Draft USACE Preconstruction Notification

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U.S. Army Corps of Engineers (USACE)

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

33 CFR 325. The proponent agency is CECW-CO-R.

Form Approved - OMB No. 0710-0003 Expires: 01-08-2018

The public reporting burden for this collection of information, OMB Control Number 0710-0003, is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or burden reduction suggestions to the Department of Defense, Washington Headquarters Services, at whs.mc-alex.esd.mbx.dd-dod-information-collections@mail.mil. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR APPLICATION TO THE ABOVE EMAIL.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and/or instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned. System of Record Notice (SORN). The information received is entered into our permit tracking database and a SORN has been completed (SORN #A1145b) and may be accessed at the following website: http://dpcld.defense.gov/Privacy/SORNsIndex/DOD-wide-SORN-Article-View/Article/570115/a1145b-ce.aspx

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required)
First - Komi Middle - Last - Hassan	First - Sean Middle - Last - Sparks
Company - New Fortress Energy Louisiana FLNG LLC	Company - Tetra Tech, Inc.
E-mail Address -	E-mail Address - Sean.Sparks@tetratech.com
6. APPLICANT'S ADDRESS:	**9. AGENT'S ADDRESS:**
Address- 111 W 19th St., 2nd Floor	Address- 10 Post Office Square, Ste 1100
City - New York State - NY Zip - 10011 Country - USA	City - Boston State - MA Zip - 02109 Country - USA
7. APPLICANT'S PHONE NOs. w/AREA CODE	**10. AGENTS PHONE NOs. w/AREA CODE**
a. Residence b. Business 281-704-5391 c. Fax	a. Residence b. Business 774-219-4838 c. Fax

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Sean Sparks to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

K. O. Hassan — SIGNATURE OF APPLICANT

3/29/2022 — DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)
New Fortress Energy Louisiana FLNG Project

13. NAME OF WATERBODY, IF KNOWN (if applicable)	14. PROJECT STREET ADDRESS (if applicable)
Gulf of Mexico	Address N/A
15. LOCATION OF PROJECT	City - State- Zip-
Latitude: °N Section 1.2.2 of narrative Longitude: °W	

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)

State Tax Parcel ID Municipality

Section - Township - Range -

17. DIRECTIONS TO THE SITE

Start at 7400 Leake Ave, New Orleans, LA 70118. Get on US-90 W/Huey P Long Bridge in Elmwood from Leake Ave and River Rd. Continue on US-90 W to Raceland. Take exit 215B from US-90 W. Merge onto LA-308 S. Follow LA-3235 and LA-1 S to Caminada Rd in Grand Isle. Continue on Caminada Rd. Drive to Sandollar Ct and arrive at Grand Isle Marina, 158 Sandollar Ct, Grand Isle, LA 70358. Take boat northeast to Barataria Pass to Gulf of Mexico. Head south to 029°04'47.4885"N, 089°50'37.1953"W. Arrive at site.

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

See section 1.2 of the narrative as well as the attachment for project drawings.

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

See Section 1.1 of the narrative.

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

20. Reason(s) for Discharge

Fill material includes the piles that will impact the seafloor to support platforms above. See Section 3.0 of the narrative.

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

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards
See Section 3.0 of the narrative		

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

Acres See section 3.0 of the narrative

or

Linear Feet

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

See Alternatives Analysis (2.0 through 2.4) and section 3.9 of the narrative.

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

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

a. Address- N/A

City - State - Zip -

b. Address-

City - State - Zip -

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

City - State - Zip -

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

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
EPA	NPDES				
MARAD	DWP				
EPA	Title V				

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

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

K. O. Hansen — SIGNATURE OF APPLICANT
3/29/2022 — DATE
SIGNATURE OF AGENT
3/29/22 — DATE

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

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

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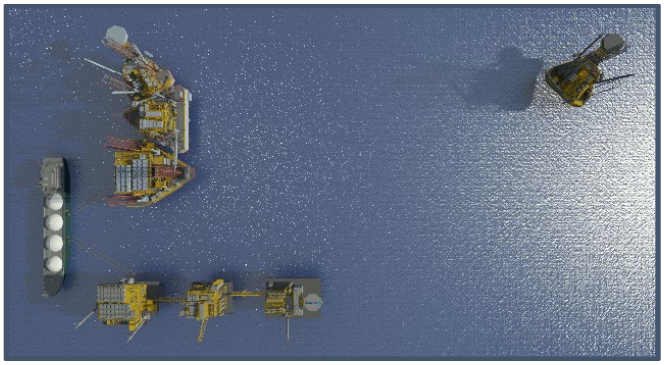
New Fortress Energy Louisiana FLNG Project

Volume I – General (Public)

USACE New Orleans District Pre-Construction Notification Supplemental Information



Submitted to:

United States Army Corps of Engineers
New Orleans District
7400 Leake Ave #3651
New Orleans, LA 70118

Submitted by:

NewFortress energy

New Fortress Energy
111 W 19th St., 2nd Floor
New York, New York 10011

Prepared by:

TETRA TECH

March 2022

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LIST OF ACRONYMS AND ABBREVIATIONS

§	section
APE	area of potential effects
API	American Petroleum Institute
Applicant	New Fortress Energy Louisiana FLNG LLC
BOEM	Bureau of Ocean Energy Management
BOG	Boil-off gas
CFR	Code of Federal Regulations
DWP	deepwater port
DWPA	Deepwater Port Act
EFH	essential fish habitat
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
ESD	emergency shutdown
FLNG	Fast LNG
FR	Federal Register
FSU	Floating Liquefied Natural Gas Storage Unit
g/L	gram per liter
GOM	Gulf of Mexico
IMO	International Maritime Organization
IPaC	Information, Planning, and Conservation
Kinetica	Kinetica Energy Express, LLC
km	kilometer
LDNR	Louisiana Department of Natural Resources
LNG	Liquefied Natural Gas
LNGC	Liquefied Natural Gas Carrier
LOOP	Louisiana Offshore Oil Port
m^3	cubic meter
MAOP	Maximum Allowable Operating Pressure
MARAD	Maritime Administration
mbar(g)	millibar-gage
MLV	mainline valvc
MSA	Magnuson-Stevens Fishery and Conservation Act
MTPA	million metric tonnes per annum
NEPA	National Environmental Policy Act
NFE	New Fortress Energy
nm	nautical mile
NOAA Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
OCS	Outer Continental Shelf
P	Pioneer
PHMSA	Pipeline and Hazardous Materials Safety Administration
Project	New Fortress Energy Louisiana FLNG Project
psi	pounds per square inch

psig	pounds per square inch gauge
RCM	restricted catenary mooring
RHA	Rivers and Harbors Act
SHPO	State Historic Preservation Office
STS	ship-to-ship transfer
TBtu	trillion British thermal units
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VGP	Vessel General Permit
WD-38	West Delta Block 38

1.0 INTRODUCTION

New Fortress Energy Louisiana FLNG LLC ("Applicant"), a limited liability company organized under the laws of Delaware, is proposing to construct, own, and operate the New Fortress Energy ("NFE") Louisiana FLNG Project ("Project"), a deepwater port ("DWP") export terminal approximately 16 nautical miles ("nm") off the southeast coast of Grand Isle, Louisiana. The primary purpose of the Project is to provide much needed gas supplies to global markets in the form of liquefied natural gas ("LNG"). The Project, which will provide a safe and reliable source of LNG, is in furtherance of the Applicant's commitment to make clean affordable energy available to markets around the world. The Applicant is filing an application for a license to construct, own, and operate the DWP export terminal pursuant to the Deepwater Port Act of 1974, as amended ("DWPA"), and in accordance with the United States Coast Guard's ("USCG") and the Maritime Administration's ("MARAD") implementing regulations. See Figure 1 for the general Project location.

The Project will consist of predominantly water-dependent offshore/marine components that tie into existing infrastructure (Kinetica Energy Express LLC ["Kinetica"] pipeline), allowing direct transport of natural gas to the Project.

Issuing permits for construction of the proposed Project qualifies as a major federal action and, therefore, require a National Environmental Policy Act ("NEPA") analysis. The Applicant is filing an application for a license to construct, own, and operate the Project pursuant to the DWPA, as amended, and in accordance with implementing regulations. The initiation of the NEPA under the DWPA will be carried out by the USCG and MARAD as these agencies have federal jurisdiction over the entire Project. The USCG and MARAD have made the determination that an Environmental Impact Statement ("EIS") will be prepared for the proposed Project. Once MARAD deems the Application complete, they will start the NEPA process. Their regulations require that their decision-making process, including the EIS, is completed in 356 days. As part of the NEPA process, the United States Army Corps of Engineers ("USACE"), Louisiana Department of Natural Resources ("LDNR"), and other federal and state agencies will be given the opportunity to participate as cooperating agencies for the preparation and development of the EIS.

Based on discussions with the New Orleans USACE District, the Applicant is seeking coverage for Project activities under the Nationwide Permit 8 (Oil and Gas Structures on the Outer Continental Shelf). This permit application will cover the requirements of the USACE Form 4345.

Section 10 of the River and Harbors Act ("RHA") applies to all of the proposed new offshore facilities for the Project as described in Section 1.2. These structures and impacts, subject to Section 10 of the RHA, are located within the New Orleans District jurisdiction. Impacts to Section 10 waters are described in Section 3.0 of this application.

1.1 Purpose and Need

The Applicant proposes to construct, own, operate, and eventually decommission the Project in West Delta Block 38 ("WD-38"), 16 nm (about 30 kilometers ["km"]) off the coast from Grand Isle, Louisiana. The purpose of the Project is to source domestic natural gas from multiple supply hubs in the Southeast Louisiana local market, liquify, and export as LNG up to 2.8 million metric tonnes per annum ("MTPA"), from a deepwater port located in federal waters off of Louisiana. The Project will continue the Applicant's business line of building and operating LNG-to-power infrastructure to provide cleaner, affordable and

reliable energy globally. The Applicant currently delivers more than 2 million MTPA") of LNG to its customers with the capacity to provide more than 10 MTPA. To date, the Applicant has purchased more than $7 billion of LNG to meet its customer's needs. To meet this demand, the Applicant is taking the natural next step in producing its own LNG to meet the growing demand. The Project will provide cheaper LNG on a faster schedule while reducing impacts on the environment when compared to a traditional land-based facility.

The Project has been sited and designed to meet the above described purpose while avoiding, minimizing, and, where necessary, mitigating environmental impacts. The Project has a number of environmental objectives that were incorporated into the site selection process, evaluation of the natural gas supply pipeline, overall design, and the LNG liquefaction process. These objectives include selecting:

- An offshore DWP site in an available Bureau of Ocean Energy Management ("BOEM") lease block;
- An offshore DWP site near an existing natural gas pipeline in the Southeast Louisiana market that has available capacity to deliver pipeline quality feed gas in order to avoid the need for new or modified onshore pipeline facilities, thus avoiding onshore environmental impacts;
- An offshore site for the DWP that minimizes or eliminates the need for increased vessel traffic in congested nearshore and inland waterways or the need for creating and maintaining new navigational channels or turning basins nearshore or along inland waterways;
- An offshore DWP site a safe distance from designated shipping fairways to minimize impacts to navigation;
- An offshore DWP site that has no direct or indirect impacts upon marine commerce;
- An offshore DWP site on the Outer Continental Shelf ("OCS"), distant from wetlands and other sensitive coastal resources;
- An offshore DWP site that avoids and minimizes impacts to marine archeological resources;
- An offshore DWP site that is not within designated sensitive marine habitats;
- An offshore DWP site that minimizes air emission and noise impacts to land-based receptors;
- An offshore DWP site that has no direct or direct impacts to human population demographics, regional or local economies, emergency services, recreation or tourism;
- A DWP design that utilizes self-elevating platforms to the extent available and modular accommodation, gas processing, and liquefaction components to allow for construction of the facilities in a controlled environment located off-site, and also allow for removal and redeployment of the Project upon decommissioning or unforeseen changes to market conditions;
- A DWP design that utilizes an existing vessel for LNG storage to avoid need for new construction of the LNG storage component, and also allow for removal and redeployment of the Project upon decommissioning or unforeseen changes to market conditions; and
- A liquefaction process that minimizes seawater use.

1.2 Project Overview

The Project will involve the installation of two nominal 1.4 MTPA liquefaction systems (FLNG1 and FLNG2) installed in WD-38[1] in approximately 30 meters (98 feet) of water. Each system will contain three platforms consisting of natural gas processing, natural gas liquefaction, and accommodations. FLNG1 will incorporate self-elevating platforms (aka jack-up platforms or rigs), and FLNG2, which will be located adjacent to FLNG1, will utilize fixed platform structures. An additional self-elevating platform will house a dedicated gas compressor station to increase production volumes to a nominal 2.8 MTPA (Figure 2). The feed gas supply to the Project will be transported to the WD-38 site via the existing offshore natural gas pipeline system of Kinetica and two, newly constructed, 24-inch pipeline laterals connecting the Kinetica pipeline system to the Project. Two additional laterals will transfer gas from the Compression Rig to each FLNG (Figure 3). Each FLNG will be connected to a single Floating LNG Storage Unit ("FSU") via a flexible, partially submerged, 220-meter cryogenic hose transfer system. The FSU will be positioned approximately 100 meters (328 feet) from the FLNGs. Up to 40 LNG carriers ("LNGCs") will call on the Project per year. Other than temporary construction staging areas, there are no onshore facilities associated with the Project. Staging for construction, if needed, will utilize existing staging, laydown and warehouse space near Port Fourchon, Port Sulphur, or Venice.

The Project is designed with a modular approach, allowing the Applicant to reduce capital expenditures and quickly supply the global market. Each FLNG will be capable of producing 1.4 MTPA for a total nominal capacity of 2.8 MTPA. Each FLNG is expected to consume 71 trillion British thermal units ("TBtu") of natural gas per annum and produce 63 TBtu of liquified natural gas per annum (all figures are calculated on a higher heating value basis and assumes a 95 percent capacity factor). The difference between consumption and production is due to primarily (a) power generation feed gas consumption and (b) process gas loss during the pretreatment process. The design life for the Project is 20 years. Figures 4 through 9 depict elevation/isometric views of the platforms Pioneer ("P") 1 through P6 (discussed in Section 1.2.3).

1.2.1 Existing Kinetica Mainline

The Project will receive natural gas through the existing Kinetica pipeline system (Segment Numbers 1394 and 15033), currently configured in a loop with pig launchers at the mainline valve ("MLV") 526 platform located near Bayou Chaland, Louisiana. Gas will be sourced from domestic natural gas from multiple supply hubs in the Southeast Louisiana local market and will flow approximately 15 nm (28 km) through the existing 24-inch-diameter pipeline until the interconnection with the Project pipeline laterals.

The Kinetica pipeline system has been in continuous natural gas service since it was placed in service. The pipeline pressure is currently operating at 750 pounds per square inch ("psi") with an onshore Maximum Allowable Operating Pressure ("MAOP") of 1,000 psi and an offshore MAOP of 1,250 psi. The pipeline has been under regulatory oversight since it was placed in-service. The Pipeline and Hazardous Materials Safety Administration ("PHMSA") oversees integrity management and safety on the entire line. Kinetica will continue to own and operate its pipeline facilities to the tie-in point with the new Project facilities.

[1] For the dual pipeline laterals from the Kinetica pipeline system, approximately 975 feet for northern lateral and 919 feet for southern lateral will be located within West Delta Block 39.

1.2.2 Pipeline Laterals

In order to provide the feed gas to the FLNGs, the Applicant will require the construction of dual buried pipeline laterals. The laterals will connect to the existing Kinetica pipeline system in OCS block WD-39 via hot-tap assemblies. From the hot tap locations, two new 24-inch pipeline laterals will extend to the Project area. Initially both laterals will extend to FLNG1, a total length of approximately 925 meters (3,036 feet) for the northern lateral and 906 meters (2,972 feet) for the southern lateral, providing redundant gas supply through either leg of the Kinetica pipeline system. The laterals will be connected to a pipeline riser at the base of the Gas Treating Platform (P1). Drop out spools will be installed in the laterals to allow the subsequent installation of the Compression Rig (P7) without significant natural gas flow disruption to FLNG1. The southern pipeline lateral will be disconnected from FLNG1 and extended approximately 145 meters (475 feet) to tie into, and ultimately supply natural gas to, FLNG2. As with FLNG1, the pipeline lateral will connect to a riser at the base of the Gas Treating Platform (P4).

Where the two pipeline laterals are parallel, the pipeline centerlines are offset by 50 meters (164 feet). This spacing is based on the required survey offset as well as to allow suitable separation for safe pipeline construction and trenching operations.

Other than the interconnect to the existing Kinetica pipeline, there are no foreign pipeline, cable, or umbilical crossings associated with the planned pipeline routes. Both pipelines will be installed so the top of pipe is a minimum of 3 feet below the natural seafloor (in accordance with 30 Code of Federal Regulations ["CFR"] section ["§"] 250.1003). The pipelines will be protected against mechanical damage with 3-inches of concrete coating (also used as a weight coating) and concrete mattresses installed over the tie-in spools. Further, the pipelines will be protected against corrosion with an anti-corrosion coating and a cathodic protection system (sacrificial anodes). Finally, the pipelines will be protected against overpressure by a safety system designed in accordance with American Petroleum Institute ("API") 14c and will include the requisite shut-down valves and Pressure Safety High Low shutdown system.

The pipeline laterals will be designed and tested to confirm a MAOP of 1,250 pounds per square inch gauge ("psig"). The pipelines will be designed to allow for smart pigs to be run during pipeline operation in order to ensure PHMSA integrity compliance of the pipeline laterals.

Each pipeline lateral will be constructed of 24-inch outer diameter x 0.688-inch wall thickness pipe manufactured in accordance with API 5L PSL2 and will be of grade X42 or stronger. Pipeline risers, tie-in spools, and pipe bends will be constructed of 24-inch outer diameter x 0.969-inch wall thickness pipe, also manufactured in accordance with API 5L with grade X42 or stronger. Each pipeline will be capable of delivering the required 470 million standard cubic feet per day of gas required for operation. Delivered gas will be metered initially at the FLNG1 Gas Treating platform (P1), then at the Compression Rig once installed. It is envisaged the meter will be a standard ultrasonic meter.

The pipelines have been designed for a MAOP of 1,250 psig using the following codes:

- ASME B31.8 Gas Transmission and Distribution Piping Systems
- 49 CFR 192 Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards
- API RP 1111 Design, Construction, Operation, and Maintenance of Offshore Hydrocarbon Pipeline (Limit State Design)
- DNV-RP-F109 On-Bottom Stability Design of Submarine Pipelines, Cables and Umbilicals

On-bottom stability of the pipelines was performed in accordance with:

- API RP 1111 Design, Construction, Operation, and Maintenance of Offshore Hydrocarbon Pipeline (Limit State Design)
  - AGA analysis for submarine pipeline on-bottom stability performed using PRCI's commercially available tool

The cathodic protection system was designed in accordance with:

- DNV-RP-F103 Cathodic Protection of Submarine Pipelines

1.2.3 Offshore Facilities

The Offshore Facilities will consist of the FLNGs, one Compression Rig, and the FSU. Each FLNG will comprise three platforms: a Gas Treating Platform, a Liquefaction Platform, and a Utilities Platform. While the topsides of the two FLNGs will be mirrors of one another, FLNG1 will be contained on self-elevating platforms, while FLNG2 will be contained on fixed platforms. Since FLNG1 and FLNG2 will utilize the same topsides design, the descriptions provided below are applicable to the platforms for each FLNG. The Compression Rig will also be contained on a self-elevating platform.

1.2.3.1 Natural Gas–Treating Platforms

The Gas Treating Platforms (P1 and P4) will contain facilities to remove impurities (carbon dioxide, water, mercury, sulfur, and heavy metals) from the feed gas. Production modules will be located on the deck which will prepare the feed gas prior to liquefaction. A warm flare for accepting the warm and wet process streams will be located on this platform. A raw water system and emergency power will also be contained on this platform.

1.2.3.2 Liquefaction Platform

The Liquefaction Platforms (P2 and P5) will serve as the primary natural gas liquefaction plant. On the deck, liquefaction unit modules will be housed liquefy the natural gas for transfer to the FSU. A boil-off gas ("BOG") compressor will also be housed on deck to boost the pressure of the BOG for use elsewhere. A cryogenic flare will be provided in this platform.

The Project will utilize Chart's IPSMR technology for the liquefaction process. This is an integrated pre-cooled single mixed refrigerant process with an integrated warm end refrigeration loop provided by the liquids derived from the mixed refrigerant compression. The mixed refrigerant compressor will be a Baker Hughes LM6000PF+ combustion gas turbine.

The process offers the advantage of simplicity of operation because there is no sequential start-up of series systems. The liquefaction train is driven by a single gas turbine/compressor unit which leads to more reliability and less outage time. The IPSMR process can handle a wide variety of feed gas compositions, ambient temperature conditions, and other operating parameters.

To aid in the transfer the LNG to the FSU, the platform will contain a hose reel system for the retrieval and storage of the cryogenic hose transfer system.

1.2.3.3 Utilities Platform

The Utilities Platforms (P3 and P6) will include an accommodations block for 87 workers, a helideck for transportation, and a hospital and emergency services for the workers. The helideck will be able to accommodate S61N and S92 helicopters. The Utilities Platform will also contain a main control room,

gas turbine driven main/normal power generation, diesel driven emergency power generation, and services such as instrument air compression, nitrogen generation, potable water production, and wastewater treatment. Power will be provided by three Siemens SGT-400 gas turbine driven electric generators. Also contained on deck will be warehouse space and three cranes.

1.2.3.4 Compression Rig

The Compression Rig (P7) will receive gas from the Kinetica pipeline system and increase the pressure in order to feed FLNG1 and FLNG2 with gas at a pressure that will allow the liquefaction to operate at 100 percent capacity. The Compression Rig will contain three Caterpillar compressor/turbine packages. This platform will also have accommodations for staff as well as a helideck.

1.2.3.5 Cryogenic Hose Transfer System

The cryogenic hose transfer system will offload LNG produced on the Gas Liquefaction Platform to the FSU as well as return boil-off gas from the FSU back to the Gas Liquefaction Platform. This will be done through the use of two separate cryogenic hoses. The hoses will be the CRYODYN flexible pipe system constructed of stainless-steel composite, vacuum insulated and fitted with a leak detection. The hose is also constructed with double containment to prevent LNG release should a single barrier fault occur.

1.2.3.6 FSU

The FSU will be positioned approximately 107 meters (350 feet) from the DWP. The FSU is a specialized LNG carrier that will be "spread moored" and manned by a marine crew in accordance with its approved manning requirements and under the supervision of the FSU captain. The mooring system for the FSU will allow for it to release from its moorings and get underway during tropical storms or unsafe conditions.

For this Project, the Applicant will deploy the GOLAR PENGUIN as the FSU. The GOLAR PENGUIN is approximately 281 meters (922 feet) in length with a beam of 43.4 meters (142.4 feet). (At its highest point the FSU GOLAR PENGUIN is approximately 49 meters (161 feet) above the water line and has a draft of approximately 12.2 meters (40 feet) when fully laden. The FSU has a net storage capacity of 158,273 m3 when 98.5 percent full of LNG distributed into the four cargo tanks.

The GOLAR PENGUIN is fitted with an emergency shutdown ("ESD") system according to International Maritime Organization ("IMO") and Class rules. The ESD system will isolate, in a fail-safe-closed method, the FSU from the LNGC in case of an emergency during cargo transfer. The FSU will have a restricted venting policy and can operate at tank pressures of up to 350 millibar-gage ("mbar(g)") setting of the safety relief valves, though it is anticipated the permitted settings will be increased to 700 mbar(g) for the Project. The natural BOG from the cargo tanks will be utilized and managed for ship-board power generation to meet hotel and cargo operations electrical requirements.

The GOLAR PENGUIN will be classed under the IMO Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk. The Applicant will request Class to assign a "UWILD" notation to the FSU which will allow for an extended term of 10 years between required dry dockings. The GOLAR PENGUIN, including its hull, machinery, equipment and outfitting, was constructed in accordance with the ship rules and regulations (edition and amendments thereto being in effect as of date of June 2010) of the Class and under survey of the Class surveyors and shall be distinguished in register by symbol of: Det Norske Veritas. The GOLAR PENGUIN complies with the following rules, regulations, and requirements of the regulatory authorities in force and as amended including those amendments which are officially declared and ratified by the concerned authorities.

1.2.3.7 FSU Mooring System

The FSU will utilize the restricted catenary mooring ("RCM") system developed by CAN Systems of Norway. It is a Class approved system that works in a similar manner to a conventional spread mooring system while still providing clear access for calling LNGCs. It is designed to hold tankers and other vessels in a relatively small, precise area with limited movement. The FSU will be oriented with the vessel heading fixed at 145 degrees, which is the direction of the prevailing wind and significant swell. Both Lloyds Register and Det Norske Veritas will witness and certify the installation of the RCM mooring system. The fixed heading of the FSU will minimize the effect of swell on the FSU and LNGCs during ship-to-ship transfer ("STS") transfer operations.

For both the bow and aft of the FSU, the mooring system will utilize a 3+3 mooring chain configuration which uses a six-anchor mooring spread for the bow and a four-anchor mooring spread aft (10 total anchors) with two restrictor plates and a 2+2 mooring chain connection to the FSU. The chains are connected through fairleads in the bulwarks for the bow and on the aft deck. Purpose-built chain stoppers leading downwards to the restrictor plates hold the moorings together and away from the hull, propeller and rudder contact with the LNGC. The chain 3+3 mooring system will be composed of an 84-100 millimeter (mm) R4 chain between the restrictor plates for both the bow and aft. The 2+2 mooring chain arrangement above the restrictor plates will utilize an 84 mm R4 chain both for the bow and aft. The overall length of the mooring chain on the bow will be 350 to 400 meters (1,148 to 1,312 feet) measured from the anchors to the restrictor plates. The length of the aft mooring chain will be 250 to 300 meters (820 to 984 feet) measured from the anchors to the restrictor plates. The length and weight of the bow and aft chains are necessary to avoid uplift of the anchors during storm loads; however, the shorter length aft are all that is necessary to meet the restorative forces to minimize yaw, sway and surge movements of the FSU.

1.2.4 LNGCs

The LNGCs will be drawn from the existing and future global fleet compatible with the STS transfer operations of the Project. All LNGCs calling on the Project will be expected to meet all applicable federal and state laws and regulations and be certified by their flag states and compliant with all applicable international safety and pollution prevention requirements. All LNGCs calling on the Project will obtain a Certificate of Compliance issued by the USCG per 46 CFR 154 prior to cargo transfer operations.

LNGCs calling on the Project are expected to range in size from 125,000 cubic meters ("m^3") to 160,000 m^3 and will moor alongside the FSU in a double-banked arrangement. It is anticipated that LNG transfer operations will take about 24 hours of pumping time to complete with the total DWP call time being 36 hours inclusive of berthing, cargo transfer, and sail-away. It is anticipated that a single cargo transfer will occur 40 times per year.

1.2.5 Location

The Project will be located within the Gulf of Mexico ("GOM"), approximately 16 nm (30 km) off the coast of Grand Isle, Louisiana. With the exception of a 975-foot section for the northern lateral and 919-foot section of the southern lateral that will be in OCS block WD-39, all Project components will be located in OCS block WD-38. The Project will consist of two, newly constructed 24-inch pipeline laterals (1,091 feet for northern lateral and 1,053 feet for southern lateral), installation of a self-elevating compression platform, installation of three self-elevating platforms and three fixed jacket platforms, a

1,945-foot pipeline to FLNG1 (northern lateral), a 2,394-foot pipeline to FLNG2 (southern lateral), and a moored FSU. LNG will be transferred to incoming LNGCs via STS transfer.

Table 1-1 provides latitude and longitude information for all Project components.

Table 1-1 Project Facilities

Component	Latitude (N)	Longitude (W)	Water Depth (meters)
Northern Lateral Tie-In	029° 04' 42.05"	089° 50' 22.95"	26.72
Southern Lateral Tie-In	029° 04' 40.34"	089° 50' 23.65"	26.79
FLNG1 Gas Treating (P1)	029° 04’ 29.31”	089° 50’ 49.94”	27.68
FLNG1 Liquefaction	029° 04’ 25.91”	089° 50’ 50.74”	27.83
FLNG1 Utilities	029° 04’ 30.58”	089° 50’ 54.45”	27.48
FLNG2 Gas Treating	029° 04’ 22.72”	089° 50’ 42.59”	28.16
FLNG2 Liquefaction	029° 04’ 22.93”	089° 50’ 47.01”	28.11
FLNG2 Utilities	029° 04’ 25.63”	089° 50’ 39.70”	28.21
Compression Rig	029° 04’ 47.48”	089° 50’ 37.19”	27.09
FSU GOLAR PENGUIN	029° 04’ 21.96”	089° 50’ 53.43”	27.84
Mooring Anchor 1	029° 04' 37.80"	089° 50' 54.74"	27.09
Mooring Anchor 2	029° 04' 37.63"	089° 50' 53.61"	27.14
Mooring Anchor 3	029° 04' 37.37"	089° 50' 52.50"	27.18
Mooring Anchor 4	029° 04' 17.24"	089° 50' 36.73"	28.53
Mooring Anchor 5	029° 04' 16.23"	089° 50' 36.85"	28.53
Mooring Anchor 6	029° 04' 15.22"	089° 50' 37.06"	28.54
Mooring Anchor 7	029° 04' 06.11"	089° 50' 52.29"	28.27
Mooring Anchor 8	029° 04' 06.30"	089° 50' 53.43"	28.22
Mooring Anchor 9	029° 04' 06.62"	089° 50' 54.55"	28.18
Mooring Anchor 10	029° 04' 26.84"	089° 51' 10.10"	26.97
Mooring Anchor 11	029° 04' 27.84"	089° 51' 09.96"	26.92
Mooring Anchor 12	029° 04' 28.83"	089° 51' 09.73"	26.87
Service Vessel Mooring Buoy 1	029° 04’ 41.63”	089° 50’ 47.12”	27.16
Service Vessel Mooring Buoy 2	029° 04’ 06.86”	089° 50’ 36.37”	28.76

2.0 ALTERNATIVE ANALYSIS

The Alternative Analysis for the Project was conducted in accordance with NEPA guidelines. This section describes the purpose and need of the Project, the process and criteria for identifying and evaluating alternatives to the Project, and the description and analysis of each alternative. The alternatives examined include:

- No Action Alternative;
- System Alternatives;
- DWP siting alternatives;
- DWP design alternatives;
- Construction methodology alternatives; and
- Decommissioning alternatives.

An alternative would generally be considered to be preferable to the Project if the alternative:

- Meets the stated purpose and need of the Project;
- Is technically feasible and practicable;
- Offers a significant environmental advantage over the Project as proposed; and
- Has the ability to meet the Project's objectives.

An alternative that cannot achieve the Project's purpose and need cannot be considered an acceptable replacement for the Project as proposed. To be a technically practicable alternative generally requires that the alternative uses common construction methods. Although an alternative that requires the use of a new, unique, or experimental construction method may be feasible, it may not be technically practical because the required technology is either unproven or not available. If the environmental impacts of an alternative are equal to or only provide a minor advantage over the Preferred Alternative, the alternative would not be considered to provide a significant advantage that warrants changing the Project as proposed. Lastly, an economically practical alternative needs to generally maintain the price-competitive nature of the Project as proposed where the added cost to design, permit, construct, and operate the alternative would not render it economically impractical.

2.1 No Action and System Alternatives

The following sections evaluate a No Action Alternative where the Project would not be constructed, as well as system alternatives where the Project would make use of other existing (or proposed) facilities, including the alternative of constructing an inshore versus DWP facility, to meet the Project's purpose and need.

2.1.1 No Action Alternative

Under the No Action Alternative, the infrastructure proposed by the Applicant would not be built or brought online, and the environmental impacts identified in this DWP application would not occur. Potential impacts associated with the Project would be avoided under the No Action Alternative; however, the benefits of the proposed Project would not be realized, and potential customers would likely

seek to obtain LNG from other sources. The Applicant does not consider adoption of the No Action alternative to be a viable alternative.

2.1.2 System Alternatives

System alternatives were evaluated to determine if other existing, planned, or proposed facilities could be used to meet the Project's purpose and need. A system alternative could include infrastructure additions or other modifications to existing, planned, or proposed facilities to adjust capacity to provide receipt, transport, or export capabilities consistent with that of the Project. The assessment of system alternatives was based on current publicly available information.

The Project is for LNG export and any system alternatives considered must have the ability to export LNG. Although development of onshore LNG export facilities is not considered a true alternative to the Project, existing, approved, and proposed onshore LNG export projects are included in this analysis, along with offshore projects. There are currently 24 operating, approved but not yet constructed, or proposed LNG export facilities within the Gulf Coast region (FERC 2022; MARAD 2021). These projects serve the same demand for LNG export, however, are not considered true alternatives to the Project because each has its own customer base or could be constructed and operated regardless of the outcome of the Project. Other existing, authorized, or proposed LNG export facilities are independent of each other, not mutually exclusive, and for that reason, do not represent true alternatives to each other. For these reasons, other existing, authorized, or proposed LNG export projects in the GOM are not considered reasonable system alternatives to the Project.

2.2 DWP Siting Criteria

The Applicant considered applicable USCG siting guidelines (33 CFR § 148.720) when identifying potential sites for its Project. In addition to the USGC siting criteria, the Applicant developed Project-specific criteria for development of the Project that have direct relevance to Project siting. The Project-specific siting criteria are summarized in Table 2-1.

Table 2-1 Siting Criteria for the New Fortress Energy Louisiana FLNG Project

Criteria	Rationale
1. Natural gas sourced from southeast Louisiana market	Take advantage of the abundant domestic natural gas supply available in the southeast Louisiana market.
2. Natural gas sourced from existing pipeline with adequate capacity without need for new or modified onshore facilities	Avoid construction of new or modified on shore facilities and associated environmental impacts
3. Location in water depths between approximately 20 – 33 meters, to accommodate the FLNG 1 self-elevating platforms, FSU, and LNGCs.	Minimum depth to accommodate FSU and LNGC drafts, maximum depth for FLNG 1 self-elevating platforms design limits
4. Potential site in a BOEM lease block that is available for new development	Construction and operation require site control, with no competing interests
5. Minimize distance between feed gas pipeline and FLNG platforms.	Minimize length of new pipeline lateral(s) to minimize environmental impacts and cost
6. Minimize distance from existing designated shipping safety fairway	Minimize LNGC traffic outside of established shipping fairways
7. Avoid sensitive habitats or other marine constraints	Avoid sensitive resources and existing infrastructure

2.2.1 Source Pipeline Alternatives

The primary siting criterion for the Project is sourcing natural gas from the southeast Louisiana market to take advantage of the abundant domestic natural gas supply sourced from this area. A second primary criterion is tying into an existing offshore natural gas pipeline in this market with existing capacity to supply the Project feed gas requirements without the need to add or modify onshore facilities. A pipeline can meet this criterion with natural gas produced either onshore or offshore, or a combination of both.

Several other criteria were applied during the search for the potential source pipeline. These criteria included: the pipeline must traverse water depths suitable for the construction and operation of a DWP of this design, or a minimum depth of approximately 20 to 33 meters (66 to 108 feet), located in an area with reasonable and safe vessel access, and the pipeline must avoid areas that may preclude the construction and operation of a DWP, including National Marine Sanctuaries, USCG Lightering Areas, designated anchorage areas, or designated marine disposal areas.

Application of these criteria resulted in the identification of the Kinetica pipeline system as the natural gas source pipeline that could meet the Project objectives.

2.2.1.1 Kinetica Line 5236D-100 and Line 526C-100 (Proposed)

The Kinetica Line 526D-100 24-inch pipeline and the parallel Line 526C-100 20-inch pipeline run from near Scofield Bay, Plaquemines Parish, Louisiana, southward offshore to Grand Isle lease block 43 and WD-68. Line 526D-100 and 526C-100 are part of Kinetica's West Delta 68 System that connects to the TGP pipeline system in Port Sulphur, Louisiana (Kinetica 2022). Based on consultation with Kinetica and an independent flow analysis, the Applicant confirmed that Line 526D-100 and 526C-100, either independently or in combination, have existing capacity to meet the Project needs without construction of new or modified onshore facilities.

Gas will be sourced from domestic natural gas from multiple supply hubs in the Southeast Louisiana local market and will flow approximately 15 nm (28 km) through the existing Kinetica pipeline system to the interconnection with the Project pipeline laterals. The Kinetica pipeline system has been in continuous natural gas service since it was placed in service. The pipeline pressure is currently operating at 750 psi with an onshore MAOP of 1,000 psi and an offshore MAOP of 1,250 psi. The pipeline has been under regulatory oversight since it was placed in service. PHMSA oversees integrity management and safety on the entire line.

2.2.2 DWP Site Alternatives

After identifying the Kinetica Lines 526D-100 and 526C-100 as the preferred source pipeline(s), the Applicant applied the Project environmental objectives and the USGC siting criteria described above and identified five alternative locations along the Kinetica Line 526D-100 and 526C-100 pipelines for placement of the FLNG facilities. For the purpose of initial siting, the Applicant assumed the FLNG platforms and FSU mooring system could be sited within an area encompassing a diameter of approximately 3,500 feet (1,066 meters). Each alternative location is depicted on **Figure 10** and described below.

2.2.2.1 WD Block 39 North

The Applicant initially sought to identify potential site locations between the existing Kinetica Line 526D-100 and 526C-100 pipelines to allow flexibility of connecting the Project to either or both pipelines with minimal pipeline lateral length(s). Kinetica requested that any seafloor disturbance remain at least

200 feet (91 meters) from the existing pipelines, with the exception of the pipeline lateral itself. The Applicant evaluated a site within the northern portion of WD-39 between the Kinetica pipelines where the pipelines are approximately 3,500 feet (1,066 meters) apart. This alternative site would allow a Project width of up to approximately 3,100 feet (945 meters) while maintaining the requested 200-foot (91-meter) protective buffer from the existing pipelines. This site would be situated between an existing production platform and pipeline to the north and an existing pipeline to the south. This site is approximately 16 nm north[2] of the end of the Louisiana Offshore Oil Port ("LOOP") project fairway in water depth of 79 to 84 feet (24 to 26 meters). This site avoids sensitive marine resources and obstructions and meets all other siting criteria. While this site meets most of the Project siting criteria, the requirement to maintain 200 feet (91 meters) from the existing Kinetica pipelines reduces the usable space to only 3,100 feet (945 meters). This limited available space between the two Kinetica pipelines would restrict the ability to micro-site the location and/or orientation of facilities during final design to account for bottom and/or metocean conditions if required. Therefore, this site was not selected as the preferred alternative.

2.2.2.2 WD Block 39 South

The Applicant evaluated a second site within the southern portion of WD-39 and adjacent WD-38 and between the Kinetica pipelines where the pipelines are approximately 4,000 feet (1,219 meters) apart. This alternative site would allow a Project width of up to approximately 3,600 feet (1,097 meters) while maintaining the requested 200-foot (91-meter) protective buffer from the existing pipelines. This site would be situated between an existing Shell 30-inch oil pipeline to the north and an existing production platform and pipeline to the south. This site is approximately 14 nm north of the end of the LOOP project fairway in water depth of 94 to 98 feet (29 to 30 meters). This site avoids sensitive marine resources and obstructions and meets all other siting criteria. While this site meets all Project siting criteria including siting the facility within a 3,500-foot (1,066-meter) -diameter area, the relatively limited available space between the two Kinetica pipelines would restrict the ability to micro-site the location and/or orientation of facilities during final design to account for bottom and/or metocean conditions if required. Therefore, this site was not selected as the preferred alternative.

2.2.2.3 WD Block 68

The Applicant evaluated a third site between the Kinetica pipelines within the northern portion of WD-68 where the pipelines are approximately 3,500 feet (1,066 meters) apart. This alternative site would allow a Project width of up to approximately 3,100 feet (945 meters) while maintaining the requested 200-foot (91-meter) protective buffer from the existing pipelines. This site would be situated between an existing production platform and connecting 3-inch pipeline to the north and 10-inch pipeline to the south. This site is approximately 13 nm north of the end of the LOOP project fairway in water depth of 99 to 104 feet (30 to 32 meters). This site avoids sensitive marine resources and obstructions and meets all other siting criteria. While this site meets most of the Project siting criteria, the requirement to maintain 200 feet (91 meters) from the existing Kinetica pipelines reduces the usable space to only approximately 3,100 feet (945 meters). This would restrict the ability to microsite the location and/or orientation of facilities during final design to account for bottom and/or metocean conditions if required. Therefore, this site was not selected as the preferred alternative.

[2] This distance and other similar distances reported in Section 2.5.2 are measured from the edge of a 3,500-foot diameter potential project site.

2.2.2.4 WD Block 40

In addition to evaluating sites between the Kinetica pipelines, the Applicant evaluated potential sites adjacent to, but not between, the Kinetica pipelines. The Applicant evaluated these sites to meet Kinetica's request to maintain at least 200 feet (91 meters) from their existing pipelines, while also allowing the flexibility for micro-siting and adjusting the orientation of the facilities during final design if needed to account for bottom and/or metocean conditions without the constraint of the existing pipelines. The Applicant evaluated a site east of the existing pipelines, in block WD 40 approximately 5,500 feet (1,676 meters) east of the Kinetica Line 526C-100 20-inch pipeline. This site would be between 2,000 and 4,000 feet (609 and 1,219 meters) from existing production platforms to the north, northeast, and south, and adjacent to existing gathering pipelines to the east. This site is approximately 16 nm north of the end of the LOOP project fairway in water depth of 85 to 89 feet (26 to 27 meters). Use of this site would require a pipeline lateral of at least 5,500 feet (1,676 meters) that would cross two known gathering pipelines. While this site avoids sensitive marine resources and obstructions and meets all other siting criteria and provides flexibility, as needed, for micro-siting and/or orientation during final design, it would require over 1 mile of pipeline lateral that would cross two known existing pipelines. For this reason, this site was not selected as the preferred alternative.

2.2.2.5 WD Block 38 (Preferred)

In addition to the WD-40 alternative, the Applicant evaluated a site west of the existing pipelines, in WD-38 approximately 500 feet (152 meters) west of the Kinetica Line 526D-100 24-inch pipeline. This site would be over 600 feet (182 meters) from a Shell 30-inch oil pipeline to the northeast and over 3,500 feet (1,066 meters) from an existing production platform and connecting pipeline to the northwest. There are no obstructions in the near vicinity to the south or southwest. This site is approximately 15 nm north of the end of the LOOP project fairway in water depth of 85 to 93 feet (26 to 28 meters). This site avoids sensitive marine resources and obstructions and meets all other siting criteria, while providing flexibility if needed for micro-siting and/or orientation during final design. The Applicant selected this site as the preferred alternative.

2.2.3 Pipeline Laterals

Siting of the pipeline laterals was driven by the location of FLNG1 and FLNG2. The Applicant sited the pipeline laterals between the Kinetica Line 526D-100 pipeline and the Project site west of the Kinetica pipeline in generally the shortest possible pipeline route that also provides clearance for platform installation activities, in order to minimize cost and seafloor disturbance and related environmental impacts. The Applicant did not identify any reasonable pipeline lateral siting alternatives to the proposed route.

2.3 DWP Design Alternatives

2.3.1 Pipeline Lateral Design Alternatives

The Project location is west of the Kinetica Line 526D-100 24-inch pipeline. The Applicant evaluated three lateral design alternatives to tie the Project into Line 526D-100.

2.3.1.1 Pipeline Lateral Option 1

Pipeline lateral Option 1 includes a single pipeline lateral that would connect the Project to the Kinetica Line 526D-100. The design includes a single subsea piggable "Y" connection with the existing pipeline and three subsea pipeline valves. This design is the lowest cost of the three options considered.

2.3.1.2 Pipeline Lateral Option 2

Pipeline lateral Option 2 also includes a single pipeline lateral that would connect the Project to the Kinetica Line 526D-100. Pipeline Lateral Option 2 includes installation of two piggable "Ys" on the existing pipeline plus a third piggable "Y" on the single pipeline lateral. This design option would also require seven pipeline valves and a new section of pipeline to replace the pipeline between the two "Y" connections on the Kinetica pipeline.

2.3.1.3 Pipeline Lateral Option 3 (Proposed)

Pipeline Lateral Option 3 includes two parallel 24-inch pipeline laterals between the Kinetica Line 526D-100 and the Project. The pipeline laterals would be installed with gradual bends instead of piggable "Y"s to allow pigging of both laterals.

2.3.2 FLNG Design Alternatives

The Applicant evaluated two design alternatives for the platform component of the FLNG facilities

2.3.2.1 Self-Elevating Platform Design

The Applicant is proposing the use of self-elevating platforms for one FLNG unit (FLNG 1) and the compression platform. The Applicant also evaluated the use of self-elevated platforms for the second FLNG unit (FLNG 2), which would require acquisition of three additional self-elevating platforms. For the three platforms required for FLNG 1 as well as the Compression Rig, the Applicant will use self-elevating platforms converted from high capacity drilling operations and fitted for the Project-specific requirements. The self-elevating platforms are designed for the harsh GOM environment. Because of limited availability of three additional suitable self-elevating platforms on the desired Project development schedule, the Applicant will use fixed platforms for the second FLNG unit (FLNG 2).

2.3.2.2 Fixed Platform Design

The Applicant is proposing the use of fixed jacketed platforms for FLNG 2. The Applicant also evaluated the use of fixed platforms for all components including FLNG 1 and the Compression Rig. The Applicant determined that additional fixed platforms are generally available on the desired Project development schedule, therefore a Project design utilizing fixed platforms for each of the seven proposed platforms would be feasible. However, because self-elevating platforms generally can be installed quicker and with less construction-related impacts on the marine environment, the Applicant is proposing to utilize three self-elevating platforms to reduce overall environmental impacts, and a design alternative utilizing entirely fixed platforms is not preferred. However, because an alternative that would use entirely fixed platforms is a reasonable alternative that meets the Project objectives.

2.3.3 FSU Mooring Alternatives

The criteria for the FSU mooring system is to provide a permanent mooring in a water depth of approximately 100 feet (30 meters) that provides for uninterrupted transfer of LNG from the FLNG production platform as well as STS transfer of gas from the FSU to LNGCs. The mooring system must also provide for the metocean conditions expected at the Project site over the Project lifespan of up to 20 years.

The Applicant evaluated two mooring systems for the FSU. A description of each system evaluated is below.

2.3.3.1 Restricted Catenary Mooring (Proposed)

CAN Systems in Norway developed and designed the RCM system, a refined spread mooring system that comprises a bow mooring system, a mooring restrictor arrangement and stern hold back lines. The RCM system works in a similar manner as a conventional spread mooring system but with the key difference of allowing uninterrupted transfer of LNG on one side of the FSU, and clear access for incoming LNGCs on the other side of the FSU. The main feature of the RCM system is a specialized, subsurface connecting plate and restrictor arrangement that keeps the mooring lines at the bow and stern close together below keel level, thereby preventing the mooring lines from interfering and the LNGCs tied alongside during STS operation (Offshore Magazine 2020). The RCM system also avoids mooring lines from interfering with the cryogenic lines connecting the FLNG production platform to the FSU.

The RCM system meets all Project design criteria and has also been in use for similar projects in similar ocean conditions. Therefore, the Applicant selected the RCM system as the preferred alternative.

2.3.3.2 Conventional Spread Mooring System

The Applicant evaluated the use of a conventional spread mooring system for the FSU. A conventional spread mooring system would include mooring anchors on the bow and stern as well and port and starboard side of the FSU. However, this system would not allow for uninterrupted transfer of LNG on one side of the FSU, and clear access for incoming LNGCs on the other side of the FSU. Therefore, using a conventional spread mooring system for the FSU is not a feasible alternative for the Project.

2.3.4 FSU Anchor Alternatives

The Applicant evaluated anchor alternatives for use with the FSU mooring system. Design conditions for the anchors were the same as described above for the mooring system. A description of each anchor type evaluated is below.

2.3.4.1 Class A Fluke Anchor (Proposed)

The Applicant proposes to use a class A fluke anchor, model Vryhof Stevpris®. This anchor is a high holding power, drag embedment anchor commonly used in the oil and gas offshore industry including in challenging environments. The anchor works on hard soils, subsea permafrost, complex gravel and over-consolidated clays, and its design allows for use on relatively small construction and dredging vessels, where its higher efficiency allows for using a smaller anchor for the same holding capacity (Delmar-Vryhof 2021). Because this anchor type is commonly used, will meet the Project mooring system requirements, can be installed with minimal seafloor impact, remains mostly buried during operation, and can be removed during decommissioning, a class A fluke anchor is proposed.

2.3.4.2 Suction Piles

The Applicant evaluated the use of suction piles as an FSU anchor alternative. A suction pile, also known as a suction anchor or suction installed anchor in a mooring application, is an open-ended cylinder with a closed top which is penetrated into the bottom sediments by its own weight. A suction pile is held in place by suction formed inside the enclosed compartment after initial penetration into the bottom sediments. Suction piles are commonly used to provide an anchor point for horizontal loads in a mooring system (Tjelta 2001). Use of suction pile anchors have no advantage to the Project design and operation, and generally would have a greater area of impact on the seafloor during operation, this anchor type is not preferred.

2.4 Summary of Resource Effects from the DWP Alternatives

Based on the analysis above, use of self-elevating and fixed platforms along the Kinetica pipeline system in WD-38 is the Preferred Alternative. To further evaluate the alternatives, the Applicant also examined relevant resource areas as identified in the applicants detailed alternative analysis.

The alternatives considered include the:

- Preferred Alternative (Proposed) – A combination of four self-elevating platforms for FLNG1 and the Compression Rig, and three fixed platforms for FLNG2, situated in proximity to the Kinetica pipeline in WD-38; and
- Alternative 1 – Use of fixed platforms only for FLNG1, FLNG2, and the Compressor Rig, situated in the same general location as the Preferred Alternative.

The pipeline lateral and FSU components of each alternative would be identical. In addition, during operation the impacts would be similar between both alternatives. Therefore, any differences between alternatives are limited to construction/installation of the FLNG platforms.

3.0 IMPACTS

This section summarizes the potential impacts that may occur as a result of the Project. The focus of this summary is on direct and indirect impacts within the marine environment as a result of construction of offshore components. The majority of potential impacts associated with the Project are temporary; however, some long-term loss and conversion of the seabed for the duration of operations will occur due to the presence of permanent structures.

The Project will be located in federal waters of the OCS. No Project components will be located within Louisiana state waters, however support vessels during construction and operation will pass through state waters.

Construction of the offshore facilities will cause seafloor disturbances and may result in short-term and localized turbidity plumes and increases in total suspended solids; however, potential impacts are anticipated to be negligible. Furthermore, the seabed and near-bottom water column in the Project area are highly dynamic environments, with suspension and redeposition of sediment occurring continuously due to storms and tidal currents. The majority of seafloor impacts from construction will be caused by lay barge anchor placement and anchor chain sweep during pipeline installation. Water quality impacts from these processes and other anthropogenic processes, such as trawling and commercial vessel anchoring, are similar to or much larger than any potential Project effects.

Installation of the platforms and FSU anchors will also result in a long-term reduction of useable marine environment surface area. Although this impact will be negative, it will be reversible and minor. The key factors in habitat restoration include time of year when disturbance occurred and proximity of healthy habitat to the disturbed areas. Recovery of benthic infauna is typically restored to original productivity levels within a few years after the disturbance. Given the extent of locally available soft-bottom and pelagic habitat present in the area and that there are no live-bottom areas, reefs, or other special marine resources located near the Project, construction of the Project will not have a significant impact on the seafloor.

Although the suspension of sediments will be greater than average for a period of days after Project installation and other intrusive activities cease, the overall negative impact of reduced primary productivity will be temporary and negligible. Because no live-bottom areas, reefs, or other special marine resources are located near the Project, and the effects are expected to be short term and localized, no significant impacts on marine resources from pipeline installation are expected. Additionally, installation of the Project will cause a short-term, direct disturbance to bottom sediments, resulting in the reduction and change of benthic communities that occur within the area affected. As with turbidity effects, these impacts will be negative, direct, and likely, but temporary, reversible, and negligible.

Increased turbidities due to bottom turbulence will be expected, as fine-grained sediment is suspended within the currents. The impact is expected to be short term, diminishing over time (days to weeks) as equilibrium is established along the pipeline corridor and the size of the berms is reduced. The impacts will only be relevant during the construction period and shortly thereafter and will not result in long-term increases in turbidity for the region.

Minor but localized impacts on water quality and currents are expected during construction, operation, and decommissioning of the Project. Construction impacts will include increased turbidity and sedimentation resulting from pipeline and platforms installation. Minor spills from construction and

operation support vessels may result in water quality impacts that could affect marine resources, but adherence to the Project's Facility Response Plan will minimize these effects. Minor, insignificant impacts from turbidity and sedimentation as a result of scour around each platform pile could occur. Changes to currents will be negligible during all phases of the Project. No impacts on regional sensitive marine resources are expected from construction, operation, or decommissioning of the Project. The overall levels of magnitude for these potential impacts are outlined in Table 3-1.

During operations, seafloor impacts will consist of the permanent impacts from spud placement for the FLNG1 and the Compression Rig, pile placement for FLNG2, anchor placement for the FSU and service vessel buoy, and anchor chain sweep. An overview of the estimated seafloor disturbance that will occur during Project operations is provided in Table 3-2. Project operations will affect a total of 6.37 acres.

Construction of the pipeline laterals will also result in suspension of sediments in the local area of construction along the pathway, and the extent of the plume will be influenced by local current velocities and water depths. Increases in turbidity will result from a sediment plume from the pipeline lowering to the sediment bottom. Sediment plumes generated from the pipeline installation will be temporary and only represent a fraction of the total sediment load overall based on the sediment loading attributed to the Mississippi River. Benthic communities that have established in this dynamic environment are well adapted to periodic resuspension and deposition of sediments from this influence on sediment loading from the Mississippi River. Thus, any impacts associated with sediment resuspension and redeposition are expected to be short term and temporary in impact. Following resuspension during construction, coarse sediments will fall out and resettle quickly (within hours) while fine sediments may remain suspended for a longer period of time (hours to days) depending on the prevailing currents. The potential impacts to water quality are anticipated to be short-term, localized, and minor. Due to the negligible amount of the water column that could be affected relative to the volume of the GOM within a half-mile of the site, the potential impacts will not be significant. Although sediments may be transported over a short distance, there will be no anticipated change in sediment quality as a result of these construction activities.

Resuspension of sediments into the water column may also result in the introduction of sediment-based contaminants via dissolution. Elutriate analysis data collected for sediments from within the Project area were assessed at two slurry concentrations (1.0 gram per liter ["g/L"] and 10.0 g/L). Results of the elutriate analysis revealed select exceedances of ambient water criteria concentrations for select metals. Comparison to regional elutriate analyses (WD-68 and WD-39) revealed comparable trends in concentrations relative to the Project area (WD-38). Exceedances of water quality criteria are expected to be of short duration and not significant.

Table 3-1 Estimated Seafloor Affected by Project Construction

Project Component	Polygons		Circles	Area	Individual Area (acres)	Number	Total Area (acres)
	Length (feet)	Width (feet)	Radius (feet)	Individual Area (square feet)			
North Pipeline - Kinetica to Compression Rig Location	1,200	20	---	24,000	0.551	1	0.55
North Pipeline - Compression Rig Location to FLNG1	2,000	20	---	40,000	0.918	1	0.92
South Pipeline - Kinetica to Compression Rig Location	1,200	20	---	24,000	0.551	1	0.55
South Pipeline - Compression Rig Location to FLNG1	2,000	20	---	40,000	0.918	1	0.92
South Pipeline - Sequence 3 FLNG1 to FLNG2	500	20	---	10,000	0.230	1	0.23
Lay barge anchor spread (1,500 ft wide + 1500 ft on either end of each pipeline)			---				313
Pipeline Laterals subtotal							**316.2**
FLNG1 - Jack-up platforms							
Utility Platform Can footprint	---	---	33	3419.46	0.079	3	0.24
Treatment Platform Can footprint	---	---	33	3419.46	0.079	3	0.24
LNG Platform Can footprint	---	---	33	3419.46	0.079	3	0.24
FLNG1 subtotal							**0.7**
FLNG2 - Fixed platforms							
P4-Gas Treatment Platform (mud mat footprint for area)	20	20	---	400	0.009	4	0.04
P5-Liquefaction Platform (mud mat footprint for area)	20	20	---	400	0.009	4	0.04
P6-Utilities Platform (mud mat footprint for area)	20	20	---	400	0.009	4	0.04
FLNG2 subtotal							**0.1**
Compressor Platform Can footprint	---	---	33	3419.46	0.079	3	0.2
Compressor Platform Subtotal							**0.2**
FSU Mooring Anchor Drag to Set	150	15	---	2250	0.052	12	0.62
FSU Mooring Anchor Chain Placement (1)	730	15	---	10950	0.251	12	3.02
FSU Mooring Subtotal							**3.3**
Construction Jack-Up Barge Spuds	---	---	20	1256	0.029	8	0.26
Construction Support Vessel Anchor Drops			10	314	0.007	100	0.72
Construction Vessel subtotal							**1.0**
Total							**321.8**

Assumptions:
(1) anchor chain length 1,100', assumes ~2/3 of chain in contact with seafloor.
Pipelines installed by jetting; assumed minimal trench width required.

Table 3-2 Estimated Seafloor Affected by Project Operations

Project Component	Polygons		Circles	Area (sq feet)	Area (acres)	Number	Total Area (acres)
	Length (feet)	Width (feet)	Radius (feet)				
Lateral Pipeline to FLNG1 (Kinetica to FLNG1)	NA	NA	NA	NA	NA	NA	0
Lateral Pipeline to FLNG2 (Kinetica to FLNG2)	NA	NA	NA	NA	NA	NA	0
Pipeline Laterals subtotal							**0**
FLNG1 – Self-elevating platforms							
Utility Platform Can footprint (exposed on seafloor surface)	---	---	15	706.5	0.016	3	0.049
Treatment Platform Can footprint (exposed on seafloor surface)	---	---	15	706.5	0.016	3	0.049
LNG Platform Can footprint (exposed on seafloor surface)	---	---	15	706.5	0.016	3	0.049
FLNG1 subtotal							**0.1**
FLNG2 - Fixed platforms							
P4-Gas Treatment Platform (mud mat footprint for area)	20	20	---	400	0.009	4	0.037
P5-Liquefaction Platform (mud mat footprint for area)	20	20	---	400	0.009	4	0.037
P6-Utilities Platform (mud mat footprint for area) (piles for volume)	20	20	---	400	0.009	4	0.037
FLNG2 subtotal							**0.1**
Compressor Platform Can footprint (exposed on seafloor surface)	---	---	15	706.5	0.016	3	0.049
Compressor Platform subtotal							**0.05**
FSU Mooring Anchors (exposed on seafloor surface)	10	10	---	100	0.0022957	12	0.028
FSU Mooring Anchor Chain Sweep (1)	730	30	---	21900	0.5027548	12	6.033
FSU Mooring Subtotal							**6.1**
						Total	**6.4**

Assumptions:
(1) anchor chain length 1,100', assumes ~2/3 of chain in contact with seafloor.
pipelines installed by jetting so assumed minimal trench width required

3.1 Hydrostatic Testing

Before the pipelines and platform piping are placed into service, the Applicant will conduct hydrostatic testing to verify their structural integrity. The pipeline laterals will be filled with seawater that is withdrawn from the GOM following installation but prior to operation. Based on the design for two, 4,020-foot, pipeline lengths of 2-foot-diameter pipe, approximately 60,000 gallons will be required to fill the pipeline laterals. While the pipelines are filled with seawater, the water may be treated with chemicals to prevent corrosion. Following hydrotesting of the pipeline laterals and before performing a nitrogen purge, a second biocide, possibly in the form of a biocide pill, might be used. The biocide pill, if used, will be contained between two pigs as it is sent through the pipelines. Biocides are usually a combination of glutaraldehyde and quaternary amine actives, which may not meet regulations for overboard discharge. Therefore, the Applicant will stage holding tanks at each FLNG to gather and treat the fluids between the two pigs and then transfer them to shore for appropriate disposal. Permitted discharges will be to the water column near the surface through an aerating device and will not reach the seafloor to cause scour.

The discharges will be made in accordance with the terms of the general discharge permit governing hydrostatic testing operations of this type in the GOM. Water quality will not be impacted as a result of the hydrostatic testing of the pipeline laterals. To ensure that water quality standards are met, all test water will be required to meet United States Environmental Protection Agency ("EPA") National Pollutant Discharge Elimination System ("NPDES") permit requirements prior to discharge. With adherence to permit requirements, potential impacts to water and sediment quality from hydrostatic testing and test water discharge are anticipated to be negligible.

To limit the amount of hydrostatic test water discharges that are necessary offshore, all new pipe assemblies and skids containing pressurized pipe that were pre-fabricated in an onshore, third-party fabrication yard (e.g., pipe assemblies, platform piping, tie-in spools, risers) will have already been hydrostatically pressure tested prior to transport offshore.

During the operational life of the Project, maintenance of the pipeline will include periodic pigging to clean out residual materials. The unmanaged release of these materials into the surrounding environment can lead to water quality impacts and contamination of adjacent benthic habitats. However, due to the expected short duration of these impacts, if they occur, no significant negative effects on water or sediment quality are expected. It is anticipated that such internal inspections will be conducted in accordance with the Operational Manual for the Project.

Discharges for the new facilities will be addressed in an individual NPDES Permit issued by EPA Region 6. None of the anticipated environmental consequences from DWP operations are expected to have irreversible or significant impacts to water or sediment quality.

3.2 Pipelines

The pipelines will be installed using a pipelay barge utilizing the S-lay pipelay installation method. The barge will contain stations for pipe welding, weld inspection, and field joint application. Prior to transport to the Project area, the pipe segments will be concrete coated and cathodic protection anodes will be installed at the fabrication yard.

Excavation of the trench will be via jet sled or similar pipe burial equipment utilizing the same Anchor Handling Tug. The jet sled will be lowered over the pipe resting on the seafloor. Jet pumps will then be utilized to lower the pipe by jetting out the sediment from under the pipe. The pipe will be lowered to a sufficient depth to allow at least 3 feet of cover between the seafloor and the top of pipe. The jetted trench

typically has a V-shaped cross-section. If necessary, divers will utilize hand jetting equipment to ensure the required depth is achieved. After the pipe has been buried to the desired depth, a sled will be dragged back over the trench spoil to re-fill the trench. Impacts from construction of the pipeline laterals are provided above in Table 3-1.

During operations, the pipeline lateral will be below the seafloor. Any maintenance activities that require pipeline excavation are anticipated to have similar impacts to those described for pipeline construction. However, they will affect a much smaller area and the work will likely be performed by divers. If necessary, excavation and subsequent reburial of an area along the pipeline may result in a localized increase in turbidity and sediment displacement. Although sediments may be transported over a short distance, changes in sediment quality are not anticipated as a result of maintenance activities. Any impacts to water quality (e.g., turbidity) from pipeline maintenance will be intermittent, short term, and minor.

3.3 Platforms

Once on location and heading in the correct direction, the self-elevating platforms (FLNG1 and Compression Rig) will be "pinned" to the sea floor by extending the legs into the ocean floor. They are then jacked up clear of the water and ballasted to create a "pre-load" on the legs to push them into the sea floor to the point of resistance. When the legs go no further into the sea floor, the ballast is discharged and the platforms are jacked-up to the pre-determined height creating an "air gap" above any possible storm waves.

Similar to the self-elevating platforms, the fixed platforms (FLNG2) will be floated out to position. Prior to arriving on site, the piles will be driven in place. Each of the platforms will have four legs and therefore require four piles per platform.

Scour is the removal, by hydrodynamic forces, of granular bed material in the vicinity of a structure and can occur when the hydrodynamic bottom shear stresses are greater than the sediment critical shear stress. Scour can cause changes in local turbidity concentrations and result in sediment disruption and movement due to changing tides and currents. Placement of new platforms will result in the driving of piles in the area. This will result in sediment disturbances on the seafloor. This sediment disturbance is expected to be short term and will not result in significant impacts to water quality. Presence of the pilings for the platforms will be subject to near bottom currents that could result in localized scouring around the platforms in the fine sediments of the GOM. This scouring is anticipated to be local to the platform structures and not result in any significant sedimentation.

3.4 FSU Mooring Anchors

The small changes to currents that could occur around the FSU mooring anchors could result in local scour of sediment. However, as described above, the potential for scour is minimal. The area consists of fine-grained sediments that are expected to be cohesive in nature and not prone to scour.

The chain between the FSU and associated anchors could also result in disturbance to the seafloor as the chain sweeps along the bottom. As the chains sweep along the seafloor, they will result in an increase in turbidity levels and sedimentation in proximity to the mooring due to re-suspension of sediments. Although sediments may be transported over a short distance, changes in sediment quality are not anticipated as a result of the chain sweeps. The area that could be affected will be limited to the maximum swing of the chain. Potential adverse impacts to water quality (i.e., turbidity) from the chain sweeps will

be long term but intermittent, minor, and localized. Due to the negligible amount of the water column that will be affected relative to the size of the GOM, the potential impacts will not be significant.

3.5 Operational Seawater Withdrawals

During operations, seawater withdrawals will occur at each platform and by the LNGCs, FSUs, and service vessels. The LNGCs that will call on the DWP will not be part of the Project. Shippers who transport LNG through the Project will use the worldwide fleet of available LNGCs. As independent carriers these vessels will be permitted under the NPDES Vessel General Permit ("VGP") program as a vessel in commerce. LNGCs will maneuver to the FSU and alongside for STS transfer. For general information purposes, potential water and sediment quality impacts associated with LNGCs and other service vessels are discussed below.

3.6 FLNGs and Compression Rig

Seawater intake will be limited to the withdrawal of water needed for the cooling water, utilities, process water, firewater and seawater pumps. The intake locations will be below the water surface.

Firewater pumps that will be operated only in the case of an emergency or during maintenance and testing. Maintenance and testing of the firewater system will require each firewater pump to be run for thirty minutes per week. A seawater pump will also be used to support various systems and facilities, providing water to the potable water converter, utility water, and sewage treatment systems, and also maintaining charging pressure on the firewater header system. The seawater pump will be run on demand at a flow rate of approximately 20 gallons per minute.

Operation of the Project will result in long-term seawater withdrawal from the GOM. Water withdrawal demand by the Project will only be a fraction of that present in the GOM basin. The estimated volume of seawater in the GOM is approximately 634 quadrillion gallons (Davis 2017). Relative to this volume, the Project withdrawals will be negligible in volume, resulting in negligible impacts on water quantity and quality in the GOM. The pumps and intakes servicing the FSU and platforms will be located less than 50 feet from the water surface and will not impact the bottom sediments owing to the water depths at the project site.

Ballast water is seawater used to stabilize a ship when loading/unloading cargo. and to maintain optimal vessel speed. Since the Project will involve LNG loading onto LNGCs, these vessels will likely discharge ballast water during operations rather than uptake seawater for ballast. A discussion of ballast water discharges is provided in the "Operational Discharges" section below. Service vessels offloading supplies at the DWP may require the uptake of ballast water; however, the uptake will be intermittent and any impacts from the withdrawal are anticipated to be localized and minimal.

According to the Ballast Water Management Plan (Golar LNG 2019), although the FSU has three ballast pumps, only two of them can be used at a time during ballasting/de-ballasting (one pump to each ballast water treatment system), except in cases of emergencies. The normal operating parameters are 2 pumps x 2,500 m^3/hour. The FSU Ballast Water Management Plan states that any ballast water that is withdrawn will be mechanically, physically, chemically, or biologically processed, either singularly or in combination, to remove, render harmless, or avoid the uptake or discharge of harmful aquatic organisms and pathogens within ballast water and sediments. Ballast water treatment equipment may operate at the uptake or discharge of the ballast water, during the voyage, or at a combination of these events. Any impacts from the withdrawal of ballast water are anticipated to be localized and minimal.

3.7 Upsets and Accidents

Water and sediment quality could be impacted if an inadvertent release of oil, diesel, lubricants, or other chemicals were to occur. The fate and transport of a spill is dependent on the size of the spill and the type of material spilled, in addition to other factors. Potential spills during all phases of the Project are likely to be small or minor.

Hazardous materials will be stored and managed in accordance with all applicable regulations. The Project will not include refueling capabilities for personnel and supply vessels. Limited amounts of fuel will be stored for emergency needs to support vessels and helicopters, and for use during startup. In the event of an inadvertent release, a Project-specific Spill Contingency Plan and the Port Operations Manual will be followed. Based on this requirement and the fact that large quantities of petroleum hydrocarbons or other hazardous waste will not be stored, the risk of impacts to the coastal and marine environment from a spill is considered negligible.

3.8 Decommissioning

Decommissioning will involve removal of the platforms as well as the piles to approximately 4.5 meters (15 feet) below the seabed, and abrasive cutters, explosives, or water cutters may be used during the decommissioning. After removal, the platforms will likely be used as an artificial reef as part of the Rigs to Reef program, which will provide a long-term benefit to fish and other marine life. The pipeline laterals will be abandoned in place, and all other offshore components (i.e., FSU anchors) will be removed and transported to shore for reuse or disposal.

Potential impacts to the water and sediment quality from decommissioning will be similar to those described for construction. Removal of the platforms and anchor piles will temporarily disturb the seafloor. Vessel anchoring to support the decommissioning activities will also result in disturbance to the seafloor. Turbidity and sedimentation levels may temporarily increase due to re-suspension of sediments; however, the increase will be short-term and will return to background levels without mitigation. Potential deposition of suspended sediments in soft bottom habitats is expected to migrate only a short distance and cover a small area relative to the total habitat available.

Overall, decommissioning activities may involve localized, short-term, and negligible to minor effects to the water and sediment quality. No significant impacts are anticipated as a result of Project decommissioning.

3.9 Mitigation Measures

Construction of the Project will result in short-term and minor impacts during Project construction. Potential impacts on water and sediment quality from Project construction, operation, and decommissioning are expected to be negligible to minor with most impacts short term. None of the potential impacts to the water and sediment quality are expected to be significant or irreversible, therefore, no mitigation measures are proposed. Activities associated with construction, operation, and decommissioning of the Project components that may have environmental consequences on water, sediment, and habitat quality are included in Table 3-3 below.

Table 3-3 Summary of Potential Impacts on the Marine Environment		
Action/Activity	**Impacts**	**Level of Impact**
Construction and Installation		
Pipeline Jetting and Backfilling	Decreased water quality through increase in turbidity Changes to current patterns due to creation of obstructions	Negligible
Pile Driving	Decreased water quality through increase in turbidity Loss of benthic habitat Conversion of softbottom to artificial hardbottom habitat	Negligible
Hydrostatic Testing	Withdrawal and discharge of water Decreased water quality through increase in turbidity Alteration of currents	Negligible
Operations		
Maintenance	Hazardous materials spills Potential sustained increase turbidity	Negligible
Platform	Potential sustained increased turbidity due to scour Potential benefits to pelagic species and invertebrates (vertical structures for foraging or shelter)	Negligible
FSU/LNGCs	Ballast water discharge Introduction of non-native species	Negligible
Upsets and Accidents		
Accidental Spills	Water quality degradation	Negligible
Decommissioning		
Abandonment of Pipeline	Decreased water quality (through increase in turbidity)	Negligible
Removal of Platforms	Alteration of local currents Reduction in water quality Loss of vertical structures/artificial hardbottom habitat	Negligible
Support Vessels Water Intake	Alteration of localized currents	Negligible
Accidental Spills	Water quality degradation	Negligible

Activities required for construction and development of the Project will include the installation of both self-elevating structures and fixed structures, including anchor placement and pile driving installation of equipment; minor bottom disturbances to install the pipeline laterals; construction vessel traffic; including construction vessel anchoring and dragging; and hydrostatic testing, including test water discharge. These activities have potential environmental consequences to water and sediment quality. Additional impacts could also be caused by accidental releases (i.e., spills). None of the potential environmental consequences from Project construction are expected to have irreversible or significant impacts to water or sediment quality. All Project-related activities will comply with federal regulations (i.e., USCG and EPA) to ensure that significant effects to water and sediment quality do not occur. Further, construction of the pipeline laterals, construction of the platforms, and adherence to all regulations and permit requirements, as well as spill contingency planning, will limit potential impacts from construction and operation of the Project. Therefore, no mitigation measures specifically directed at water and sediment quality are proposed.

The Project is not located in proximity to any sensitive or unique benthic habitat such as live bottom or reefs. Further, adhering to all regulations and permit requirements, as well as spill contingency planning, will limit potential impacts from construction and operation of the Project. Therefore, no mitigation measures specifically directed at sensitive marine resources are proposed.

The assemblages of demersal and pelagic fishes and invertebrate species in the Project Area may be minimally altered by the introduction and long-term presence of Project structures and their foundations. While the placement of permanent structures will result in the conversion of some softbottom habitat to artificial hardbottom habitat, this would potentially result in beneficial impacts, as new hardbottom habitat would be quickly colonized by organisms that attach to hard substrate (e.g., sessile anthozoans, sponges, bryozoans, mussels), mobile macroinvertebrates such as crabs, and small demersal fish (Wilson et al. 2003)

Hard-bottom substrate would be introduced in up to 6.40 acres of the Project area for the operational duration of the Project. The infrastructure would become colonized by algae and invertebrates and attract mobile fish and invertebrates that favor areas of high rugosity and structure to form a complex living reef. Pelagic species would aggregate around the vertical structures to forage or shelter. The primary permanent effect of decommissioning would be the removal of the vertical habitat and the loss of artificial hardbottom. Temporary effects of decommissioning would be nearly identical to those described for construction, namely increased noise, turbidity, and sedimentation. Some organisms that had attached or encrusted on the foundations would be injured or killed when the infrastructure was removed.

On balance, the Project's impact on benthic and pelagic habitat would be either neutral or beneficial to most fish and invertebrates. While the presence of new hard bottom may influence local distributions of demersal fish and invertebrates on a small spatial scale, no population-level effects are expected. The new infrastructure would neither harm nor benefit demersal species that prefer open sandy bottoms, because sandy bottom is not a limiting feature in the Project area; therefore, impacts are expected to be minor, and no mitigation measures for habitat conversion are proposed.

Neither lights nor sounds associated with the Project would affect softbottom habitat. During decommissioning, some infaunal and epifaunal organisms would likely be crushed or buried. Following decommissioning, softbottom habitat would return to its original condition and be recolonized by individuals from adjacent areas or recruited from the plankton. Both adverse and beneficial effects would be largely reversible following decommissioning, therefore, no mitigation measures are proposed at this time.

Potential impacts to marine mammals, sea turtles, federally listed threatened and endangered species, migratory birds, and essential fish habitat are discussed in Section 4.0 below and will be addressed in further detail in the EIS that will be completed for the Project. The final effects determination of the construction and operation of the Project on federally listed species will be made during Section 7 consultation with the United States Fish and Wildlife Service ("USFWS") and National Oceanic and Atmospheric Administration, National Marine Fisheries Service ("NOAA Fisheries").

4.0 FEDERALLY LISTED SPECIES, MIGRATORY BIRDS, AND ESSENTIAL FISH HABITAT

4.1 Federally Listed Species

The Endangered Species Act of 1973 ("ESA") set forth the protection and conservation of threatened and endangered species and the ecosystem that supports them. Section 7 of the ESA states that any project authorized, funded, or conducted by any federal agency should not "… jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined … to be critical."

Federally listed species under the protection of the ESA in the vicinity of the Project were identified by a review of publicly available databases and through coordination with federal resource agencies. A search using the USFWS Environmental Conservation Online System Information, Planning, and Conservation ("IPaC") System consultation tool (USFWS 2022) for the Project lease area was used to generate an official species list to fulfill the requirements of Section 7 of the ESA. Based on the results of the IPaC consultation tool, species and critical habitats under the sole responsibility of NOAA Fisheries are not shown on the IPaC.

NOAA Fisheries lists 19 threatened and endangered species under their jurisdiction that occur within the GOM. These include five species of sea turtle, five species of fish, seven species of coral, and two species of whale (NOAA Fisheries 2021a). See Table 4-1 below for all listed species under the ESA identified by IPaC and NOAA Fisheries with the potential to occur in the Project Lease Area and GOM, respectively.

Based on the available habitat within the footprint of the onshore pipeline and biology of each species, the Project is not anticipated to adversely affect any federal listed species protected under the ESA. The final effects determination of the construction and operation of the Project on federally listed species will be made during Section 7 consultation with USFWS and NOAA Fisheries.

4.1.1 Fishes

Five marine fish species in the GOM are listed as Threatened or Endangered under the ESA, as provided in Table 4-1: giant manta ray (*Manta birostris*), Gulf sturgeon (*Acipenser oxyrinchus desotoi*), oceanic whitetip shark (*Carcharhinus longimanus)*, Nassau grouper (*Epinephelus striatus*) and smalltooth sawfish (*Pristis pectinata*). One fish species, the shortfin mako shark (*Isurus oxyrinchus*), is currently under status review as a candidate species (86 Federal Register ["FR"] 19863). NOAA Fisheries manages most ESA-protected marine fish species, and it co-manages some species that move between freshwater and saltwater (e.g., sturgeon) with the USFWS.

Nassau grouper are found in tropical and subtropical waters of the western North Atlantic. This includes Bermuda, Florida, Bahamas, the Yucatan Peninsula, and throughout the Caribbean to southern Brazil. There has only been one verified report of Nassau grouper in the GOM at Flower Gardens Bank; therefore, this species is unlikely to be affected by the Project. They generally live among shallow reefs, but can be found in depths to 426 feet (NOAA Fisheries 2021b).

NOAA Fisheries manages most ESA-protected marine fish species, and it co-manages some species that move between freshwater and saltwater (e.g., sturgeon) with the USFWS.

Table 4-1 ESA Listed Threatened and Endangered Species in the Gulf of Mexico				
Common Name	**Scientific Name**	**ESA Status**	**Critical Habitat (in GOM)**	**Occurrence in Project Area**
Sea Turtles				
Green sea turtle	*Chelonia mydas*	Threatened	None	yes
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	None	yes
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	None	Possible but unlikely
Loggerhead sea turtle	*Caretta caretta*	Threatened	Coastal/inshore waters of the GOM	yes
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	None	Possible but unlikely
Mammals				
West Indian manatee	*Trichechus manatus latirostris*	Threatened	Coastal/Inshore waters of FL	Possible but unlikely
Rice's whale	*Balaenoptera edeni*	Endangered	None	Possible but unlikely
Sperm whale	*Physeter microcephalus*	Endangered	None	yes
Fish				
Giant manta ray	*Manta birostris*	Threatened	None	**yes**
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	Threatened	Coastal/Inshore waters of FL, AL, MS	no
Oceanic whitetip shark	*Carcharhinus longimanus*	Threatened	None	**yes**
Smalltooth sawfish	*Pristis pectinata*	Endangered	Coastal/Inshore waters of Southern FL	no
Nassau grouper	*Epinephelus striatus*	Threatened	None	no
Coral				
Elkhorn coral	*Acropora palmata*	Threatened	None	no
Staghorn coral	*Acropora cervicornus*	Threatened	None	no
Boulder star coral	*Orbicella franksi*	Threatened	None	no
Mountainous star coral	*Orbicella faveolata*	Threatened	None	no
Lobed star coral	*Orbicella annularis*	Threatened	None	no
Rough cactus coral	*Mytophyllia ferox*	Threatened	None	no
Source: NOAA Fisheries 2021a, USFWS 2022				

4.1.2 Coral

The closest coral reefs to the Project in the GOM are the East and West Flower Garden Banks and Stetson Bank (located within the Flower Garden National Marine Sanctuary). These reefs are approximately 209 nm (387 km) and 240 nm (445 km), respectively, south and west from the Project. A designated Essential Fish Habitat and associated concentration of black coral is located approximately 28.6 nm (53 km) southeast of the Project. Because no available coral reef habitats are located in or in the vicinity of the Project, these species are not likely to be affected by the Project.

4.1.3 Marine Mammals

Marine mammals are protected under both the ESA and he Marine Mammal Protection Act, which prohibits the "take" of marine mammals, with certain exceptions, in waters under U.S. jurisdiction and by U.S. citizens on the high seas. Three species of marine mammals that may occur in the GOM and are also listed as threatened or endangered include West Indian manatee, sperm whale (*Physeter microcephalus*), and Rice's whale (*Balaenoptera edeni*) (Table 4-1). There is currently no designated critical habitat for any of these marine mammal species in the northern GOM. Note that Biological Assessments and NEPA documents are likely to eliminate most of these species from consideration because their occurrence near the Project is so exceptionally rare that exposure to Project stressors is possible but not plausible.

4.1.4 Sea Turtles

Five of the world's seven sea turtle species are found in the GOM: Kemp's ridley, hawksbill, green, loggerhead, and leatherback (Table 4-1). All are listed under the ESA as either threatened or endangered and are under the joint jurisdiction of NOAA Fisheries and USFWS. USFWS has lead responsibility on the nesting beaches, while NOAA Fisheries is the lead agency in the marine environment. All five sea turtle species nest on coastal beaches, but suitable nesting habitat is not available near the Project area (Valverde and Holzwart 2017).

All five sea turtle species could occur in the vicinity of the Project area, but at very low densities because of degraded habitat value near the Mississippi River delta (Valverde and Holzwart 2017).

The most recent aerial survey was conducted during October and November 2018, with the survey area encompassing the area between Key West, Florida, and Brownsville, Texas, including estuarine waters of Mississippi Sound and Barataria Bay. All five sea turtle species were sighted during this survey with a total of 338 individuals counted. Loggerhead was the most commonly observed species, followed by Kemp's ridley, leatherback and green sea turtle, therefore, these three species are the most likely to occur within the Project area.

Since the 1990s, three of the largest nesting subpopulations in the Western North Atlantic (Peninsular Florida, Northern U.S., and Mexico) have shown decreasing trends (TEWG 2009).

4.2 Migratory Birds

Migratory birds are protected under the Federal Migratory Bird Treaty Act of 1918 (16 United States Code ["U.S.C."] 703-712; Ch. 128; July 13, 1918; 40 Stat. 755) and was enacted as a prohibition on the killing of migratory birds. Migratory bird species listed under this act occur throughout the general Project vicinity and are ubiquitous worldwide. Additionally, Executive Order 13186 (66 FR 3853) directs federal agencies to identify where unintentional take is likely to have a measurable negative effect to migratory bird populations and to avoid or minimize adverse impacts on migratory birds through enhanced collaboration with the USFWS. While the act does not explicitly contain specific compliance measures to address potential impacts on migratory birds, developers are encouraged to evaluate existing avian resources within a proposed region of influence and take reasonable measures to prevent avian impacts. Executive Order 13186 also states that emphasis should be placed on species of concern, priority habitats, and key risk factors, and that particular focus should be given to addressing population-level impacts.

The GOM is an extremely important pathway for migratory birds, including many coastal and marine species that utilize the coastlines of Louisiana and eastern Texas along their migratory routes (BOEM

2016). Migratory birds are known to sometimes utilize offshore structures associated with oil and gas platforms as rest stops or temporary shelter during their migrations. While over 400 species of birds have been noted in the northern GOM, most species reside primarily in interior habitats, coastal beaches, or wetland habitats, and not over open-ocean environments such as where the Project would be located (BOEM 2016).

Seabirds spend most of their lives over marine waters and generally are year-round residents in nearshore and coastal habitats of the northern GOM. However, several seabird species migrate and are found within the GOM region seasonally; some inhabiting only open water pelagic habitats (e.g., boobies, petrels, and shearwaters). Seabird ranges are variously defined using categories such as "nearshore (onshore from the coast out to 4 nm [8 km])." Offshore birds generally are greater than 4 nm (8 km) off the coast, and pelagic birds are defined as occurring in waters deeper than 180 meters (590 feet). The majority of northern GOM birds are nearshore or onshore waterbird species.

Some of the more common species that occur offshore in the GOM include the brown booby (*Sula leucogaster*) and skua (*Stercorarius* spp.). Skuas were the most common bird seen in autumn in offshore areas, and skuas and gulls (*Larus* spp.) are the most common in winter (Ribic et al. 1997). Terns (*Sterna* spp.) are the most common birds seen in late summer. Other species with seasonal presence include petrel species and shearwater species., very few reside in open ocean environments such as the proposed project area.

Based on data available in the USFWS online IPaC consultation tool, there are no federally listed endangered species, and there are no migratory birds of conservation concern expected to occur at the Project location (USFWS 2022).

4.3 Essential Fish Habitats

The Magnuson-Stevens Fishery Conservation and Management Act ("MSA"), amended by the Sustainable Fisheries Act of 1996, establishes procedures designed to identify, conserve, and enhance essential fish habitat ("EFH") for those species regulated under a Federal Fishery Management Plan ("FMP"). The MSA requires federal agencies to consult with NOAA Fisheries on all actions or proposed actions authorized, funded, or undertaken by the agency that might adversely affect EFH.

Fishery management councils are required to identify EFH for each species or management unit covered under a fishery management plan. EFH is defined as the waters and seafloor necessary for spawning, breeding, or growth to maturity (16 U.S.C. 1802[10]). Fish are defined as "finfish, mollusks, crustaceans, and all other forms of marine animals and plant life other than marine mammals and birds."

Habitat Areas of Particular Concern are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation. Regional fishery management councils may designate a specific habitat area as a habitat areas of particular concern based on one or more of the following reasons: (1) importance of the ecological function provided by the habitat, (2) the extent to which the habitat is sensitive to human-induced environmental degradation, (3) whether, and to what extent, development activities are, or will be, stressing the habitat type, and (4) rarity of the habitat type (67 FR 2343). The habitat areas of particular concern designation does not confer additional protection or restrictions upon an area, but can help prioritize conservation efforts.

The fishery management councils classify EFH for federally managed species in terms of five basic life stages: eggs, larvae, juveniles, adult, and spawning adult (GMFMC 1998). For highly migratory species, sharks in particular, NOAA Fisheries categorizes the life stages of managed highly migratory species

somewhat differently, to include; neonate (primarily includes newborns and only small young-of-the-year), juvenile (includes all immature sharks from young to older/late juveniles), and adult (sexually mature sharks; largest size class) (NOAA Fisheries 2009).

EFH designation in the GOM is based on species distribution and habitat association. Marine EFH includes all marine waters and substrates (mud, sand, shell, rock, and hard bottom biological communities) from the shoreline to the boundary of the Exclusive Economic Zone (GMFMC 1998). Table 4-2 lists each species managed under the fishery management plans that overlap the Project area. The designated EFH for each of the habitat categories is included, by life stage where applicable.

Table 4-2 Managed Species with Essential Fish Habitat that Intersects the Project Area

Fishery Management Plan, Family, Common Name, Scientific Name		Life Stage				
		Eggs	Larvae (or Neonate[1])	Juveniles	Adults	Spawning Adults
Shrimp Fishery Management Plan						
Brown shrimp	*Farfantepenaeus aztecus*	✓	✓		✓	✓
White shrimp	*Litopenaeus setiferus*	✓	✓		✓	✓
Pink shrimp	*Farfantepenaeus duorarum*	✓	✓	✓	✓	✓
Royal red shrimp	*Pleoticus robustus*	✓	✓	✓	✓	✓
Red Drum Fishery Management Plan						
Red Drum	*Sciaenops ocellatus*				✓	
Reef Fish Fishery Management Plan						
Snappers Lutjanidae Family						
Red snapper	*Lutjanus campechanus*	✓	✓	✓	✓	✓
Gray (mangrove) snapper	*Lutjanus griseus*	✓			✓	✓
Lane snapper	*Lutjanus synagris*	✓			✓	✓
Wenchman	*Pristipomoides aquilonaris*	✓	✓		✓	✓
Vermilion snapper	*Rhomboplites aurorubens*			✓	✓	
Queen snapper	*Etelis oculatus*	✓	✓		✓	
Mutton snapper	*Lutjanus analis*					✓
Schoolmaster	*Lutjanus apodus*	✓	✓	✓	✓	✓
Blackfin snapper	*Lutjanus buccanella*	✓			✓	✓
Cubera snapper	*Lutjanus cyanopterus*	✓			✓	✓
Dog snapper	*Lutjanus jocu*				✓	
Mahogany snapper	*Lutjanus mahogoni*	✓	✓	✓	✓	
Silk snapper	*Lutjanus vivanus*				✓	
Yellowtail snapper	*Ocyurus chrysurus*	✓			✓	
Groupers Serranidae Family						
Yellowedge grouper	*Epinephelus flavolimbatus*	✓	✓	✓	✓	✓
Goliath grouper	*Epinephelus itajara*	✓	✓		✓	✓

Table 4-2 Managed Species with Essential Fish Habitat that Intersects the Project Area

Fishery Management Plan, Family, Common Name, Scientific Name		Life Stage				
		Eggs	Larvae (or Neonate[1])	Juveniles	Adults	Spawning Adults
Warsaw grouper	*Epinephelus nigritus*	✓	✓		✓	
Yellowmouth grouper	*Mycteroperca interstitialis*	✓	✓	✓	✓	
Gag grouper	*Mycteroperca microlepis*	✓	✓	✓	✓	
Dwarf sand perch	*Diplectrum bivittatum*				✓	
Sand perch	*Diplectrum formosum*				✓	
Rock hind	*Epinephelus adscensionis*	✓	✓		✓	✓
Speckled hind	*Epinephelus drummondhayi*	✓	✓		✓	✓
Red hind	*Epinephelus guttatus*	✓	✓		✓	✓
Red grouper	*Epinephelus morio*	✓	✓		✓	
Misty grouper	*Epinephelus mystacinus*	✓			✓	✓
Snowy grouper	*Epinephelus niveatus*	✓	✓	✓	✓	
Nassau grouper	*Epinephelus striatus*				✓	✓
Marbled grouper	*Epinephelus inermis*				✓	
Black grouper	*Mycteroperca bonaci*	✓	✓		✓	
Scamp	*Mycteroperca phenax*	✓	✓		✓	✓
Yellowfin grouper	*Mycteroperca venenosa*				✓	
Tilefishes Malacanthidae Family						
Golden tilefish	*Lopholatilus chamaeleonticeps*	✓	✓	✓	✓	
Goldface tilefish	*Caulolatilus chrysops*	✓	✓		✓	
Blackline tilefish	*Caulolatilus cyanops*	✓	✓		✓	
Anchor tilefish	*Caulolatilus intermedius*	✓	✓		✓	
Blueline tilefish	*Caulolatilus microps*	✓	✓		✓	
Jacks Carangidae Family						
Greater amberjack	*Seriola dumerili*	✓	✓	✓	✓	✓
Lesser amberjack	*Seriola fasciata*			✓	✓	✓
Almaco jack	*Seriola rivoliana*	✓		✓	✓	✓
Banded rudderfish	*Seriola zonata*			✓	✓	✓
Triggerfishes Balistidae Family						
Gray triggerfish	*Balistes capriscus*	✓			✓	✓
Coastal Migratory Pelagics Fishery Management Plan						
King mackerel	*Scomberomorus cavalla*	✓	✓	✓	✓	✓
Spanish mackerel	*Scomberomorus maculatus*	✓	✓	✓	✓	✓
Cobia	*Rachycentron canadum*		✓	✓	✓	✓

Table 4-2 Managed Species with Essential Fish Habitat that Intersects the Project Area						
Fishery Management Plan, Family, Common Name, Scientific Name		**Life Stage**				
		Eggs	**Larvae (or Neonate[1])**	**Juveniles**	**Adults**	**Spawning Adults**
Highly Migratory Species Fishery Management Plan						
Atlantic sailfish	*Istiophorus platypterus*	--			✓	
Scalloped hammerhead shark	*Sphyrna lewini*	--		✓	✓	
Blacktip shark	*Carcharhinus limbatus*	--	✓	✓	✓	
Bull shark	*Carcharhinus leucas*	--	✓	✓	✓	
Spinner shark	*Carcharhinus brevipinna*	--	✓	✓	✓	
Finetooth shark	*Carcharhinus isodon*	--	✓	✓	✓	
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*	--	✓	✓	✓	
Yellowfin tuna	*Thunnus albacares*			✓		

[1] Neonate life stage applicable to sharks, skates, and rays
Sources: NOAA Fisheries 2022b; GMFMC and SAFMC 2005, 2004

4.3.1 EFH Habitats

Within the Project area there are two EFH types: soft bottom and water column/currents. EFH types are summarized in Table 4-3 below.

Table 4-3 Essential Fish Habitats		
EFH Category	**Representative Habitats**	**Presence in Project Area**
Water Column and Currents	All waters from the surface to the ocean floor (but not including the ocean bottom), including bays, estuaries, and rivers; floating *Sargassum*	✓
Benthic – Soft Bottom	May include the seafloor substrate on the continental shelf and slope that consists of soft or unconsolidated sediments such as gravel, cobbles, pebbles, sand, clay, mud, silt, and shell fragments	✓
Hard Bottom/ Live Bottom	Consolidated sediments such as rock; areas of vertical relief such as crevices, overhangs, and vertical walls, including banks/ridges/slopes	NO
Submerged Vegetation	Seagrass, kelp, macroalgae	NO
Shoreline Vegetation	Salt marsh, mangrove	NO
Biogenic Reefs	Scallop beds, mussel beds, oyster reefs; coral reefs; some deepwater coral	NO
Deepwater Corals	Non-reef forming corals on continental shelves, slopes, canyons, and seamounts	NO

4.3.2 Potential Effects to EFH

Potential effects to EFH as a result of Project activities are summarized in Table 4-4 below. The Applicant will like to exercise its authority under the Ports and Waterway Safety Act and the Magnuson Act and to request the USCG Captain of the Port to establish a Safety Zone as defined in 33 CFR § 148.5. The Safety Zone will restrict vessels and persons from specified areas, namely the platforms and FSU, and only be open to calling LNGCs and the necessary service vessels. The DWP Safety Zone will be marked with lighted buoys at each corner. The Applicant is requesting a 500-meter (1,640-foot) Safety Zone from the outer limits of the platforms, FSU, and LNGCs **(Figure 11)**. Within this Safety Zone, harvest of managed species will be prevented.

Table 4-4 Summary of Impacts on Essential Fish Habitat

Proposed Action Component/Impacts		Habitat Type		
		Soft Bottom	**Hard Bottom**	**Impact on Water Column Associated Habitat**
Construction	Pipeline Lateral Installation and Hydrostatic Testing	Displacement of sediments. Localized injury/mortality and temporary displacement of prey species.	No Effect	Temporary increase in turbidity. Mortality of negligible number of ichthyoplankton.
	DWP Pile-Driving and Installation	Displacement of sediments. Localized injury/mortality and temporary displacement of prey species.	No Effect	Temporary increase in turbidity. Short-term increase in noise.
	Construction Vessel Traffic/Operations*	No Effect	No Effect	Temporary increase in noise.
Operation	DWP Presence	Creation of hard-bottom habitat Safety/exclusion zone prevents harvest of managed species.	Creation of hard-bottom habitat. Safety/exclusion zone prevents harvest of managed species.	Creation of hard-bottom habitat Safety/exclusion zone prevents harvest of managed species.
	FSRU and DWP Water Use	No Effect	No Effect	Transient effect on water quality. Entrainment of ichthyoplankton.
	Accidental Release	No Effect	No Effect	Minor release: transient effect on water quality. Major release: highly unlikely but large local increase in mortality of ichthyoplankton and adults by freezing; significant local effect on managed species but no long-term significant effect on water column EFH
Decommissioning		Displacement of sediments. Localized injury/mortality and temporary displacement of prey species.	No Effect	Temporary increase in turbidity.

* The proposed action component is part of both construction and operation

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5.0 CULTURAL RESOURCES

Cultural resources include archaeological sites (prehistoric and historic; terrestrial and marine), historic standing structures, objects, districts, traditional cultural properties, and other properties that illustrate important aspects of prehistory or history or have important long-standing associations with established communities or social groups. Archaeological and architectural properties that meet criteria to be eligible for listing in the National Register of Historic Places ("NRHP") may be determined significant in consultation with the Louisiana Office of Cultural Development and the Division of Historic Preservation, which functions as the State Historic Preservation Office ("SHPO") in Louisiana. As lead Federal agencies, the USCG and MARAD would determine if the permitting of the Project will adversely affect cultural resources that are listed in or potentially eligible for listing on the NRHP, i.e., historic properties. The area of potential effects ("APE") on archaeological resources for the Project, as specified in Section 106 of the NHPA, includes all marine locations that undergo Project-related disturbance. The APE for aboveground cultural resources that qualify as historic properties include areas that may be subject to visual, auditory, or other indirect effects resulting from the Project's construction, operation, and decommissioning that result in changes in the character or use of the historic properties.

5.1 Offshore Cultural Resources Assessment

The Project's potential effects on the offshore cultural resources have been evaluated based on their potential to: impact submerged cultural resources (minor to major depending on extent of adverse direct or indirect impact); Have irretrievable or irreversible damage to a prehistoric or historic property that is listed or eligible for listing on the NRHP (major); Adversely impact a prehistoric or historic property that is listed or eligible for listing on the NRHP (minor to major depending on extent of adverse impact); Violate cultural resource standards by impacting resources that are of value to Native American culture and heritage (major); and Disturb any human remains, including those interred outside of formal cemeteries (major) Potential impacts on environmental resources may be long-term or short-term; negligible, minor, moderate, or major; adverse or beneficial; or direct or indirect.

Detailed archaeological and hazard surveys for the Project were performed in January 2022 in compliance with guidelines of BOEM and provided in accordance with BOEM requirements under Minerals Management Service NTL No. 2005-G07, NTL No. 2008-G05, and NTL No. 2011 – Joint – G01. Assessment of the archaeological potential of the portions of the submerged continental shelf crossed by the Project in comparison to known site location information will form a basis for the identification of areas where potentially submerged prehistoric sites may be located and possibly affected by the Project.

5.2 Historic Archaeological Resources

A number of historic properties and one state-designated Cultural District in the vicinity of the Project are recorded within the historic structure database maintained by the Louisiana Office of Cultural Development, Division of Historic Preservation. The Grand Isle and Cheniere Caminada Cultural District is located on Grand Isle approximately 16 nm (30 km) northwest of the Project. Located within the Cultural District some individual properties are noted in the database as listed individually in the NRHP including Kirby-Adam House, Pocher House, Robin House, and U.S. Coast Guard Station #79. Other National Register-listed structures that may have views of the Project include Fort Jackson (listed as a National Historic Landmark) located in Buras (approximately 53 miles to the north), St. Patrick's Catholic Church in W. Pointe a la Hache (approximately 35 miles north of the Project), and Fort Livingston located on Grand Terre Island (approximately 16 miles northwest of the Project). If these

historic properties (and possibly others that may be within the viewshed) were demonstrated to have views of the Project, the potential effects of the views will be assessed to determine if they result in adverse effects. Onshore viewers include residents, tourists, and people visiting the area for their work. Beachgoers traveling and residents of Grand Isle will be the most sensitive viewers because of their direct views toward the ocean and expectations for ocean views. However, as with recreational boating viewers, because of the prevalence of offshore platforms already present, it is expected that beachgoers and residents are accustomed to viewing such structures and therefore will have a high tolerance for an additional platform in their viewshed.

Remnants of various types of vessels, vessel fragments, and possibly other associated cultural items could be contained within the APE portions of the OCS and the coastal zone. Spanish navigators crossed through the area of the OCS and GOM, including the APE from the mid-1500s through to the mid-1800s. Weather events and unmapped navigational hazards resulted in wrecks of sailing ships. Trade vessels affected by piracy could also have resulted in wrecks or loss of property from vessels. Any of these may be a source of historic period cultural resources in the submerged area of the OCS and GOM, including in the APE. Records of vessel sinkings most likely do not reflect the actual number of vessels that may remain submerged. Databases reviewed indicate records of at least four obstructions just outside of WD-38. Two wreck sites are recorded as located within 6 nm of WD-38.

The Project has the potential to impact submerged cultural resources during construction and installation. Studies have been performed to identify submerged potential cultural landscapes (e.g., areas that would have been available land surfaces during periods when the sea level was lower and when precontact hunter and gatherer populations may have lived or used shoreline landscapes) and submerged marine-related cultural resources (e.g., shipwrecks, obstructions related to remnants of prior cultural activity) that may be extant within the APE. NFE has committed to avoid effects to identified resources that have the potential to meet the criteria to be eligible to the NRHP. Findings will be submitted to MARAD/USCG for their review. Results of cultural resources investigations of the onshore pipeline will be presented to the SHPO for concurrence. Resources that have the potential to meet the criteria to be eligible to the NRHP have been identified within the APE. However, there is the potential that unanticipated discoveries could be encountered during Project installation. The Applicant has prepared an Unanticipated Discoveries Plan that will be followed during construction.

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FIGURES

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