demersal habitat. Unconsolidated seafloor habitat may affect shrimp and fish distributions directly in terms of feeding and burrowing activities or indirectly through food availability, water column turbidity, and related factors. The small amounts of solid waste deposition predicted from the proposed project should minimize any potential physical impacts to unconsolidated seafloor habitat. Organic carbon loading is likely to have little measurable effect on associated benthic communities.

6.2.3 Live Bottoms

Live bottoms are defined as those areas that contain biological assemblages consisting of such sessile invertebrates as sea fans, sea whips, hydroids, anemones, ascidians, sponges, bryozoans, seagrasses, or corals living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography favoring the accumulation of turtles and fishes. These communities are scattered across the shallow waters of the west Florida Shelf and within restricted regions of the rest of the Gulf. Hard substrate on the west Florida shelf ranges from scattered low relief limestone outcroppings to major structures or groups of structures which are high relief, biologically developed areas with extensive inhabitation by hermatypic corals, octocorals and related communities. Additionally, the NPDES will require the proposed facility to be placed at least 500 meters from any hardbottom habitat to protect those communities from physical impacts due to the deposition of solids and potential impacts due to organic enrichment; the DA permit will not authorize the anchor system to be placed on vegetated and/or hardbottom habitat (see mitigation measures shown in Section 7).

6.2.4 West Florida Shelf

The west Florida shelf is composed mainly of carbonate sediments. These sediments are in the form of quartz-shell sand (> 50 percent quartz), shell-quartz sand (< 50 percent quartz), shell sand, and algal sand. The bottom consists of a flat limestone table with localized relief due to relict reef or erosional structures. The benthic habitat types include low relief hardbottom, thick sand bottom, coralline algal nodules, coralline algal pavement, and shell rubble. The west Florida shelf provides a large area of scattered hard substrates, some emergent, but most covered by a thin veneer of sand, that allow the establishment of a tropical reef biota in a marginally suitable environment. The only high relief features are a series of shelf edge prominences that are themselves the remnants of extensive calcareous algal reef development prior to sea level rise and are now, in most cases, too deep to support active coral communities.

Along the west Florida shelf are areas with substantial relief. In an area south of the Florida Middle Grounds, in water depths of 46 to 63 m, is a ridge formed from limestone rock termed the Elbow, and it is about 5.4 km at its widest and has a vertical relief of 6.5 to 14 m. South of Panama City are two notable areas with high relief. The Madison Swanson Marine Reserve are in 66 to 112 m of water and have rock ledges with 6 to 8 m of relief and are covered with coral and other invertebrate growth. The Mud Banks are formed by a ledge that has a steep drop of 5 to 7 m. The ledge extends for approximately 11 to 13 km in 57 to 63 m of water. The "3 to 5s", a series of ledges located southwest of Panama City, occur in water depths of 31 to 42 m of water. The ledges are parallel to the 36.5-m isobath and have relief of 5.5 to 9 m. The features listed above are part of a larger area of shelf-edge reefs that extend along the 75-m isobath offshore of Panama City to just north of the Tortugas which also includes the Twin Ridges, The Edges, Steamboat Lumps Marine Reserve (Koenig et. al: 2000). According to Koenig et. Al (2000), the northeastern portion of this area represents the dominant commercial fishing grounds for gag and contains gag and scamp spawning aggregation sites. Two of the areas, Madison Swanson and Steamboat Lumps, were designated as marine reserves on June 19, 2002 for a four-year period to protect a portion of the gag spawning aggregations and to protect a portion of the offshore population of male gag.

Another west Florida shelf region with notable coral communities is bounded by the waters of Tampa Bay on the north and Sanibel Island on the south. The area consists of a variety of bottom types. Rocky bottom occurs at the 18 m contour where sponges, alcyonarians, and the scleractinians Solenastrea hyades and Cladocora arbuscula are especially prominent.

The Pulley Ridge HAPC is a 100+ km-long series of north-south trending, drowned, barrier islands approximately 250 km west of Cape Sable, Florida. The ridge is a subtle feature about 5 km across with less than 10 m of relief. The shallowest parts of the ridge are about 60 m deep. The southern portion of the ridge hosts an unusual variety of zooxanthellate scleractinian corals, green, red and brown macro algae, and typically shallow-water tropical fishes. The corals Agaricia sp. and Leptoceris cucullata are most abundant, and form plates up to 50 cm in diameter and account for up to 60% live coral cover at some localities. Less common species include: *Montastrea cavernosa, Madracis formosa, M. decactis, Porities divaricata, and Oculina tellena*. Sponges, calcareous and fleshy algae, octocorals, and sediment occupy surfaces between the corals. Coralline algae appear to be producing as much or more sediment than corals, and coralline algal nodule and cobble zones surround much of the ridge in deeper water (greater than 80 m). The fishes of Pulley ridge comprise a mixture of shallow water and deep species with more than 60 species present.

7.0 Federal Action Agency Determination and Mitigation

The implementing regulations of MSA define adverse effect as "any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions" (50 CFR 600.910(a)).

The EPA and USACE have determined that the minimal short-term impacts associated with the discharge will not result in substantial adverse effects on EFH, HAPC, or managed species in any life history stage, either immediate or cumulative, in the proposed project area. A summary of findings is presented in Table 4. Any potentially harmful physical characteristics and chemical constituents present at the time of discharge should disperse rapidly as the waste streams undergo physical dilution processes. Major adverse impacts to any benthic or demersal EFH are unlikely to occur as a result of the discharge. The high degree temporal and spatial patchiness regarding the distribution of plankton assemblages in the water column should greatly limit plankton exposure to potentially harmful water quality conditions. Major adverse impacts to any benthic EFH are unlikely to occur because of the installation of the proposed MAS mooring system.

The EPA will require mitigation measures to be incorporated into the NPDES permit to avoid or limit organic enrichment and physical impacts to habitat that may support associated hardbottom biological communities. The NPDES permit will require a condition that the proposed project must be positioned at least 500 m from any hardbottom habitat. The DA permit condition will state that the proposed MAS anchor system shall be installed on substrate devoid of vegetated and/or hardbottom habitat.

The federal action agencies used multiple sources to support the determinations described within this EFH assessment including the analysis of potential impacts that the NMFS used as the basis for its EFH determination for up to twenty commercial scale offshore marine aquaculture facilities in the Gulf (NMFS, 2009). Additionally, the EFH determination for the proposed project is also supported by the NMFS' concurrence with EPA's EFH determination for the eastern Gulf Oil and Gas General NPDES Permit (NMFS, 2016). These assessments and determinations have been provided to the NMFS and are incorporated by reference pursuant to 50 CFR § 600.920(e)(5).[11] The EPA and USACE request concurrence from the NMFS for this EFH determination under the MSA Section 305(b)(2).

[11] 50 CFR § 600.920(e)(5) states that "The assessment may incorporate by reference a completed EFH Assessment prepared for a similar action, supplemented with any relevant new project specific information, provided the proposed action involves similar impacts to EFH in the same geographic area or a similar ecological setting. It may also incorporate by reference other relevant environmental assessment documents. These documents must be provided to NMFS with the EFH Assessment."

Table 4: Summary of Potential Impacts to EFH and Geographically Defined HAPC

EFH	Presence	Impact Assessment	Reason
Continental Shelf Fisheries	Yes	No Significant Impact	No exposure
Coral Reefs	No	No Significant Impact	Not present
Geologic Features	Yes	No Significant Impact	No exposure
Live Bottoms	Yes	No Significant Impact	Limited solid waste deposition
Non-vegetated Bottoms	Yes	No Significant Impact	Limited solid waste deposition
Vegetated Bottoms	Yes	No Significant Impact	Limited solid waste deposition
Water Column	Yes	No Significant Impact	Low levels of ammonia and BOD will be quickly diluted and dissipated
West Florida Shelf	Yes	No Significant Impact	Limited solid waste deposition
Habitat Ares of Particular Concern	**Presence**	**Impact Assessment**	**Reason**
Dry Tortugas	No	No Significant Impact	Avoided
Florida Bay	No	No Significant Impact	Avoided
Florida Keys National Marine Sanctuary	No	No Significant Impact	Avoided
Florida Middle Grounds	No	No Significant Impact	Avoided
Madison-Swanson and Steamboat Lumps Marine Reserves	No	No Significant Impact	Avoided
Pulley Ridge	No	No Significant Impact	Avoided

References

Gulf Fishery Management Council. 1998. General Amendment for Addressing EFH Requirements in the Fishery Management Plans of the Gulf.

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Gulf Fishery Management Council. 2010. 5-Year Review of the Final Generic Amendment Number 3. Addressing EFH Requirements, Habitat Areas of Particular Concern, and Adverse Effects of Fishing in the Fishery Management Plans of the Gulf.

Koenig, CC, Coleman, CC, Grimes, CB, Fitzhugh, GR, Scanlon, KM, Gledhill, CT, Grace, M. 2000. Protection of Fish Spawning Habitat for the Conservation of Warm-Temperate Reef-Fish Fisheries of Shelf-Edge Reefs of Florida. Bulletin of Marine Science, 66(3): 593-616, 2000.

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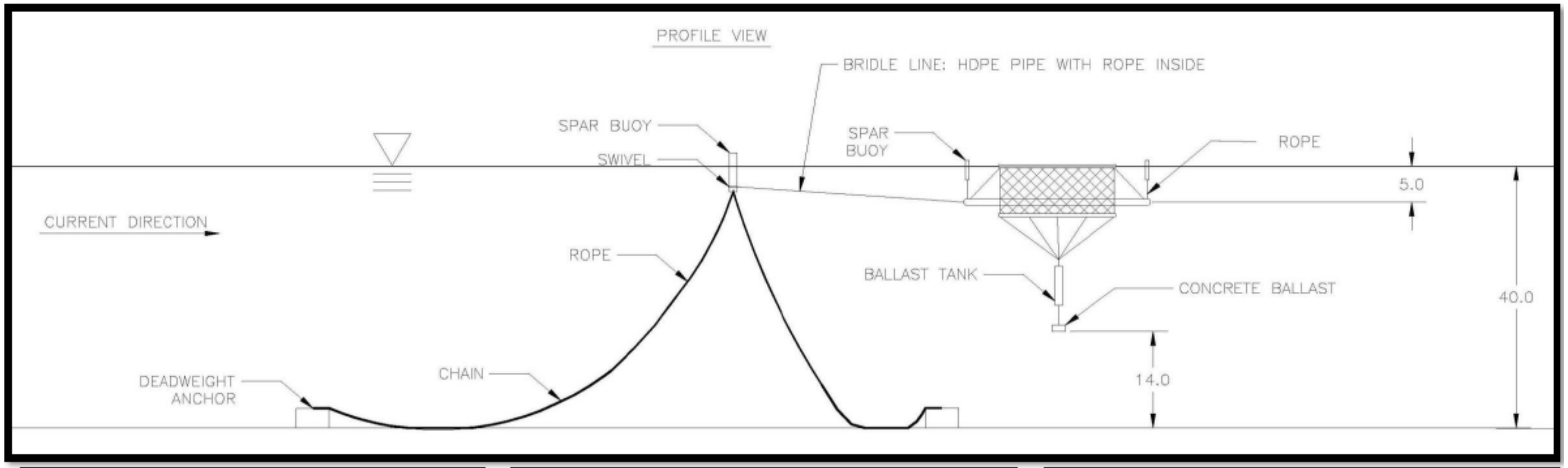
NMFS (National Marine Fisheries Service). 2009. Essential Fish Habitat (EFH) Review of the Fishery Management Plan for Regulating Offshore Marine Aquaculture in the Gulf of Mexico.

NMFS (National Marine Fisheries Service). 2015. EFH – Gulf. NOAA Southeast regional Office. Ver: 082015. http://sero.nmfs.noaa.gov/habitat_conservation/efh/guidance_docs/efh_gmfmc_ver082015.pdf

NMFS (National Marine Fisheries Service). 2016. EFH concurrence for the eastern Gulf of Mexico Oil and Gas General NPDES Permit.

U.S. Department of Commerce and U.S. Department of Interior. Federal Inventory Sites of the Eastern Gulf Region. http://www.mpa.gov/mpaservices/atlas/Gulf/gome.thml.

Appendix A – Cage and Mooring Detail



1) Deadweight Anchors (concrete):
- Three (3) anchors equally spaced @:
  - 120m from mooring centerline
  - 120 degrees from each other
- Each @ 4.5m x 4.5m x 4.5m (91 m3)
- Concrete friction factor = 0.5 on wet sand
- Each has an effective weight of 217 MT

2) Mooring Chain (Grade 2 steel):
- 80m length on each anchor
- 50mm (2") thick links
- No load = 70m length of each on seafloor
- Design load = some entirely off seafloor/ others completely on seafloor

3) Mooring Lines (rope):
- 40m length on each chain
- AMSTEEL®-BLUE
- 36mm (1 1/2") thick lines

4) Spar Buoy w/ Swivel (steel):

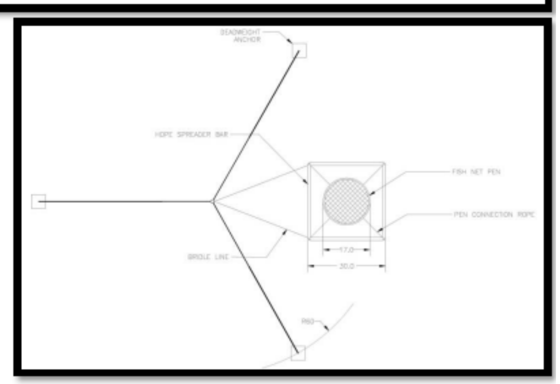
5) Bridle Lines (rope inside HDPE pipe):
- Three (3) ~30m bridle lines (rope) from swivel to spreader bar
- AMSTEEL®-BLUE
- 33.3mm (1 5/16") lines inside HDPE pipe

6) Spreader Bar (HDPE):
- Header Bar (load bearing) connected to Bridle Lines
  - 30m in length
  - 0.36m OD DR 11 HDPE pipe
- Side and Rear Bars (smaller load bearing)
  - 30m in length
  - 0.36m OD DR 17 HDPE pipe
- Four (4) corner spar buoys

7) Net Pen Connection Lines (rope):
- Four (4) ~13m connection lines (rope)
- Connected from Spreader Bar to Net Pen Float Rings
- AMSTEEL®-BLUE
- 33.3mm (1 5/16") lines

8) Net Pen Frame Structure (HDPE):
- Top Frame Structure
  - 18m in diameter
  - One (1) HDPE side-by-side Float Rings
    - On the sea surface
    - ~ 0.36m OD DR 11 HDPE pipe
  - One (1) HDPE net ring (railing)
    - Connected ~ 1.0m above Float Rings
    - Connected to Net Pen Mesh
    - ~ 0.15m OD DR 17 HDPE pipe
- Bottom Frame Structure
  - 18m in diameter
  - One (1) HDPE sinker ring
    - 7.0m below Float Rings
    - Connected to Net Ring
    - ~ 0.36m OD DR 11 HDPE pipe
  - One (1) HDPE net ring
    - 7.0m below float rings
    - Connected to copper alloy mesh
    - ~ 0.15m OD DR 17 HDPE pipe

9) Net Pen Mesh (copper alloy):
- 17m diameter x 7m depth
- Top connected to top net ring (railing)
- Bottom connected to bottom net ring
  - 4mm wire diameter
  - 40mm x 40mm mesh square
- Effective volume of 1,600m^3

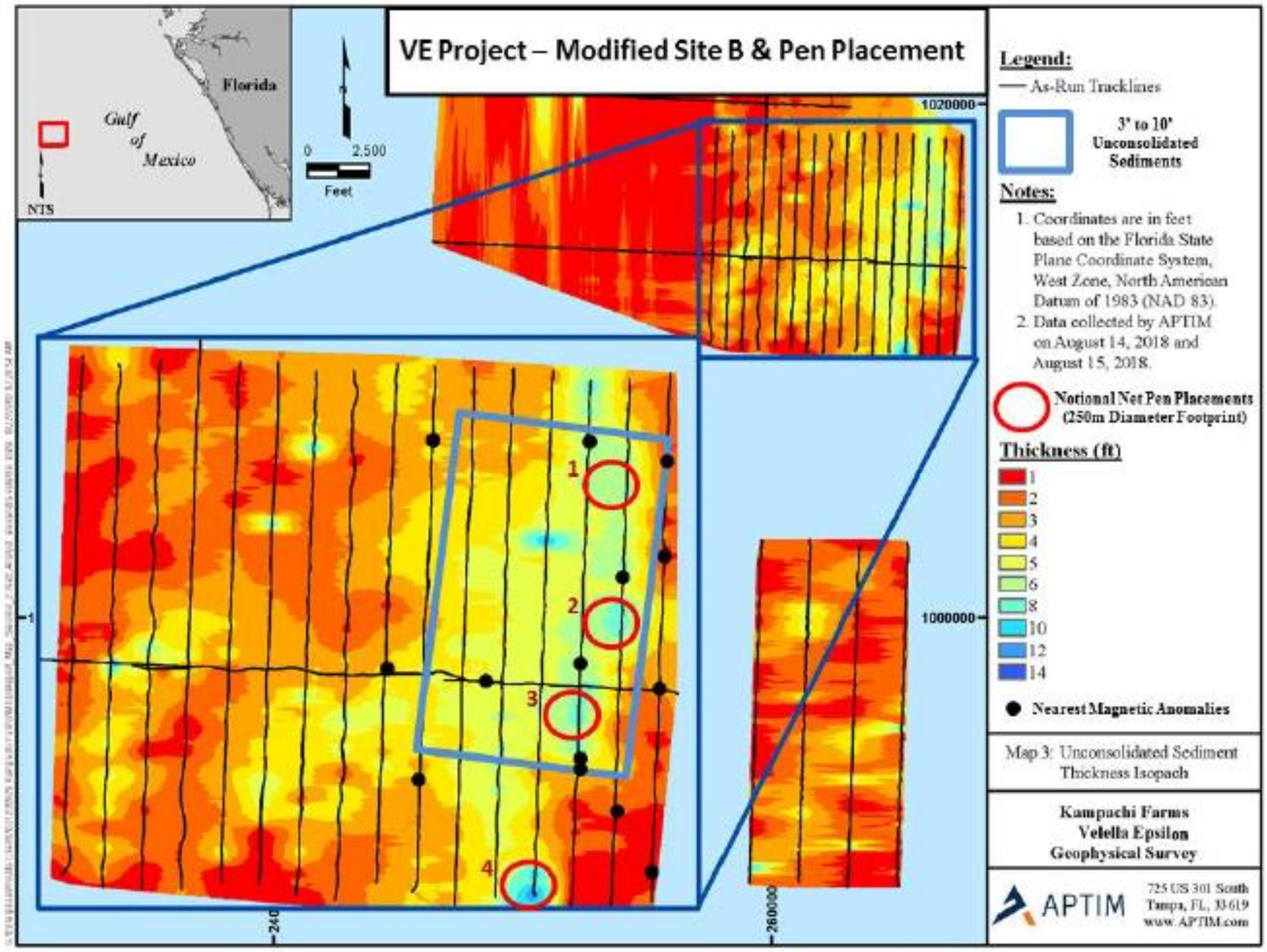


10) Shackle Point Connection (steel):
- One (1) ~0.13m^2 shackle plate
- Four (4) connection lines
  - 12 mm in diameter x 10m in length
  - Connected from shackle plate to HDPE sinker ring
- ~1m Grade 2 steel chain (32mm) connected to Floatation Capsule

11) Floatation Capsule (steel):
- ~ 1.5m in diameter x ~3.45m in length
- Effective floatation volume = 6m^3
- ~3m Grade 2 steel chain (32mm) connected to Counter Weight

12) Counter Weight (concrete):
- ~ 1.1m in diameter x ~2.2m in length
- Effective weight of 5 MT

Appendix B – Location Area



Position	° Decimal ' Latitude	° Decimal ' Longitude	Decimal ° Latitude	Decimal ° Longitude	Perimeter (km)	Area (km^2)
			Modified Site B from BES Report			
Upper Left	27° 7.86863' N	83° 13.45827' W	27.131143° N	83.224303° W		
Upper Right	27° 7.83079' N	83° 11.63237' W	27.130512° N	83.193872° W		
Lower Right	27° 6.43381' N	83° 11.69349' W	27.107230° N	83.194890° W		
Lower Left	27° 6.50261' N	83° 13.52658' W	27.108377° N	83.225442° W		
Center	27° 7.11266' N	83° 12.58604' W	27.118543° N	83.209767° W	11.1571	7.7237
			Targeted Subset Area of Modified Site B from BES Report (3' to 10' Unconsolidated Sediments)			
Upper Left	27° 7.70607' N	83° 12.27012' W	27.128445° N	83.204502° W		
Upper Right	27° 7.61022' N	83° 11.65678' W	27.126837° N	83.194278° W		
Lower Right	27° 6.77773' N	83° 11.75379' W	27.112962° N	83.195897° W		
Lower Left	27° 6.87631' N	83° 12.42032' W	27.114605° N	83.207005° W		
Center	27° 7.34185' N	83° 12.02291' W	27.122365° N	83.200382° W	5.2273	1.6435
			Notional Net Pen Placements within Modified Site B from BES Report			
1	27° 7.54724' N	83° 11.85393' W	27.125787° N	83.197565° W		
2	27° 7.17481' N	83° 11.82576' W	27.119580° N	83.197095° W		
3	27° 6.93930' N	83° 11.94780' W	27.115655° N	83.199130° W		
4	27° 6.52579' N	83° 12.09175' W	27.108763° N	83.201530° W	0.7854	0.0491

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
https://www.fisheries.noaa.gov/region/southeast

August 23, 2019

Ms. Mary Jo Bragan, Chief
NPDES Permitting and Enforcement Branch
Water Protection Division
United States Environmental Protection Agency
Region 4, Atlanta Federal Center
61 Forsyth Street
Atlanta, Georgia 30303-8960

Attention: Ms. Meghan Wahlstrom-Ramler

Dear Ms. Bragan,

NOAA's National Marine Fisheries Service (NMFS), Southeast Region, Habitat Conservation Division has reviewed your staff's email and revised essential fish habitat (EFH) assessment dated August 2, 2019, regarding issuance of the U.S. Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) Permit Number FL0A00001. The U.S. Army Corps of Engineers also received an application for a Rivers and Harbors Act Section 10 permit for structures and work affecting navigable federal waters at the same facility. The project applicant, Kampachi Farms, LLC is proposing to operate a pilot-scale marine aquaculture facility, Velella Epsilon, in federal waters of the Gulf of Mexico in 130 feet of water approximately 45 miles southwest of Sarasota, Florida.

The NMFS previously completed our EFH consultation for this project on March 12, 2019. The EPA's revised EFH assessment includes the following proposed project design changes:

(1) The anchoring system for the project would utilize either deadweight or embedment style anchors. Final anchor style(s) would be placed within three to 10 feet deep unvegetated sandy sediments and sited through diver-assisted placement on the sea floor when deployed.

(2) The NPDES permit will include mitigation measures requiring the proposed facility to be placed at least 500 meters from any hardbottom habitat to protect those communities from physical impacts due to the deposition of solids and potential impacts due to organic enrichment.

The August 2, 2019, EFH assessment includes a determination that issuance of the NPDES and Section 10 permits for the Kampachi Farms project will not result in substantial adverse effects on EFH. We concur with the EPA's determination in the EFH assessment. Therefore, NMFS has no EFH conservation recommendations to provide. Assuming the NPDES and Section 10 Permits are not further revised, this satisfies the consultation procedures outlined in 50 C.F.R.

Section 600.920 of the regulation to implement the EFH provisions of the Magnuson-Stevens Act.

Thank you for your consideration of these comments. Please contact Mr. Mark Sramek at the letterhead address, through email at Mark.Sramek@noaa.gov or by calling (727) 824-5311 if you have questions regarding these comments.

Sincerely,

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

cc: File
DIR Blough
F/SER Silverman, Beck-Stimpert
F/SER2 Malinowski
F/SER3 Bernhart, Lee, Powell
F/SER4 Fay, Dale, O'Day
F/SER46 Sramek
NOS NCCOS Riley
USACE Tampa Damico

Appendix F

CASS Technical Report

Environmental Modelling to Support NPDES Permitting for Velella Epsilon Offshore Demonstration Project in the Southeastern Gulf of Mexico

Lead Scientists: Kenneth Riley, Ph.D. and James Morris, Ph.D.
Environmental Engineer: Barry King, PE
Submitted to Jess Beck (NMFS) and Kip Tyler (EPA), July 19, 2018

This analysis uses an environmental model to simulate effluent to inform the NMFS Exempted Fishing Permit (EFP) and EPA National Pollutant Discharge Elimination System (NPDES) Permit for the Velella Epsilon Offshore Demonstration Project. Kampachi Farms, LLC (applicant) proposes to develop a temporary, small-scale demonstration net pen operation to produce two cohorts of Almaco Jack (*Seriola rivoliana*) at a fixed mooring located on the West Florida Shelf, approximately 45 miles offshore of Sarasota, Florida (Figure 1; Table 1). Scientists from the NOAA Coastal Aquaculture Siting and Sustainability (CASS) program worked with the EPA project manager and the applicant to develop estimates of effluents and sediment related impacts for the offshore demonstration fish farm.

A numerical production model for two cohorts of Almaco Jack was constructed based upon anticipated farming parameters including configuration (net pen volume and mooring configuration), fish production (species, biomass, size) and feed input (feed rate, formulation, protein content). Using industry standard equations, daily estimates of biomass, feed rates, total ammonia nitrogen production, and solids production (*see Microsoft Excel Spreadsheet – Velella Epsilon Production Model*) were developed under a production scenario to estimate the maximum biomass of 20,000 fish that would be grown to 1.8 kg in approximately 280 days. The total biomass produced with one cohort and no mortality was determined to be 36,280 kg. The density in the cage at harvest would be 28 kg/m^3. Fish will be fed a commercially available growout diet with 43% protein content. Daily feed rations range from 12 kg at stocking to a maximum total daily feed ration equivalent to 399 kg at harvest. Maximum daily excretion of total ammonia nitrogen is estimated at 16 kg and solids production is 140 kg. A total of 66,449

The **Coastal Aquaculture Siting and Sustainability (CASS)** program supports works to provide science-based decision support tools to local, state, and federal coastal managers supporting sustainable aquaculture development. The CASS program is located with the Marine Spatial Ecology Division of the National Centers for Coastal Ocean Science, National Ocean Service, NOAA. To learn more about CASS and how we are growing sustainable marine aquaculture practices at: https://coastalscience.noaa.gov/research/marine-spatial-ecology/aquaculture/ or contact Dr. Ken Riley at Ken.Riley@noaa.gov.

kg of feed will be used for production of each cohort of fish to achieve a feed conversion ratio (FCR) of 1.8. Summary statistics were developed for each cohort and the entire project (Table 2).

Table 1. Boundary locations for the Velella Epsilon Offshore Aquaculture Project.

Location	Latitude	Longitude
Northwest corner	27.072360 N	-83.234709 W
Northeast corner	27.072360 N	-83.216743 W
Southwest corner	27.056275 N	-83.216743 W
Southeast corner	27.056275 N	-83.234709 W

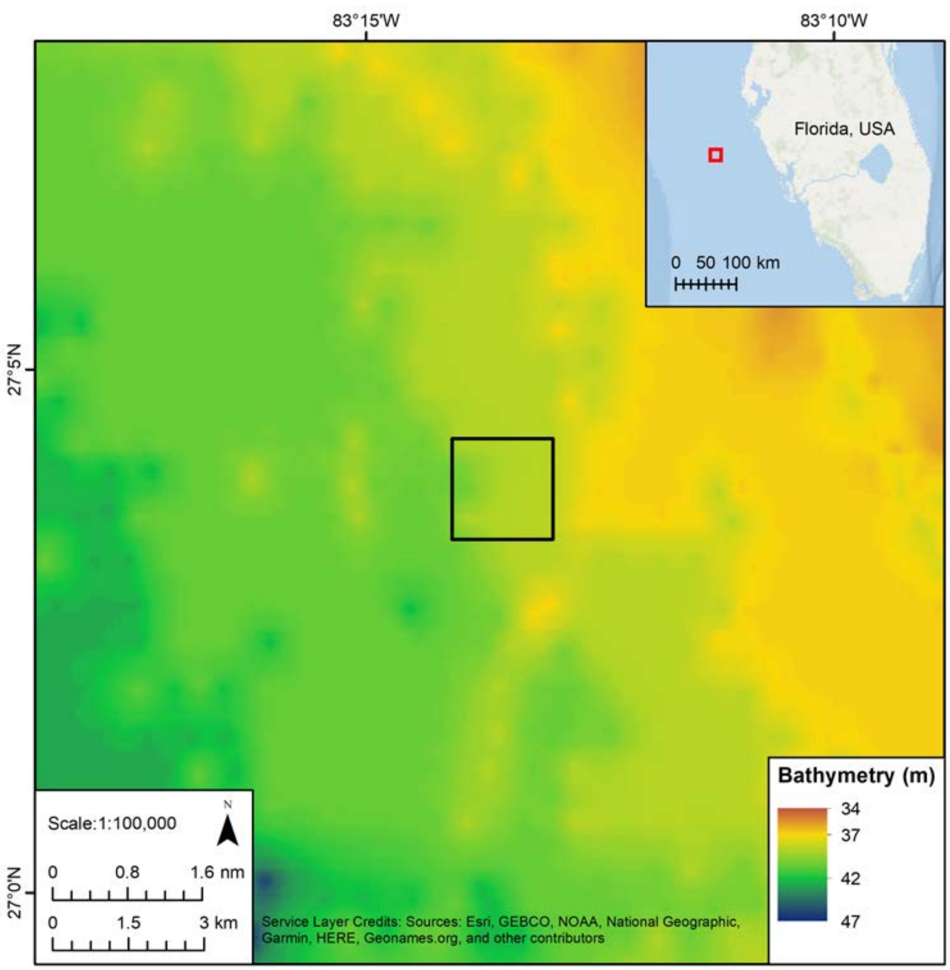


Figure 1. Bathymetric map of proposed Velella Epsilon Offshore Aquaculture Project.

Table 2. Summary statistics for the Velella Epsilon Offshore Aquaculture Project.

Farming parameter	Value
Growout duration	280 days per cohort
Total number	20,000 fish per cohort
Individual size at harvest	1.8 kg
Maximum biomass	36,280 kg
Cage density at harvest	28 kg/m^3
Maximum daily feed rate	399 kg
Total feed used	66,449 kg
Feed conversion ratio	1.8

In order to estimate sediment related impacts, a depositional model (DEPOMOD; Cromey et al 2002) was parameterized with data from the production model and environmental and oceanographic data on the proposed offshore location. DEPOMOD is the most established and widely used depositional model for estimating sediment related impact from net pen operations. DEPOMOD is a particle tracking model for predicting the flux of particulate waste material (with resuspension) and associated benthic impact of fish farms. The model has been proven in a wide range of environments and is considered through extensive peer-review to be robust and credible (Keeley et al 2013). Although this modelling platform was initially developed for salmon farming in cool-temperate waters (Scotland and Canada), it has since been applied and validated with warm-temperate and tropical net pen production systems (Magill et al. 2006; Chamberlain and Stucchi 2007; Cromey et al. 2009; Cromey et al. 2012). Coastal managers responsible for permitting aquaculture worldwide have been using this modelling platform because it produces consistent results that are field validated and comparable (Chamberlain and Stucchi 2007; Keeley et al 2013). It is routinely used in Scotland and Canada to set biomass (and thereby feed use) limits and discharge thresholds of in-feed chemotherapeutants (SEPA 2005). Further, the model output has been used to develop comprehensive and meaningful monitoring programs that ensure environmentally sustainable limits are not exceeded (ASC 2012).

Traditionally a baseline environmental survey is used to inform water quality and depositional models with site specific analysis of currents, tidal flows, sediment profiles, and benthic infaunal profiles (species richness and abundance). In the absence of a survey, data were collected from oceanographic and environmental observing systems in the vicinity of the project area. Current data were obtained from NOAA Buoy Station 42022 along the 50-m isobath and located 45 miles northwest of the project location (27.505 N, 83.741 W). Currents were recorded continuously from July 2015 through April 2018. Currents were measured at 1-meter intervals from 4.0 meters to 42.0 meters below the surface (Table 3). Bathymetric data were obtained from the

NOAA Coastal Relief Model. Bathymetry was resampled to 10 x 10 meter grid cells using a bilinear interpolation to all for use within the deposition model.

Table 3. Water column related impacts for the Velella Epsilon Offshore Aquaculture Project. Values represent summation of daily values over a 280-day production cycle.

Parameter	Value (kg)
Total solids production	23,257
Total ammonia nitrogen	2,743
Total oxygen consumption	16,612
Total carbon dioxide production	19,187

The depositional model was executed for two different production simulations that assume maximum standing biomass and maximum feed rate, which is characteristic when the fish are at pre-harvest size. The first simulation represented the maximum standing biomass for the Velella Epsilon Offshore Aquaculture Project. The model was run for 365 days assuming a net pen with a constant daily standing biomass at 36,275 kg (28 kg/m^3) and a daily feed rate of 1.1 percent of biomass or equivalent to 399 kg of feed. The second simulation doubled production to assess sediment related impacts at higher levels of biomass and feed rates. The second simulation at a higher level of production was intended to aid EPA in development of an environmental monitoring program. Under the second simulation, the model was run for 365 days assuming two net pens each with a combined constant daily standing biomass at 72,550 kg (28 kg/m3 per net pen) and a daily feed rate of 1.1 percent of biomass or equivalent to 798 kg of feed.

Waste feed and fish fecal settling rates are important determinants of distance that these particles will travel in the current flow. The model does not allow the settling velocity of particles to change through the growing cycle. The values used for feed and feces represented those that would be encountered during the period of highest standing biomass, largest feed pellet size, and highest waste output. Each simulation assumed maximum standing biomass each day of the simulation with a fecal settling velocity at 3.2 cm/s. Many marine fish have fecal settling velocities ranging from 0.5 to 2.0 cm/s, while salmonids tend to have higher settling velocities ranging from 2.5 to 4.5 cm/s. Fecal settling velocities applicable to salmon production were used because they are well studied, validated, and allow for maximum benthic impact assessment. Standard feed waste was estimated at 3% and the food settling velocity was 9.5 cm/s. Pelleted fish feed is the single largest cost of fish farming, and because of this expense, farms use best feeding practices to ensure minimal loss. Feed digestibility and water content were set at 85% and 9%, respectively, which are standards based on technical data provided by feed manufacturers. All other model parameters were consistent with existing net pen farm waste modelling methodologies (Cromey et al. 2002a,b) and regulatory farm modelling standards (SEPA 2005).

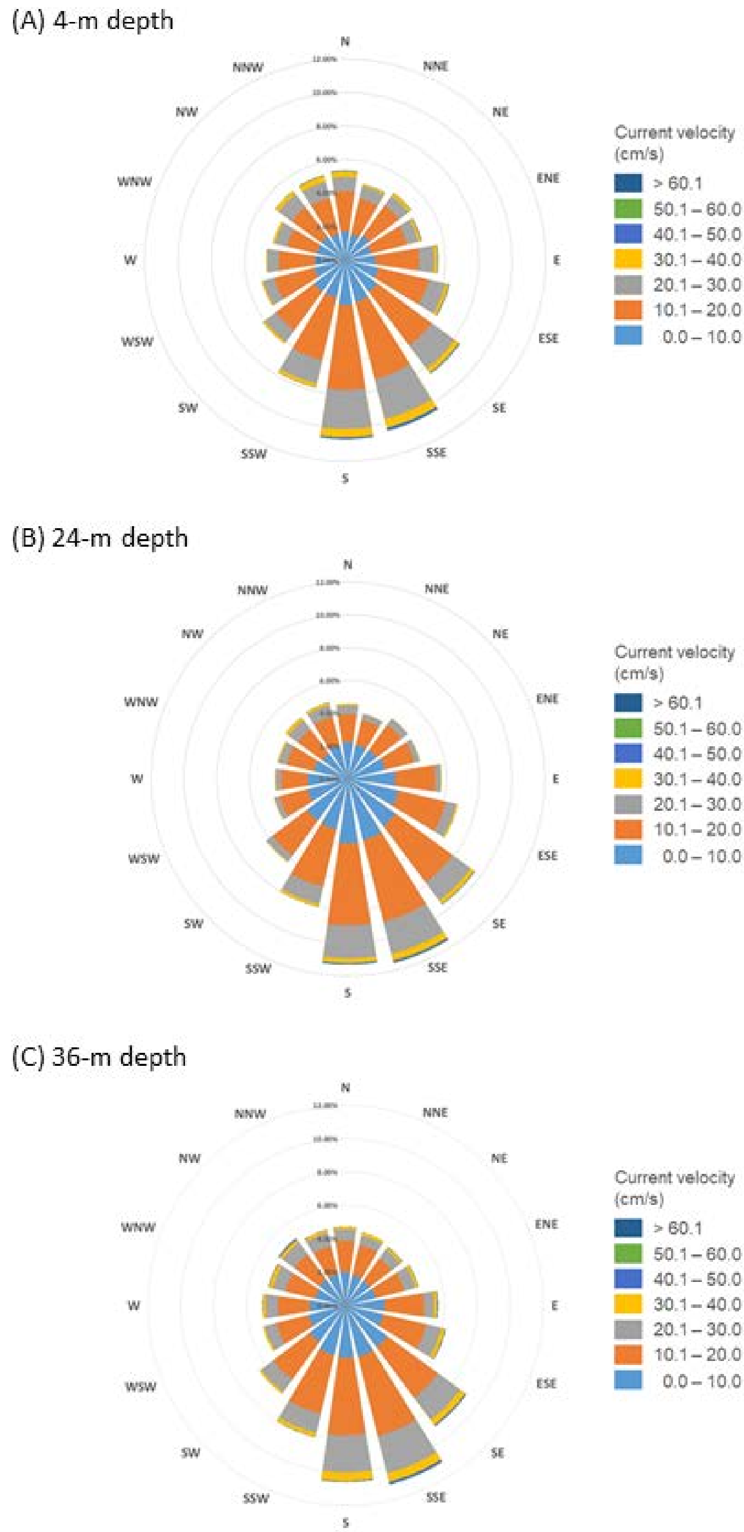


Figure 2. Distribution of current velocities (cm/s) and direction for NOAA Buoy Station 42022 located along the 50-m isobath approximately 45 miles northwest of project location. Currents are reported for water column depths of 4 m, 24 m, and 36 m.

Table 4. Current velocities (cm/s) for NOAA Buoy Station 42022 located along the 50-m isobath approximately 45 miles northwest of project location. Average current velocities are reported with standard deviation.

Depth (m)	Average current (cm/s)	Maximum current (cm/s)
4	14.6 ± 8.1	83.9
10	12.8 ± 8.0	80.3
20	12.2 ± 7.3	67.6
30	13.8 ± 8.2	70.8
40	12.9 ± 7.6	68.7

Table 5. Model settings applied for depositional simulations of an offshore fish farm in the Gulf of Mexico.

Input variable	Setting
Feed wastage	3%
Water content of feed pellet	9%
Digestibility	85%
Settling velocity of feed pellet	0.095 m/s
Settling velocity of fecal pellet	0.032 m/s

Offshore fish farms can be managed in terms of maximum allowable impacts to water quality and sediment that are based on quantifiable indicators. This project will be difficult to monitor and detect environmental change because of the relatively low level of production associated with a demonstration farm and the nature of the net pen configuration deployed and moving about on a single point mooring.

Overall, this analysis found that the proposed demonstration fish farm is not likely to cause significant adverse impacts on water quality, sediment, or the benthic infaunal community. Water quality modelling demonstrated that at the maximum farm production capacity of 36,280 kg only insignificant effects would occur in the water column. We believe that the excreted ammonia levels of 16 kg per day will be rapidly diluted to immeasurable values near (within 30 meters) of the net pen under typical flow regimes of 12.8 ± 8.0 cm s^{-1}. Dilution models could be used to estimate nearfield and farfield dilution as used in conventional ocean outfall systems.

However, based on our experience with offshore aquaculture installations and development of modeling and monitoring programs, we believe that ammonia levels will be difficult to detect beyond the zone of initial dilution.

The model does not allow the net pen or mooring configuration to move in space or time, therefore, the model was executed at a fixed location (27.064318, -83.225726) in the center of the project location (i.e., farm footprint). Net depositional flux was predicted in g m^{-2} yr^{-1} on a two-dimensional grid overlaid on the farm footprint. The grid size was selected such that it would encompass the whole depositional footprint. The distribution of deposited materials beneath the cage is a function of local bathymetry and hydrographic regime. In low current speed environments, only limited distribution of the solids footprint occurs. As current speeds increase, greater dispersion of solids occurs during settling resulting in a more distributed footprint. Greater water depth at a site results in increased settling times and result in a more distributed footprint. Solids distribution is even greater where bottom current speeds are high causing sediment erosion and particle resuspension and redistribution.

The predicted carbon deposition and magnitude of biodeposition for the single and dual cage scenarios were estimated over a 2.04 km by 2.04 km evaluation grid. The grid is partitioned into cells numbering 82 east-west by 82 north-south and identified as 1-82 in both directions. The units of the axes in both Figures 3 and 4 are these cell counts. The dimension of a single cell therefore is 2,040m/82=24.87 m. The depositional model predicted and integrated at each one-hour step, the total carbon that ended up in each cell in the model grid, of which there are 82 x 82 = 6,724 cells. At the end of an execution run the accumulated mass of carbon within each cell is reported. Predicted annual benthic carbon deposition are presented in Figures 3 and 4. Frequency histograms of the carbon deposition per cell were created to help with interpretation of results. The depositional data derived from the frequency histograms are presented in Table 6 and 7.

Table 6 shows the distribution of carbon that results from a single net pen operated for one year at maximum standing biomass. Of the 6,724 computational cells, 1,386 had no carbon from the farm. Over 88% of the cells received less than or equal to 1 gram of carbon. Only 2 cells on the farm measured more than 4 grams of carbon over the year-long simulation.

Table 7 shows the distribution of carbon that results from a two net pens operated for one year at maximum standing biomass. Similar to the depositional model with one cage, over 75% of the cells received less than or equal to 1 gram of carbon. One cell was calculated to receive more than 11 grams, but it is a minuscule mass of carbon to be assimilated by a square meter of ocean bottom.

Table 6. Frequency of carbon deposition within 6,724 cells, each measuring 619 m^2, over a 4.16-km^2 grid system. Values represent an annual sum of carbon deposition resulting from an offshore fish farm with a constant standing stock biomass of 36,275 kg.

Carbon deposition ($g/m^2/yr$)	Occurrence (N)	Frequency (%)
0	1,386	20.6
0.1 – 1.0	4,561	67.8
1.1 – 2.0	620	9.2
2.1 – 3.0	141	2.1
3.1 – 4.0	14	0.2
4.1 – 5.0	2	0.03

Table 7. Frequency of carbon deposition within 6,724 cells, each measuring 619 m^2, over a 4.16-km^2 grid system. Values represent an annual sum of carbon deposition resulting from an offshore fish farm with a constant standing stock biomass of 72,550 kg.

Carbon deposition ($g/m^2/yr$)	Occurrence (N)	Frequency (%)
0	999	14.9
0.1 – 1.0	4,086	60.8
1.1 – 2.0	903	13.4
2.1 – 3.0	390	5.8
3.1 – 4.0	200	3.0
4.1 – 5.0	75	1.1
5.1 – 6.0	40	0.6
6.1 – 7.0	20	0.3
7.1 – 7.0	7	0.1
8.1 – 9.0	3	0.04
9.1 – 10.0	0	0.0
10.1 – 11.0	0	0.0
11.1 – 12.0	1	0.01

Because of physical oceanographic nature of the site including depth and currents (>10 cm/sec), dissolved wastes will be widely dispersed and assimilated by the planktonic community (Rensel et al. 2017). The results of the depositional model show that benthic impacts and accumulation of particulate wastes would not be detectable or distinguishable from background levels through measurement of organic carbon, even when the standing stock biomass is doubled. The final component or step in the modeling process is to predict some measure of change in the benthic community as a result of increased accumulation of waste material. Deposition of nutrients may result a minor increase in infaunal invertebrate population or no measureable effect whatsoever.

As part of the model assessment, benthic community impact was predicted by an empirical relationship between depositional flux (deposition and resuspension) and the Infaunal Trophic Index (ITI). The ITI is a biotic index that has been used to quantitatively model changes in the feeding mode of benthic communities and community response to organic pollution gradients (Word 1978, 1980; Maurer et al. 1999). ITI scores are calculated based on predicted solids accumulation on the seabed (g m^{-2} yr^{-1}). ITI scores range from 0 to 100 g m^{-2} yr^{-1} and are banded in terms of impact as:

- 60 < ITI < 100 – benthic community normal
- 30 < ITI < 60 – benthic community changed
- ITI < 30 – benthic community degraded.

Correlations between predicted solids accumulation and observed ITI and total infaunal abundance have been established using data from numerous farm sites around the world. Among the findings of these studies, a completely unperturbed benthic community at equilibrium is considered to have an ITI of 60 and an ITI rating of 30 is the boundary where the redox potential of the upper sediment goes from positive to negative and sulfide production begins. A standard approach in Europe and Canada is to use an ITI of 30 as a lower limit for acceptable impacts. In the present study with the Velella Project, the two model simulations resulted in ITI predictions ranging from 58.67 to 58.81. The predicted ITI close to 60 suggests that the Velella Project, as proposed, will not likely have a discernable impact on the sediment or benthic infaunal community around the site.

In summary, the resulting model predictions covered a range of outputs representing both submitted farming parameters and a worst-case scenario (doubled standing stock biomass) for the Velella Epsilon Project. We conclude that there are minimal to no risks to water column or benthic ecology functions in the subject area from the operation of the net pen as described in Kampachi Farms, LLC applications for EFP and NPDES permits.

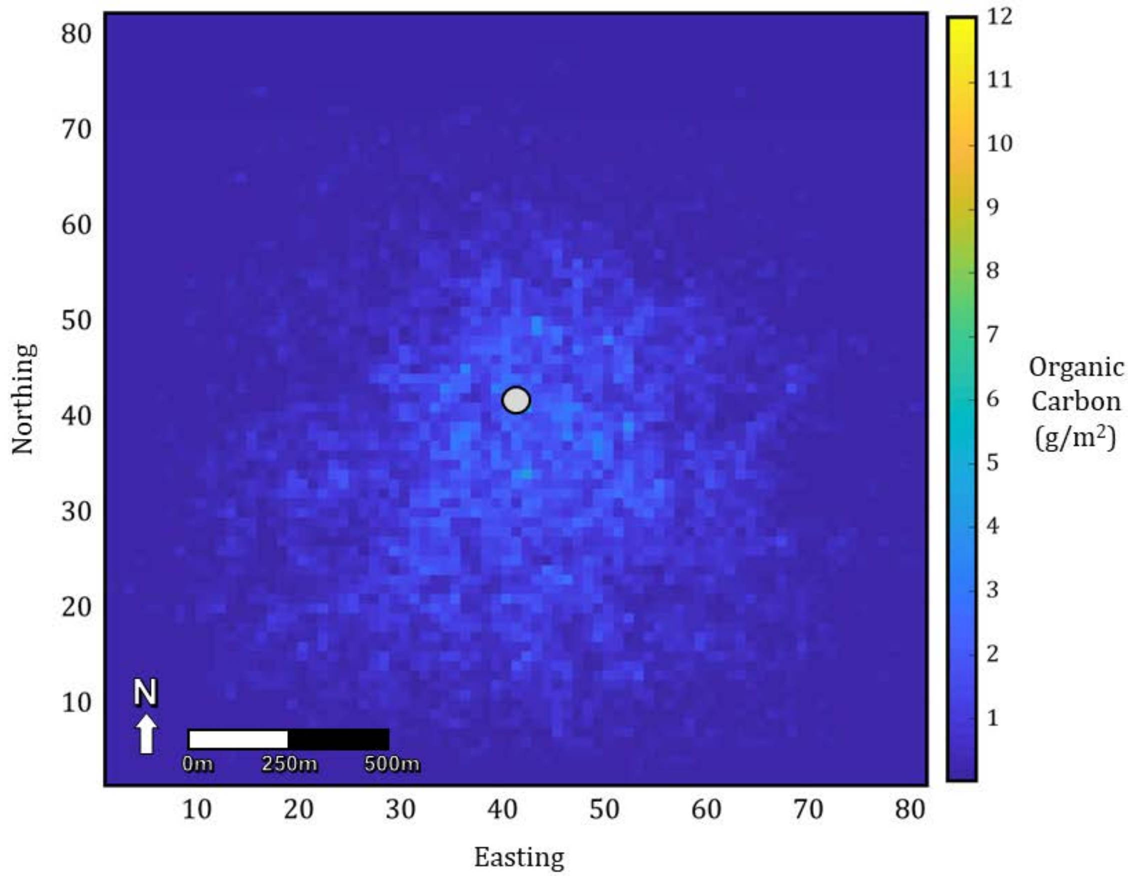


Figure 3. Predicted annual benthic carbon deposition field beneath one net pen with a standing stock biomass of 36,280 kg of Almaco Jack (*Seriola rivoliana*). Gray circle indicates center position of the net pen. Axes indicate simulation cell numbers and deposition mass is in grams.

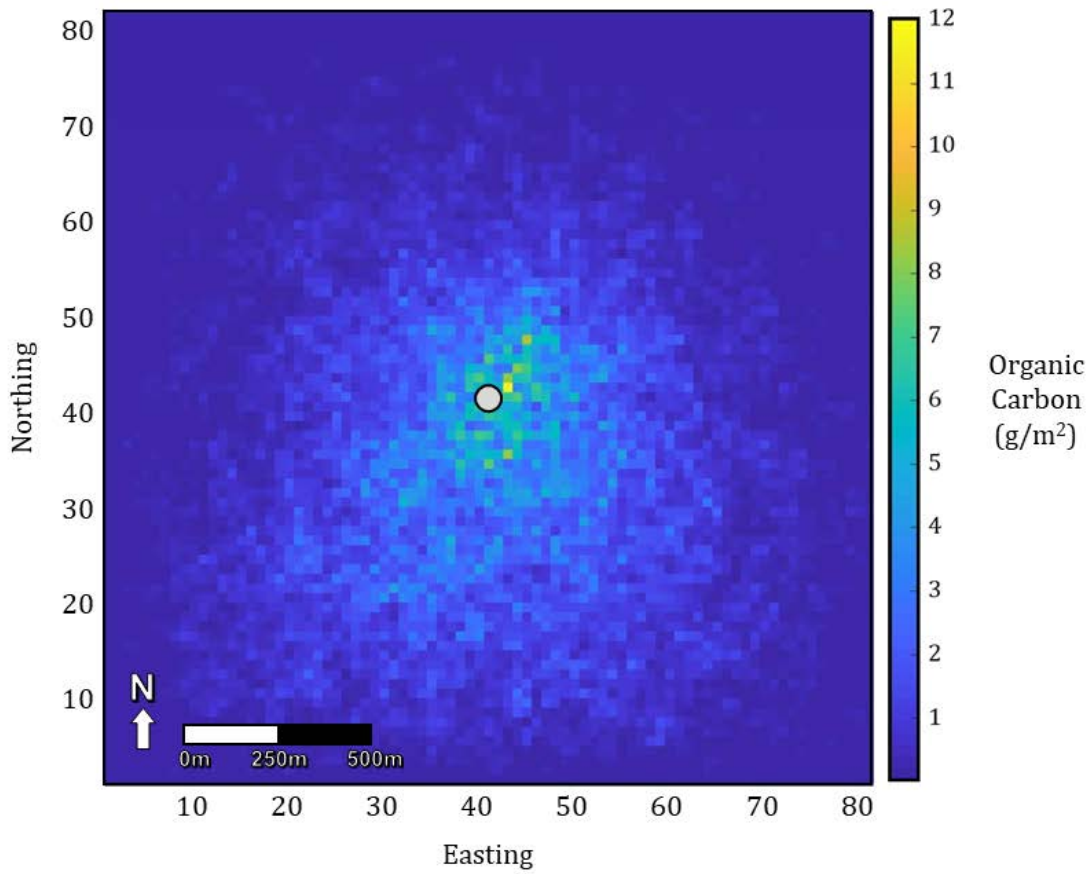


Figure 4. Predicted annual benthic carbon deposition field beneath two net pens with a standing stock biomass of 72,560 kg of Almaco Jack (*Seriola rivoliana*). Gray circle indicates center position of the net pen. Axes indicate simulation cell numbers and deposition mass is in grams. The center of the pens is located at (27.056275 N, -83.216743 W). Predicted carbon loading was derived from the 12-month time series relationship based on depositional flux with resuspension.

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CASS Technical Report

Addendum: Environmental Modelling to Support NPDES Permitting for Velella Epsilon Offshore Demonstration Project in the Southeastern Gulf of Mexico

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Environmental Engineer: Barry King, PE
Submitted to Kip Tyler (EPA), September 23, 2020

This report is submitted as an addendum to the report "Environmental Modelling to Support NPDES Permitting for Velella Epsilon Offshore Demonstration Project in the Southeastern Gulf of Mexico" of August 2018. The Environmental Protection Agency (EPA) is preparing to issue an NPDES permit for the Velella Epsilon Offshore Demonstration Project. The applicant, Kampachi Farms, LLC (now Ocean Era, Inc.), proposes to develop a temporary, small-scale demonstration net pen operation to produce a single cohort of Almaco Jack (*Seriola rivoliana*) at a fixed mooring located on the West Florida Shelf, approximately 45 miles offshore of Sarasota, Florida. With this addendum, scientists from the NOAA Coastal Aquaculture Siting and Sustainability (CASS) program continued to work with the EPA NPDES permitting program to develop estimates of farm discharge deposition on the seabed and surrounding benthic community. Specifically, the farm simulation was executed for five years at the maximum stocking density, with the predicted feed and fish waste daily contributions. The most recent version of DEPOMOD modelling software (i.e., NewDEPOMOD) was used to calculate the distribution and deposition of solid materials at the project location.

Current data were obtained from NOAA Buoy Station 42022 along the West Florida Shelf at the 50-m isobath and located 45 miles northwest of the project location (27.505 N, 83.741 W). The buoy is owned and data are collected by the University of South Florida Coastal Ocean Monitoring and Prediction System with support from the U.S. Integrated Ocean Observing System. Lacking five continuous years of water column flow data at the site, a single year of current data from the original simulation was used to produce the assumed current profile at the project location. Given that single year current data was used for this model, year-to-year variability in oceanographic patterns that are associated with changing climate and weather patterns, water temperature, and storm tracks (e.g., hurricanes) are not evaluated.

As previously reported, bathymetric data were obtained from the NOAA Coastal Relief Model. Bathymetry was resampled to 25 x 25 meter grid cells using a bilinear interpolation to all, for use within the deposition model. The characterization of the site and composition of benthic surfaces were informed by U.S. Geological Survey offshore surficial sediment data (usSEABED) that describes seabed characteristics, including textural, geochemical, and compositional information for the Gulf of Mexico. The benthic surfaces for the project location were also informed by acoustic survey and sub-bottom profile data included with the applicant's Baseline Environmental Survey (BES). Sediment samples, including core or grab samples, were not collected or analyzed as part of the BES. Without knowing explicitly the hydraulic roughness of the benthic surface at the project location, the model was run (as previous) with the assumption of a smooth benthic surface characteristic of unconsolidated sediments (coarse to fine grain sand bottom) such as those common on the West Florida Shelf. Modelling with a smooth benthic surface and reduced roughness tends to lower the bed shear stress and increase resuspension.

The model does not allow the net pen or mooring configuration to move in space or time, therefore, the model was executed at a fixed location (27.064318, -83.225726) in the center of the project location (i.e., farm footprint). The model domain also remained as reported. The model domain was set to encompass the whole initial depositional footprint under average current velocities estimated at 20 cm/s and with particles settling at rates faster than 0.75 cm/s. The dimensions for the model domain are standards required by the Scottish Environmental Protection Agency for marine aquaculture operations. The domain also captures reasonable efficiency in processing large data sets or long time-series data (*i.e.*, model requires 24-36 hours to process). The predicted carbon deposition and magnitude of biodeposition were estimated over a 2.04 km by 2.04 km evaluation grid. The grid is partitioned into square cells with sides measuring 24.87 m and cells numbering 82 east-west by 82 north-south with cells identified as 1-82 in both directions. The modelling software reports the average solids and carbon within each cell as grams per square meter at the moment it is queried, typically at the end of the simulation period.

This model execution did not allow the settling velocity of particles to change through the growing cycle. The values used for feed and feces represented those that would be encountered during the period of highest standing biomass, largest feed pellet size, and highest waste output from the net pen operation. Each simulation assumed maximum standing biomass each day of the simulation with fecal settling and food settling velocities applicable to salmon production at 3.5 and 9.5 cm/s, respectively. The values for fecal settling velocity may have implications for dispersion. For this study, a conservative settling velocity (3.5 cm/s) was used to assess the maximum extent of fecal deposition on benthic surfaces. Knowledge of the physical properties of fish feces under net pen conditions is rudimentary. Most reported literature addresses the fecal stability, density, and settling velocity (3.5 cm/s) of farmed salmon (Reed et al. 2009). Data on fecal settling velocity for Amberjack (*Seriola* spp.) are scarce. Amberjack feces are shapeless and unstable in the water column (*e.g.*, lacking cohesiveness). The species has a reported fecal settling velocity of about 1.6 cm/s owing to its smaller size and density (Fernandes and Tanner 2008).

The model was run for 1,825 days assuming a net pen with a constant daily standing biomass at 36,288 kg (22.85 kg/m3) and a daily feed rate of 1.1 percent of biomass or equivalent to 399 kg of feed. Standard feed waste was estimated at 3%. The model simulates release of fecal and feed particles from a net pen at hourly increments. Multiple particles are released representing different mass percentages and different settling velocities defined in the set-up files. The particles are all tracked throughout the domain at each time step over the duration of the simulation. Particles that are transported out of the domain boundary at 1,020 m away at the closest, are lost and removed from the calculations. Only masses of material that remain in the domain at the moment a surface is queried and recorded are reported. At high current velocity sites, such as this project location where the average flow is 13 cm/s and peaking at 67 cm/s at 4 meters above the seabed (Figure 1), the bulk of settleable solids from the aquaculture operation are dispersed outside of the simulation domain. It is expected that these solids would continue to be oxygenated and transported along benthic surfaces downstream where currents allow for deposition and resuspension. This particulate organic carbon would be readily available and consumed by bacteria and benthic infauna.

SOFTWARE UPDATES

NewDEPOMOD (version 1.3, released July 2020) and previous versions of DEPOMOD are computer models that have been developed by the Scottish Association of Marine Science to inform siting, permitting, and regulation of marine fish farms. The model predicts the impact of farm deposition on the seabed in order to optimize the operation of aquaculture sites to match the environmental capacity. The Scottish Environmental Protection Agency has used the software for over a decade in direct support of their aquaculture permitting standards.

NewDEPOMOD incorporates a range of features in its newest release including:

- improved predictive abilities for offshore aquaculture projects including the capacity to use three-dimensional hydrodynamic flow field data;
- an updated and characterized resuspension process using data from an extensive set of field measurements of erosion, resuspension and transport at farm sites;
- a new model framework for sediment deposition which allows the model to include varying bathymetry; and
- a model that produces conservative estimates of the holding capacity of a proposed site that can be tuned using data collected once a farm enters production to improve predictions, also useful for planning expansion of an existing farm.

ESTIMATING DEPOSITION AND MASS FLOW TO THE BENTHOS

Mass flows of solids onto the seabed were estimated from the mass of cultured fish on the farm and the specific rate, which they are fed (Table 1). We developed a model for a 1,296-m^3 net pen[1] with a stocking density of 28 kg/m^3, which will yield a biomass of 36,288 kg. An estimated 399.17 kg of feed will be applied per day at a feeding rate of 1.1 percent of body weight. During permitting, the applicants changed the net pen design to a larger volume, however the biomass within remained the same at 36,288 kg which is the keystone value for the waste dispersion simulation.

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[1] After completion of modelling, it was noted by the EPA that minor changes occurred with submission of the Ocean Era permit application. The net pen configuration changed as did the size of fish at harvest. The discrepancy in net pen volume (1,296 m^3 vs 1,588 m^3) and fish size (1.8 kg vs. 2.0 kg), and the implications on model results are negligible.

With a feed moisture content of 9% and an estimated 3% food waste rate, the feed dry mass lost from the net pen is: [399.17 kg feed * (100%-9% kg dry feed / kg feed) * 3% kg dry feed lost/kg dry feed] = 10.89 kg dry feed lost to the environment each day, or 0.454 kg per hour.

Since the feed is measured as 49% carbon, the flux is: 10.89 kg dry feed wastage * 0.49 kg carbon/ kg dry feed = 5.34 kg carbon per day from feed.

Similarly, for the fecal mass produced with the assumed 9% feed moisture and 85% utilization: [(399.17 kg feed – 3% lost (11.97 kg)) * 15% fecal mass/mass of solid feed ingested * 91% kg solid feed / kg feed] = 52.85 kg of fecal solids per day, or 2.2022 kg per hour.

Fecal matter is measured as 30% carbon and yields: 52.85 kg of fecal solids * 0.30 kg carbon / kg of fecal solids = 15.85 kg carbon per day

Combining the flux masses for solids and carbon an estimated 63.74 kg of solids and 21.19 kg of carbon are released into the environment each day from the demonstration project.

Table 1. Summary statistics for the Velella Epsilon Offshore Aquaculture Demonstration Project.

Farming parameter	Value
Initial Total number	20,000 fish
Individual size at harvest	1.8 kg
Maximum biomass during growout	36,288 kg
Net pen density at harvest	22.85 kg/m^3
Maximum daily feed rate	399 kg
Total feed used	66,449 kg
Feed conversion ratio	1.8

Table 2 reports the mass flows of solids and carbon from the Velella Epsilon Offshore Aquaculture Demonstration Project within the simulation domain. The bulk of released solids and their carbon are lost from the domain, carried into the far-field by currents. Comparing values of solids in Table 2, the simulation predicts that 3.63% of the solids remain within the simulation domain after five years. There are periods in the water flow cycles when solids accumulation is variable in the domain, as illustrated in Figure 2. The masses on the final day approximate the average concentrations.

Table 2. Mass flows of solids and carbon from the Velella Epsilon Offshore Aquaculture Demonstration Project within the simulation domain at the end of 5 years.

Model Parameters and Simulation Results	Value
Mass of feed applied (5 years)	728,481.60 kg
Mass of feed wastage (5 years)	19,887.57 kg
Mass of feed wastage carbon (5 years)	9,744.89 kg
Mass of fecal materials (5 years)	96,454.61 kg
Mass of fecal carbon (5 years)	28,936.38 kg
Total mass dry solids released / day	63.75 kg
Total mass dry solids released / year	23,268.43 kg
Total mass dry solids released / 5 years	116,342.17 kg
Total mass carbon released / day	21.20 kg
Total mass carbon released / year	7,736.25 kg
Total mass carbon released / 5 years	38,681.27 kg
Solids balance (Total solids within domain after 5 years)	4,224.87 kg
% solids retained inside domain	3.63 %
% solids exported outside domain	96.37 %
Carbon balance (Total carbon within domain after 5 years)	1,406.13 kg
% carbon retained inside domain	3.64 %
% carbon exported outside domain	96.36 %

At the project location, water velocities are typical for currents along the West Florida Shelf. Figure 1 illustrates the water velocity at the Velella site at a depth of 36.7 meters or approximately 4.0 meters above the seafloor. Currents at this project location will likely re-suspend feed wastes and fecal materials transporting these solids across the seafloor. The simulation software calculates the movement of the released solids using the particle characteristics, the nature of the seafloor, and the velocity of the water body in the proximity of the seafloor.

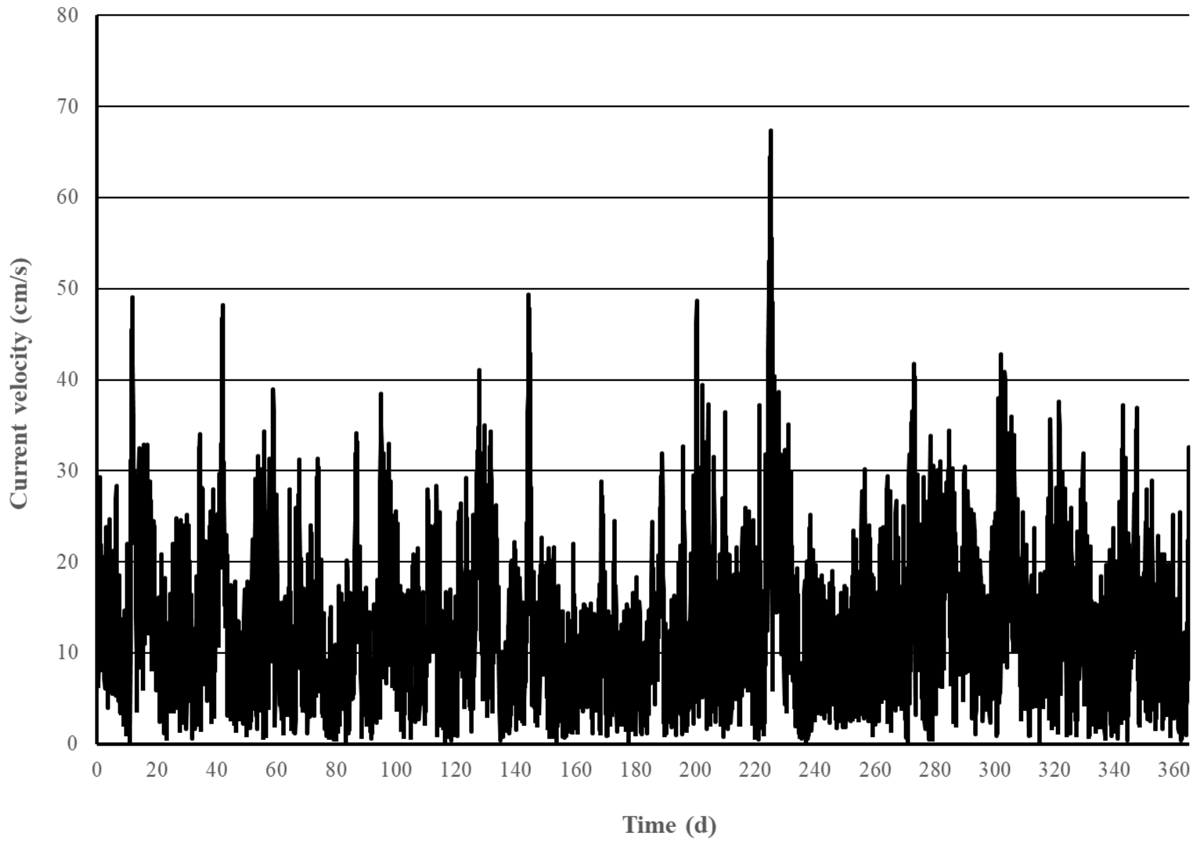


Figure 1. Water currents and flow velocity measured at 4 m above the seafloor.

Figure 2 illustrates the fate of the remaining solids within the domain over the five-year simulation, calculated from the total mass of released solids, minus the total mass of solids that are exported out of the simulation domain. The figure shows that over the five-year simulation solids on the seafloor within the domain reach an equilibrium, at an average total mass of 4,013 kg. The leading edge of the plot illustrates the point material accumulates on the seabed where it will eventually resuspend leading to more material being transported away from the depositional site as currents reach the shear force threshold. During the first days of operation little material was available for resuspension, all the while, new material was being added at a constant 63.75 kg per day.

NewDEPOMOD reports distribution of solids as surface plots of either solids or carbon, it does not distinguish between the sources of the carbon, either feed or fecal, and are combined. In Figure 3, the distribution of carbon is plotted for the final hour of the five-year simulation. Within the software, each surface plot generates its own scale to coincide with the colors on the map. The reader should use caution when comparing plots.

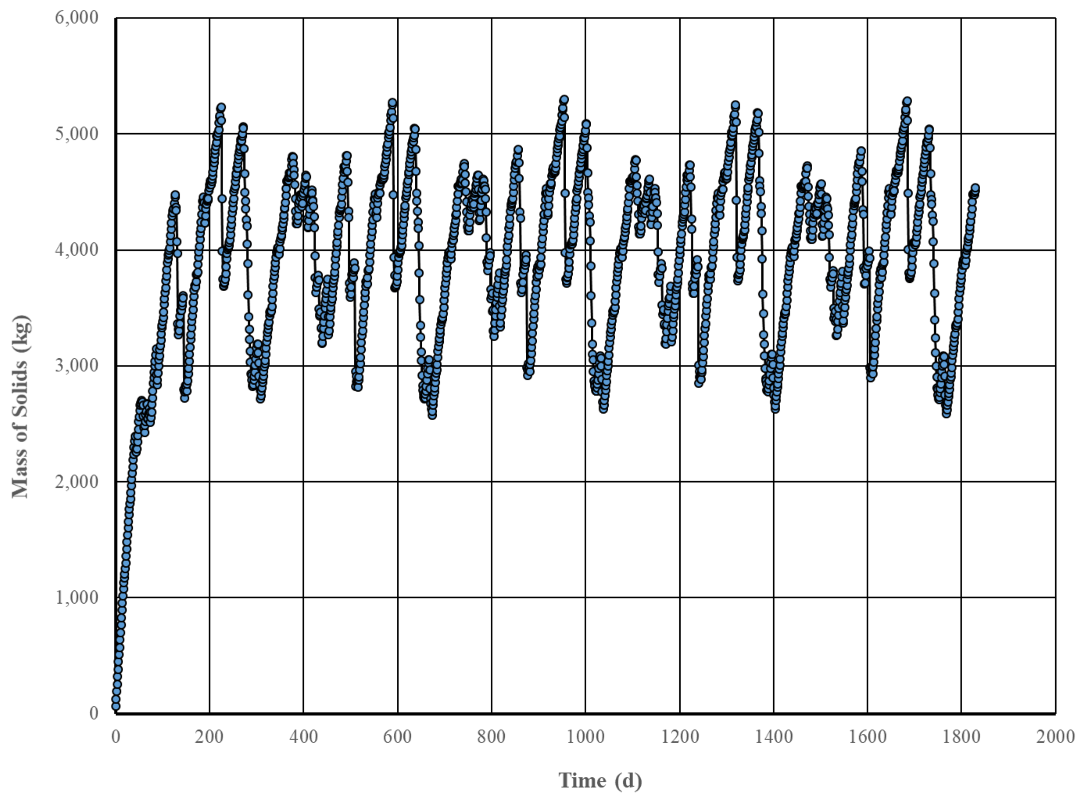


Figure 2. Predicted solids deposition beneath one net pen with a standing stock biomass of 36,288 kg of Almaco Jack (*Seriola rivoliana*) after five-year farm simulation.

Figure 3 shows the carbon distribution over the 2,040 x 2,040 meter Velella simulation domain on day number 1,830. The highest concentration of aquaculture sourced carbon on the site is 4.35 g/m^2. Most noticeable in this deposition prediction map is the wide distribution of carbon over 4 km^2 with small accumulations and no areas of excessive concentrations. Frequency histograms of the carbon deposition per cell were created to help with interpretation of results. The depositional data derived from the frequency histograms are presented in Table 3.

This wide dispersion and low concentration of carbon created the average Infaunal Trophic Index (ITI) score for this final overall benthic surface of 58.96 out of 60. As previously reported, a predicted ITI of close to 60 suggests that the Velella project will not likely have a discernable impact on benthic communities around the project location. Similar to other studies reporting ITI as a measure of benthic impacts from net pen operations, we do not expect significant impact on sediment redox potential or sulfide production. For example, Hargrave (2010) and Keeley et al. (2013) extensively documented correlations among the carbon deposition rate, redox potential, hydrogen sulfide concentration, interstitial dissolved oxygen, and ITI. We believe that the Velella project will present challenges for monitoring and detecting environmental impacts on sediment chemistry or benthic communities because of the circulation around the project location and the small mass flows of materials from the net pen installation. As the simulation illustrates, the high energy environment at the site and the mass flow of materials equilibrates at a resident total mass of waste products at approximately 4,000 kg with local masses never exceeding more than 43.4 g solids per square meter for a single sample point over the 5 year simulation.

CONCLUSION

There are minimal to no risks to sediment chemistry or benthic ecology functions in the project area from the operation of the net pen as described in the Ocean Era, LLC application for an NPDES permit.

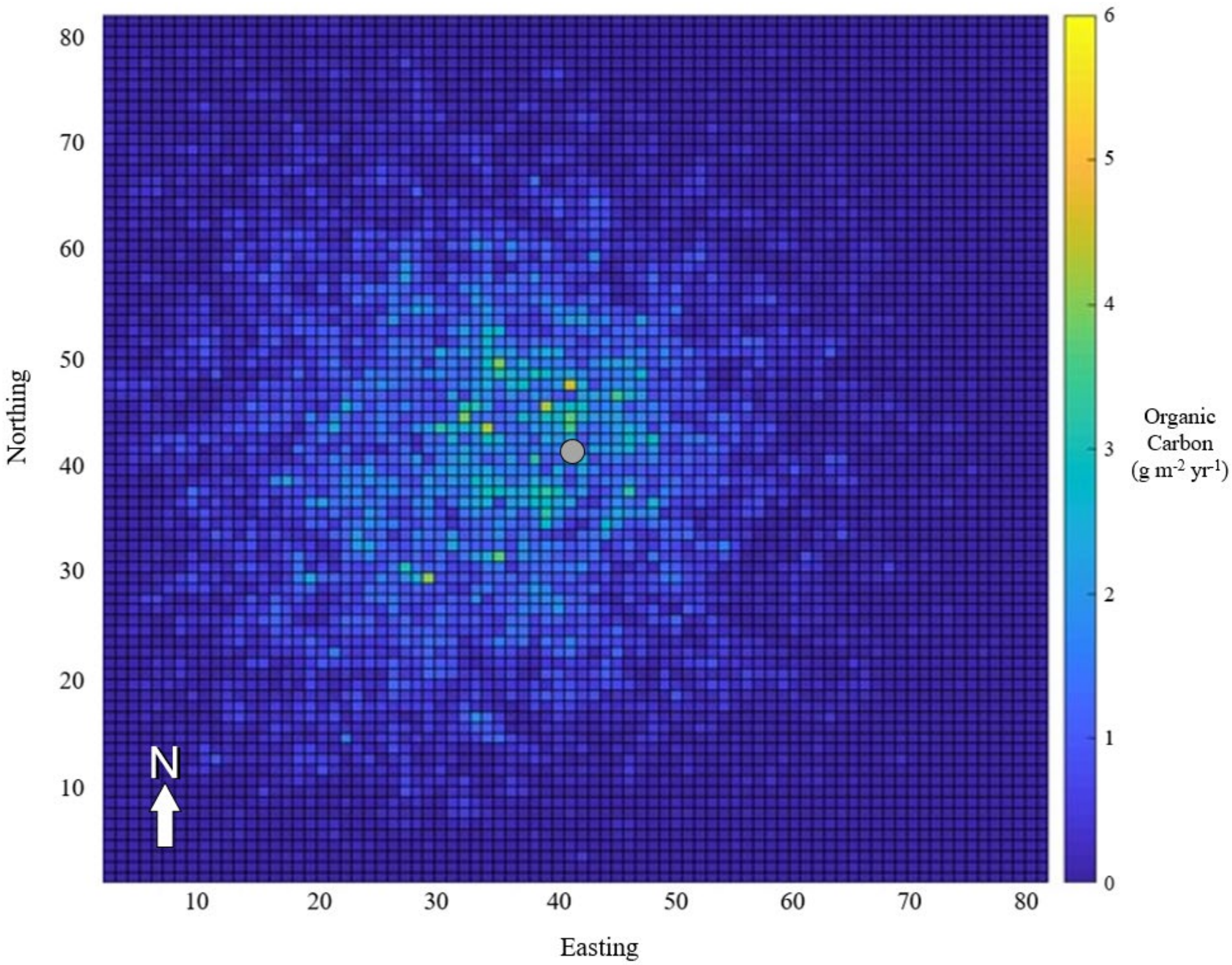


Figure 3. Predicted benthic carbon deposition field beneath one net pen with a standing stock biomass of 36,288 kg of Almaco Jack (*Seriola rivoliana*) after five years. Grey circle indicates center position of the net pen. Axes indicate simulation cell numbers and carbon deposition mass is in grams.

Table 3. Frequency of carbon deposition within 6,724 cells, each measuring 619 m^2, over a 4.16-km^2 grid system. Values represent an annual sum of carbon deposition resulting from an offshore fish farm with a constant standing stock biomass of 36,288 kg.

Carbon deposition ($g/m^2/yr$)	Occurrence (N)	Frequency (%)
0	1,508	22.43
0.1 – 1.0	4,526	67.32
1.1 – 2.0	559	0.08
2.1 – 3.0	111	1.65
3.1 – 4.0	16	< 0.01
4.1 – 5.0	4	< 0.01

REFERENCES

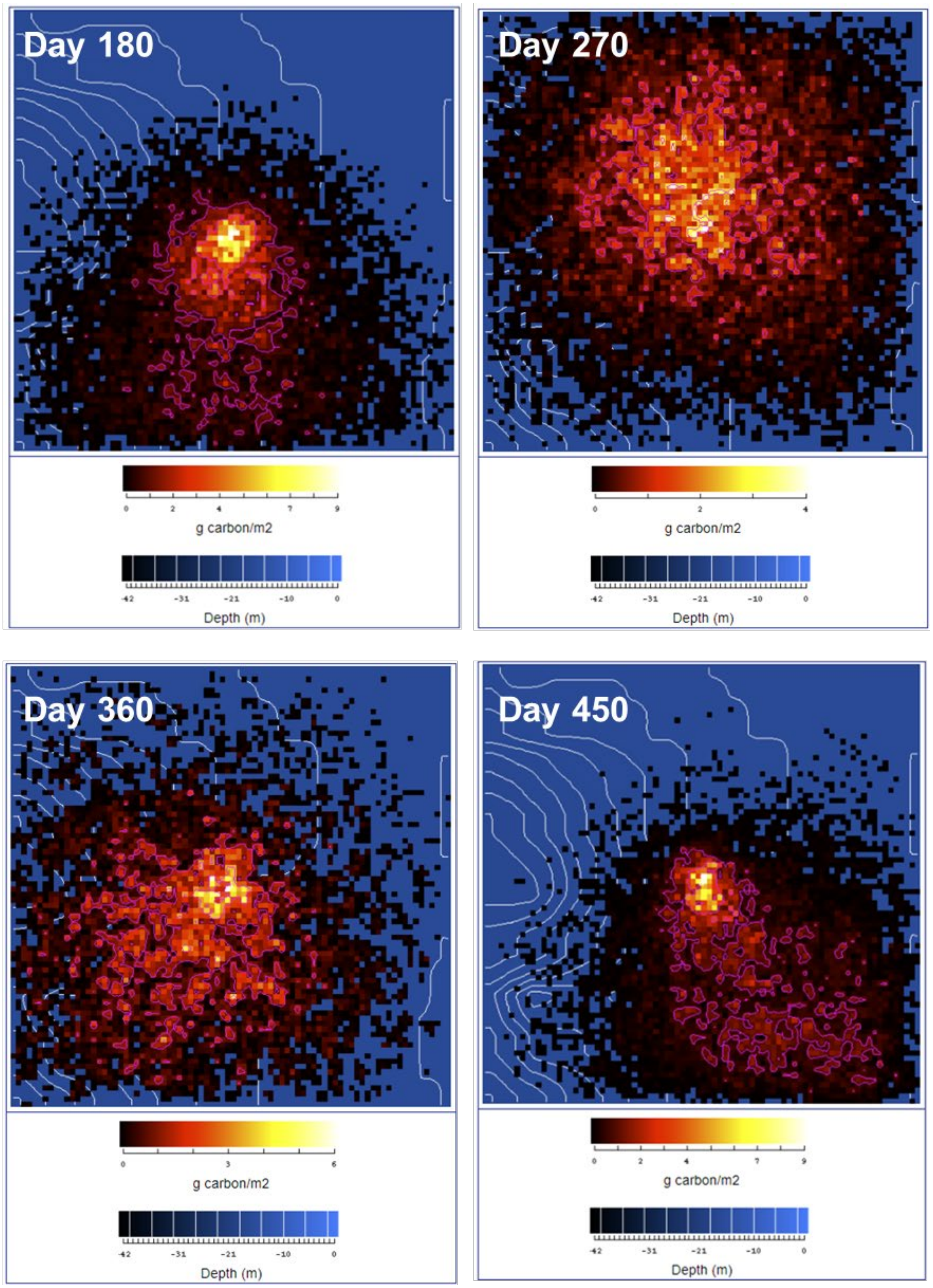
Fernandes, M. and J. Tanner. 2008. Modelling of nitrogen loads from the farming of yellowtail kingfish *Seriola lalandi* (Valenciennes, 1833). Aquac. Res. 39: 1328–1338.

Hargrave, B.T. 2010. Empirical relationships describing benthic impacts of salmon aquaculture. Aquac. Env. Inter. 1(1): 33-46.

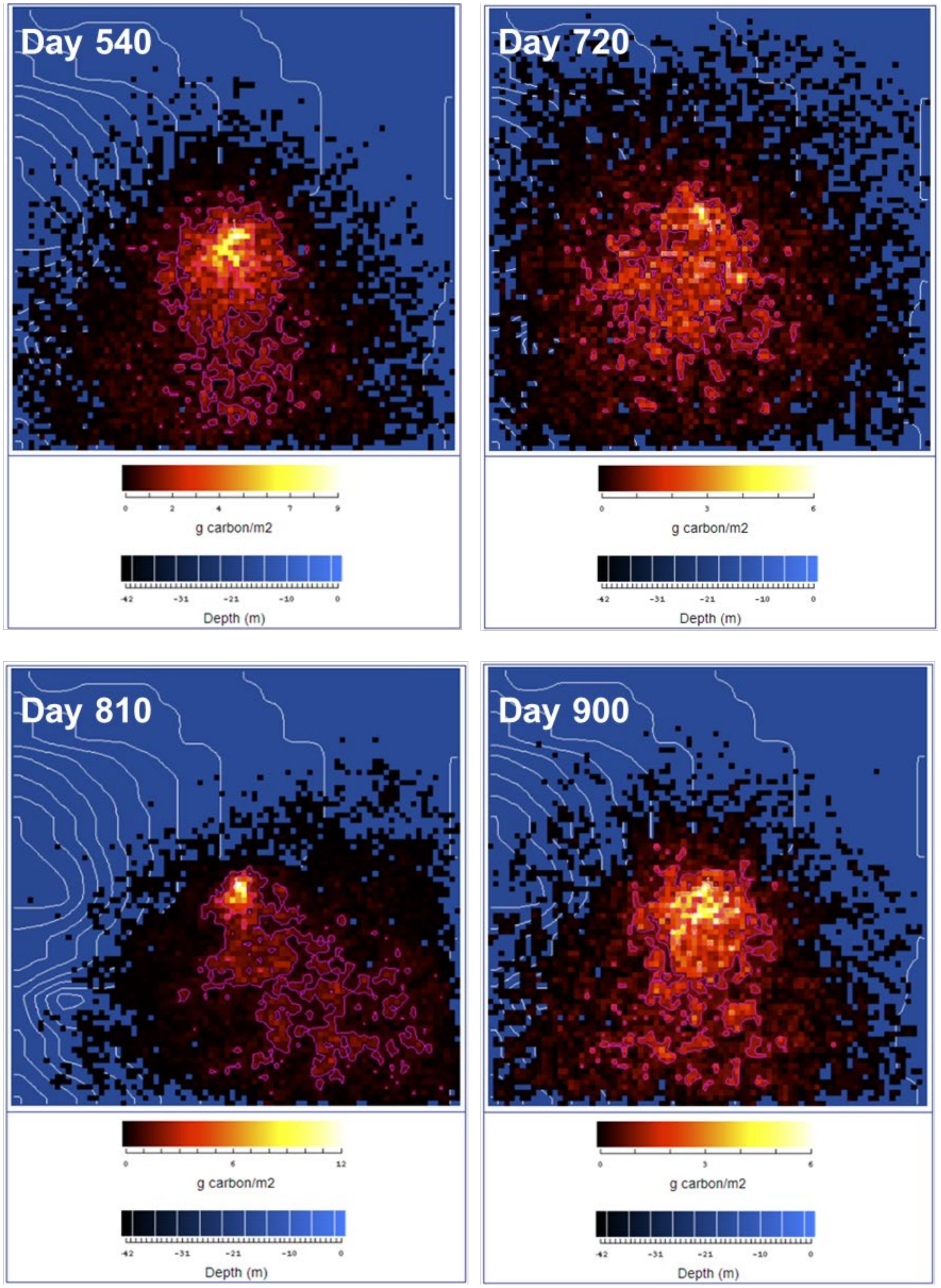
Keeley, N. B., C. J. Cromey, E. O. Goodwin, M. T. Gibbs, and C. M. Macleod. 2013. Predictive depositional modelling (DEPOMOD) of the interactive effect of current flow and resuspension on ecological impacts beneath salmon farms. Aquac. Env. Inter. 3(3): 275-291.

Reid, G. K., M. Liutkus, S. M. C. Robinson, T. R. Chopin, and others. 2009. A review of the biophysical properties of salmonid faeces:implications for aquaculture waste dispersal models and integrated multi-trophic aquaculture. Aquac. Res. 40: 257–273

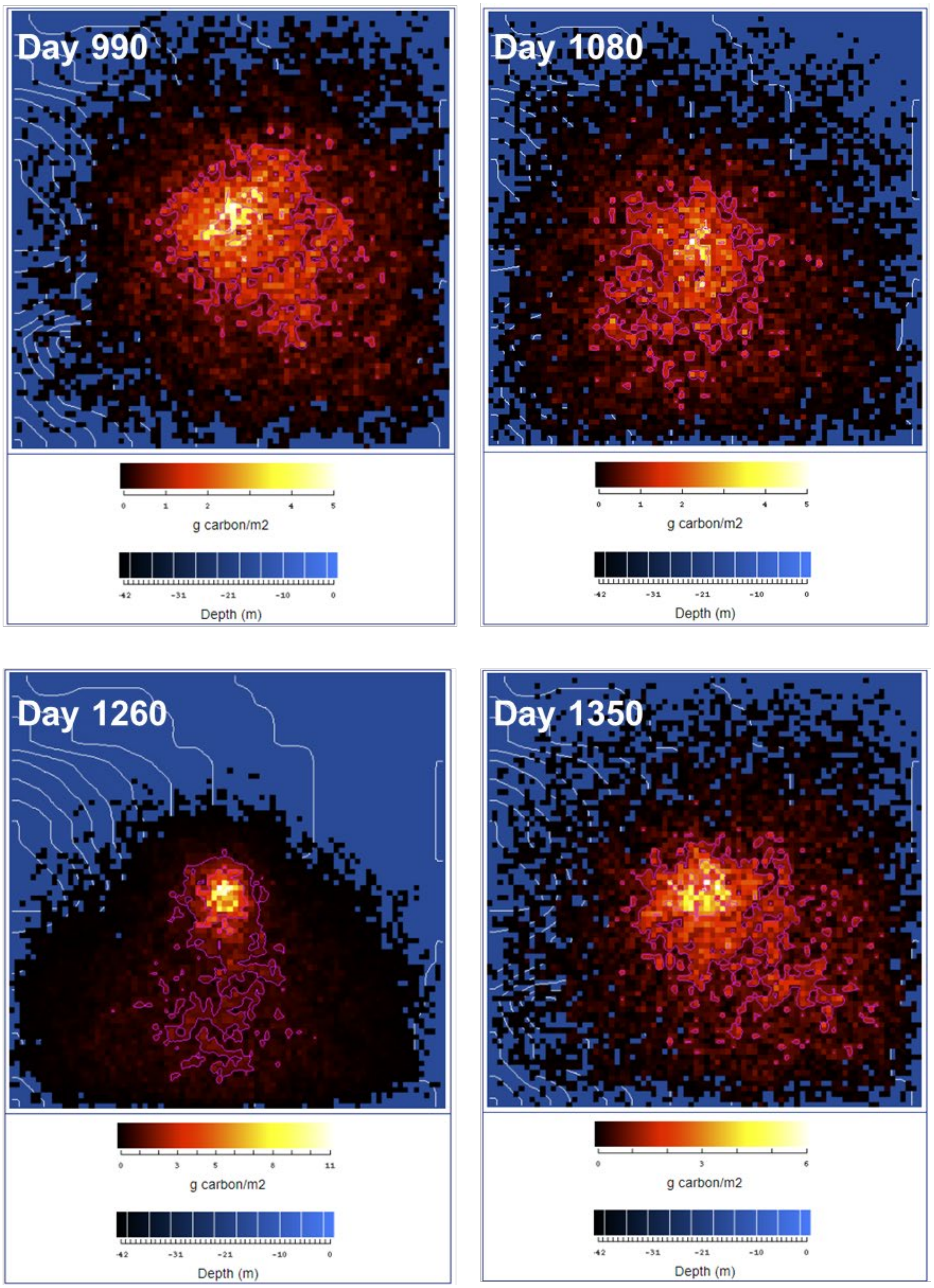
Appendix: Time-series simulation of predicted benthic carbon deposition beneath one net pen with a standing stock biomass of 36,288 kg of Almaco Jack (*Seriola rivoliana*). The reader should use caution comparing plots. The software generates a new legend for each plot in the time series. The scale and color ramp varies with each surface plot.



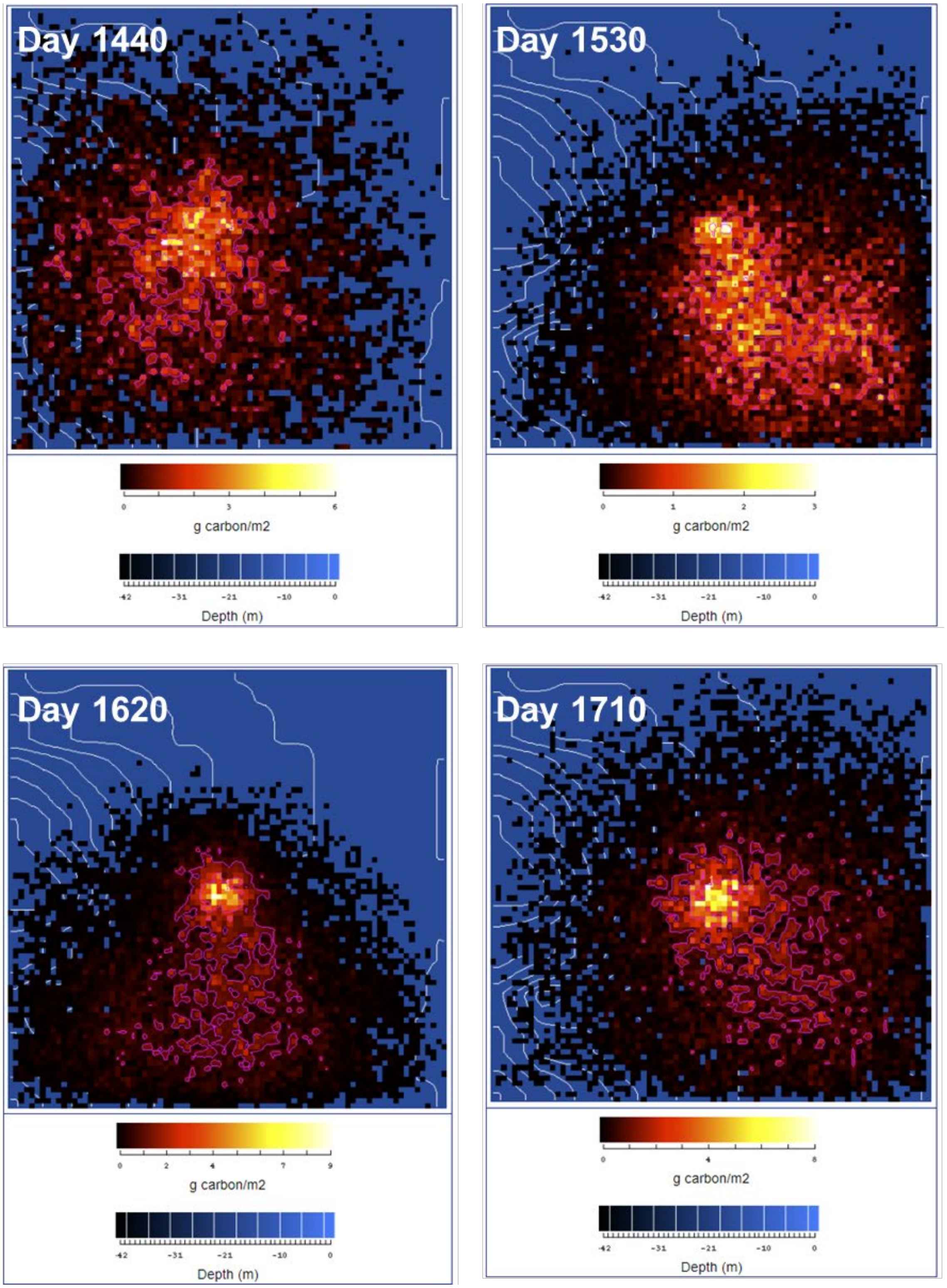
Appendix: Time-series simulation of predicted benthic carbon deposition beneath one net pen with a standing stock biomass of 36,288 kg of Almaco Jack (*Seriola rivoliana*). The reader should use caution comparing plots. The software generates a new legend for each plot in the time series. The scale and color ramp varies with each surface plot.



Appendix: Time-series simulation of predicted benthic carbon deposition beneath one net pen with a standing stock biomass of 36,288 kg of Almaco Jack (*Seriola rivoliana*). The reader should use caution comparing plots. The software generates a new legend for each plot in the time series. The scale and color ramp varies with each surface plot.



Appendix: Time-series simulation of predicted benthic carbon deposition beneath one net pen with a standing stock biomass of 36,288 kg of Almaco Jack (*Seriola rivoliana*). The reader should use caution comparing plots. The software generates a new legend for each plot in the time series. The scale and color ramp varies with each surface plot.



Appendix G

Finding of No Significant Impact
Ocean Era, Inc. Velella Epsilon
National Pollutant Discharge System Elimination (NPDES) Permit

Ocean Era, Inc (formerly Kampachi Farms, LLC) (applicant) is proposing to operate and discharge from a pilot-scale marine aquaculture facility in federal waters of the Gulf of Mexico (Gulf) and has applied for a National Pollutant Discharge Elimination (NPDES) permit from the U.S. Environmental Protection Agency, Region 4 (EPA).

The applicant requested a permit and authorizations for the Velella Epsilon project, which is a single net pen demonstration project for open ocean aquaculture of marine finfish in federal waters of the Gulf. The applicant needs an NPDES permit in order to operate and discharge from its proposed aquaculture facility in compliance with the Clean Water Act (CWA).

The EPA is required to comply with the procedural requirements of the National Environmental Policy Act (NEPA) when issuing NPDES permits under section 402 of the CWA for "new sources," as defined in section 306 of the CWA. The proposed facility does not meet the definition of a "new source" under section 306 of the CWA and therefore, is exempt from NEPA compliance under section 511(c) of the CWA and is not subject to NEPA analysis requirements. Nevertheless, as a matter of policy, EPA voluntarily used NEPA procedures for this proposed action since the Agency determined that such an analysis would be beneficial. *See* 63 FR 58045 (Notice of Policy and Procedures for Voluntary Preparation of National Environmental Policy Act Document, October 29, 1998). While the EPA voluntarily used NEPA review procedures in conducting the analysis for the NPDES permit issuance, the EPA also has explained that "[t]he voluntary preparation of these documents in no way legally subjects the Agency to NEPA's requirements" (63 FR 58046).

The environmental review process, which is documented by the enclosed final Environmental Assessment (EA), indicates that no significant environmental impacts are anticipated from the proposed action. The NPDES permit conditions include protective measures, and these measures are described in the EA and the final NPDES permit. The issuance of the NPDES permit to the applicant will not cause a significant environmental impact to water quality or result in any other significant impacts to human health or the natural environment. Accordingly, the EPA is issuing this Finding of No Significant Impact (FONSI) to document this determination. Substantive public comments received on the Velella Epsilon NPDES permit and EA and the responses to those comments are included in the response to comment (RTC) document which is included in the final NPDES permit package and administrative record.

Responsible Official: MARY WALKER Digitally signed by MARY WALKER Date: 2020.09.30 13:50:34 -04'00' Date: ____________

Mary S. Walker, Regional Administrator

Appendix H

FLORIDA DEPARTMENT of STATE

RON DESANTIS
Governor

LAUREL M. LEE
Secretary of State

Chris Stahl
Florida State Clearinghouse
Florida Department of Environmental Protection
3800 Commonwealth Blvd., M.S. 47
Tallahassee, Florida 32399-2400

February 08, 2019

RE: DHR Project File No.: 2018-6301-B, Received by DHR: January 02, 2019
Application No.: FL201901048510C
Project Name: *Department of Commerce, National Oceanic and Atmospheric Administration, Velella Epsion Project by Kampachi Farms, Offshore Aquaculture, Gulf of Mexico*
County: Sarasota

To Whom It May Concern:

The Florida State Historic Preservation Officer reviewed the referenced project for possible effects on historic properties listed, or eligible for listing, on the *National Register of Historic Places.* The review was conducted in accordance with Section 106 of the *National Historic Preservation Act of 1966,* as amended, and its implementing regulations in *36 CFR Part 800: Protection of Historic Properties.*

In 2018, a baseline environmental survey (BES) employing single-beam bathymetry, sidescan sonar, magnetometry, and sub-bottom profiling was completed for the proposed project, *Baseline Environmental Survey Report For the Velella Epsilon Project – Pioneering Offshore Aquaculture in the Southeastern Gulf of Mexico, NOAA Sea Grant 2017 Aquaculture Initiative*.

Dr. Gordon Watts, Jr., Senior Marine Archaeologist and Principal Investigator at Tidewater Atlantic Research, Inc. (TAR), analyzed and interpreted the resulting data sets, determining that no submerged cultural resources will be impacted by the proposed project if anchors and/or sinkers can be located on, or within, 50 feet of the surveyed lines. Conditional upon the placement of anchors and/or sinkers on, or within, 50 feet of the surveyed lines, TAR recommended no additional archaeological investigation of the project area. TAR recommended additional investigation of the project area should the anchoring design require placing ground tackle outside of the 100 foot corridors centered on the data tracklines.

Based on the information provided, our office concurs with TAR's recommendations. Should the anchoring design for the proposed project require placing ground tackle outside of the 100 foot corridors centered on the data tracklines or project plans change, we request additional consultation with our office, as supplemental remote sensing surveying may be required.

It is the opinion of this office that the proposed project will have no effect on historic properties. However, unexpected finds may occur during ground-disturbing activities, and we recommend that the permit, if issued, should include the following "Unexpected Discovery Protocol," as outlined by Kampachi Farms, LLC in the referenced BES report:

- In the event that any project activities expose potential prehistoric/historic cultural materials not identified during the remote-sensing survey, operations should be immediately shifted from the site. The respective Point of Contact for regulatory agencies with jurisdictional oversight should be immediately apprised of the situation. Notification should address the exact location, where possible, the nature of material exposed by project activities, and options for immediate archaeological inspection and assessment of the site.

If you have any questions, please contact Kristen Hall, Historic Sites Specialist, by email at *Kristen. Hall @dos.myflorida.com*, or by telephone at 850.245.6342 or 800.847.7278.

Sincerely,

Jason Aldridge
For

Timothy A Parsons, Ph.D.
Director, Division of Historical Resources
& State Historic Preservation Officer

Florida Fish and Wildlife Conservation Commission

Division of Marine Fisheries Management
Jessica McCawley
Director

(850) 487-0554
(850) 487-4847 FAX

Managing fish and wildlife resources for their long-term well-being and the benefit of people.

620 South Meridian Street
Tallahassee, Florida
32399-1600
Voice: 850-488-4676

Hearing/speech-impaired:
800-955-8771 (T)
800 955-8770 (V)

MyFWC.com

February 18, 2019

Submitted via Electronic Mail

Mr. Chris Stahl
Florida Department of Environmental Protection
Florida State Clearinghouse
state.clearinghouse@dep.state.fl.us

RE: FL201901048510C; Department of Commerce, National Oceanic and Atmospheric Administration, Velella Epsilon Project by Kampachi Farms, Offshore Aquaculture, Gulf of Mexico; Coastal Zone Management Act Consistency Determination

Dear Mr. Stahl:

The Florida Fish and Wildlife Conservation Commission (FWC), Division of Marine Fisheries Management has reviewed the Coastal Consistency Determination (CCD) for the Kampachi Farms offshore aquaculture Velella Epsilon Project (VEP), and provide the following comments pursuant to the Coastal Zone Management Act/Florida Coastal Management Program.

Section 3.17 of the CCD briefly analyzes the potential impacts from VEP to fish and wildlife resources of the State of Florida. While the analysis for this Section does identify what steps VEP is taking to avoid genetic impacts to Florida's coastal fishery resources (e.g., using native broodstock that are not genetically engineered, only using first generation offspring), the analysis does not address the mating ratios and cohort sizes which could also affect the genetics of Florida's coastal fishery resources. While this information is critical to the review of a CCD for offshore aquaculture activities, the FWC did coordinate with VEP in advance of the CCD being submitted (email correspondence dated 3/12/2018) and confirmed the proposed mating ratios and cohort sizes were genetically appropriate. The FWC would emphasize that this information should be included in any future CCD provided for review of proposed offshore aquaculture activities.

Another potentially significant impact from VEP-proposed activities which was not addressed in the CCD is the potential to affect the health of Florida's coastal fishery resources. The analysis in the CCD did not identify any steps VEP may be taking to ensure that unhealthy fish are not introduced into the wild or maintained in net pens. While this information is also critical to the review of a CCD for offshore aquaculture activities, the FWC does not want to delay permitting for VEP and is confidant that this issue will be appropriately addressed through application for an FWC Special Activity License and facility certification with the Department of Agriculture and Consumer Services (DACS).

The FWC finds the CCD provided for VEP consistent with FWC statutes and rules included in Florida's Coastal Management Program, and looks forward to working with Kampachi Farms during the FWC licensing and DACS certification processes.

The FWC appreciates the opportunity to review this Coastal Consistency Determination. For questions or additional information, please contact Lisa Gregg in the Division of Marine Fisheries Management at: Lisa.Gregg@MyFWC.com or (850) 617-9621.

Sincerely,

Jessica McCawley
Director

jm/lg

DIVISION OF AQUACULTURE
(850) 617-7600
(850) 617-7601 FAX

THE HOLLAND BUILDING, SUITE 217
600 SOUTH CALHOUN STREET
TALLAHASSEE, FLORIDA 32399-1300

FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES
COMMISSIONER NICOLE "NIKKI" FRIED

January 15, 2019

Mr. Chris Stahl
Florida State Clearinghouse
Florida Department of Environmental Protection
2600 Blairstone Road, MS 47
Tallahassee, Florida 32399-2400

RE: FL201901048510C - Coastal Consistency Determination in Compliance with the Federal Consistency Requirements of the Coastal Zone Management Act in Support of the Velella Epsilon Project

Dear Mr. Stahl:

In response to a request submitted on January 3, 2019, the Florida Department of Agriculture and Consumer Services, Division of Aquaculture has conducted a review of the Florida Coastal Zone Management Coastal Consistency Determination in Support of the Velella Epsilon Project – Pioneering Offshore Aquaculture in the Southeastern Gulf of Mexico (CCD:VE Project). Pursuant to Chapter 597 F.S., the Florida Department of Agriculture and Consumer Services (the department) is designated as the primary agency responsible for regulating aquaculture in the state. Additionally, in section 253.68, F.S., the Florida Legislature recognizes aquaculture as a practicable resource management alternative to produce aquaculture products, to protect and conserve natural resources, to reduce competition for national stocks and to augment and restore natural populations. The department is directed to foster the development of aquaculture activities that are consistent with state resource management goals, environmental protection, proprietary interests, and the state aquaculture plan.

Based upon our review of the CCD:VE Project, the department concurs with the conclusion of the report and finds that the proposed activities are consistent with all department statutory responsibilities. Further, this project is in the public interest as it may yield critical information regarding the regulatory permitting process and the commercial viability of offshore, finfish aquaculture in the Gulf of Mexico.

If you need further information, please feel free to contact me at (850) 617-7600.

Sincerely,

Portia Sapp

Portia Sapp, Director
Division of Aquaculture

From:	Tyler, Kip
To:	Holliman, Daniel; Schwartz, Paul; Ferry, Rol; Wahlstrom-Ramler, Meghan
Subject:	FW: State_Clearance_Letter_For_FL201901048510C_Velella Epsilon Project by Kampachi Farms, Offshore Aquaculture, Gulf of Mexico, Florida
Date:	Tuesday, February 26, 2019 12:02:46 AM
Attachments:	FWC Comments - Velella Epsilon Project.pdf Stahl-FL Clearinghouse-FL201901048510C.pdf DHR Comments for 2018-6301-B Velella Epsion Project by Kampachi Farms Offshore Aquaculture Gulf of Mexico App. No. FL201901048510C 106 EPA.msg

CZMA concurrence for the Kampachi project is complete.

Note that: CZMA concurrence is from FDACS, NHPA concurrence is from FDEP, and Florida coastal management program concurrence comes from FDEP/FWC.

Kip Tyler
w 404.562.9294 | m 404.323.6094

From: Dennis Peters <dpeters@gsrcorp.com>
Sent: Monday, February 25, 2019 6:29 PM
To: Chris.Stahl@dep.state.fl.us
Cc: Tyler, Kip <Tyler.Kip@epa.gov>; Jess Beck - NOAA Federal <jess.beck@noaa.gov>; Damico, Katy R CIV USARMY CESAJ (US) (Katy.R.Damico@usace.army.mil) <Katy.R.Damico@usace.army.mil>; Neil Sims (neil@kampachiworld.com) <neil@kampachiworld.com>; lisa@kampachifarm.com; Ken Riley (ken.riley@noaa.gov) <ken.riley@noaa.gov>; Sapp, Portia <Portia.Sapp@freshfromflorida.com>
Subject: FW: State_Clearance_Letter_For_FL201901048510C_Velella Epsilon Project by Kampachi Farms, Offshore Aquaculture, Gulf of Mexico, Florida

Thank you Chris –

The Kampachi Team and our stakeholders appreciate the State's thorough review of the VE Project plan.

V/R - Dennis

Dennis J. Peters
Gulf South Research Corporation (GSRC)
(850) 240-3414 (Cell)

From: Stahl, Chris [mailto:Chris.Stahl@dep.state.fl.us]
Sent: Monday, February 25, 2019 2:11 PM
To: petersd1@cox.net
Cc: State_Clearinghouse; 'FWC Conservation Planning Services'; Sapp, Portia
Subject: State_Clearance_Letter_For_FL201901048510C_Velella Epsilon Project by Kampachi Farms, Offshore Aquaculture, Gulf of Mexico, Florida

February 25, 2019

Dennis Peters
Gulf South Research Corporation
815 Bayshore Drive
Niceville, Florida 32579

RE: Department of Commerce, National Oceanic and Atmospheric Administration, Velella Epsilon Project by Kampachi Farms, Offshore Aquaculture, Gulf of Mexico, Florida
SAI # FL201901048510C

Dear Dennis:

Florida State Clearinghouse staff has reviewed the proposal under the following authorities: Presidential Executive Order 12372; § 403.061(42), Florida Statutes; the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended; and the National Environmental Policy Act, 42 U.S.C. §§ 4321-4347, as amended.

The Florida Departments of Agriculture and Consumer Services and Department of State, as well as the Florida Fish and Wildlife Conservation Commission have reviewed the proposed project and provided comment letters which are attached and incorporated hereto.

Staff of the Florida Departments of Transportation noted on Page 8 of 20 (see pdf page 9 of 123), of the "Supplemental Data: In support of the – Velella Epsilon Project" document dated 01/03/2019, states "NOAA navigational charts of the area were referenced and did not indicate any conflict with major shipping channels or DoD Restricted Access areas." Florida Department of Transportation's Seaport Office compared the spatial location of the proposed "Most Desired Alternative Sites" with historical AIS (Automatic Identification System) vessel tracking data, and was able to identify potential cargo and cruise vessel conflicts with the proposed locations. This same finding appears to be confirmed by a NOAA National Centers for Coastal Ocean Science slide "Vessel Traffic (AIS Data – 2013)" also included in the document data 01/03/2019 (see pdf page 53 of 123).

Based on the information submitted and minimal project impacts, the state has no objections to the subject project and, therefore, the funding award is consistent with the Florida Coastal Management Program (FCMP). The state's final concurrence of the project's consistency with the FCMP will be determined during any environmental permitting processes, in accordance with Section 373.428, Florida Statutes, if applicable.

Thank you for the opportunity to review the proposed plan. If you have any questions or need further assistance, please don't hesitate to contact me.

Sincerely,

Chris Stahl

Chris Stahl, Coordinator
Florida State Clearinghouse
Florida Department of Environmental Protection
3800 Commonwealth Blvd., M.S. 47
Tallahassee, FL 32399-2400
ph. (850) 717-9076
State.Clearinghouse@floridadep.gov