Federal Energy Regulatory Commission
Office of Energy Projects
888 First Street, NE, Washington, DC 20426

FERC/DEIS-0290D **November 2018**

Gulf LNG Liquefaction Project

Draft Environmental Impact Statement

Gulf LNG Liquefaction Company, LLC; Gulf LNG Energy, LLC; and Gulf LNG Pipeline, LLC

FERC Docket No.: CP15-521-000

Cooperating Agencies:

U.S. Department of Energy

U.S. Army Corps of Engineers

Pipeline Hazardous Materials Safety Administration

U.S. Environmental Protection Agency

U.S. Coast Guard

U.S. Fish & Wildlife Service

National Oceanic and Atmospheric Administration & National Marine Fisheries Service

Mississippi Office of the Secretary of State

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas 1
Gulf LNG Liquefaction Company, LLC
Gulf LNG Energy, LLC
Gulf LNG Pipeline, LLC
Gulf LNG Liquefaction Project
Docket No. CP15-521-00

TO THE INTERESTED PARTY:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared a draft environmental impact statement (EIS) for the Gulf LNG Liquefaction Project proposed by Gulf LNG Liquefaction Company, LLC; Gulf LNG Energy, LLC; and Gulf LNG Pipeline, LLC (GLP) (collectively referred to as Gulf LNG) in the above-referenced docket. Gulf LNG requests authorization pursuant to sections 3(a) and 7 of the *Natural Gas Act* (NGA) to construct and operate onshore liquefied natural gas (LNG) liquefaction and associated facilities to allow export of LNG, and to construct, own, operate, and maintain new interconnection and metering facilities for the existing Gulf LNG Pipeline in Jackson County, Mississippi. The proposed actions are referred to as the Gulf LNG Liquefaction Project (Project) and consist of the Gulf LNG Terminal Expansion (Terminal Expansion) and the GLP Pipeline Modifications.

The draft EIS assesses the potential environmental effects of construction and operation of the Project in accordance with the requirements of the *National Environmental Policy Act* (NEPA). The FERC staff concludes that approval of the proposed Project, with the mitigation measures recommended in the EIS, would have some adverse environmental impacts; however, these impacts would be avoided or reduced to less-than-significant levels.

The U.S. Army Corps of Engineers; U.S. Coast Guard; U.S. Department of Energy, Office of Fossil Energy; the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration; U.S. Fish and Wildlife Service; National Oceanic and Atmospheric Administration, National Marine Fisheries Service; and U.S. Environmental Protection Agency participated as cooperating agencies in the preparation of the EIS. In addition, the Mississippi Office of the Secretary of State has jurisdiction over the wetland mitigation property and, therefore, is assisting us as a cooperating agency. Cooperating agencies have jurisdiction by law or special expertise with respect to resources potentially affected by the proposal and participated in the NEPA analysis. Although the cooperating agencies provided input to the conclusions and recommendations presented in the draft EIS, the agencies will present their own conclusions and recommendations in their respective Records of Decision for the Project.

The draft EIS addresses the potential environmental effects of the construction and operation of the following proposed facilities:

- feed gas pre-treatment facilities, including a mercury removal system, an acid gas removal system (to remove carbon dioxide and hydrogen sulfide), a molecular sieve dehydration system (to remove water), and a heavy hydrocarbon removal system (to remove natural gas liquids);
- two separate propane precooled mixed refrigerant liquefaction trains that liquefy natural gas, each with a nominal liquefaction capacity of 5 million metric tons per year (mtpy) and a maximum capacity of more than 5.4 mtpy of LNG;
- liquefaction facility utilities and associated systems, including two gas-fired turbine compressors per liquefaction train;
- storage facilities for condensate, ammonia and refrigerants;
- utilities systems, including instrument, plant air, and nitrogen;
- a truck loading/unloading facility to unload refrigerants and to load condensate produced during the gas liquefaction process;
- four flares (including one spare flare) in a single flare tower to incinerate excess gases associated with maintenance, startup/shutdown, and upset conditions during an emergency;
- two supply docks (North and South Supply Docks) designed to receive barges transporting materials and large equipment during construction, with one dock retained for use during operation;
- new in-tank LNG loading pumps in the existing LNG storage tanks to transfer LNG through the existing transfer lines to LNG marine carriers;
- new spill impoundment systems designed to contain LNG, refrigerants and other hazardous fluids;
- minor changes to piping at the existing berthing facility to permit bi-directional flow;
- a new concrete storm surge protection wall that connects to the existing storm surge protection wall near the southwest corner of the Terminal

Expansion site and extends along the southern border of the Terminal Expansion site;

- a new earthen berm extending from the northeastern to the southeastern boundaries of the Terminal Expansion site, between the Terminal Expansion and the Bayou Casotte Dredged Material Management Site, and connecting to the new segments of the storm surge protection wall;
- six off-site construction support areas for use as staging and laydown areas, contractor yards, and parking;
- modifications to the existing metering stations at the existing Gulfstream Pipeline Company and Destin Pipeline Company interconnection facilities[1]; and
- modifications to the existing Gulf LNG Pipeline at the existing Terminal to provide a connection to the inlet of the LNG liquefaction pre-treatment facilities.

The Commission mailed a copy of the *Notice of Availability* to federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners and other interested individuals and groups; and newspapers and libraries in the Project area. The draft EIS is only available in electronic format. It may be viewed and downloaded from the FERC's website (www.ferc.gov), on the Environmental Documents page (https://www.ferc.gov/industries/gas/enviro/eis.asp). In addition, the draft EIS may be accessed by using the eLibrary link on the FERC's website. Click on the eLibrary link (https://www.ferc.gov/docs-filing/elibrary.asp), click on General Search, and enter the docket number in the "Docket Number" field, excluding the last three digits (i.e. CP15-521). Be sure you have selected an appropriate date range. For assistance, please contact FERC Online Support at FercOnlineSupport@ferc.gov or toll free at (866) 208-3676, or for TTY, contact (202) 502-8659.

Any person wishing to comment on the draft EIS may do so. Your comments should focus on draft EIS's disclosure and discussion of potential environmental effects, reasonable alternatives, and measures to avoid or lessen environmental impacts. To ensure consideration of your comments on the proposal in the final EIS,

[1] Additionally, Transcontinental Gas Pipe Line Company, LLC (Transco) would construct modifications to the existing Transco/Florida Gas Transmission Company, LLC Interconnect. FERC would review this project under Transco's blanket certificate.

it is important that the Commission receive your comments on or before 5:00 pm Eastern Time on **January 7, 2019**.

For your convenience, there are four methods you can use to submit your comments to the Commission. The Commission will provide equal consideration to all comments received, whether filed in written form or provided verbally. The Commission encourages electronic filing of comments and has staff available to assist you at (866) 208-3676 or FercOnlineSupport@ferc.gov. Please carefully follow these instructions so that your comments are properly recorded.

1) You can file your comments electronically using the eComment feature on the Commission's website (www.ferc.gov) under the link to Documents and Filings. This is an easy method for submitting brief, text-only comments on a project;

2) You can file your comments electronically by using the eFiling feature on the Commission's website (www.ferc.gov) under the link to Documents and Filings. With eFiling, you can provide comments in a variety of formats by attaching them as a file with your submission. New eFiling users must first create an account by clicking on "eRegister." If you are filing a comment on a particular project, please select "Comment on a Filing" as the filing type; or

3) You can file a paper copy of your comments by mailing them to the following address. Be sure to reference the Project docket number (CP15-521-000) with your submission: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street NE, Room 1A, Washington, DC 20426

4) In lieu of sending written or electronic comments, the Commission invites you to attend a public comment session its staff will conduct in the Project area to receive comments on the draft EIS, scheduled as follows:

Date and Time	Location
Tuesday, December 18, 2018 4:00 – 8:00 pm local time	Pelican Landing Convention Center 6217 Mississippi Highway 613 Moss Point, MS 39563 228-474-1406

The primary goal of this comment session is to have you identify the specific environmental issues and concerns with the draft EIS. Individual verbal comments will be taken on a one-on-one basis with a court reporter. This format is designed to receive the maximum amount of verbal comments in a convenient way during the timeframe allotted.

The comment session is scheduled from 4:00 pm to 8:00 pm local time. You may arrive at any time after 4:00 pm. There will not be a formal presentation by Commission staff when the session opens. If you wish to speak, the Commission staff will hand out numbers in the order of your arrival. Comments will be taken until 8:00 pm. However, if no additional numbers have been handed out and all individuals who wish to provide comments have had an opportunity to do so, staff may conclude the session at 7:30 pm.

Your verbal comments will be recorded by the court reporter (with FERC staff or representative present) and become part of the public record for this proceeding. Transcripts will be publicly available on FERC's eLibrary system (see below for instructions on using eLibrary). If a significant number of people are interested in providing verbal comments in the one-on-one settings, a time limit of 5 minutes may be implemented for each commentor.

It is important to note that verbal comments hold the same weight as written or electronically submitted comments. Although there will not be a formal presentation, Commission staff will be available throughout the comment session to answer your questions about the environmental review process.

Any person seeking to become a party to the proceeding must file a motion to intervene pursuant to Rule 214 of the Commission's Rules of Practice and Procedures (18 CFR Part 385.214). Motions to intervene are more fully described at http://www.ferc.gov/resources/guides/how-to/intervene.asp. Only intervenors have the right to seek rehearing or judicial review of the Commission's decision. The Commission grants affected landowners and others with environmental concerns intervenor status upon showing good cause by stating that they have a clear and direct interest in this proceeding that no other party can adequately represent. **Simply filing environmental comments will not give you intervenor status, but you do not need intervenor status to have your comments considered.**

Questions?

Additional information about the Project is available from the Commission's Office of External Affairs, at **(866) 208-FERC**, or on the FERC website (www.ferc.gov) using the eLibrary link. The eLibrary link also provides access to the texts of all formal documents issued by the Commission, such as orders, notices, and rulemakings.

In addition, the Commission offers a free service called eSubscription that allows you to keep track of all formal issuances and submittals in specific dockets. This can reduce the amount of time you spend researching proceedings by automatically providing you with notification of these filings, document summaries, and direct links to the documents. Go to www.ferc.gov/docs-filing/esubscription.asp.

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ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
AERMOD	American Meteorological Society/EPA Regulatory Model
amsl	above mean sea level
APCI	Air Products and Chemicals Inc.
APE	Area of Potential Effect
API	American Petroleum Institute
AQCR	Air Quality Control Region
ASME	American Society of Mechanical Engineers
AVO	Audio Visual and Olfactory
BA	Biological Assessment
BACT	Best Available Control Technology
BCC	Birds of Conservation Concern
BCDMMS	Bayou Casotte Dredge Material Management Site
bcfd	billion cubic feet per day
BCHCIP	Bayou Casotte Harbor Channel Improvement Project
BCR	Bird Conservation Region
BGEPA	*Bald and Golden Eagle Protection Act of 1940*
bgs	below ground surface
BLEVE	boiling liquid expanding vapor explosion
BMP	best management practice
BOG	boil-off gas
BPVC	Boiler and Pressure Vessel Code
Btu/ft^2-hr	British thermal units per square foot per hour
BU	Beneficial Use
CAA	*Clean Air Act of 1963*
CEDA	Central Dredging Association
CEQ	Council on Environmental Quality
Certificate	Certificate of Public Convenience and Necessity
CF	Conservation Fund
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
CI	Compression Ignition
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent (red are subscripts)
COE	U.S. Army Corps of Engineers
Commission	Federal Energy Regulatory Commission
COPT	Captain of the Port
CPT	cone penetration test
CPTu	cone penetration test with pore pressure measurement
CSA	construction support area
CWA	*Clean Water Act of 1972*
cy	cubic yards
CZMA	*Coastal Zone Management Act of 1972*

CZMP	Coastal Zone Management Program
DAP	diammonium phosphate
dB	decibels
dBA	A-weighted sound level
DCS	Distributed Control System
DDT	dichlorodiphenyltrichloroethane
Destin	Destin Pipeline Company, LLC
DHS	Department of Homeland Security
DOD	Department of Defense
DOE/FE	U.S. Department of Energy Office of Fossil Energy
DOT	U.S. Department of Transportation
EEM	estuarine emergent
EFH	essential fish habitat
EI	environmental inspector
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EPAct 2005	*Energy Policy Act of 2005*
ERL	Effects Range Low
ERP	*Emergency Response Plan*
ESA	*Endangered Species Act of 1973*
ESD	Emergency Shut-down
FEED	front-end-engineering-design
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FERC Plan	FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan*
FERC Procedures	FERC's *Wetland and Waterbody Construction and Mitigation Procedures*
FGT	Florida Gas Transmission Company, LLC
FLAG	Federal Land Manager's Air Quality Related Values Workgroup
FS	U.S. Forest Service
FSA	Facility Security Assessment
FSP	*Facility Security Plan*
ft^3	cubic feet
FTA	free trade agreement
FWS	U.S. Fish and Wildlife Service
g	gravity
gal	gallons
GHG	greenhouse gases
GLE	Gulf LNG Energy, LLC
GLP	Gulf LNG Pipeline
GMD	geomagnetic disturbance
GMFMC	Gulf of Mexico Fisheries Management Council
Grand Bay NERR	Grand Bay National Estuarine Research Reserve
Grand Bay NWR	Grand Bay National Wildlife Refuge

Gulf LLC	Gulf LNG Liquefaction, LLC
Gulf LNG Plan	Gulf LNG's project-specific *Upland Erosion Control, Revegetation, and Maintenance Plan*
Gulf LNG Procedures	Gulf LNG's project-specific *Wetland and Waterbody Construction and Mitigation Procedures*
Gulfstream	Gulfstream Natural Gas System, LLC
H_2S	hydrogen sulfide
H_2SO_4	sulfuric acid mist
HAPs	Hazardous Air Pollutants
HAZOP	hazard and operability review
HGM	hydrogeomorphic
HMB	heat and material balance
HUC	hydrologic unit code
IBC	International Building Code
ICE	Internal Combustion Engines
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
ISA	International Society for Automation
JCPA	Jackson County Port Authority
km	kilometer
kPA	kilopascals
kV	kilovolt
lb	pound
L_d	daytime sound level
LDAR	Leak Detection and Repair
L_{dn}	day-night sound level
$L_{eq(24)}$	24-hour equivalent sound level
L_{max}	maximum sound level
L_n	nightime sound level
LNG	liquefied natural gas
LOD	Letter of Determination
LOI	Letter of Intent
LOR	Letter of Recommendation
LOR-A	Letter of Recommendation-Analysis
LOS	level of service
m^3	cubic meters
MACT	Maximum Achievable Control Technology
MARAD	DOT's Marine Administration
MBTA	*Migratory Bird Treaty Act of 1918*
MDAH	Mississippi Department of Archives and History
MDEQ	Mississippi Department of Environmental Quality
MDMR	Mississippi Department of Marine Resources
MDOT	Mississippi Department of Transportation
MDWFP	Mississippi Department of Wildlife, Fish, and Parks

Memorandum	Memorandum of Understanding on Natural Gas Transportation Facilities
MEOW	maximum envelope of water
mg/kg	milligrams per kilogram
MLLW	mean lower low water
MMBtu/hr	million British thermal units per hour
MMNS	Mississippi Museum of Natural Science
MMPA	*Marine Mammal Protection Act of 1972*
MMS	Minerals Management Service
MOU	Memorandum of Understanding
MPC	Mississippi Power Company
MR	mixed refrigerant
MSA	*Magnuson-Stevens Fishery Conservation and Management Act of 1976*
MsCIP	Mississippi Coastal Improvement Program
msl	mean sea level
mtpa	metric tonnes per annum
MTSA	*Maritime Transportation Security Act*
mtyp	million metric tons per year
MW	megawatts
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAVD	North America Vertical Datum of 1988
NBSIR	National Bureau of Standards and Information Report
NCDC	National Climatic Data Center
NEHRP	National Earthquake Hazards Reduction Program
NEPA	*National Environmental Policy Act of 1969*
NESHAPs	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NGA	*Natural Gas Act of 1938*
NGL	natural gas liquids
NGO	non-governmental organization
NHPA	*National Historic Preservation Act of 1966*
NMFS	National Marine Fisheries Service
NNSR	Nonattainment New Source Review
NO_2	nitrogen dioxide
NOA	*Notice of Availability*
NOAA	National Oceanic and Atmospheric Administration
NOI	*Notice of Intent to Prepare an Environmental Document for the Planned Gulf LNG Liquefaction Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting*
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places

NSA	noise-sensitive area
NSPS	New Source Performance Standards
nT	nano-Tesla
ntu	Nephelometric Turbitity Units
NWI	National Wetland Inventory
O_3	ozone
OBE	operating basis earthquake
ODMDS	Ocean Dredged Material Disposal Sites
^{o}F	degrees Fahrenheit
P&ID	piping and instrumentation diagram
Pb	lead
PEM	palustrine emergent
PFD	process flow diagram
PFO	palustrine forested
PGA	peak ground acceleration
PHMSA	Pipeline and Hazardous Materials Safety Administration
PHR	process hazard review
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
ppb	parts per billion
ppm	parts per million
Project	Gulf LNG Liquefaction Project
PSD	Prevention of Significant Deterioration
PTE	potential-to-emit
PWS	public water system
RICE	Reciprocating Internal Combustion Engines
RMP	Risk Management Program
RV	recreational vehicle
SAFE	*Security and Accountability For Every Port Act*
SAV	submerged aquatic vegetation
SCPT	seismic cone penetration tests
SCPTu	seismic cone penetration test with pore pressure measurement
SCR	Selective Catalytic Control
SH	State Highway
SHPO	State Historic Preservation Office
SIL	significant impact level
SIP	State Implementation Plan
SIS	safety instrument system
SLOSH	Sea, Lake, and Overland Surge from Hurricanes
SO_2	sulfur dioxide
SPCC Plan	*Spill Prevention, Control, and Countermeasure Plan*

SPT	Standard Penetration Test
SSE	safe shutdown earthquake
SSURGO	Soil Survey Geographic
SWAP	Source Water Assessment Program
SWEL	standing water elevation
SWPA	Source Water Protection Area
SWPPP	*Stormwater Pollution Prevention Plan*
TDS	total dissolved solids
TIGER	DOT's *Transportation Investment Generating Economic Recovery*
tpy	tons per year
Transco	Transcontinental Gas Pipe Line Company, LLC
TWIC	Transportation Worker Identification Credential
USC	United States Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VdB	vibration velocity decibels
VOCs	volatile organic compounds
Vs	shear wave velocity
WSA	Water Sustainability Assessment
µg	microgram
µPa	micropascal

EXECUTIVE SUMMARY

The staff of the Federal Energy Regulatory Commission (FERC or Commission) prepared this draft Environmental Impact Statement (EIS) to assess the environmental impacts associated with the construction and operation of facilities proposed by Gulf LNG Liquefaction Company, LLC (Gulf LLC), Gulf LNG Energy, LLC (GLE), and Gulf LNG Pipeline, LLC (GLP). The combined Gulf LLC, GLE, and GLP actions and facilities are referred to herein as the Gulf LNG Liquefaction Project (Project), and the applicants are collectively referred to as Gulf LNG.

On June 19, 2015, Gulf LNG filed an application with the FERC in Docket No. CP15-521-000 pursuant to Sections 3(a) and 7 of the *Natural Gas Act of 1938* (NGA), as amended, and parts 153, 157, and 284 of the Commission's regulations. The proposed actions consist of the Gulf LNG Terminal Expansion (Terminal Expansion) and the GLP Pipeline Modifications.

Gulf LNG proposes to construct and operate onshore liquefied natural gas (LNG) liquefaction and associated facilities at its existing LNG Import Terminal (existing Terminal) to allow the export of LNG, and to construct, own, operate, and maintain new interconnection and metering facilities for the existing Gulf LNG Pipeline. All proposed facilities would be located in Jackson County, Mississippi.

The EIS was prepared in accordance with the requirements of the *National Environmental Policy Act of 1969* (NEPA) and the Commission's implementing regulations under Title 18 of the Code of Federal Regulations, Part 380 (18 CFR 380). The purpose of the EIS is to inform the FERC decision-makers, the public, and the permitting agencies about the potential adverse and beneficial environmental impacts of the proposed Project and its alternatives, and recommend mitigation measures that would reduce adverse impacts to the extent practicable. We[1] prepared this analysis based on information provided by Gulf LNG and further developed from data requests, field investigations, interagency meetings, technical meetings, company presentations, Project scoping, literature research, and contacts with or comments from federal, state, and local agencies, Native American tribes, and individual members of the public.

The FERC is the federal agency responsible for authorizing interstate natural gas transmission facilities under the NGA, and is the lead federal agency for the preparation of this EIS in compliance with the requirements of NEPA. The U.S. Army Corps of Engineers (COE); U.S. Coast Guard (USCG); U.S. Department of Energy, Office of Fossil Energy; U.S. Department of Transportation (DOT), Pipeline and Hazardous Materials Safety Administration; U.S. Fish and Wildlife Service (FWS); National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS); and U.S. Environmental Protection Agency are cooperating agencies for the development of this EIS consistent with 40 CFR 1501.6(b). In addition, the Mississippi Office of the Secretary of State has jurisdiction over the wetland mitigation property and, therefore, is assisting us as a cooperating agency. A cooperating agency has jurisdiction by law or has special expertise with respect to environmental resource issues associated with the Project.

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[1] "We," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

PROPOSED ACTION

According to Gulf LNG, the Project would transport domestic natural gas into LNG for export to free trade agreement (FTA) nations and, if approved, non-FTA nations and deliver competitively-priced LNG to foreign markets.

Gulf LNG designed its Project to meet each of the following purposes:

- enable bi-directional flow of natural gas along the Gulf LNG Pipeline system and allow natural gas to be received from three pipeline interconnections;
- allow natural gas to be received by pipeline at the Terminal Expansion that would be treated, liquefied, stored, and loaded from LNG storage tanks into vessels berthed at the existing Terminal's marine facility; and
- preserve the import and re-gasification capabilities of the existing Terminal.

Terminal Expansion

Gulf LNG would construct the Terminal Expansion on a 46-acre site adjacent to the existing Terminal near the south end of State Highway 611, southeast of Pascagoula, Mississippi. The proposed site is north and east of and partially within the existing Terminal's boundaries in Jackson County, Mississippi. The Terminal Expansion would include the following key facilities:

- feed gas pre-treatment facilities, including a mercury removal system, an acid gas removal system (to remove carbon dioxide and hydrogen sulfide), a molecular sieve dehydration system (to remove water), and a heavy hydrocarbon removal system (to remove natural gas liquids);
- two separate propane precooled mixed refrigerant liquefaction trains that liquefy natural gas, each with a nominal liquefaction capacity of 5 million metric tons per year (mtpy) and a maximum capacity of more than 5.4 mtpy of LNG;
- liquefaction facility utilities and associated systems, including two gas-fired turbine compressors per liquefaction train;
- storage facilities for condensate, ammonia, and refrigerants;
- utilities systems including instrument, plant air, and nitrogen;
- a truck loading/unloading facility to unload refrigerants and to load condensate produced during the gas liquefaction process;
- four flares (including one spare flare) in a single flare tower to incinerate excess gases associated with maintenance, startup/shutdown, and upset conditions during an emergency;
- two supply docks (North and South Supply Docks) designed to receive barges transporting materials and large equipment during construction, with one dock retained for use during operation;
- new in-tank LNG loading pumps in the existing LNG storage tanks to transfer LNG through the existing transfer lines to LNG marine carriers;
- new spill impoundment systems designed to contain LNG, refrigerants, and other hazardous fluids;
- minor changes to the existing berthing facility piping to permit bi-directional flow;

- a new concrete storm surge protection wall that connects to the existing storm surge protection wall near the southwest corner of the Terminal Expansion site and extends along the southern border of the Terminal Expansion site;
- a new earthen berm extending from the northeastern to the southeastern boundaries of the Terminal Expansion site, between the Terminal Expansion and the Bayou Casotte Dredged Material Management Site, and connecting to the new segments of the storm surge protection wall; and
- six off-site construction support areas (CSAs) for use as staging and laydown areas, contractor yards, and parking.

Pipeline Modifications

Gulf LNG proposes to modify its existing pipeline system to provide bi-directional flow along the Gulf LNG Pipeline system, allowing gas to flow to or from the expanded Terminal and its existing intra- and interstate pipeline interconnections.[2] The Pipeline Modifications would consist of the following:

- modifications to the existing Gulf LNG Pipeline metering station at its interconnection with the Destin Pipeline Company, LLC Pipeline to permit bi-directional flow;
- modifications to the existing Gulf LNG Pipeline metering station at its interconnection with the Gulfstream Natural Gas System, LLC Pipeline to permit bi-directional flow; and
- modifications to the existing Gulf LNG Pipeline at the existing Terminal to provide a connection to the inlet of the LNG liquefaction pre-treatment facilities.

PUBLIC INVOLVEMENT

Gulf LNG initially filed a request with the FERC to use our pre-filing process on December 5, 2012. FERC staff issued a follow-up letter to Gulf LNG on December 14, 2012 stating that it would consider Gulf LNG's December 5, 2012 pre-filing request upon full compliance with the procedures described in the Commission's regulations at 18 CFR 157.21. At that time, the FERC assigned the Project Pre-Filing Docket No. PF13-4-000. On May 9, 2014, Gulf LNG filed a second request with the FERC to use the pre-filing review process, along with supplemental information on the proposed Project. The FERC approved use of the pre-filing process for the Project in its May 21, 2014 letter to Gulf LNG, stating that the FERC had determined that Gulf LNG had complied with the procedures in 18 CFR 157.21.

At that time, Gulf LNG was in the preliminary design stage of the Project and no formal application had been filed with the FERC. The pre-filing review process provides opportunities for interested stakeholders to become involved early in project planning, facilitates interagency cooperation, and assists in the identification and resolution of issues prior to a formal application being filed with the FERC.

On June 26, 2014, Gulf LNG held a public open house in Moss Point, Mississippi. The purpose of the open house was to provide affected landowners, government and agency officials, and the general public with information about the Project and to give them an opportunity to ask questions and express

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[2] Additionally, Transcontinental Gas Pipe Line Company, LLC (Transco) would construct modifications to the existing Transco/Florida Gas Transmission Company, LLC Interconnect. FERC would review this project under Transco's blanket certificate.

their concerns. We participated in the open house and provided information regarding the Commission's environmental review process to interested stakeholders.

On July 31, 2014, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Gulf LNG Liquefaction Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting* (NOI). This notice was sent to 218 interested parties including federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers in the Project area; and property owners in the vicinity of Project facilities. The NOI indicated that the Project was in the FERC pre-filing process, that a scoping meeting would be held on August 18, 2014, and established a 30-day scoping period, ending on September 1, 2014, for the submission of comments, concerns, and issues related to the environmental aspects of the Project. However, the FERC determined that some of those on the environmental mailing list were not provided timely copies of the NOI, and on August 27, 2014, issued a notice extending the scoping period to September 15, 2014.

On August 18, 2014, we held a public scoping meeting at the Pelican Landing Convention Center in Moss Point, Mississippi. We accepted verbal and written comments at the meeting, provided information on the FERC environmental review process, and described procedures for providing written comments. The meeting was transcribed to ensure that verbal comments were accurately recorded.[3]

On August 19, 2014, we held an interagency coordination meeting and conference call for the Project. Additional interagency coordination conference calls and meetings were held throughout the pre-filing and application review, primarily to address and resolve issues related to the evolution of Gulf LNG's proposed wetland mitigation plan.

Through the scoping and agency comment process, we received comments on a variety of environmental issues. We continued to receive and consider public comments during the entire pre-filing period and throughout development of this EIS. Substantive environmental issues identified through this public review process are addressed in this EIS.

PROJECT IMPACTS

We evaluated the potential impacts of construction and operation of the Project on geology; soils; water use and quality; wetlands; vegetation; wildlife, aquatic resources and Essential Fish Habitat (EFH); threatened, endangered, and special status species; land use, recreation, and visual resources; socioeconomics and environmental justice; cultural resources; air quality and noise; reliability and safety; cumulative impacts; and alternatives. Where necessary, we recommended additional mitigation to minimize or avoid these impacts. Section 5 of the EIS contains a compilation of our recommendations.

Overall, construction of Project facilities would temporarily disturb about 230.8 acres for construction, including 97.2 acres within the existing Terminal and Bayou Casotte Dredged Material Management Site, 16.7 for the supply docks, 19.0 acres for access roads, 3.6 acres for the Pipeline Modifications, and 94.4 acres for six CSAs that would be used for temporary storage, staging, and parking. Operation of the Terminal Expansion would result in permanent impacts on about 172.1 acres of open land, industrial/commercial land, non-forested wetlands, and open water. Gulf LNG would remove the Project's South Supply Dock and allow the land affected by the temporary facility to return to pre-construction conditions and uses. Gulf LNG would also return the CSAs, except for CSA-3 which it owns, to pre-construction conditions or as requested by the landowners. CSA-3 would be maintained

[3] Transcripts of the comments are part of the public record in Docket No. PF13-4-000; Accession Number 0140818-4008), available on the FERC website at http://ferc.gov/docs-filing/elibrary.asp.

during operation of the Project for warehousing and equipment storage. All of the Pipeline Modifications would be constructed on industrial land within the fence lines of the existing meter stations (or associated pipeline right-of-way) or interconnection facility, and Gulf LNG would restore the land affected by construction to pre-construction conditions.

Based on our analysis, Project scoping, agency consultations, and public comments, the main Project construction and operational impacts would be on wetlands, EFH, federally listed species, socioeconomics (onshore traffic), air quality and noise, reliability and safety, and cumulative impacts.

Wetlands

Construction and operation of the Terminal Expansion would affect about 31.1 acres of coastal marsh and about 7.6 acres of freshwater wetland at CSA-5. Gulf LNG would permanently fill all 38.7 acres of wetlands as part of construction of the Terminal Expansion; however, Gulf LNG would offset impacts on COE-jurisdictional wetlands by mitigation measures included in the COE and Mississippi Department of Marine Resource (MDMR) permits expected to be issued to Gulf LNG after issuance of the final EIS for the Project. The proposed mitigation measures include creation of a 50-acre tidal salt marsh, and expanding the existing COE-created wetland mitigation site into the Mississippi Sound just south of the existing Terminal. To further minimize impacts on wetlands, Gulf LNG would comply with all conditions of the COE Section 404 and Section 10 permits.

Based on Gulf LNG's proposed permanent filling of the wetlands at CSA-5, and our experience with natural gas facility construction, we have determined that Gulf LNG has not adequately justified permanently filling the wetlands at CSA-5. Therefore, we recommend that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the Commission's *Wetland and Waterbody Construction and Mitigation Procedures*. Construction of the Pipeline Modifications and use of the five other CSAs would not affect wetlands.

Construction of the Pipeline Modifications and use of the five other CSAs would not affect wetlands.

Essential Fish Habitat

Based on the results of consultation with NMFS, we determined that the proposed supply docks are within EFH, as defined by the *Magnuson-Stevens Fishery Conservation and Management Act of 1976*, as amended. Although construction of the North Supply Dock would involve permanent conversion of EFH estuarine sub-tidal water bottom habitat to deep water habitat, the deep water habitat would recolonize with soft-bottom benthic organisms between periods of dredging and would continue to provide a prey base for EFH species. After construction is complete, the South Supply Dock would be removed and maintenance dredging would cease, allowing sedimentation to continue undisturbed within the previously dredged area. To minimize impacts from dredging and construction on EFH and EFH species, Gulf LNG proposes to install and maintain turbidity curtains around the area being excavated to limit the transport of turbid water beyond the vicinity of the dredging operations, and adhere to measures contained in its *Upland Erosion Control, Revegetation, and Maintenance Plan*; *Wetland and Waterbody Construction and Mitigation Procedures*; the *Spill Prevention, Control, and Countermeasure Plan*; and existing and future federal and state permit requirements. Based on a review of the EFH species' habitats and life histories and implementation of Gulf LNG's conservation measures, we conclude that no substantial adverse impacts on EFH or EFH species would occur during construction or operation of the Terminal Expansion, as impacts would primarily be localized, temporary, and minor. Where impacts on coastal marsh and shallow estuarine EFH would be permanent, Gulf LNG would provide adequate compensation, as required by the COE for wetland impacts, through the successful completion of the wetland compensatory mitigation site.

Threatened and Endangered Species

Based on Gulf LNG's species-specific surveys and consultations with the FWS and NMFS, 19 federally listed species, and 2 species that are under federal review, potentially occur in the general Project area. We anticipate that construction and operation of the proposed Project *is not likely to adversely affect* the Alabama red-bellied turtle, rufa red knot, piping plover, wood stork, least tern, interior least tern, West Indian manatee, blue whale, sperm whale, fin whale, humpback whale, sei whale, gulf sturgeon, smalltooth sawfish, Kemp's ridley sea turtle, green sea turtle, loggerhead sea turtle, leatherback sea turtle, and hawksbill sea turtle. We expect that Project-related construction and operation would not contribute to a trend toward federal listing for the Bryde's whale or saltmarsh topminnow. As part of the *Endangered Species Act* Section 7 consultation process, we have prepared a Biological Assessment, which is summarized in section 4.7.1 and provided in appendix B of this EIS.

Based on the analysis of information and potential affects regarding federally listed species and their critical habitats, we have determined that adherence with the FWS' and NMFS' avoidance and minimization recommendations, Gulf LNG's proposed construction procedures and mitigation measures described in its application, and compliance with federal and state permit conditions, the Project is not likely to adversely affect federally listed species. With the draft EIS, we request that the FWS and NMFS concur with our determination of effects on these protected species and complete Section 7 consultation. Because consultation with the FWS and NMFS is ongoing, we have included a recommended condition that the FERC staff completes any necessary *Endangered Species Act* consultation with these agencies prior to construction.

Based on consultations with the Mississippi Department of Wildlife, Fish, and Parks (MDWFP) and Gulf LNG's species-specific surveys, three state-listed bird species (snowy plover, peregrine falcon, and brown pelican), one plant species of state concern (Carolina grasswort), and one state special status species (bald eagle) occur within 2 miles of the Project facility sites and could be affected by the Project. We anticipate that impacts from the Project would not be significant for the snowy plover, peregrine falcon, brown pelican, or bald eagle. A small population of Carolina grasswort is at the proposed Terminal Expansion. We recommend that Gulf LNG transplant the Carolina grasswort population to a similar habitat using protocols determined in consultation with the Mississippi Museum of Natural Science. With implementation of our recommendation, we expect that Project-related impacts on the population of Carolina grasswort would not be significant.

Coastal Zone Management Program

A determination from the MDMR that the Project is consistent with the Mississippi Coastal Zone Management Program (CZMP) has not yet been obtained by Gulf LNG. Therefore, we recommend Gulf LNG file documentation of concurrence from the MDMR that the Project is consistent with the Mississippi CZMP prior to construction.

Socioeconomics

Gulf LNG would minimize traffic into and out of the Terminal Expansion site by having parking areas off-site. Gulf LNG's traffic study predicted poor levels of service at traffic intersections near CSA-6 and high volumes of traffic near residential areas. However, the Project schedule has changed since preparation of the traffic study. Therefore, we recommend that prior to the end of the draft EIS comment period, Gulf LNG file an updated traffic analysis based on the current traffic conditions and current construction schedule. To mitigate traffic impacts at the Bayou Casotte Parkway and Orchard Road intersection, Gulf LNG is proposing to add signage to clearly identify lane movements, add raised pavement markers within the intersection, and restripe the intersection. These measures would help improve the functionality of the intersection and improve safety for drivers that are unfamiliar with driving in the area. Gulf LNG would implement these measures prior to starting construction.

To further improve traffic flow into and out of the parking area at CSA-6, Gulf LNG would prohibit parking along Bayou Casotte Parkway adjacent to the parking area and they would stripe the three driveways that access the parking area to ensure the entry lane would be a minimum of 14 feet wide. Additionally, a large business along Bayou Casotte Parkway has reduced its number of employees by around 1,000 since the traffic analysis was conducted, which would further reduce traffic during construction. While residents from the area to the west of CSA-6 could access their residences and schools along Bayou Casotte Parkway, it is more likely that they would use other, more direct routes such as Martin Street. With the mitigation measures outlined by Gulf LNG, our recommendation for an updated analysis, and the availability of other routes for local residents, construction of the Project would have a temporary and minor impact on traffic in the area of the Project.

The primary effect of barge traffic on marine transportation would occur during the 2-month period when Gulf LNG constructs the supply docks. Effects on marine transportation would decline to a minor impact for the rest of the construction period. During operation of the Project, there would not be an impact on marine traffic beyond the previously authorized LNG marine vessel traffic.

Air Quality and Noise

Construction of the Project would result in temporary impacts on air quality caused by emissions from fossil-fueled construction equipment and fugitive dust. Gulf LNG would incorporate dust control measures during construction to minimize fugitive dust, and we conclude the impact of construction on air quality would be minor. Gulf LNG has not provided total estimated emissions for operation of train 1 while train 2 is under construction. Therefore, we recommend that Gulf LNG file updated air quality estimates prior to the end of the draft EIS comment period.

Long-term impacts on air quality would be caused during operation of the Terminal Expansion. However, Gulf LNG would minimize potential impacts on air quality associated with operation of the Terminal Expansion by adhering to applicable federal and state regulations and installing Best Available Control Technology to minimize emissions. Gulf LNG, in consultation with the Mississippi Department of Environmental Quality, is currently revising its Prevention of Significant Deterioration application including additional modeling, updated emissions, and revised Class I impact analysis, which we will incorporate in the final EIS.

Construction activities and the associated noise would vary depending on the phase of construction in progress at any one time. The most prevalent sound generating equipment during site construction of the Terminal Expansion would be internal combustion engines of construction equipment. The sound levels experienced at the nearby noise sensitive areas (NSAs) would depend on the type of equipment used, the mode of operation of the equipment, the length of time the equipment is in use, the amount of equipment used simultaneously, and the distance between the sound generation source and the receptor. However, based on the distance to the NSA, construction noise from this typical construction equipment is not anticipated to exceed the Commission's noise criterion. If perceived noise levels cause a nuisance at the nearby NSAs, Gulf LNG proposes to ensure the Commission's noise criterion of 55 A-weighted decibels (dBA) is met by construction of sound barriers or installation of residential grade exhaust mufflers on equipment as necessary.

Dredging of the marine off-loading facilities and for material barge access to the wetland mitigation area, as well as, pile driving during onshore construction of the Terminal Expansion and during offshore construction of the supply docks, would produce peak sound levels that would be perceptible above the prevalent sound levels during construction. However, the resulting noise is less than the Commission's noise criterion, and would not be expected to result in significant impacts on the NSA.

Operation of the Terminal Expansion would generate sound levels that would occur throughout the life of the Project. Based on preliminary operational noise levels for anticipated equipment, the increase in noise levels would be below the "barely detectable" noise level increase of 3 dBA and would result in minor impacts on the nearest NSA. In addition, the noise level would be below the FERC limit of a day-night sound level (L_{dn}) of 55 dBA. We recommend, however, that Gulf LNG file a full-load noise survey no later than 60 days after each liquefaction train is put in service for the first and second liquefaction trains. If noise levels attributable to operation of the Terminal Expansion exceed the FERC limit of an L_{dn} of 55 dBA, Gulf LNG would be required to install additional mitigation to reduce the Terminal's noise contribution to ensure that the noise level is no higher than the FERC requirement. We also recommend that Gulf LNG file a full-load noise survey no later than 60 days after placing all the Terminal Expansion facilities in service.

Noise impacts would also occur from flare operation on an intermittent basis during startup, shutdown, or commissioning of the liquefaction facility, and infrequently in the event of a malfunction de-pressuring event. We anticipate that noise attributable to planned flare events would achieve 55 dBA L_{dn} or less once detailed design is completed, the flare design/vendor is selected, and final emergency flare rates are known. Unplanned flare events would produce more noise, with an estimated L_{dn} of 56 to 61 dBA at the nearest NSAs; however, because of the infrequent occurrence and expected operation of flares during these events, we conclude that the resulting noise would not result in a significant impact on the NSAs.

Reliability and Safety

As part of the NEPA review and NGA determinations, Commission staff assesses the potential impact to the human environment in terms of safety and assesses whether the proposed facilities would be able to operate safely, reliably, and securely.

As a cooperating agency, the DOT assists the FERC by determining whether Gulf LNG's proposed design would meet the DOT's 49 CFR 193 Subpart B siting requirements. The DOT would provide a Letter of Determination on the Project's compliance with 49 CFR 193 Subpart B. This would be provided to the Commission for consideration during its decision and final action on the Project application. If the Terminal Expansion is authorized and constructed, the facility would be subject to the DOT's inspection and enforcement program and final determination of whether the facility is in compliance with the requirements of 49 CFR 193 would be made by the DOT staff.

As a cooperating agency, the USCG also assisted the Commission by reviewing the Terminal Expansion and the associated LNG marine vessel traffic. The USCG reviewed a Water Suitability Assessment (WSA) submitted by Gulf LNG that focused on the navigation safety and maritime security aspects of LNG marine vessel transits along the affected waterway. On May 4, 2016, the USCG issued a Letter of Recommendation indicating the Bayou Casotte turning basin, Bayou Casotte Channel, Lower Pascagoula Channel, Horn Island Pass Channel, and Pascagoula Bar Channel would be considered suitable for accommodating the type and frequency of LNG marine traffic associated with the Project, based on the WSA and in accordance with the guidance in the USCG's NVIC 01-11. If the Project is authorized and constructed, the facilities would be subject to the USCG's inspection and enforcement program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

We conducted a preliminary engineering and technical review of the Gulf LNG design, including potential external impacts based on the site location. Based on our review, we recommend the Commission consider incorporating into the Order a number of conditions providing for mitigation measures and continuous oversight prior to initial site preparation, prior to construction of final design, prior to commissioning, prior to introduction of hazardous fluids, prior to commencement of service, and throughout the life of the facility to enhance the reliability and safety of the facility and to mitigate the risk of impact on the public. With the incorporation of these mitigation measures and oversight, we conclude that the Terminal Expansion design would include acceptable layers of protection or safeguards that would reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public.

Cumulative Impacts

We conclude that the potential impacts of the Project, when combined with the impacts from the other projects considered, would not result in a significant impact on resources within the cumulative impact geographic areas. However, concurrent construction of the proposed Project and other projects north of the Terminal Expansion site would result in increased workers in the area, periods of substantial traffic impact on portions of Highway 611 south of Interstate 90, and impacts on public services.

We further conclude that, contingent upon Gulf LNG successfully completing their proposed mitigation measures for impacts on wetlands and land transportation, and Gulf LNG following our recommendations to moderate impacts on land transportation, the Project's contribution to cumulative impacts on the affected resources would not be significant. More detailed discussions of Project impacts, Gulf LNG's proposed mitigation measures, and the recommendations to avoid or further reduce impacts are presented in sections 4.0 and 5.0 of this EIS.

ALTERNATIVES CONSIDERED

We assessed alternatives that could achieve the Project objectives. The range of alternatives analyzed included the No-Action Alternative, system alternatives, alternative Terminal Expansion sites, alternative plot plans for the Terminal Expansion, supply dock alternatives, alternative CSA sites, alternative Pipeline Modification sites, an alternative power source for the refrigeration compressors, and an alternative power source for the Terminal Expansion. However, none of the alternatives evaluated would provide a significant environmental advantage over the proposed action.

CONCLUSIONS

We conclude that construction and operation of the Project in accordance with applicable laws and regulations, and implementation of Gulf LNG's proposed mitigation and our recommendations presented in section 5.2 of this EIS would ensure that impacts of the Project would be avoided or minimized and would not be significant. The principal reasons for our decision include the following:

- the Terminal Expansion facilities would be an expansion of an existing, operating LNG Import Terminal with existing LNG storage tanks and berthing and loading/unloading facilities;
- Gulf LNG's compensatory wetland mitigation plan would adequately address impacts on wetlands;
- the siting requirements of DOT for the Project, the Letter of Recommendation issued by the USCG for the LNG marine traffic associated with the Project, FERC staff's preliminary engineering review and recommendations for the Project, and the regulatory requirements for the pipeline system and Project would avoid a significant increase in public safety risks;

- Gulf LNG would implement its Project-specific *Upland Erosion Control, Revegetation, and Maintenance Plan* and its Project-specific *Wetland and Waterbody Construction and Mitigation Procedures* to minimize construction impacts on soils, wetlands, and waterbodies;
- the Project is not likely to adversely affect any species listed under the Endangered Species Act, would not contribute to a trend toward federal listing for any federally or state-listed threatened or endangered species, or have a substantial adverse impact on EFH;
- we have included a recommended condition that Gulf LNG file documentation of concurrence from the MDMR that the Project is consistent with the Mississippi CZMP prior to construction;
- the Project would have no effect on cultural resources;
- all appropriate consultations with the FWS, NMFS, the MDWFP, and the MDMR would be completed before construction is allowed to start; and
- the FERC's environmental and engineering inspection and mitigation monitoring program for the Project would ensure compliance with all mitigation measures and conditions of any FERC Authorization.

In addition, we developed site-specific mitigation measures that Gulf LNG should implement to reduce the environmental impacts that would otherwise result from construction of the Project. We recommend that these mitigation measures, presented in section 5.2 of this EIS, be attached as conditions to any authorization issued by the Commission for the Project.

1.0 INTRODUCTION

On June 19, 2015, Gulf LNG Liquefaction Company, LLC (Gulf LLC),[1] Gulf LNG Energy, LLC (GLE), and Gulf LNG Pipeline, LLC (GLP) filed an application with the Federal Energy Regulatory Commission (Commission or FERC). Pursuant to Section 3 of the *Natural Gas Act of 1938*, as amended (NGA), Gulf LLC and GLE requested authorization to site, construct, and operate liquefied natural gas (LNG) liquefaction and export facilities adjacent to and integrated with the existing GLE LNG Import Terminal (existing Terminal) in Jackson County, Mississippi. The proposed action is called the Terminal Expansion in this Environmental Impact Statement (EIS). The combined Gulf LLC, GLE, and GLP actions and facilities are referred to herein as the Gulf LNG Liquefaction Project (Project), and the applicants are collectively referred to as Gulf LNG.

Pursuant to Section 7(c) of the NGA, Gulf LNG requested authorization to site, construct, operate, and maintain modifications to the existing GLP Pipeline in Jackson County, Mississippi. The proposed GLP modifications, termed the Pipeline Modifications in this EIS, would add bi-directional flow capability to the existing GLP pipeline system (called the Gulf LNG Pipeline in this EIS), allowing the pipeline to transport natural gas from various existing interstate pipeline interconnections to the Terminal Expansion for liquefaction and export, or alternatively, to send out regasified (vaporized) LNG from the existing Terminal to the same pipeline interconnections. The Project would allow Gulf LNG to liquefy domestic natural gas supplies for the export of up to 10.85 million metric tons per year (mtpy) of LNG during the life of the facility.

As part of the Commission's consideration of these applications, we[2] prepared this draft EIS to assess the potential environmental impacts resulting from construction and operation of the proposed Project in accordance with the requirements of the *National Environmental Policy Act of 1969*, as amended (NEPA). The distribution list for the *Notice of Availability* of the draft EIS is presented in appendix A.

The existing Terminal is southeast of the City of Pascagoula in Jackson County, Mississippi, at the south end of State Highway 611 (SH-611) on land leased from the Port of Pascagoula. It is on the Mississippi Sound, adjacent to the federally maintained Bayou Casotte Navigation Channel. Currently, the existing Terminal is authorized to receive LNG by marine vessel shipment (LNG carriers) for regasification and transport by pipeline to interconnections with interstate and intrastate pipelines that provide access to markets throughout the United States. The Terminal Expansion would allow the export of domestic natural gas in the form of LNG from the existing Terminal. Gulf LNG requested that the maximum size of LNG carriers authorized to use the berthing facility be increased from 170,000 cubic meters (m^3) to 208,000 m^3. However, Gulf LNG did not request changes to the currently authorized annual number of LNG carrier transits to the existing Terminal (about 150 LNG carriers per year).

In addition to liquefying natural gas and exporting LNG, the expanded Terminal would continue to have the capability to regasify imported LNG. However, the proposed design of the facility would not allow concurrent liquefaction, regasification, and transfer of LNG to and from an LNG carrier. As a result, at any point in time, the expanded Terminal would operate exclusively as a liquefaction and export facility or exclusively as an import and regasification facility.

1 Gulf LNG Liquefaction Company, LLC is a Kinder Morgan operated company.

2 "We," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

If Gulf LNG receives FERC authorization for the Terminal Expansion, a FERC Certificate of Public Convenience and Necessity (Certificate) for the Pipeline Modifications, and all other permits, authorizations, and approvals for the Project, it anticipates initiating export of LNG from the first liquefaction train[3] in the third quarter of 2024, with in service of the second liquefaction train in the second quarter of 2025. The Terminal Expansion would include the following key facilities:

- feed gas pre-treatment facilities, including a mercury removal system, an acid gas removal system (to remove carbon dioxide and hydrogen sulfide), a molecular sieve dehydration system (to remove water), and a heavy hydrocarbon removal system (to remove benzene and heavy components such as C5+ from feed gas also known as natural gas liquids [NGLs]);
- two separate propane pre-cooled mixed refrigerant liquefaction trains that liquefy natural gas, each with a nominal liquefaction capacity of 5 mtpy and a maximum capacity of more than 5.4 mtpy of LNG;
- liquefaction facility utilities and associated systems, including two gas-fired turbine compressors per liquefaction train;
- storage facilities for condensate, ammonia, and refrigerants;
- utilities systems, including instrument, plant air, and nitrogen;
- a truck loading/unloading facility to unload refrigerants and to load condensate produced during the gas liquefaction process;
- four flares (including one spare flare) in a single flare tower to incinerate excess gases associated with maintenance, startup/shutdown, and upset conditions during an emergency;
- two supply docks designed to receive barges transporting materials and large equipment during construction, with one dock retained for use during operation[4];
- new in-tank LNG loading pumps in the existing LNG storage tanks to transfer LNG through the existing transfer lines to LNG carriers;
- new spill impoundment systems designed to contain LNG, refrigerants, and other hazardous fluids;
- minor changes to piping at the existing berthing facility to permit bi-directional flow;
- a new concrete storm surge protection wall that connects to the existing storm surge protection wall near the southwest corner of the Terminal Expansion site and extends along the southern border of the Terminal Expansion site;
- a new earthen berm extending from the northeastern to the southeastern boundaries of the Terminal Expansion site, between the Terminal Expansion and the Bayou Casotte Dredged Material Management Site (BCDMMS), and connecting to the new segments of the storm surge protection wall; and
- six off-site construction support areas (CSAs) for use as staging and laydown areas, contractor yards, and parking.

[3] The term "train" is used to describe the series of process steps used to convert feed gas to LNG.

[4] Ownership of the North Supply Dock would be transferred to the Jackson County Port Authority.

The existing Terminal receives natural gas only by LNG carriers. The proposed Pipeline Modifications would provide bi-directional flow along the existing Gulf LNG pipeline system, allowing gas to flow to or from the expanded Terminal and the pipeline interconnections described below.[5]

The Pipeline Modifications would consist of the following:

- modifications to the existing Gulf LNG Pipeline metering station at its interconnection with the Destin Pipeline Company, LLC (Destin) Pipeline to permit bi-directional flow;
- modifications to the existing Gulf LNG Pipeline metering station at its interconnection with the Gulfstream Natural Gas System, LLC (Gulfstream) Pipeline to permit bi-directional flow; and
- modifications to the existing Gulf LNG Pipeline at the existing Terminal to provide a connection to the inlet of the LNG liquefaction pre-treatment facilities.

Gulf LNG anticipates that construction of the Pipeline Modifications would occur concurrent with the Terminal Expansion, with service available prior to completion of the first liquefaction train.

Under Section 3 of the NGA, the Commission considers all factors bearing on the public interest as part of its decision to authorize natural gas facilities. Specifically, regarding whether or not to authorize natural gas facilities used for importation or exportation, the Commission shall authorize the proposal unless it finds that the proposed facilities will not be consistent with the public interest.

Under Section 7 of the NGA, the Commission determines whether or not proposed interstate natural gas transportation facilities are in the public convenience and necessity and, if so, grants Certificates to construct and operate them. The Commission bases its decisions on technical competence, financing, rates, market demand, gas supply, environmental impact, long-term feasibility, and other issues concerning proposed projects.

1.1 PROJECT PURPOSE AND NEED

Gulf LNG states its purpose and need for the proposed Project is to transport domestic natural gas to the Terminal Expansion, liquefy the natural gas into LNG for export to free trade agreement (FTA) nations and, if approved, non-FTA nations, and deliver affordably priced LNG to foreign markets. Specific Project objectives are to:

- enable bi-directional flow of natural gas along the GLP pipeline system and allow domestic natural gas to be received by the system;
- transport natural gas by pipeline to the expanded Terminal, and treat, liquefy, store, and load LNG from the LNG storage tanks into LNG carriers berthed at the Terminal's existing marine facility; and
- preserve the import and regasification capabilities of the existing Terminal.

When global market conditions are favorable, Gulf LNG would be able to export LNG. Conversely, when global market conditions favor imports, Gulf LNG may elect to receive cargoes of LNG and distribute regasified LNG to markets in the United States through existing interconnections.

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[5] Additionally, Transcontinental Gas Pipe Line Company, LLC (Transco) would construct modifications to the existing Transco/Florida Gas Transmission Company, LLC Interconnect. FERC would review this project under Transco's blanket certificate.

Gulf LNG stated that the need for the Project is primarily in response to demand from overseas markets resulting from the substantially increased and affordably priced natural gas resource base in the United States.

1.2 PURPOSE AND SCOPE OF THIS EIS

The principal purposes in preparing an EIS are to:

- identify and assess potential impacts on the human environment that would result from implementation of the proposed action;
- identify and assess reasonable alternatives to the proposed action that would avoid or minimize adverse effects on the human environment;
- facilitate public involvement in identifying significant environmental impacts; and
- identify and recommend specific mitigation measures to avoid or minimize environmental impacts.

This EIS focuses on the facilities that are under the FERC's jurisdiction (i.e., the proposed Terminal Expansion and Pipeline Modification facilities). The topics addressed in this EIS include geology; soils and sediments; water use and quality; wetlands; vegetation; wildlife; aquatic resources and essential fish habitat (EFH); threatened, endangered, and special status species; land use, recreation, and visual resources; socioeconomics and environmental justice; cultural resources; air quality; noise; reliability and safety; cumulative impacts; and alternatives. The EIS describes the affected environment as it currently exists, discusses the potential environmental consequences of the Project, compares the Project's potential impacts to those of alternatives, and presents our conclusions and recommended mitigation measures.

The *Energy Policy Act of 2005*, as amended (EPAct 2005) states that the FERC shall act as the lead agency for coordinating all applicable authorizations related to jurisdictional natural gas facilities and for purposes of complying with NEPA. The FERC, as the "lead federal agency," is responsible for preparation of this EIS. This effort was undertaken with the participation and assistance of seven "cooperating agencies." As defined by NEPA, cooperating agencies have jurisdiction by law or special expertise with respect to environmental impacts involved with a proposal. The participating cooperating agencies consist of the U.S. Army Corps of Engineers (COE); the U.S. Coast Guard (USCG); the U.S. Department of Energy, Office of Fossil Energy (DOE/FE); the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (DOT); the U.S. Fish and Wildlife Service (FWS); the National Oceanographic and Atmospheric Administration (NOAA) - National Marine Fisheries Service (NMFS); and the U.S. Environmental Protection Agency (EPA). In addition, the Mississippi Office of the Secretary of State has jurisdiction over the wetland mitigation property and, therefore, is assisting us as a cooperating agency. The roles of the FERC and the cooperating agencies in the Project review process are described below.

The EIS provides a basis for coordinated federal decision making in a single document, avoiding duplication among federal agencies in the NEPA environmental review processes. In addition to the FERC and cooperating agencies, other federal, state, and local agencies may use this EIS in approving or issuing permits for all or part of the proposed Project. Federal, state, and local permits, approvals, and consultations for the Project are addressed in section 1.5.

1.2.1 Federal Energy Regulatory Commission

Based on its authority under the NGA, the FERC is the lead agency for the preparation of this EIS in compliance with the requirements of NEPA, the Council on Environmental Quality (CEQ) regulations for implementing NEPA (Title 40 of the Code of Federal Regulations, Parts 1500 through 1508 [40 CFR 1500 through 1508]), and FERC regulations implementing NEPA (18 CFR 380).

As the lead federal agency for the environmental review of the Project, the FERC is required to comply with Section 7 of the *Endangered Species Act of 1973* (ESA), as amended, the *Magnuson-Stevens Fishery Conservation and Management Act of 1976*, as amended (MSA), Section 106 of the *National Historic Preservation Act of 1966*, as amended (NHPA), and Section 307 of the *Coastal Zone Management Act of 1972*, as amended (CZMA). Each of these statutes has been taken into account in the preparation of this EIS. The FERC will use this document to consider the environmental, safety, and reliability impacts that could result if it issues an authorization to Gulf LNG under Section 3 and Section 7(c) of the NGA.

In accordance with Section 3A(e) of the NGA (added by Section 311 of the EPAct 2005), the act stipulates that in any order authorizing an LNG terminal, the Commission must require the LNG terminal operator to develop an *Emergency Response Plan* (ERP) in consultation with the USCG and state and local agencies. Gulf LNG has provided a preliminary draft of an ERP. The final ERP would need to be evaluated by appropriate emergency response personnel and officials. Section 3A(e) of the NGA as amended by EPAct 2005 also requires that the ERP include a Cost-Sharing Plan that contains a description of any direct cost reimbursements the applicant agrees to provide to any state and local agencies with responsibility for security and safety at the LNG terminal and in proximity to LNG marine carriers that serve the facility.

1.2.2 U.S. Army Corps of Engineers

The COE has jurisdictional authority pursuant to Section 404 of the *Clean Water Act of 1972*, as amended (CWA) (Title 33 of the United States Code [USC], Section 1344 [33 USC 1344]), which governs the discharge of dredged or fill material into waters of the U.S., and Section 10 of the *Rivers and Harbors Act of 1899*, as amended (33 USC 403), which regulates any work or structures that potentially affect the navigable capacity of a waterbody. Because the COE would need to evaluate and approve several aspects of the Project and must comply with the requirements of NEPA before issuing permits under the above statutes, it has elected to participate as a cooperating agency in the preparation of this EIS. The COE would adopt the EIS in compliance with 40 CFR 1506.3 if, after an independent review of the document, it concludes that the EIS satisfies the COE's comments and suggestions. The Project is under the jurisdiction of the COE Mobile District. Staff from this district participated in the NEPA review and will evaluate COE authorizations, as applicable.

As an element of its review, the COE must consider whether a proposed project avoids, minimizes, and compensates for impacts on existing aquatic resources, including wetlands, to strive to achieve a goal of no overall net loss of values and functions. The COE will issue a Record of Decision to formally document its decisions on the proposed action, including Section 404(b)(1) analyses and required environmental mitigation commitments, if permits are issued for the Project.

1.2.3 U.S. Coast Guard

The USCG has authority over the safety of an LNG terminal's marine transfer area and LNG marine traffic, as well as over security plans for the entire LNG terminal and LNG marine traffic. The USCG also exercises regulatory authority over LNG facilities that affect the safety and security of port areas and navigable waterways under Executive Order 10173; the *Magnuson Action of 1950* (50 USC

191); the *Ports and Waterways Safety Act of 1972*, as amended (33 USC 1221, et seq.), and the *Maritime Transportation Security Act of 2002* (46 USC 701). The USCG is responsible for matters related to navigation safety, vessel engineering and safety standards, and all matters pertaining to the safety of facilities or equipment in or adjacent to navigable waters up to the last valve immediately before the receiving tanks. As a cooperating agency, the USCG assists the FERC staff in evaluating whether an applicant's proposed waterway would be suitable for LNG marine traffic and whether the terminal facilities would be in accordance with 33 CFR 105 and 127. If the facilities are constructed and become operational, the facilities would be subject to the USCG inspection program. Final determination of whether the facilities are in compliance with the requirements of 33 CFR 105 and 127 would be made by the USCG.

As required by its regulations, the USCG is responsible for issuing a Letter of Recommendation (LOR) as to the suitability of the waterway for LNG marine traffic following a review of a Waterway Suitability Assessment (WSA). On December 11, 2012, Gulf LNG initiated consultation with the USCG regarding the proposed Project. Gulf LNG did not request changes to the currently authorized annual number of LNG carrier transits to the existing Terminal, but did request that the maximum size of LNG carriers authorized to use the berthing facility be increased from 170,000 m^3 to 208,000 m^3. In a letter dated June 17, 2015, the USCG stated that both the existing LOR and WSA were valid and no revisions were needed. In that letter, the USCG also stated that Gulf LNG would be required to update the existing Terminal's *Operations Manual, Emergency Manual, and Facility Security Plan* (FSP), as necessary. However, in October 2015, the USCG determined that the navigation portion of the original WSA did not account for larger LNG carriers. The USCG prepared an updated draft LOR and Letter of Recommendation-Analysis (LOR-A), which was provided to the FERC in January 2016. The USCG prepared the final LOR and LOR-A dated May 4, 2016 which was provided to the FERC on August 9, 2017. Additional discussion of the WSA can be found in section 4.12.1.2.

1.2.4 U.S. Department of Energy

The DOE/FE must meet its obligation under Section 3 of the NGA to authorize the import and export of natural gas, including LNG, unless it finds that the import or export is not consistent with the public interest. Gulf LNG filed applications with the DOE/FE (DOE/FE Docket Nos. 12-47-LNG and 12-101-LNG) seeking authorization to export up to 11.5 mtpy of domestically produced LNG (the equivalent of approximately 547.5 billion cubic feet per year of natural gas) for a 25-year period, commencing the earlier of either the date of first export or 7 years from the date of issuance of the requested authorization.[6] Gulf LNG seeks to export LNG from the Terminal Expansion to any country (1) with which the United States has, or in the future may have, a FTA requiring national treatment for trade in natural gas; (2) with which the United States does not have a FTA requiring the national treatment for trade in natural gas and LNG; (3) that has, or in the future develops, the capacity to import LNG; and (4) with which trade is not prohibited by United States law or policy.

On June 15, 2012, the DOE/FE issued an order (DOE/FE Order No. 3104) granting authorization to Gulf LNG to export LNG by vessel to any country which has or in the future develops the capacity to import LNG via ocean-going carrier and with which the United States has, or in the future enters into, a

[6] According to Gulf LNG, the Heat & Material Balance Sheets supporting the application for the proposed liquefaction Project show a Net LNG In-Tank Production of 10.85 MTPA. Gulf LNG understands that FERC review will be limited to analyzing the engineering information and siting for a liquefaction/export rate of 10.85 MTPA. If subsequent design changes result in an increase in LNG production which can be supported by heat and material balance information, Gulf LNG would request authorization for the additional capacity at that time. Accordingly, Gulf LNG is requesting authorization for the Gulf LNG Liquefaction Project to produce 10.85 MTPA of LNG at its proposed facility (accession number 201802-13-5046).

FTA requiring national treatment for trade in natural gas. Section 3(c) of the NGA, as amended by Section 201 of the *Energy Policy Act of 1992* (Public Law 102-486), requires that applications to authorize the import and export of natural gas, including LNG, from and to a nation with which there is in effect a FTA requiring national treatment for trade in natural gas be deemed consistent with the public interest and granted without modification or delay. The DOE/FE will review the Gulf LNG application to export to non-FTA countries after the environmental review process is completed. In accordance with 40 CFR 1506.3, after an independent review of the EIS, the DOE/FE may adopt it prior to issuing a Record of Decision on the Gulf LNG application for authority to export LNG to countries without a FTA.

1.2.5 U.S. Department of Transportation

The DOT establishes federal safety standards in 49 CFR 193 for the siting, construction, operation, and maintenance of onshore LNG facilities, as well as for the siting of marine cargo transfer systems at waterfront LNG plants. In 1985, the FERC and the DOT entered into a Memorandum of Understanding (MOU) regarding the execution of each agency's respective statutory responsibilities to ensure the safe siting, construction, and operation of LNG facilities. In addition to the FERC's existing ability to impose requirements to ensure or enhance the operational reliability of LNG facilities, the MOU specified that the FERC may, with appropriate consultation with the DOT, impose more stringent safety requirements than those in Part 193. As a cooperating agency, the DOT assists the FERC staff in evaluating whether an applicant's proposed project siting meets the DOT requirements. If the Project is constructed and becomes operational, the facilities would be subject to the DOT's inspection program. Final determination of whether the facilities are in compliance with the requirements of 49 CFR 193 would be made by the DOT staff.

In February 2004, the USCG, the DOT, and the FERC entered into an Interagency Agreement to ensure greater coordination among these three agencies in addressing the full range of safety and security issues at LNG terminals, including terminal facilities and tanker operations, and maximizing the exchange of information related to the safety and security aspects of the LNG facilities and related marine operations. Under the Interagency Agreement, the FERC is the lead federal agency responsible for the preparation of the analysis required under NEPA for impacts associated with terminal construction and operation. The DOT and the USCG participate as cooperating agencies but remain responsible for enforcing their regulations covering LNG facility design, construction, and operation.

On August 31, 2018 the DOT and the FERC signed an MOU to coordinate the siting and safety review of FERC-jurisdictional LNG facilities. The MOU establishes a framework for coordination between the FERC and the DOT to process LNG applications in a timely and expeditious manner while ensuring decision-makers are fully informed on public safety impacts. The MOU provides that DOT will review LNG project applications to determine whether a proposed facility complies with the safety standards set forth in DOT's regulations, and that the DOT will issue a letter to the FERC stating its findings regarding such compliance. The FERC will then consider DOT's compliance findings in its decision and final action on the Project application.

1.2.6 U.S. Fish and Wildlife Service

The FWS is responsible for ensuring compliance with the ESA. Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any federal agencies 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…" (16 USC 1536[a][2]). The FWS also reviews project plans and provides comments regarding protection of fish and wildlife resources under the provisions of the *Fish and Wildlife Coordination Act of 1938*, as amended (16 USC 661 et seq.). The FWS is responsible for the implementation of the provisions of the

Migratory Bird Treaty Act of 1918, as amended (MBTA) (16 USC 703) and the *Bald and Golden Eagle Protection Act of 1940*, as amended (BGEPA) (16 USC 688).

Section 7 of the ESA requires identification of and consultation on aspects of any federal action that may have effects on federally listed species, species proposed for federal listing, and their habitat. The ultimate responsibility for compliance with Section 7 remains with the lead federal agency. As the lead federal agency for the Project, the FERC staff consulted with the FWS pursuant to Section 7 of the ESA to determine whether federally listed endangered or threatened species or designated critical habitat occur in the vicinity of the Project and to evaluate the proposed action's potential effects on those species or critical habitats. We also consulted with the FWS regarding the BGEPA, the MBTA, the *Fish and Wildlife Coordination Act*, and NEPA. The FWS elected to cooperate in preparing this EIS because it has special expertise with respect to environmental impacts associated with the Gulf LNG proposal. As part of the consultation process, we have prepared a biological assessment (BA), which is summarized in section 4.7.1 and provided in appendix B.

1.2.7 National Marine Fisheries Service

The NMFS has the responsibility for protecting marine mammals and threatened/endangered marine life and works to conserve, protect, and recover species listed under the ESA and the *Marine Mammal Protection Act of 1972*, as amended (MMPA). The MMPA prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. Congress amended the MMPA in 1994 to provide for certain exceptions to the take prohibitions, including a program to authorize and control the taking of marine mammals incidental to commercial fishing operations; preparation of stock assessments for all marine mammal stocks in waters under U.S. jurisdiction; and studies of pinniped-fishery interactions.[7]

The MSA, as amended by the *Sustainable Fisheries Act of 1996* (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan. The MSA also requires that federal agencies consult with the NMFS on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH (MSA §305(b)(2)). Although absolute criteria have not been established for conducting EFH consultations, the NMFS recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as NEPA, the *Fish and Wildlife Coordination Act*, or the ESA, to reduce duplication and improve efficiency (50 CFR 600.920(f)). The FERC staff consulted with the NMFS as recommended. As part of the consultation process, we prepared an EFH Assessment, which is summarized in section 4.6.3 and provided in appendix C and a BA which is summarized in section 4.7.1 and provided in appendix B.

1.2.8 U.S. Environmental Protection Agency

The EPA has delegated water quality certification (Section 401 of the CWA) to the jurisdiction of individual state agencies (in this case Mississippi Department of Marine Resources [MDMR]), but the EPA may assume this authority if no state program exists, if the state program is not functioning adequately, or at the request of a state. Water used for hydrostatic testing of pipelines that is point-source discharged into waterbodies requires a National Pollutant Discharge Elimination System (NPDES) permit (Section 402 of the CWA) issued by the state with oversight by the EPA. In addition, the EPA has the authority to review and veto the COE decisions on Section 404 permits.

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7 Pinnipeds are marine mammals that include front and rear fins. This includes walruses, seals, and sea lions.

The EPA also has jurisdictional authority to control air pollution under the *Clean Air Act of 1963*, as amended (CAA) (42 USC Chapter 85) by developing and enforcing rules and regulations for all entities that emit toxic substances into the air. Under this authority, the EPA has developed regulations for major sources of air pollution. The EPA has delegated the authority to implement these regulations to state and local agencies, while state and local agencies are allowed to develop their own regulations for non-major sources. The EPA also establishes general conformity applicability thresholds, with which a federal agency can determine whether a specific action requires a general conformity assessment. In addition to its permitting responsibilities, the EPA is responsible for implementing certain procedural provisions of NEPA (e.g., publishing the Notices of Availability [NOA] of the draft and final EISs in the Federal Register) to establish statutory timeframes for the environmental review process.

1.3 PUBLIC REVIEW AND COMMENT

1.3.1 Pre-filing Process and Scoping

Gulf LNG initially filed a request with the FERC to use our pre-filing process on December 5, 2012. FERC staff issued a follow-up letter to Gulf LNG on December 14, 2012 stating that it would consider Gulf LNG's December 5, 2012 pre-filing request upon full compliance with the procedures described in the Commission's regulations at 18 CFR 157.21. At that time, the FERC assigned the Project to Pre-Filing Docket No. PF13-4-000. On May 9, 2014, Gulf LNG filed a second request with the FERC to use the pre-filing review process, along with supplemental information on the Project. The FERC approved the use of the pre-filing process for the Project in its May 21, 2014 letter to Gulf LNG, stating that the FERC had determined that Gulf LNG had complied with the procedures in 18 CFR 157.21.

At that time, Gulf LNG was in the preliminary design stage of the Project and no formal applications had been filed with the FERC. Information filed by Gulf LNG, related documents issued by the FERC, and information on the Project from other sources were filed into the public record under Docket No. PF13-4-000. The pre-filing review process provides opportunities for interested stakeholders to become involved early in project planning, facilitates interagency cooperation, and assists in the identification and resolution of issues prior to a formal application being filed with the FERC.

On of June 26, 2014, Gulf LNG held a public open house in Moss Point, Mississippi. FERC staff participated in this meeting to describe the FERC process and provide those attending with information on the FERC's environmental review process and how to file comments with the FERC. In addition, during the day of June 26, 2014, FERC staff visited existing wetland mitigation and restoration areas, the existing Terminal, the Terminal Expansion site, the sites of the Pipeline Modifications, and CSA-3.

On July 31, 2014, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Gulf LNG Liquefaction Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting* (NOI). This notice was sent to 218 interested parties including federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers in the Project area; and property owners in the vicinity of Project facilities. The NOI indicated that the Project was in the FERC pre-filing process, that a scoping meeting would be held on August 18, 2014, and established a 30-day scoping period, ending on September 1, 2014, for the submission of comments, concerns, and issues related to the environmental aspects of the Project. However, the FERC determined that some of those on the environmental mailing list were not provided timely copies of the NOI, and on August 27, 2014, issued a notice extending the scoping period to September 15, 2014.

On August 18, 2014, we held a public scoping meeting at the Pelican Landing Convention Center in Moss Point, Mississippi. The meeting was designed to provide interested parties with more detailed information on the Project and an opportunity to provide comments on environmental issues to be addressed in the EIS. Gulf LNG representatives presented information on the Project, provided maps, and answered Project-related questions. We accepted verbal and written comments at the meeting, provided information on the FERC environmental review process, and described procedures for providing written comments. The meeting was transcribed to ensure that verbal comments were accurately recorded, and placed into the public record.[8]

The FERC received six comment letters and comment forms from federal and state agencies, non-governmental organizations (NGOs), and individuals during the scoping period. In addition, three individuals provided verbal comments at the scoping meeting.

On August 19, 2014, we held an interagency coordination meeting and conference call for the Project. Participants included representatives of the COE; DOE/FE; USCG; FWS; NOAA-NMFS; Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP); MDMR; Mississippi Department of Archives and History (MDAH);[9] Mississippi Department of Environmental Quality (MDEQ); and Gulf LNG. During the meeting, the participants discussed impacts on wetlands, EFH, migratory birds, threatened and endangered species, coordination of agency reviews, permit requirements and status, and each agency's interest in participating in our environmental review as a cooperating agency. In addition, Gulf LNG hosted a visit of the existing Terminal and the sites of the Terminal Expansion and associated facilities.

On August 20, 2014, we held a geotechnical meeting and conference call for the Project. Participants included representatives from FERC LNG Engineering, Gulf LNG, and its consultants. Gulf LNG provided an overview of its planned geotechnical program and seismic hazard analysis.

Additional interagency coordination conference calls were held on January 15, 2015; January 21, 2015; February 24, 2015; April 9, 2015; October 6, 2015; October 29, 2015; August 23, 2016; November 14, 2017; and December 13, 2017 primarily to address and resolve issues related to the evolution of Gulf LNG's proposed wetland mitigation plan (see section 4.4 for further information on this plan).

On March 23, 2015, FERC staff also participated in an interagency meeting at Gulf LNG's existing Terminal facility to discuss the range of potential wetland mitigation plans, Gulf LNG's sediment sampling and analysis plan, and also to conduct a site visit of the originally proposed wetland mitigation site at the former International Paper aeration sedimentation basin. Additionally, on March 23, 2015, FERC staff participated in a meeting held by Gulf LNG to address community concerns. Participants at this meeting included the Steps Coalition, a non-profit community support organization; Cherokee Concerned Citizens, a group of citizens representing the Cherokee Subdivision, a community several miles north of the existing Terminal; the EPA; and MDEQ.

The FERC staff had conference calls with the FWS, NMFS, and NOAA on December 10, 2014; June 29, 2015; and September 23, 2015 to discuss the BA and EFH Assessment. The FERC staff also had two conference calls, August 7, 2015 and September 18, 2015, with the cooperating agencies to discuss Gulf LNG's FERC and COE applications and identify any outstanding issues.

Environmental issues identified during and after the open houses, the public scoping process, and the interagency meetings and conference calls are summarized in table 1.3-1 along with a listing of the

8 Transcript of the August 18, 2014 FERC Public Scoping Meeting held in Moss Point, Mississippi re Gulf LNG Liquefaction Company, LLC et al. under PF13-4-000. Accession Number 20140818-4008. Available at: http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14258893.

9 The Historic Preservation Division of MDAH administers the duties of the State Historic Preservation Office (SHPO).

EIS sections that address the comments. The most frequently received comments relate to air quality, dredging, and cumulative impacts. Topics addressed in public comments that are not considered environmental issues or are outside the scope of the EIS process are summarized in table 1.3-2 and are not addressed further in this EIS.

TABLE 1.3-1

Issues Identified and Comments Received During the Public Scoping Process for the Gulf LNG Liquefaction Project

Issue/Specific Comment	EIS Section Addressing Comment
General	
Describe outreach conducted with communities that could be affected by the Project.	1.3
Alternatives	
If jurisdictional waters of the U.S. are determined to be on the Project site, assess alternatives that would not affect such waters.	3.3
If dredged or fill material would be discharged into waters of the U.S., discuss alternatives to avoid those discharges.	3.3
Identify alternatives to the Project to reduce environmental impacts.	3.3
Soils and Sediments	
Implement measures that will prevent suspended silt and contaminants from leaving the site in stormwater run-off.	4.2, 5.2
Identify impacts on water quality from dredging, construction of in-water facilities, and ship transits.	4.3
Water Resources	
Identify current groundwater conditions in the Project area, potential impacts on groundwater quality and quantity associated with the proposed Project construction and operation, and mitigation measures to prevent or reduce adverse impacts on groundwater quality and their effectiveness.	4.3
Minimize drainage impacts, including restoring original drainage patterns in the Project locale.	4.3.2
Identify impacts on surface water quality from discharges and stormwater pollution, including an analysis of potential effects of discharges on designated beneficial uses of affected waters.	4.3.2
Disclose dredging impacts, including impacts on aquatic environment from contaminated sediments.	4.3.2
If jurisdictional waters of the U.S. are determined to be on the Project site, include a final determination of the extent of such waters and the measures Gulf LNG would implement to avoid or minimize affects to such waters and to compensate for any unavoidable impacts.	4.4, 5.2
Identify any CWA Section 303(d) impaired waters in the Project area and any mitigation measures that will be implemented to avoid further degradation of impaired waters.	4.3.2
Document the Project's consistency with applicable stormwater permitting requirements.	4.3.2

TABLE 1.3-1

Issues Identified and Comments Received During the Public Scoping Process for the Gulf LNG Liquefaction Project

Issue/Specific Comment	EIS Section Addressing Comment
Wetlands	
Identify impacts of wetland/marsh disturbance and fill and the provision of in-kind mitigation, including marsh restoration for marsh impacts.	4.4, 5.2
Include a jurisdictional delineation for all waters of the U.S., including ephemeral drainages.	4.4
Wildlife and Aquatic Resources	
Incorporate mitigation, monitoring, and reporting measures that result from consultation with the FWS or NMFS that incorporate guidance to avoid and minimize adverse effects on sensitive biological resources and consider the potential for habitat fragmentation and obstructions for wildlife movement from the Project.	4.6, 5.2
Threatened and Endangered Species	
Identify impacts on federally and state-listed threatened and endangered species, species of special concern, and critical habitat affected.	4.7
If compensation lands are to be acquired, provide the locations and management plans for the lands, and include information on the compensatory mitigation proposals.	4.4
Consult with the FWS, NMFS, and MDEQ to ensure that current and consistent surveying, monitoring, and reporting protocols are applied in protection and mitigation efforts.	4.7
Socioeconomics	
Determine whether there are environmental justice populations within the geographic scope of the Project, and if such populations exist, address the potential for disproportionate adverse impacts on minority and low-income populations, the approaches used to foster public participation by these populations, and potential mitigation measures.	4.9
Identify impacts on communities in the vicinity of the Project.	4.9
Cultural Resources	
Describe the process and outcome of government-to-government consultation between the FERC and tribal governments within the Project area, issues that were raised, and how those issues were addressed.	4.10
Within cultural and historic resources, include Indian sacred sites, a summary of all coordination with Tribes and the State Historic Preservation Office (SHPO), identification of all National Register of Historic Places listed or eligible sites, and a *Cultural Resource Management Plan*.	4.10
Air Quality and Noise	
Estimate emissions from construction, operation, and maintenance of the Project as well as proposed mitigation measures to minimize those emissions.	4.11.1
Provide ambient air conditions, National Ambient Air Quality Standards (NAAQS) and non-NAAQS pollutants, criteria pollutant nonattainment areas, and potential air quality impacts of the proposed Project.	4.11.1

TABLE 1.3-1 **Issues Identified and Comments Received During the Public Scoping Process for the Gulf LNG Liquefaction Project**	
Issue/Specific Comment	**EIS Section Addressing Comment**
Provide estimates of the greenhouse gas (GHG) emissions associated with construction of the Project, and annual emissions from the operation of the liquefaction facility.	4.11.1
Address reasonably foreseeable climate change that may affect the Project over its lifetime in the “affected environment” section: e.g., sea-level rise.	4.11.1
Coordinate with the MDEQ to determine if a GHG Prevention of Significant Deterioration (PSD) permit under the CAA is necessary.	4.11.1
Identify air quality impacts on the Cherokee residential subdivision and install air monitoring station.	4.11.1
Reliability and Safety	
Address the potential impacts of hazardous waste from construction and operation of the Project, including anticipated waste types and volumes, and expected storage, disposal, and management plans, the applicability of federal and state hazardous waste requirements, and identify appropriate mitigation measures, including measures to minimize the generation of hazardous waste.	4.12
Cumulative Impacts	
Address cumulative impacts of wetland/marsh disturbance.	4.13.2
Include cumulative impacts of industrial development on residential land use.	4.13.2
Identify cumulative impact on health and safety due to industrial development.	4.13.2

TABLE 1.3-2 **Issues Identified and Comments Received that are Outside the Scope of the EIS Process**
Issue/Specific Comment
Prepare a national programmatic EIS that considers the environmental and human health/quality of life implications of increasing infrastructure for natural gas, including the cumulative effects of natural gas drilling on water quality and quantity, air quality, forest fragmentation, wildlife, public lands, recreation, property values, wastewater disposal, and radiation from hydraulic fracturing. **a/**
Prepare regional EISs for the shale basins that are targeted for extraction.
Provide estimates of GHG emissions associated with the production, transport, and combustion of the natural gas proposed to be exported by the Project.
Do not export energy from the United States.
Evaluate the difference in prices if the energy that is produced in the United States can only be used for domestic consumption versus selling to a worldwide demand.
a The development of natural gas in shale plays by hydraulic fracturing is not the scope of this EIS nor is the issue directly related to the proposed Project. Production and gathering activities, and the pipelines and facilities used for these activities, are not regulated by the FERC, but are overseen by the affected region’s state and local agencies with jurisdiction over the management and extraction of the shale gas resource. Determining the well and gathering line locations and their environmental impact is not feasible as the market and gas availability at any given time would determine the source of the natural gas. Therefore, it is outside of the scope of this EIS.

1.3.2 Public Review of the Draft EIS

This draft EIS was issued for public review on November 15, 2018, and an NOA for the draft EIS was published in the Federal Register. The NOA included notice of a public comment meeting in Moss Point, Mississippi. Copies of the NOA were sent to agencies, elected officials, media organizations, Native American tribes, private landowners, and other interested parties. The distribution list for the NOA is presented in appendix A.

1.4 NON-JURISDICTIONAL FACILITIES

Under Section 7 of the NGA, the FERC is required to consider, as part of a decision to authorize jurisdictional facilities, all facilities that are directly related to a proposed project where there is sufficient federal control and responsibility to warrant environmental analysis as part of the NEPA environmental review for the proposed Project. Some proposed projects have associated facilities that do not come under the jurisdiction of the Commission. These "non-jurisdictional" facilities may be integral to the need for the proposed facilities, or they may be merely associated as minor components of the jurisdictional facilities that would be constructed and operated as a result of authorization of the proposed facilities.

Four non-jurisdictional actions were identified in association with the proposed Project: (1) a new electric transmission line that would provide electrical power to the Project, (2) transport of NGLs by truck outside of the Terminal Expansion site boundaries, (3) the North Supply Dock Maintenance Dredging and Operation, and (4) maintenance and extension of the earthen berm. These facilities are addressed below and are also addressed in the cumulative impacts analysis in section 4.13 of this EIS.

1.4.1 Electric Transmission Lines

Operation of the Terminal Expansion would require 100 megawatts (MW) of electrical power in addition to the electrical power supply of the existing Terminal. The Mississippi Power Company (MPC) would provide this power. Facilities required to provide the power would include two new, 1.5-mile-long, 115-kilovolt (kV) transmission lines as well as a new substation within the Terminal Expansion site. Figure 1.4-1 depicts the transmission line route, which would extend from the existing MPC transmission lines adjacent to the Chevron Cogeneration Facility to the Terminal Expansion site. The right-of-way of the route would be 100 feet wide. MPC would require additional information and survey results to establish a final design for the system; however, the electrical transmission support structures would most likely consist of 16 concrete poles and/or concrete H-Frame structures. Installation of the support structures is anticipated to result in a permanent impact on less than 0.1 acre of jurisdictional wetland. During the installation of the structures, temporary wetland impacts would occur from the use of matting to support the installation equipment.

MPC may also need to upgrade some of its existing transmission system in the area, but no other new structures in the immediate area are anticipated. The new 115-kV substation would be constructed on a 250-foot-by-250-foot site adjacent to Gulf LNG's new electric service facilities within the Terminal Expansion boundaries. Construction and operation of the substation on the Terminal Expansion site is jurisdictional and is analyzed throughout this EIS.

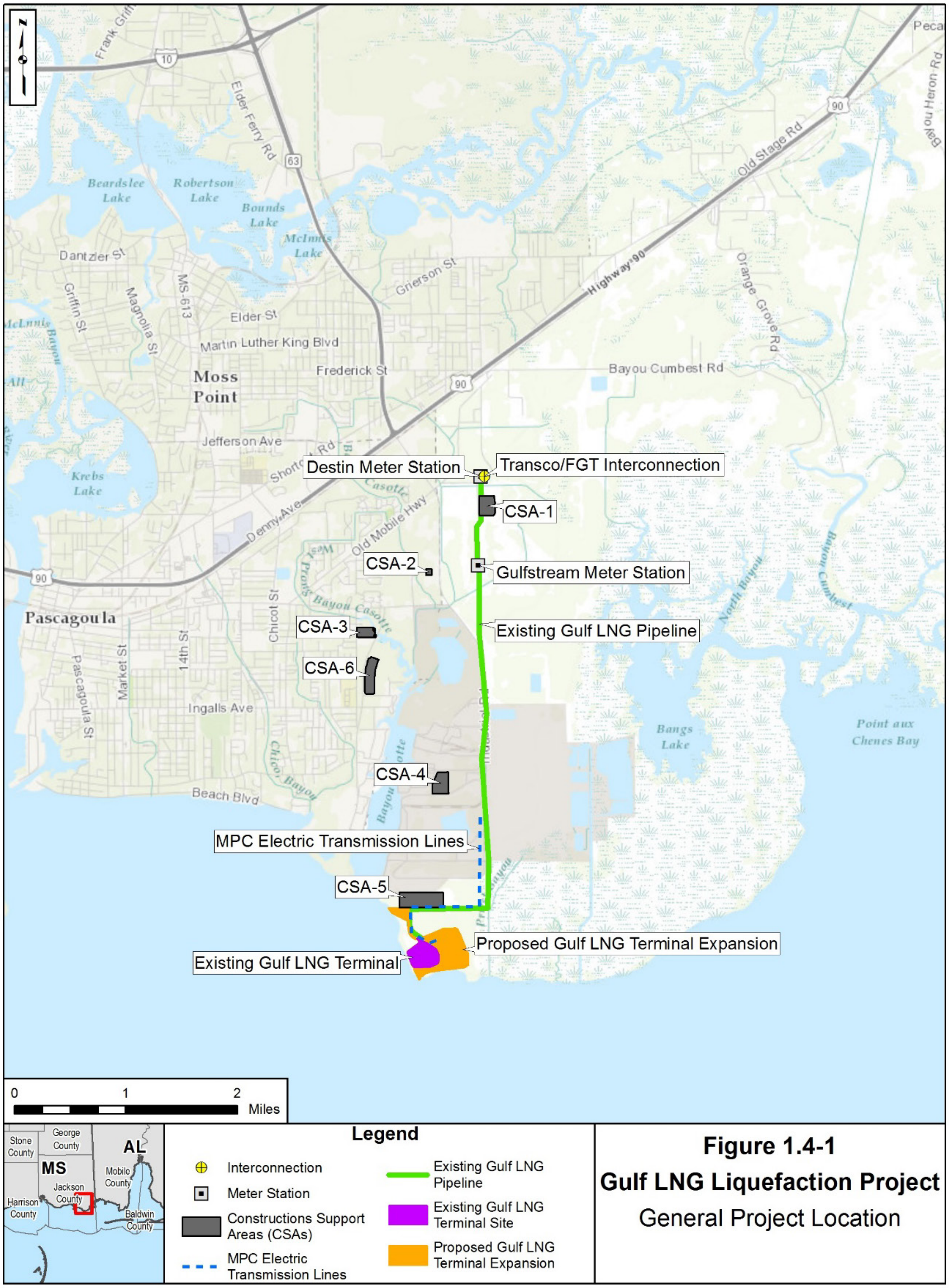

Figure 1.4-1
Gulf LNG Liquefaction Project
General Project Location

MPC would be responsible for all permits and approvals associated with the power upgrades outside of the Terminal Expansion boundaries. Gulf LNG anticipates that MPC would require the following permits:

- Section 404 of the CWA from the COE (due to wetland impacts);
- Section 401 of the CWA from MDEQ (water quality certification); and
- coastal zone consistency determination from MDMR.

1.4.2 Truck Transport of Natural Gas Liquids

The Project would require trucking of NGLs or condensate generated as part of the liquefaction process, and makeup refrigerants including ethane, propane, and nitrogen used in the liquefaction process and amine solution used in the acid gas removal system. Ethane and propane would be delivered by truck and unloaded into storage facilities. In the worst case of very rich feed gas (expected less than 10 days per year), the amount of condensate removed from the plant would be 16.5 trucks per day. For the rich case, an average of 3.2 trucks per day would be removed from the plant. During normal operation with average feed gas, approximately five trucks per month of condensate would be removed from the plant. Ethane would be trucked into the facility up to two times each month. Propane would be trucked into the facility up to four times each month. Additionally, amine associated with the acid gas removal system would be trucked in one time per year for makeup and re-inventory of the amine systems after removal of the spent amine during major scheduled maintenance activities. Liquid nitrogen would be delivered by truck twice per year for makeup refrigerant.

Construction and operation of the truck loading/unloading facility at the Terminal Expansion is jurisdictional and is analyzed throughout this EIS. However, the loaded NGL tanker trucks would be non-jurisdictional once they leave the Terminal Expansion site. After leaving the Terminal Expansion site, NGL trucking is regulated by DOT's Federal Motor Carrier Safety Administration. Gulf LNG anticipates negotiating agreements for the purchase of NGLs by processing facilities near the Terminal Expansion. After leaving the Terminal Expansion site, the trucks would use Industrial Road and SH-611 to transport the NGLs to nearby processing plants, or if Gulf LNG has more distant customers for the NGLs, they would transit Industrial Road, SH-611, and SH-63 to reach Interstate 90 (I-90) and I-10, the area's main highways. According to Gulf LNG, the Hazardous Waste Branch of the MDEQ does not have a requirement for a hazardous materials route analysis.

The DOT would require tanker trucks to comply with its requirements for the transportation of hazardous materials. Based on an average composition of feed gas, we conclude that the estimated truck traffic of 11 trucks per month would not have any significant impacts on roadway traffic.[10] No other impacts are expected as a result of shipping NGLs from the Terminal Expansion.

1.4.3 North Supply Dock Maintenance Dredging and Operation

After construction of the Project is completed, ownership of the North Supply Dock would be transferred to the Jackson County Port Authority (JCPA). A letter from the JCPA-Port of Pascagoula confirming that they would accept dock ownership was provided to Gulf LNG on May 28, 2015. In addition to use of the North Supply Dock by barges and support vessels associated with operation of the Project, the dock may also be used by the JCPA as a berthing facility for barges waiting for a berth at one

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[10] As discussed in section 4.9.6, according to Gulf LNG's *Traffic Impact Analysis*, 2013 daily traffic volumes were estimated to be 11,000 trips on the north end of SH-611 and 5,000 trips on the south end. The addition of 11 trucks per month would not be significant.

of the private or public terminals in the Bayou Casotte Harbor or for temporary berthing of other vessels not associated with the Project.

Maintenance dredging, to maintain a depth of 12 feet below mean seal level (msl), would be accomplished as needed and agreed to by Gulf LNG, the Port of Pascagoula, and the JCPA. The COE Mobile District is responsible for the routine maintenance of the Bayou Casotte Navigation Channel. The Port of Pascagoula and the COE typically bid out dredging operations concurrently, and to be cost efficient, often the same contractor conducts dredging for both entities. In some instances, the Port of Pascagoula enters into an agreement with the COE to have the COE contractor dredge at port facilities instead of conducting separate dredging activities. Dredging occurs irregularly every 24 to 48 months at port facilities, with the timing dependent on sedimentation within the areas used by marine vessels. Dredged material from maintenance dredging is placed in the BCDMMS or at an MDMR-approved Beneficial Use site or an alternate approved site. Any dredged sediment planned for disposal into an MDMR-approved Beneficial Use site would require testing under the protocols established by MDEQ and adopted by MDMR for Beneficial Use sites. Gulf LNG, the Port of Pascagoula, and the JCPA would coordinate sediment testing with the COE prior to initiation of dredging and disposal.

Based on the observed annual increase in sediment material at the existing marine berth, depth comparisons, and other variables, about 10,000 cubic yards (cy) of material would be deposited within the North Supply Dock berthing area per year.[11] However, as noted above, dredging would not be required annually.

As owner of the North Supply Dock, the JCPA would be responsible for obtaining permits and clearances for dredging operations and for issuing notifications to agencies and Port of Pascagoula users regarding dredging activities. Maintenance dredging of the North Supply Dock would require a Section 404/Section 10 permit from the COE, which would be issued after review and approval by MDMR and MDEQ. The conditions of the permit typically include directives and guidance for material testing. The type and extent of testing and agency approval would be dependent on the selected disposal location (i.e., the BCDMMS or an MDMR-Beneficial Use site). The JCPA would also have to obtain the following permits and approvals:

- a Section 401 permit (state water quality certification) from MDEQ;
- an MDMR permit for coastal development projects/dredge disposal;
- a permit for ocean disposal of dredged material from the COE in compliance with the *Marine Protection, Research, and Sanctuaries Act of 1972,* as amended;
- compliance with the ESA, MMPA, the *Fish and Wildlife Coordination Act*, and the MSA through consultation with the FWS and NMFS;
- an MDMR consistency determination for the Coastal Zone Management Program; and
- State Historic Preservation Office (SHPO) concurrence that the dredging is in compliance with the NHPA.

The Port of Pascagoula has an existing maintenance dredging permit for the existing Terminal's marine berthing facility (SAM-2010-01074-PAH) and would request modification to that permit to

[11] Dredging volumes were estimated from shoaling rates observed at the existing LNG carrier berth. The existing LNG carrier berth is about 1,500,000 ft^2. About 30,000 cy every 6 years (50,000 cy per year) are removed from the existing LNG carrier berth. The North Supply Dock berthing area would be about 300,000 ft^2 therefore the annual deposition of material should be 300,000 ft^2/1,500,000 ft^2 x 50,000 cy = 10,000 cy per year.

include maintenance dredging of the North Supply Dock. The existing maintenance dredging permit allows for dredged material to be placed within the adjacent BCDMMS or an MDMR-approved Beneficial Use Site if one is available. The permit modification request would include a provision to allow mechanical dredging, which would allow the Port of Pascagoula to place dredged material in hopper barges and transfer it to approved open water sites if appropriate and approved by the COE. The modification of the existing permit would be coordinated among JCPA, the Port of Pascagoula, and the COE, MDEQ, and MDMR prior to receipt of the modification and commencement of any work.

Maintenance dredging of the North Supply Dock is expected to result in impacts that would be similar to or the same as the impacts discussed in this EIS for the initial dredging of the dock.

1.4.4 Earthen Berm Maintenance and Extension

Gulf LNG would extend the existing storm protection system surrounding the existing Terminal to encompass the Terminal Expansion facilities. The new storm surge protection system would consist of (1) a new concrete wall with a top elevation of 27 feet NAVD (North American Vertical Datum of 1988) and (2) a new earthen berm (an extension of the existing COE berm) with a top elevation of 27 feet NAVD. Following initial construction of the berm by Gulf LNG, the COE, in order to expand capacity of the BCDMMS, would extend the berm to a height of 39.2 feet NAVD. The COE would be responsible for maintaining the berm during operations of the Project, and would be responsible for all permits and approvals associated with maintenance and extension of the height of the earthen berm.

1.5 PERMITS, APPROVALS, AND REGULATORY REVIEWS

The FERC and other federal agencies considering authorizing, permitting, or approving the Project are required to comply with a number of regulatory statutes including, but not limited to NEPA, Section 7 of the ESA, the MSA, the CAA, CWA, the *Rivers and Harbors Act*, Section 106 of the NHPA, and Section 307 of the CZMA. Each of these statutes has been taken into account in the preparation of this EIS. The major permits, approvals, and consultations for the Project are identified in table 1.5-1.

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…" (16 USC 1536(a)(2)(1988)). The FERC staff is required to determine whether any federally listed or proposed endangered or threatened species or their designated critical habitat occur in the vicinity of the proposed Project and conduct consultations with the FWS and/or NMFS, if necessary. If, upon review of existing data or data provided by Gulf LNG, the FERC staff determines that these species or habitats may be affected by the Project, the FERC staff is required to prepare a BA to identify the nature and extent of adverse impact, and to recommend measures that would avoid the habitat and/or species, or would reduce the potential impact to acceptable levels. As part of this consultation process, the FERC staff prepared a BA, which is summarized in section 4.7.1 and provided in appendix B.

TABLE 1.5-1

Major Permits, Approvals, and Consultations for the Gulf LNG Liquefaction Project

Agency	Permit/Approval/ Consultation	Status: Terminal Expansion	Status: Pipeline Modifications
Federal			
Federal Aviation Administration	Notification of Proposed Construction or Alteration	Determination of No Hazard to Aviation issued December 17, 2014. Extension of determination until December 8, 2017 issued on June 8, 2016. A new Determination of No Hazard to Aviation issued June 26, 2018 and expires on December 26, 2019.	Not applicable
Federal Emergency Management Agency	Construction with a Floodplain	Consultation ongoing	Not applicable
FERC	Authorization under Section 3 of the NGA	Application filed June 19, 2015	Not applicable
	Certification under Section 7 of the NGA	Not applicable	Application filed June 19, 2015
NOAA-NMFS	Section 7 ESA consultation	Informal consultation ongoing	Not applicable
	MMPA consultation	Informal consultation ongoing	Not applicable
	Fish and Wildlife Coordination Act consultation	Informal consultation ongoing	Not applicable
	MSA	Informal consultation ongoing	Not applicable
COE, Mobile District	CWA Section 404 Permit	Application submitted July 10, 2015. Gulf LNG is revising the application and plans to submit in December 2018.	Not applicable
	Rivers and Harbors Act, Section 10 Permit	Application submitted July 10, 2015. Gulf LNG is revising the application and plans to submit in December 2018.	Not applicable
	Section 408	Decision pending regarding the need for a Section 408 review for the proposed wetland mitigation site.	Not applicable

TABLE 1.5-1			
Major Permits, Approvals, and Consultations for the Gulf LNG Liquefaction Project			
		Status	
Agency	**Permit/Approval/ Consultation**	**Terminal Expansion**	**Pipeline Modifications**
USCG	33 CFR 127; 2004 Interagency Agreement (NVIC 05-08) LOR	The USCG prepared the final LOR and LOR-A dated May 4, 2016 which was provided to the FERC on August 9, 2017. Gulf LNG conducted its annual review to the Amendment to Follow-on WSA in July 2018.	Not applicable
	Notification to Mariners of dredging activities	Gulf LNG to submit notification to the USCG prior to commencement of dredging	Not applicable
	Approval of FSP	Gulf LNG to submit updated FSP. Approval of the FSP for construction is expected by December 2019 and operation by July 2024.	Not applicable
	Approval of Operations Manual	Gulf LNG to submit updated Operations Manual prior to facility startup	Not applicable
	Approval of Emergency Manual	Gulf LNG to submit updated Emergency Manual prior to facility startup	Not applicable
DOE/FE	Authorization to Export LNG to FTA Countries	Authorization granted June 15, 2012 (DOE/FE Order No. 3104)	Not applicable
	Authorization to Export LNG by vessel to Non-FTA Countries	Application submitted August 31, 2012; to be reviewed after completion of environmental review process	Not applicable
EPA	Title V Permit consultation and Greenhouse Gas Emission Permits	Not applicable (permitting authority transferred to MDEQ)	Not applicable
	CWA Section 402 consultation	Not applicable (permitting authority transferred to MDEQ)	Not applicable

TABLE 1.5-1			
Major Permits, Approvals, and Consultations for the Gulf LNG Liquefaction Project			
	Status		
Agency	**Permit/Approval/ Consultation**	**Terminal Expansion**	**Pipeline Modifications**
FWS	Section 7 of ESA consultation	Informal consultation ongoing	Informal consultation ongoing
	MBTA consultation	Informal consultation ongoing	Informal consultation ongoing
	BGEPA	Informal consultation ongoing	Informal consultation ongoing
	Fish and Wildlife Coordination Act consultation	Informal consultation ongoing	Informal consultation ongoing
DOT, Pipeline and Hazardous Materials Safety Administration	49 CFR 193 consultation (standards for LNG facilities)	Consultation ongoing	Not applicable
	State of Mississippi		
MDAH-SHPO	NHPA, Section 106 consultation	Concurrence received November 2014 (Terminal Expansion) and July 2015 (wetland mitigation site)	Concurrence received November 2014
MDEQ, Air Quality Division	CAA, Pre-construction Air Permit for Construction emissions (PSD) and operation emissions (Title V) for stationary sources	PSD and Title V Applications submitted June 2015. Draft revision to Application submitted June 2017. Gulf LNG is addressing MDEQ comments and performing additional modeling. A revised Application is expected by December 2018.	Not applicable
MDEQ, Office of Pollution Control	Large Construction Notice of Intent (Storm Water Construction General Permit) for projects greater than 5 acres	Application to be submitted 45 days prior to the start of construction	Not applicable
	Hydrostatic Test Notice of Intent (for projects greater than 1 acre)	Application to be submitted 45 days prior to the start of regulated activity	Not applicable
MDEQ, Water Quality Division	Section 401 of CWA, State Water Quality Determination	Application submitted July 10, 2015	Not applicable
Mississippi Office of the Secretary of State	Lease for use of Public Trust Tidelands for use as Wetland Mitigation Site	Negotiations ongoing	Not applicable
MDMR, Coastal Zone Management Office	CZMA	Consultation ongoing	Not applicable
	Coastal Zone Consistency	Consultation ongoing	Not applicable
MDMR, Bureau of Wetland Permitting	Section 401 of CWA, State Water Quality Determination	Application submitted July 10, 2015	Not applicable

TABLE 1.5-1

Major Permits, Approvals, and Consultations for the Gulf LNG Liquefaction Project

Agency	Permit/Approval/ Consultation	Status: Terminal Expansion	Status: Pipeline Modifications
	Joint Review for Coastal Wetlands	Application submitted July 10, 2015	Not applicable
MDMR, Beneficial Use of Dredge Material Program	Approval of use of Beneficial Use sites for disposal of dredged material from the supply docks	Application submitted July 10, 2015	Not applicable
MDWFP	Threatened and Endangered and Listed Species consultation	Consultation ongoing	Consultation ongoing
Local			
JCPA and Commission	Lease of Terminal Expansion Site and Wetland Mitigation Site	Consultation ongoing	Not applicable
	Transfer of ownership of North Supply Dock after construction of the Project is complete	Consultation ongoing	Not applicable
Jackson County Emergency Services	Review of ERP	Consultation ongoing	Not applicable

The MSA, as amended by the *Sustainable Fisheries Act of 1996* (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan. The MSA requires federal agencies to consult with NMFS on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH (MSA §305(b)(2)). Although absolute criteria have not been established for conducting EFH consultations, NMFS recommends consolidating EFH consultations with interagency coordination procedures required by other statues, such as NEPA, the *Fish and Wildlife Coordination Act*, or the ESA (50 CFR 600.920[e]), to reduce duplication and improve efficiency. As part of this consultation process, the FERC staff prepared an EFH Assessment, which is summarized in section 4.6.3 and provided in appendix C.

Section 106 of the NHPA requires that the FERC take into account the effects of its undertakings on properties listed, or eligible for listing, in the National Register of Historic Places (NRHP), including prehistoric or historic sites, districts, buildings, structures, objects, or properties of traditional religious or cultural importance, and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking. Gulf LNG, as a non-federal party, is assisting the FERC in meeting its obligations under Section 106 by preparing the necessary information, analyses, and recommendations under the ACHP regulations in 36 CFR 800. Section 4.10 provides information on the status of this review.

Gulf LNG must comply with Sections 401 and 404 of the CWA. Water quality certification (Section 401) has been delegated to the state agencies, with review by the EPA. Water used for hydrostatic testing that is point-source discharged into waterbodies would require an NPDES permit (CWA Section 402) issued by the EPA. The COE has responsibility for determining compliance with all regulatory requirements associated with Section 404 of the CWA. The EPA also independently reviews Section 404 applications for wetland dredge-and-fill applications for the COE and has Section 404(c) veto power for wetland permits issued by the COE. The Section 404 permitting process regulates the discharge of dredged and fill material associated with the construction of facilities across streams and within wetlands. Before an individual Section 404 permit can be issued, the CWA requires completion of a Section 404(b)(1) guideline analysis. The FERC staff, in the NEPA review represented by this EIS, has analyzed all technical issues required for the Section 404(b)(1) guideline analyses, including analysis of natural resources and cultural resources that would be affected by the Project, as well as analyses of alternatives. The results of our analysis of alternatives are provided in section 3.0, and a summary of wetland impacts is provided in section 4.4. In addition to CWA responsibilities, the COE has jurisdiction pursuant to Section 10 of the *Rivers and Harbors Act of 1899*, which requires authorization for construction activities in navigable waterways. Construction methods in wetlands and the associated impacts are summarized in section 4.4 of this EIS.

EPAct 2005 and Section 3 of the NGA require us to consult with the Department of Defense (DOD) to determine if there would be any impacts associated with the Project on military training or activities on any military installations. We initiated consultation with the DOD in a letter dated September 25, 2014. The DOD responded on March 10, 2016, concluding the Project would have minimal impact on the military operations conducted in this area.

The CZMA calls for the "effective management, beneficial use, protection, and development" of the nation's coastal zone and promotes active state involvement in achieving those goals. As a means to reach those goals, the CZMA requires participating states to develop management programs that demonstrate how those states will meet their obligations and responsibilities in managing their coastal areas. In Mississippi, the MDMR Coastal Zone Management Office, administers the Coastal Zone Management Program (CZMP). Project-related issues associated with the CZMP are addressed in section 4.8.7.

The CAA was enacted by Congress to protect the health and welfare of the public from the adverse effects of air pollution. The CAA is the basic federal statute governing air pollution. Federal and state air quality regulations established as a result of the CAA include Title V operating permit requirements and Prevention of Significant Deterioration (PSD) Review. The EPA is the federal agency responsible for regulating stationary sources of air pollutant emissions; however, the federal permitting process has been delegated to the MDEQ in Mississippi. Air quality impacts that could occur as a result of construction and operation of the Project are addressed in section 4.11.1.

Gulf LNG is responsible for obtaining all permits and approvals required to implement the Project, regardless of whether or not they appear in table 1.5-1.

2.0 PROPOSED ACTION

The Gulf LNG Liquefaction Project consists of two main components: (a) expansion of the existing Terminal in Jackson County, Mississippi (Terminal Expansion) in order to liquefy domestic natural gas into LNG for export to FTA nations and, if approved, non-FTA nations and (b) piping modifications to add bi-directional flow capability (Pipeline Modifications) to the existing pipeline facilities. Figure 1.4-1 depicts the general location of the Project, figure 2.0-1 depicts the locations of the key components of the proposed Terminal Expansion, and figure 2.0-2 depicts the locations of the Pipeline Modifications.

2.1 EXISTING FACILITIES

2.1.1 Gulf LNG Import Terminal

The existing Terminal encompasses 33 acres and is near the City of Pascagoula at the south end of SH-611. Gulf LNG constructed the existing Terminal to regasify and transport natural gas imported to the United States from foreign markets. The environmental review for the existing Terminal was provided in the FERC final EIS issued in November 2006 (FERC, 2006). In 2007, the Terminal was authorized by the Commission to send out 1.5 billion cubic feet per day (bcfd) of natural gas through the Terminal facilities for delivery to interconnections with the interstate pipeline systems of Destin and Gulfstream, and the non-affiliated third-party processing plant owned by BP American Production Company (FERC, 2007).

Construction of the Gulf LNG Import Terminal was authorized by the FERC on February 16, 2007, and the facility was placed into service on October 1, 2011. A maximum of 200 LNG carriers per year are currently authorized to import foreign LNG at the marine berth of the existing Terminal. Unloading of LNG can occur at a rate of up to 12,000 m^3 per hour, with unloading typically requiring about 24 hours. The frequency and total number of LNG carriers calling on the existing Terminal each year could vary depending on the size of carriers, with authorized vessel sizes ranging from 88,000 to 170,000 m^3. The berthing facility was designed and constructed to accommodate LNG carriers up to 250,000 m^3 in size. The average frequency of LNG carriers that could call on the existing Terminal is about one carrier every 2.4 days.

The existing Terminal includes the following major facilities:

- one berthing facility on the Bayou Casotte Navigation Channel;
- two LNG storage tanks, each with a capacity of 160,000 m^3;
- hazard detection, control, and prevention systems, cryogenic piping and insulation, and electrical and instrumentation systems;
- a firewater system;
- a concrete storm surge protection wall surrounding the Terminal with a top elevation of 27 feet NAVD;
- 23,000 volt electrical services provided by MPC, and a transformer to step down the voltage to 4,160 volts for service to the Terminal;
- two essential power backup gas turbine generators each with a capacity of 12 megawatts; and
- ancillary utilities, buildings, and service facilities.

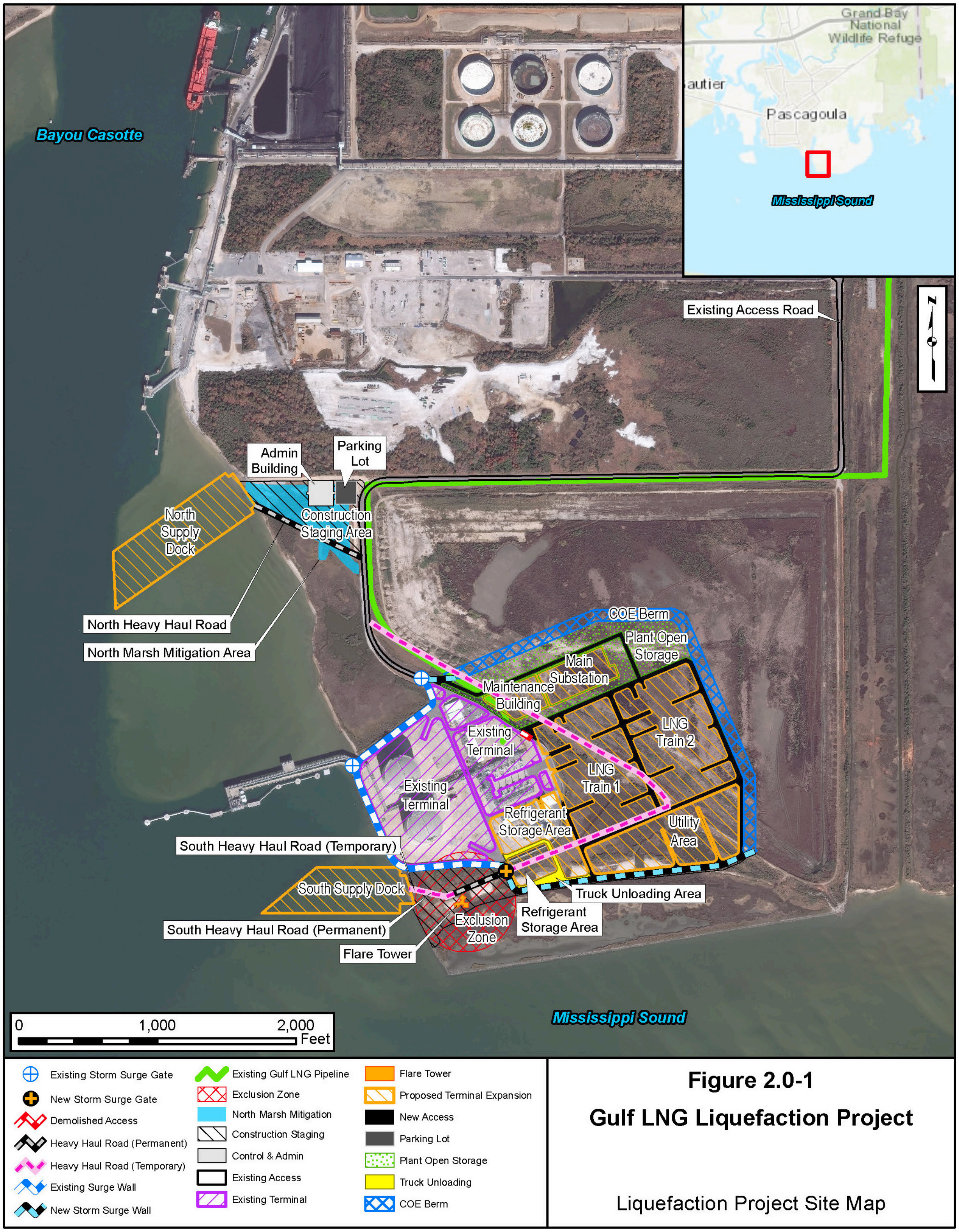

Figure 2.0-1

Gulf LNG Liquefaction Project

Liquefaction Project Site Map

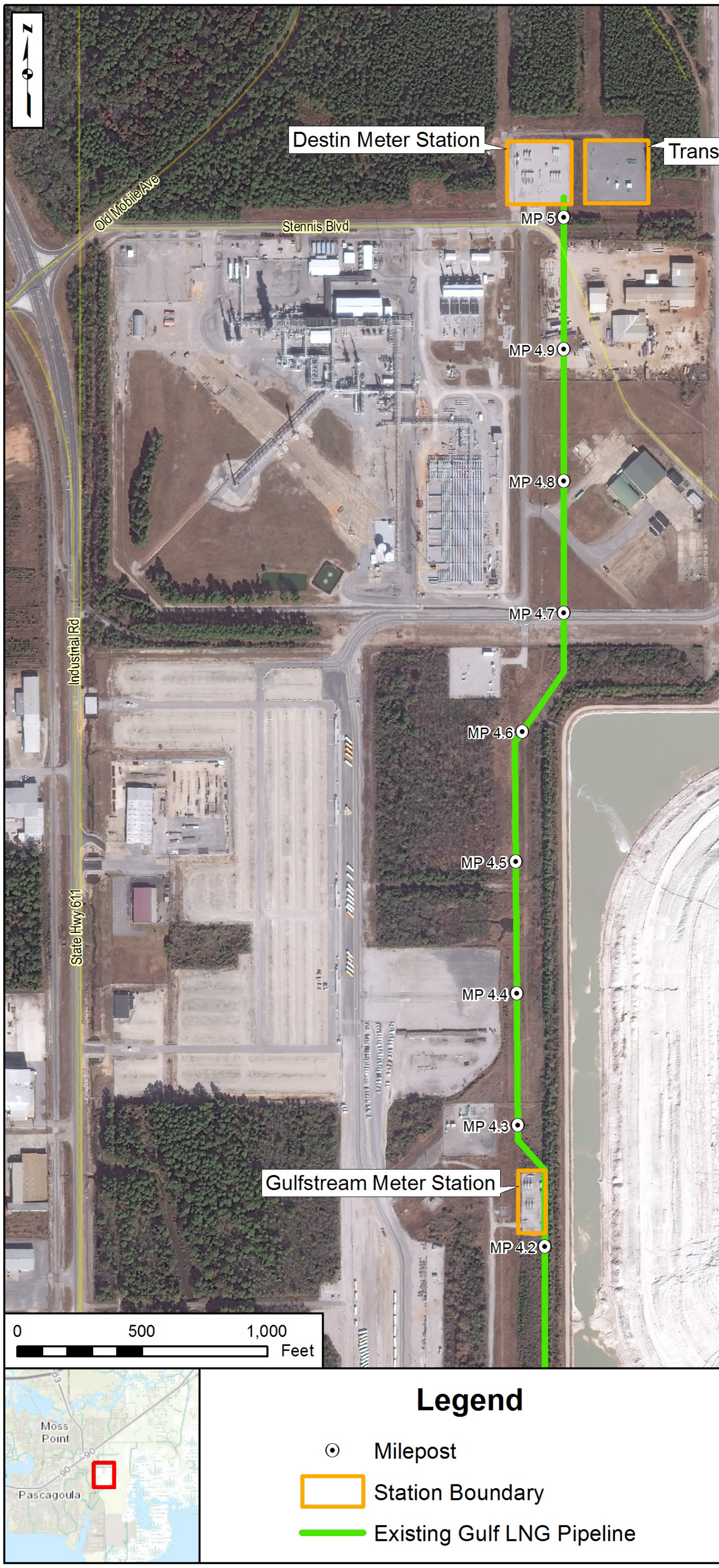

Figure 2.0-2
Gulf LNG Liquefaction Project
Pipeline Modifications

2.1.2 Gulf LNG Existing Pipeline System

Gulf LNG owns and operates the 5-mile-long, 36-inch-diameter natural gas send out pipeline and associated facilities that were constructed in conjunction with the existing Terminal (FERC, 2007). The existing Gulf LNG Pipeline extends north from the existing Terminal along SH-611 and connects to the Gulfstream, Destin, and Transco/FGT pipeline systems and the Pascagoula Gas Processing Plant operated by BP American Production Company.

2.2 PROPOSED FACILITIES

2.2.1 Terminal Expansion

The Terminal Expansion facilities would be constructed adjacent to the existing Terminal boundaries on land currently owned by the COE and the Port of Pascagoula and part of the BCDMMS (see figure 2.0-1)[1]. The BCDMMS is used by the COE for placement of dredged materials from maintenance dredging of the Bayou Casotte Navigation Channel. Gulf LNG has not requested a change to the currently authorized number of or the transit route for the LNG carriers; however, Gulf LNG has requested authorization to increase the size of LNG carriers permitted at the facility from 170,000 m^3 to 208,000 m^3. The USCG determined that the navigation portion of the original WSA did not account for larger LNG carriers. The USCG prepared an updated draft LOR and LOR-A, which was provided to the FERC in January 2016. The USCG prepared the final LOR and LOR-A dated May 16, 2016 which was provided to the FERC on August 9, 2017. The USCG concluded that the Bayou Casotte Channel was suitable for LNG marine traffic. See additional discussion in section 1.2.

2.2.1.1 Liquefaction Facilities

Liquefaction Trains, Utilities, and Systems

The existing Gulf LNG Pipeline and the Pipeline Modifications (see section 2.2.2) would transport natural gas (feed gas) to the liquefaction facilities at the existing Terminal. The liquefaction facilities would consist of two liquefaction trains, gas pretreatment units, utilities, and associated facilities (see figure 2.0-1). Prior to entering a liquefaction train, the feed gas would pass through a pretreatment unit to remove mercury, H_2S, CO_2, water, and heavy hydrocarbons. The heavy hydrocarbon removal unit would remove heavier hydrocarbons present in the feed gas (i.e. pentane, hexane, and benzene) which would be temporarily stored on-site, then trucked from the Project site to third-party customers (see sections 1.4.2 and 2.2.1.3).

After the feed gas is treated to remove the contaminants and heavy hydrocarbon components, the liquefaction unit would precool the feed gas using a closed loop propane system followed by condensing and subcooling the feed gas with a mixed refrigerant loop. The resultant liquid stream would enter an energy extraction LNG hydraulic turbine which would further lower the temperature of the LNG. Gulf LNG would then transport the LNG in cryogenic pipelines to the existing LNG storage tanks where it would be stored at -256 degrees Fahrenheit (°F) at atmospheric pressure.

Liquefaction utility components would include a boil-off gas (BOG) system, fuel gas system, hot oil system, flares, instrument and utility air systems, nitrogen generation system, source water system, tempered water system, firewater system, refrigerant storage system, NGL storage, and hydrogen sulfide storage. BOG would be generated from the transfer of heat in the liquefaction process and diverted to three new BOG compressors and two new BOG recycle compressors. Much of the compressed BOG

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1 Section 4.8.2.1 provides a discussion regarding lease agreements with the COE and the Port of Pascagoula.

would be transported by pipeline to the fuel gas system, with excess BOG recycled through the liquefaction process.

Gulf LNG would install three in-service flares and a common spare flare on the southwestern portion of the Terminal Expansion site for venting excess natural gas, if necessary, during maintenance, startup/shutdown, and upset activities. The four flares would be constructed on a common 430-foot-tall support structure (see figure 2.0-1), with an overall height of 433 feet above mean sea level (msl).

2.2.1.2 LNG Storage

Gulf LNG would use the two existing 160,000 m^3 full-containment LNG storage tanks constructed of nickel steel and concrete (FERC, 2006). The only storage tank changes required for the Project would be the new LNG loading pumps installed in the existing storage tanks to transfer LNG-to-LNG carriers through the existing transfer lines.

2.2.1.3 Refrigerant and NGL Storage and NGL Trucking

Gulf LNG would construct and operate a truck loading/unloading facility to unload makeup refrigerant (propane and ethane) transported to the Terminal Expansion site for storage and use during the liquefaction process. Gulf LNG would store ethane in three pressurized storage tanks, each with a working capacity of 8,954 cubic feet (ft^3) and would store liquid propane in a tank with a capacity of 114,485 ft^3. Each refrigerant storage tank would be installed within a secondary containment system located, sized, and designed in accordance with American Petroleum Institute (API) Standard 2510 (Design and Construction of LPG Installations) and National Fire Protection Association (NFPA) Code 30 (Flammable and Combustible Liquids). Gulf LNG anticipates a delivery frequency of three to four trucks per month to the facility for propane and one to two trucks per month for ethane.

The heavy hydrocarbon removal unit within each of the liquefaction trains would continuously produce NGLs during the liquefaction process. Gulf LNG would construct a 2,800-ft^3 capacity, low-pressure storage tank and a truck loading facility for NGLs. The NGLs would be stored in the tanks prior to pick-up and delivery to third-party customers by truck (see section 1.4.2). Gulf LNG anticipates five truck trips per month would be required to transport NGLs from the expanded Terminal. Gulf LNG estimates ethane would be trucked into the facility up to two times each month and propane would be trucked into the facility up to four times each month. As noted in section 1.4.2, NGL trucking would be a non-jurisdictional activity once the trucks leave the Terminal Expansion site. After leaving the Terminal Expansion site, NGL trucking is regulated by DOT’s Federal Motor Carrier Safety Administration.

2.2.1.4 Power Generation

To provide electrical power to the Terminal Expansion, MPC would build two 1.5-mile-long, 115-kV electric transmission lines from adjacent to the existing Chevron Cogeneration Facility to the Terminal Expansion. MPC would also construct a new 115-kV substation within the Terminal Expansion area. The electric transmission line would be considered non-jurisdictional, as discussed in section 1.4.1, which includes additional details on the electric transmission line.

Four 2.5-MW, diesel-fueled, stand-by generators would be installed in the utility area to provide a source of backup power generation for critical equipment and plant shutdown if the electrical power system were to fail. Diesel for the generators would be stored on-site in a new, 106,971-gallon (14,300 ft^3) diesel storage tank with secondary containment. The tank would store enough fuel for three generators for 7 days of backup power generation. The fourth generator would be on-site as a spare.

2.2.1.5 Supply Docks

Gulf LNG would construct two supply docks as part of the Project, a North Supply Dock and a South Supply Dock. The North Supply Dock would be a permanent facility on the northwestern part of the existing Terminal property at the mouth of Bayou Casotte in Mississippi Sound (see figure 2.2-1). The facility would extend 280 feet along the shoreline, with a 110-foot-wide docking area extending 310 feet into Bayou Casotte. Barges would moor on both sides of the 110-foot-wide extension, perpendicular to the ship channel. Gulf LNG would construct a heavy haul road from the North Supply Dock to the main gate of the existing Terminal.

During construction, Gulf LNG would use the North Supply Dock for barge delivery of large equipment, piles, construction materials, and other construction loads. As discussed in section 1.4.3, following construction, ownership of the North Supply Dock would be transferred to the JCPA. In addition to use of the North Supply Dock by barges and support vessels associated with operation of the Project, the dock may also be used by the JCPA as a berthing facility for barges waiting for a berth at one of the private or public terminals in the Bayou Casotte Harbor or for temporary berthing of other vessels not associated with the Project. Security of the North Supply Dock during operations of the Project would be addressed in Gulf LNG's *Facility Security Assessment and Facility Security Plan* (pursuant to 33 CFR 105) which would be reviewed and approved by the USCG.

The South Supply Dock would be a temporary facility just south of the existing berthing facility (see figure 2.2-2). It would extend about 200 feet along the shoreline and up to 100 feet from the shoreline and would accommodate one barge at a time. Gulf LNG would construct a heavy haul road from the South Supply Dock to a new gate installed in the storm surge protection wall (see figure 2.2-2). During construction, Gulf LNG would use the South Supply Dock for delivery of fill materials, aggregate, and the flare tower. Upon completion of construction of the Terminal Expansion, Gulf LNG would completely remove the South Supply Dock and restore the adjacent shoreline to pre-construction conditions. A portion of the South Heavy Haul Road (390 feet) would be retained by Gulf LNG during operations for access to the flare tower.

For both supply docks, dredging would be required between the shoreline and the existing channel to safely accommodate barge traffic. Hydrographic surveys conducted by Gulf LNG determined that the current depth of the sea bed at both planned supply docks is relatively flat with water depths ranging from 1 to 4 feet below msl. Gulf LNG would dredge the supply docks to a depth of 12 feet below msl. Gulf LNG estimates, based on similar sediment deposition rates for the existing LNG carrier berth, that about 10,000 cy of sediment would accumulate in each basin annually. Gulf LNG would conduct maintenance dredging of the supply docks on an as-needed basis, which is anticipated to be about every 3 years. Dredging and the disposal of dredged materials are addressed in section 2.6.1.4. Upon completion of construction, Gulf LNG would discontinue maintenance dredging at the South Supply Dock and allow the area to return to its natural bathymetric state. The Port of Pascagoula, which conducts maintenance dredging at the existing marine berth, would assume responsibility for maintenance dredging of the North Supply Dock.[2]

All of the 3.5 acres created at the South Marsh mitigation area as mitigation due to construction of the existing Terminal, would be impacted by the construction of the liquefaction facility, South Supply Dock, and the flare tower.

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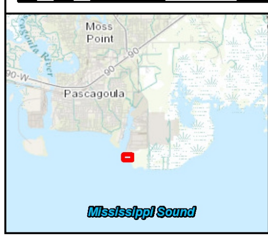
[2] See Attachment No. 8 of accession number 20170929-5228.



Legend

- Dredging Limits
- Heavy Haul Road (Permanent)
- Barge Slip
- Dock
- Bulkhead
- Proposed Gulf LNG Terminal Site

Figure 2.2-1
Gulf LNG Liquefaction Project
North Supply Dock

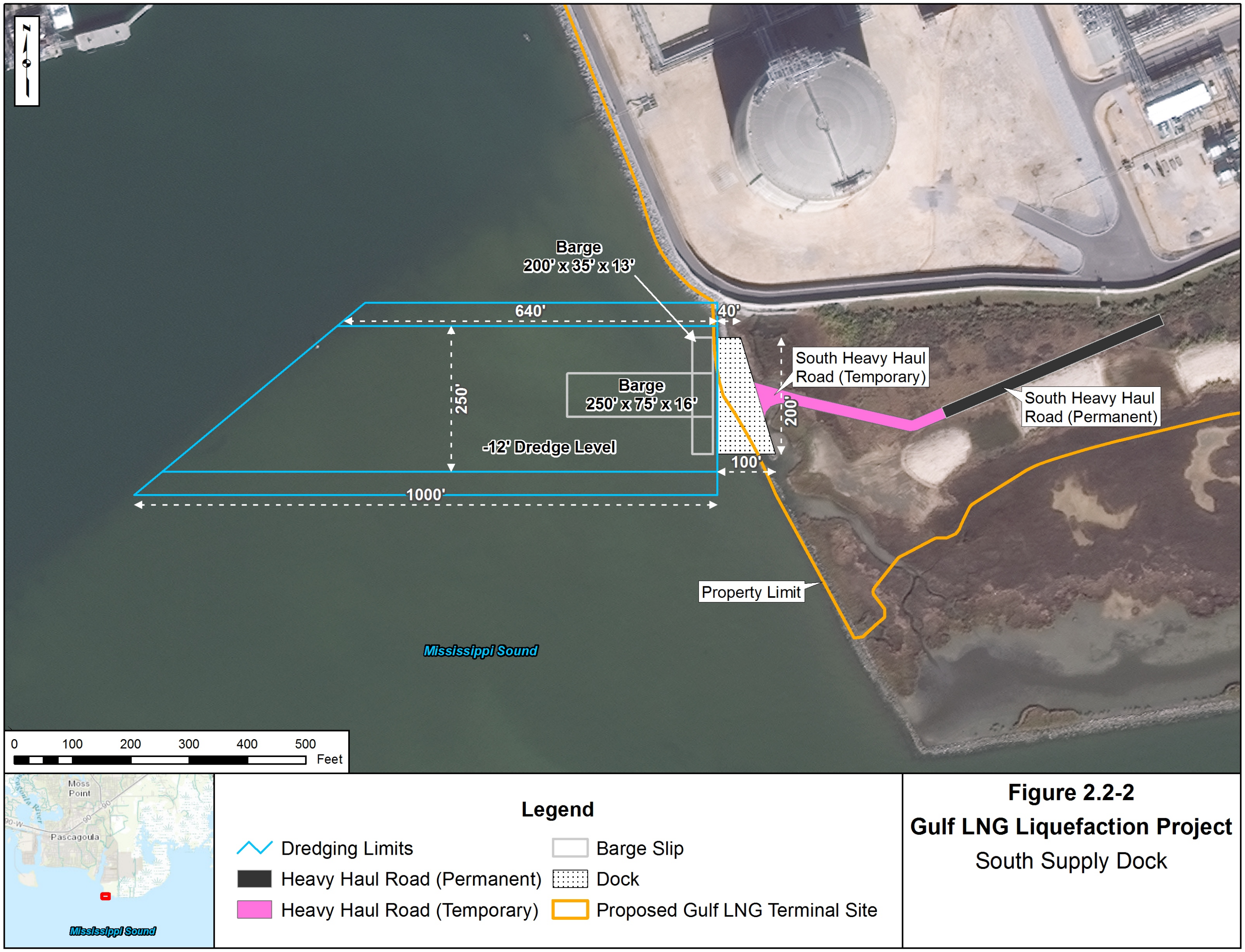


Figure 2.2-2
Gulf LNG Liquefaction Project
South Supply Dock

There are several transit routes that the barges could use before entering the Bayou Casotte Navigation Channel, dependent on the origin of the trip. Barge transit routes are described further in section 4.9.6.

During construction, a temporary barge access channel would be dredged from the South Supply Dock along the outer perimeter of the proposed wetland mitigation site (discussed more in section 4.4) (dredging of about 200,000 cy of material). Barges would use the temporary channel to install the perimeter riprap. The sediment removed for the channel would be temporarily placed within the proposed wetland mitigation site and then replaced in the temporary channel after the riprap is installed. All of the dredge material would be replaced in the temporary channel or contained within the marsh creation area, so off-site disposal would not be necessary.

2.2.1.6 Modifications to Existing Terminal Facilities

Several minor modifications to facilities at the existing Terminal are proposed as part of the Terminal Expansion. These modifications consist of the following:

- installation of three BOG compressors within the existing Terminal;
- installation of a new 115-kV substation;
- installation of an inlet gas filter;
- installation of ammonia and solvent storage tanks;
- installation of new loading pumps in the existing LNG storage tanks; and
- minor changes to the piping connected to the marine loading arms to permit bi-directional flow.

In addition, Gulf LNG would make minor modifications to the existing water intake structure. The Terminal Expansion would use the same water source as the existing Terminal, the Port of Pascagoula's Industrial Water Supply, for construction and operation of the expanded facility, including firewater. The Port of Pascagoula's Industrial Water Supply is obtained from the freshwater portion of the Pascagoula River about 14 miles north of the City of Pascagoula.

2.2.1.7 Associated Infrastructure

Infrastructure associated with the Terminal Expansion would include establishment of access roads within the Terminal Expansion site, partial removal of an existing access road, expansion of the existing shoreline protection wall, extension of the COE's existing berm, construction of a new utility/firewater tank, and spill containment, as described further below.

Access Roads

Gulf LNG would use existing public roads to access the Terminal Expansion site. In addition, the Project would include removal of a segment of an existing road and construction of new access roads within the Terminal Expansion site boundaries (see figure 2.0-1). Gulf LNG would continue to use the existing access road off SH-611 to access the existing Terminal. A portion of this existing access road along the northeastern corner of the storm protection wall would be demolished. New access roads would be constructed throughout the Terminal Expansion site. New access roads would be graveled or paved with asphalt. A temporary heavy haul access road within the Terminal Expansion site would follow the existing access road located along the earthen berm dike around the perimeter of the BCDMMS.

Gulf LNG would also construct two heavy haul roads to connect the North and South Supply Docks with the existing Terminal and the Terminal Expansion (see figures 2.0-1, 2.2-1, and 2.2-2).

Storm Protection System

Gulf LNG would extend the existing storm protection system surrounding the existing Terminal to encompass the Terminal Expansion facilities. The new storm surge protection system would consist of a new concrete wall with a top elevation of 27 feet NAVD and a new earthen berm (an extension of the existing COE berm) with a top elevation of 27 feet NAVD. The berm would be constructed to provide both storm surge protection for the Terminal as well as providing the new dredge spoils perimeter for that corresponding portion of the BCDMMS. Following initial construction of the berm by Gulf LNG, the COE, in order to expand capacity of the BCDMMS, would extend the berm to a height of 39.2 feet NAVD. The COE would be responsible for maintaining the berm during operation of the Project.

The new storm protection concrete wall would connect to the existing wall near the southeast corner of the existing facilities and extend along the southern perimeter of the Terminal Expansion site until tying into the new earthen berm that would extend along the east and northeast sides of the Terminal Expansion site (see figure 2.0-1). The concrete wall would slope into the earthen berm and the berm designed to withstand wave force due to storm surge and would be protected from wave-induced scour with protective armor stone and from seepage by providing sheet pile cut-off along its length. In addition, the berm would be designed to withstand anticipated future COE dredge spoil site loads. The portion of the existing storm protection system between the existing Terminal and the new storm protection concrete wall and new berm would be removed. Gulf LNG has not determined a final plan to extend the storm protection system. Once a final plan has been determined, Gulf LNG would submit the final plan for FERC staff to review.

There are two gates in the existing storm protection wall: one at the main entrance and one near the berthing facility. The existing steel-roller flood gates, about 30 feet wide at the main gate and 17 feet wide at the berthing facility, would remain in place and continue to be used during construction and operation of the expanded Terminal. The gates seal at the base and on both sides when closed for storm events. As part of the Project, a third flood gate would be installed to allow transport of construction materials and equipment from the South Supply Dock to the new facilities via the South Heavy Haul Road. Gulf LNG would install this flood gate in the new storm protection concrete wall in the southwest portion of the Terminal Expansion, and east of the South Supply Dock (see figure 2.0-1). It would also be a steel-roller gate that would seal along the sill and on both sides when closed for storm events.

Firewater Facilities

As noted above, the Terminal Expansion would use the same water source for firewater as the existing Terminal. The firewater delivery system would be expanded to meet the firefighting needs of the expanded Terminal. The expanded firewater system would be designed in accordance with the requirements of the NFPA 59A.

Spill Containment System

Gulf LNG would construct separate containment systems for refrigerant and LNG to contain the materials in the event of an accidental release. See sections 2.7 and 4.12 for additional details.

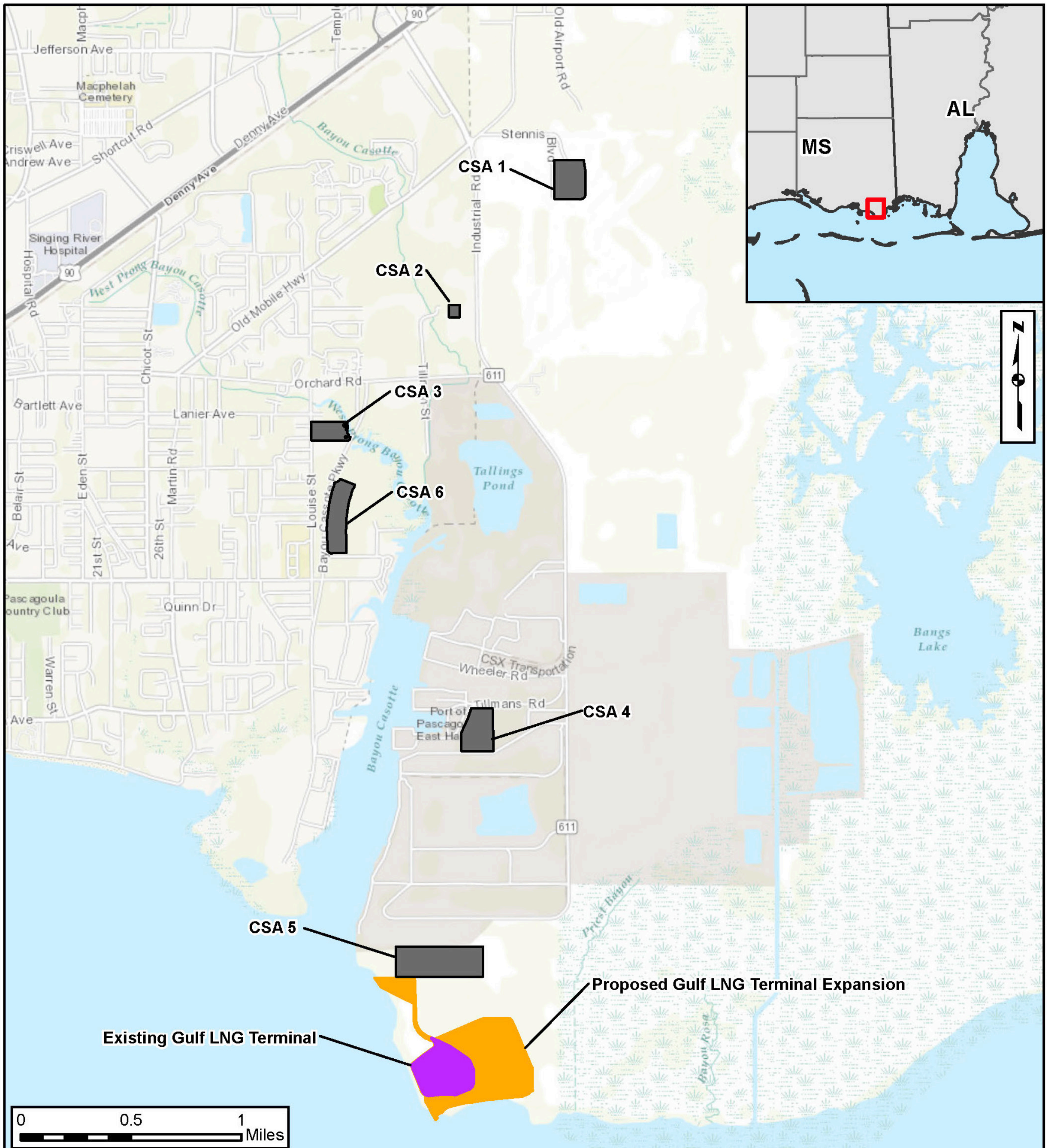
2.2.1.8 Administration and Maintenance Buildings

Gulf LNG would relocate the existing Terminal's administrative building to a site east of and near the North Supply Dock. The administrative building and parking lot would impact about 1.3 acres of the North Marsh Mitigation Area created as mitigation due to construction of the existing Terminal. The existing Terminal's warehouse/maintenance building would be relocated within the Terminal Expansion site. The proposed locations of the administrative building and the warehouse/maintenance building are depicted on figure 2.0-1.

2.2.1.9 Construction Staging Areas and Construction Support Areas

Gulf LNG would use 11.7 acres of land within the Terminal Expansion area for on-site construction staging areas (see figure 2.0-1). Gulf LNG would impact about 4.2 acres of the North Marsh Mitigation Area for a construction staging area. In addition, Gulf LNG would use six off-site CSAs for staging, laydown, contractor yards, fabrication, and parking (see figure 2.2-3). Details regarding each construction staging area are provided below.

- CSA-1 (Knight Yard #1): A 16-acre property about 5 miles north of the existing Terminal on Colmer Drive. The property currently includes existing parking, warehousing, office space, and undeveloped areas. Following construction of the Project, Gulf LNG would restore CSA-1 to landowner specifications.
- CSA-2 (Knight Yard #2): A 1.8-acre property behind an existing warehouse on SH-611 about 4 miles north of the existing Terminal. The current owner has filled the property with rock. Gulf LNG would use CSA-2 for storage and parking during construction of the Terminal Expansion. Following construction of the Project, Gulf LNG would restore CSA-2 to landowner specifications.
- CSA-3 (Louise Street): An 8.8-acre property about 2.8 miles northwest of the existing Terminal on Louise Street. CSA-3 (Louise Street), which is owned by Gulf LNG, is currently used for warehousing and equipment storage. Gulf LNG would continue the present use of this site during and after Project construction.
- CSA-4 (Port Property): A 16.2-acre property about 2.5 miles north of the existing Terminal within the Port of Pascagoula's property off SH-611. The property is an existing industrial site and was previously used as a construction support area for the existing Terminal. Following construction of the Project, Gulf LNG would restore CSA-4 to landowner specifications.
- CSA-5 (Chevron Property): A 34.5-acre property adjacent to the existing Terminal to the north. Portions of the property are existing industrial and portions are wetlands. Following construction of the Project, CSA-5 would be restored according to landowner specifications.
- CSA-6 (Bosarge Property): An 18.1-acre property on Bayou Casotte Parkway about 2.5 miles north-northwest of the existing Terminal. The property is an existing industrial site currently developed as a parking lot. Gulf LNG would use CSA-6 for additional parking during construction. Following construction of the Project, CSA-6 would be restored according to landowner specifications.



Constructions Support Areas (CSAs)
Existing Gulf LNG Terminal Site
Proposed Gulf LNG Terminal Expansion

Figure 2.2-3
Gulf LNG Liquefaction Project

Construction Support Areas

2.2.2 Pipeline Modifications

Gulf LNG would modify two existing pipeline metering stations and the existing Gulf LNG Pipeline at the existing Terminal to enable bi-directional (north/south) flow capability.

At the Destin and Gulfstream interconnections, Gulf LNG would install two pipeline segments at each interconnect and the necessary switching valves to allow the existing metering stations to meter natural gas flow to the Terminal Expansion while retaining the ability to meter natural gas flow from the existing Terminal to the distribution pipelines. Gulf LNG would install a 30-inch-diameter 200-foot-long pipeline segment and a 30-inch-diameter 40-foot-long pipeline segment at the Gulfstream Meter Station. Additionally, Gulf LNG would install a 36-inch-diameter 240-foot-long pipeline segment and a 36-inch-diameter 210-foot-long pipeline segment at the Destin Meter Station. All existing instrumentation at the meter stations would remain unchanged. In addition, Gulf LNG would install filters at both interconnections to remove trace quantities of solids, which could affect the liquefaction equipment. Gulf LNG would construct the modifications within the existing fenced and graveled areas, with the exception of 0.1 acre of temporary workspace outside the fence line of the existing Gulfstream Meter Station but within the existing pipeline right-of-way. No other equipment within the existing facilities would be affected.

Transco would also make modifications to the existing and jointly owned Transco/FGT Interconnection to permit bi-directional flow. These modifications would be constructed by Transco and would be reviewed by the FERC under its blanket Certificate process. According to Gulf LNG, modifications at the Transco/FGT Interconnection would be completed between April 2022 and September 2022.

The Gulf LNG Pipeline connection to the existing Terminal, which is within the existing Terminal boundaries, would also be modified to allow bi-directional flow and to provide a connection to the inlet of the pretreatment facilities of the liquefaction process. The flow capacity of the existing Gulf LNG Pipeline would not change.

The Destin and Gulfstream Meter Stations and the Transco/FGT Interconnection already have existing permanent access roads to each facility.

2.3 LAND REQUIREMENTS

Gulf LNG would disturb 230.8 acres of land and open water for construction of the Project (both the Terminal Expansion and the Pipeline Modifications) and 172.1 acres for its operation. Operation of the Terminal Expansion (excluding access roads) would permanently impact 100.5 acres of land. Construction of the Pipeline Modifications would impact 3.6 acres of land, which would be restored following construction. Land requirements for the Project are summarized in table 2.3-1.

2.3.1 Terminal Expansion

Construction of the Terminal Expansion facilities would require a combined area of 132.8 acres on land and on open water. Operation would affect 129.7 acres, including the Terminal Expansion site, the North Supply Dock, the North Supply Heavy Haul Road, and access roads. Of that area, 10.6 acres are within the boundaries of the existing Terminal. Gulf LNG would maintain all onshore areas with concrete or gravel cover and permanently convert them to industrial use.

TABLE 2.3-1 **Land Requirements for the Proposed Gulf LNG Liquefaction Project a/**		
Facility	**Land Affected During Construction (acres)**	**Land Affected During Operation (acres) b/**
Terminal Expansion		
Existing Terminal Facilities c/	22.7	22.7
Construction Staging Areas	11.7	11.7
Maintenance Building	2.0	2.0
Main Substation	2.9	2.9
LNG Train 1	11.8	11.8
LNG Train 2	11.7	11.7
Plant Open Storage	10.0	10.0
Utility Area	8.9	8.9
Refrigerant Storage Area	6.3	6.3
Truck Unloading Area	1.0	1.0
Flare Tower	0.1	0.1
Flare Exclusion Zone	0.0	3.1 d/
Extension of the COE's Berm	6.8	6.8
Admin Building & Parking	1.3	1.3
Total Terminal Expansion	***97.2***	***100.3***
Supply Docks		
North Supply Dock	9.1	9.1
North Heavy Haul Road	0.8	0.8
South Supply Dock	6.4	0.2
South Heavy Haul Road	0.4	0.4
Total Supply Docks	***16.7***	***10.5***
Access Roads e/		
Existing Access Roads	9.8	9.8
New Access Roads	9.2	9.2
Access Roads Converted to Terminal Open Space	0.1	0.0
Total Access Roads	***19.0***	***19.0***
Off-site CSAs		
CSA-1 (Knight Yard #1)	16.0	0.0
CSA-2 (Knight Yard #2)	1.8	0.0
CSA-3 (Louise Street) f/	7.8	7.8
CSA-4 (Port of Pascagoula Property)	16.2	0.0
CSA-5 (Chevron Property)	34.5	34.5 g/
CSA-6 (Bosarge Property)	18.1	0.0
Total CSAs	***94.4***	***42.4***

TABLE 2.3-1 **Land Requirements for the Proposed Gulf LNG Liquefaction Project a/**		
Facility	**Land Affected During Construction (acres)**	**Land Affected During Operation (acres) b/**
Pipeline Modifications		
Destin Meter Station Modifications	1.5	0.0
Gulfstream Meter Station Modifications	0.6	0.0
Transco/FGT Interconnection Modifications	1.5	0.0
Total Pipeline Modifications	***3.6***	***0.0***
Total Gulf LNG Liquefaction Project	**230.8**	**172.1**

a The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.

b The portion of construction impacts that Gulf LNG would permanently maintain.

c The existing Terminal is 33.3 acres. Portions (10.6 acres) of the Terminal Expansion would overlap with the existing Terminal. The remaining 22.7 acres were used to calculate impacts.

d The acres associated with the flare exclusion zone are related to impacts on wetland vegetation located outside the Project footprint. Radiant heat from periodic flare events may impact the wetland vegetation surrounding the flare tower. These events would be associated with maintenance, startup/shutdown, and upset conditions at the Terminal Expansion.

e All access roads would be located within the boundaries of the Terminal Expansion.

f 0.4 acre of forested wetland and 0.6 acre of upland forest at CSA-3 would be avoided and are not included in the total.

g 34.5 acres of existing vegetation at CSA-5 would be removed during construction. Mitigation is discussed in section 4.4.

2.3.1.1 Access Roads

Gulf LNG would construct new access roads within the Terminal Expansion area to connect the existing Terminal with the Terminal Expansion. These access roads would impact 9.2 acres (see figure 2.0-1). A 0.1-acre portion of an existing access road within the Terminal would be converted from an access road to open space within the existing Terminal.

2.3.1.2 Construction Support Areas

Additionally, Gulf LNG would use six off-site CSAs during construction of the Terminal Expansion. Use of these sites would temporarily impact 94.4 acres of land during construction. Of this total, 42.4 acres would be permanently converted to industrial use and 52 acres would revert to pre-construction industrial use and would no longer be utilized by Gulf LNG. Most of the CSAs are currently existing industrial sites.

2.3.2 Pipeline Modifications

Gulf LNG would affect 3.6 acres during construction of the Pipeline Modifications, all of which would be restored following construction.

2.4 CONSTRUCTION SCHEDULE AND WORKFORCE

Gulf LNG anticipates conducting construction and initiating service in two phases, with construction starting in the second quarter of 2020 (assuming receipt of all required certifications, authorizations, and permits). Gulf LNG anticipates completing construction of the first liquefaction train and associated facilities by the second quarter of 2024 and initiating service in the third quarter of 2024. From the start of construction until initiation of service for the first train would take a period of about 52 months. Construction of the second liquefaction train would begin in the fourth quarter of 2021 and Gulf LNG anticipates completing construction and initiating service in the second quarter of 2025. Overall construction would require about 66 months from initiation of site preparation to startup of the second train. To help distribute impacts of vehicle trips by workers, Gulf LNG would have two daytime shift start times and 40 percent of the workforce would work on the night shift. The construction manpower is expected to peak at about 4,300 individuals between months 31 and 46 of the 66-month Project schedule. Construction workers would be bused from parking areas at CSA-6 to the Terminal work locations. A *Traffic Mitigation Plan* has been prepared and is discussed further in section 4.9.

Modifications to the Destin and Gulfstream Meter Stations would begin in October 2023. According to Gulf LNG, modifications at the Transco/FGT Interconnection would be completed between October 2023 and March 2024 and are anticipated to be conducted under its blanket authorization with the FERC.

2.5 ENVIRONMENTAL COMPLIANCE AND TRAINING

The FERC may impose conditions on any Certificate or authorization that it grants for the Project. These conditions include additional requirements and mitigation measures recommended in this EIS to minimize the environmental impact that would result from construction and operation of the Gulf LNG Liquefaction Project (see sections 4.1 through 4.12 and section 5.2). We will recommend that these additional requirements and mitigation measures (presented in bold type in the text of the EIS) be included as specific conditions to any approving Certificate or authorization issued for the Project. We will also recommend to the Commission that Gulf LNG be required to implement the mitigation measures proposed as part of the Project unless specifically modified by other Certificate or authorization conditions. Gulf LNG would be required to incorporate all environmental conditions and requirements of the FERC Certificate, authorization, and associated construction permits into the construction documents for the Project.

Gulf LNG would employ at least one environmental inspector (EI) for the Project. The EIs would be responsible for ensuring the environmental obligations, conditions, and other requirements of permits and authorizations for the Project are met. Gulf LNG's EIs would inspect all construction and mitigation activities to ensure environmental compliance. The EIs may also oversee cultural resource and/or biological monitors that monitor and evaluate construction impacts on resources as specified in this EIS.

Gulf LNG would require that its contractors be familiar with the requirements of all environmental permits and comply with required federal, state, and local environmental regulations and ordinances that apply to construction of the facilities, including restoration of areas temporarily disturbed during construction. In addition to monitoring compliance, the EIs would assist with environmental training for Project personnel regarding environmental conditions and Project-specific plans. The environmental training program would ensure the following:

- qualified environmental training personnel provide training sessions regarding the environmental requirements applicable to the trainees' activities;

- all individuals receive environmental training before beginning work;
- adequate records regarding the training program are kept; and
- refresher training is provided as needed to maintain a high awareness of environmental requirements.

In addition to the EIs, we would also conduct field inspections during construction. Following the inspections, we would enter inspection reports into the Commission's public record. Other federal and state agencies may also conduct inspections of construction and operation to the extent determined necessary by the individual agency. After construction is completed, we would continue to conduct inspections during operation of the Project to ensure successful restoration. Additionally, the FERC staff would conduct bi-annual engineering safety inspections of the LNG facility operations.

The work areas identified in the EIS should be sufficient for construction and operation (including maintenance) of the Project. However, minor workspace refinements sometimes continue after the planning phase and during construction. These changes could involve minor shifting or adding of new extra workspaces or staging areas, adding additional access roads, or modifying construction methods. We have developed a procedure for assessing impacts on those areas that have not been evaluated in the EIS and for approving or denying their use following any authorization issuance. In general, biological and cultural resource surveys were conducted using a survey corridor larger than that necessary to construct the facilities. If Gulf LNG requests to shift or add workspace subsequent to issuance of an authorization, these areas would typically be within the previously surveyed area. We would typically review such requests using a variance request process. A variance request for additional workspace along with a copy of the survey results would be documented and forwarded to FERC in the form of a "variance request" in complying with recommended condition number 5 in section 5.2 of this EIS. Variance requests typically include any additional surveys, landowner consultation, analysis, and/or resource agency consultations, and supporting documentation.

The procedures used for assessing impacts on work areas outside the survey corridor and for approving their use are similar to those described above, except that additional surveys, analysis and resource agency consultations would be performed to assess the extent of any impacts on biological, cultural, and other sensitive resources and identify any avoidance or minimization measures that may be necessary. All variance requests for the Project and their approval status would be available of the FERC's e-Library webpage under the docket number for the Project.

2.6 CONSTRUCTION PROCEDURES

Gulf LNG proposes the following construction methods, which include measures intended to avoid or minimize environmental impacts during construction.

The FERC *Upland Erosion Control, Revegetation, and Maintenance Plan* (*FERC Plan*) and *Wetland and Waterbody Construction and Mitigation Procedures* (*FERC Procedures*)[3] are a set of construction and mitigation measures developed to minimize the potential environmental impacts of the construction of pipeline projects in general. Gulf LNG would implement the measures and procedures identified in the *Plan* and *Procedures* with Project-specific proposed modifications. Gulf LNG has not requested any substantive modifications to the *FERC Plan* other than what is necessary to differentiate

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[3] The *FERC Plan* can be viewed on the FERC Internet website at http://www.ferc.gov/industries/gas/enviro/plan.pdf. The *FERC Procedures* can be viewed on the FERC Internet website at http://www.ferc.gov/industries/gas/enviro/procedures.pdf.

the Project from pipeline construction requirements. These modified *Plan* and *Procedures* are referred to as the *Gulf LNG Plan* (see appendix D) and *Gulf LNG Procedures* (see appendix E).

Our evaluation and conclusions for the proposed modifications to the *FERC Plan* and *Procedures* are presented in table 2.6-1.

TABLE 2.6-1

Summary of Proposed Modifications to the *FERC's Plan* and *Procedures*

Reference	Description	Proposed Revision a/	FERC Staff Conclusion
Plan at II.A.1	The number and experience of EIs assigned to the Project shall be appropriate for the size and the number/significance of resources affected.	The number and experience of Environmental Inspectors assigned to the Project shall be appropriate for the size ***of the construction area, the level of activity***, and the number/significance of resources affected.	No substantive change.
Procedures at VI.A.6	Do not locate aboveground facilities in any wetland, except where the location of such facilities outside of wetlands would prohibit compliance with U.S. Department of Transportation regulations.	***Project facilities are proposed to be constructed within wetlands to be permanently filled as part of the Project, primarily due to logistical concerns and available space limitations. All wetland impacts will be appropriately mitigated, and construction of the aboveground structures will result in no net loss of wetlands. Gulf LNG will provide copies of the wetland delineation report, wetland mitigation plans, and COE/MDMR permits and approvals prior to Project construction.***	Appears justified. Wetlands within the Project site preclude avoidance.
Procedures at VI.B **b/**	WETLAND CROSSINGS, INSTALLATION	***Project access roads, including the heavy haul road from the North Supply Dock will be constructed in delineated wetland areas. Additionally, Gulf LNG proposes to clear and fill wetland areas at CSA-5 to maximize the useable area of the site for construction support. Gulf LNG will provide appropriate mitigation for the unavoidable loss of wetlands due to Project construction. Gulf LNG will provide copies of the wetland delineation report, wetland mitigation plans, and COE/MDMR permits and approvals prior to Project construction.***	Appears justified. Wetlands within the site preclude avoidance.

TABLE 2.6-1 **Summary of Proposed Modifications to the *FERC's Plan* and *Procedures***			
Reference	**Description**	**Proposed Revision a/**	**FERC Staff Conclusion**
Procedures at VI.D	WETLAND CROSSINGS, POST-CONSTRUCTION MAINTENANCE AND REPORTING	***Wetlands within the Project footprint will be permanently filled and mitigated for by creation of tidal marsh at an off-site location. Design, construction, and monitoring of the mitigation site will be by approval of the COE, MDMR, and other regulatory agencies. Gulf LNG will file copies of its plans, approvals, and monitoring reports with the Secretary for review and approval by the Director.***	Appears justified. Wetlands within the site preclude avoidance.

a Modifications to the *FERC Plan* and *Procedures* are depicted in ***bold italic*** font.
b See section 4.4.2.2 for additional information regarding *Procedures* section VI.C.5.

2.6.1 Terminal Expansion

2.6.1.1 Site Preparation

Gulf LNG would clear all construction work areas of shrubs, trees, and other obstructions. In accordance with the *Gulf LNG Plan*, Gulf LNG would install temporary erosion controls immediately after initial disturbance of the soil to minimize erosion and maintain these controls throughout construction or until permanent erosion control measures are installed.

The site would be graded and filled where necessary to create a reasonably level working surface to allow safe passage of construction equipment and materials. The areas to be developed within the existing Terminal would be raised to an elevation of 12.0 to 13.0 feet NAVD in the process area and to an elevation of 12.0 feet NAVD in other areas. Gulf LNG would remove about 1,524,600 cy of dredged material from the BCDMMS. This equates to about 7 feet of material it would remove from the BCDMMS. Gulf LNG estimates that it would use 20 percent (304,920 cy) of BCDMMS material and about 770,080 cy of fill (preferably from the COE Tombigbee Project) to raise the grade of the Terminal Expansion site. The remaining 1,219,680 cy of BCDMMS material would be disposed of at an approved upland site. An additional 323,000 cy of fill from the COE Tombigbee Project would be used as fill material for the off-site wetland mitigation site (see section 4.4.3).

2.6.1.2 Storm Protection System Installation

Expansion of the existing storm protection system would entail extending the existing storm surge protection wall and the existing COE berm to encompass the Terminal Expansion site.

Storm Surge Protection Wall

Gulf LNG would clear the storm surge wall construction work area of shrubs, trees, and the first 12 inches of organic matter. Gulf LNG would excavate the area to a depth of 1 foot above msl. The excavated area would be filled with a layer of geotextile fabric followed by clean sand to a height of 3.5 feet above msl. A layer of geogrid material would be placed onto the sand layer followed by stone to bring the elevation to 6 feet above msl. The concrete wall would be constructed on a foundation slab, which would be supported by pilings. The new concrete wall would be tied into the existing concrete wall on the west and the extension of the existing COE berm on the east. The new concrete wall would have a top elevation of 27 feet NAVD.

Extension of the Existing Army Corps of Engineers Berm

As with the new concrete wall, Gulf LNG would clear the berm work area of shrubs, trees, and the first 12 inches of organic matter. Geotextile fabric followed by geogrid material would be placed along the footprint of the berm followed by a sheet pile driven into the center of the berm. Sand would be placed to an elevation of 4 feet above grade. Once the berm height reaches 4 feet above grade, the berm material would transition to clay fill. Gulf LNG would continue to spread and compact clayey sand. Crushed stone would then be placed on the top of the berm to reach an elevation of 27 feet NAVD.

2.6.1.3 Terminal Piping and Equipment Installation

Gulf LNG would construct the majority of the facilities for the Project on-site. However, some package systems and pipe racks would be assembled off-site, delivered to the Terminal Expansion site, and assembled there.

Upon completion of the site preparation activities, Gulf LNG would initiate construction of the foundations, pipe racks, liquefaction trains, flares, major mechanical equipment, buildings, process and utility piping, electrical components, and instrumentation. Underground piping would be installed first. Gulf LNG would install any necessary underground pipe and utilities (e.g., electrical conduits) about 3 feet to 5 feet below the finish grade. This would be followed by construction of foundations, including pilings necessary for the buildings, major equipment, and pipe racks. Next, Gulf LNG would complete the pipe racks, followed by the installation of process and utility piping and cable trays, setting of the major equipment, and the establishment of piping, electrical, and instrumentation tie-ins.

About 19,500 14-inch to 18-inch-square precast pre-stressed concrete piles would be required for the liquefaction facilities and firewater tank at the Terminal Expansion. The piles would be delivered to the site by truck or barge to the supply docks. The depths to which the piles would be driven would vary but is expected to be no greater than -113 feet NAVD. After pile driving is complete, Gulf LNG would install pile caps at the top of each pile, which would consist of rebar and poured concrete.

When all process equipment is installed and electrical, mechanical, and other instrumentation work completed, key pre-commissioning activities would commence, including the following:

- conformity checks on each part or piece of equipment to ensure proper installation;
- flushing and cleaning of equipment; and
- leak testing of piping and storage tanks.

After all pre-commissioning activities are complete, Gulf LNG would clean and pneumatically pressure test cryogenic piping. Pneumatic pressure tests of cryogenic piping would be conducted at 1.5 times the operating pressure and held for 1 hour. Gulf LNG would hydrostatically test non-cryogenic piping using clean water (see sections 4.3.1.2 and 4.3.2.2 for further information on hydrostatic test water). Hydrostatic testing of process equipment would be conducted at off-site fabrication shops.

2.6.1.4 Supply Docks

Gulf LNG would install the North and South Supply Docks during the early stages of construction to allow for the transfer of large equipment and significant volumes of materials to the

Terminal Expansion construction site. Each supply dock would be constructed with AZ 18-700 steel sheet piles driven into the ground to a depth of 32 feet below msl, with a top elevation of 8 feet above msl. The North Supply Dock would be a T-shaped platform about 280 feet wide along the shoreline and 110 feet wide in the water requiring 1,070 linear feet of sheet piles. The South Supply Dock would be a trapezoidal shaped concrete platform measuring 200 feet along the shoreline and extending 40 feet into Bayou Casotte at the dock's northern end and 100 feet into Bayou Casotte at the dock's southern end requiring 590 linear feet of sheet piles. Barges would be moored to the docking area using wires and lines tied to bollards.

The supply docks would be constructed in segments beginning at the shoreline. First, Gulf LNG would create an access berm of granular fill material along the perimeter of the supply docks. The access berm would be used to support the pile driving crane. The pile driving crane would move from the shoreline onto the access berm in order to install the sheet piles that would make up the supply docks. The granular fill material used to create the access berms would remain inside the sheet piles and become part of the supply dock.

When the perimeters of the supply docks are completed, structural fill would be brought up to an elevation that corresponds to the bottom of the bulkhead tie rod systems. Gulf LNG estimates the North Supply Dock would require 22,000 cy of fill and the South Supply Dock would require 6,000 cy of fill. Fill material would be obtained from a local suppler.

Figures 2.2-1 and 2.2-2 provide conceptual designs for the proposed supply docks. Creation of the supply docks would require dredging of about 100,000 cy of sediment for each dock to a depth of 12 feet below msl. Dredging would extend about 1,200 feet from the shoreline at the North Supply Dock and about 1,000 feet from the shoreline at the South Supply Dock. Gulf LNG anticipates that maintenance dredging of up to 20,000 cy would be required annually to maintain the appropriate depth for the barges. Gulf LNG sampled and tested the sediments, and no contaminants of concern were present in the samples (see section 4.2.7).

Gulf LNG initially planned to dispose of dredge materials from construction of the supply docks at one of two state-approved Beneficial Use (BU) sites: Greenwood Island and Round Island. However, the Greenwood Island site is expected to reach capacity prior to construction of the Project and Round Island is privately owned and not expected to be available. According to Gulf LNG, the Greenwood Island site is expected to be expanded 250-acres by February 2020. Gulf LNG would prefer to use a BU site for disposal and would work with federal and state agencies to identify a suitable BU site for dredge material disposal. Gulf LNG would utilize the existing offshore dredged material disposal site, if a suitable BU site is not available.

Steel sheet piles driven to a depth of 31 feet below msl with an impact hammer would be used to construct both supply docks. Sheet piles for both supply docks would be installed using shore-based equipment. It is expected that construction of the South Supply Dock would take about 65 days while the North Supply Dock take about 120 days. Both docks are expected to be completed between April 2020 and November 2020.

The heavy haul road extending from the North Supply Dock would be about 40 feet wide and 890 feet long and retained during operations while the heavy haul road from the South Supply Dock would be 40 feet wide and 737 feet long. Both would be constructed with a crushed stone and geotextile fabric base. A portion of the South Heavy Haul Road (390 feet) would be retained by Gulf LNG during operations to access the flare tower. The remainder of the heavy haul roads would be removed.

2.6.1.5 Site Restoration

The area within the expanded storm surge protection system, the North Supply Dock, and the North Heavy Haul Road would be used during operation of the facility and would not be restored until the Project is terminated. The South Supply Dock would be removed and the area affected restored, along with the portion of the South Heavy Haul Road from the dock to the flare tower. Except for CSA-3, the CSAs would be restored to owner specifications after construction. Gulf LNG currently owns CSA-3, uses the property for warehousing and equipment storage, and would continue that use of the site during and after Project construction.

Pipeline Modifications

Construction of the interconnection and metering modifications would require excavation adjacent to the existing facilities within the existing fenced and graveled areas, with the exception of 0.1 acre of temporary workspace outside the fence line of the existing Gulfstream Meter Station but within the existing pipeline right-of-way. At the Destin Meter Station and Transco/FGT Interconnection, only limited clearing and grading activities would be necessary, and site cleanup would involve replacing gravel on previously graveled areas and restoring surface contours. Vegetation within the 0.1 acre at the Gulfstream Meter Station would be restored in accordance with the *Gulf LNG Plan*. All modifications would be constructed in accordance with the requirements of 49 CFR 192.

2.6.2 Special Construction Procedures

2.6.2.1 Road, Railroad, and Foreign Pipeline Crossings

The proposed Project would not cross any roads, railroads, or foreign pipelines.

2.6.2.2 Residential Areas

Based on aerial imagery interpretation and site surveys, no residences would be within 50 feet of the Project. The closest residence to the Terminal Expansion is 9,400 feet from the Terminal Expansion site.

2.6.3 Construction Support Areas

Preparation of the CSAs would begin with marking and staking the CSA boundaries and limits of the construction work space, including access roads or entrances from public roads to the CSAs. Fencing would be installed along the borders of sensitive areas within the CSAs that are not to be used for the Project. After the marking is completed, Gulf LNG would install silt fencing, clear and grub areas of vegetation, fill and/or grade areas as required to create safe working areas, and gravel the working portions of the site where appropriate.

2.7 OPERATION, MAINTENANCE, AND SAFETY PROCEDURES

2.7.1 Terminal Expansion

2.7.1.1 Summary of Operation

Gulf LNG would receive feed gas through the existing Gulf LNG Pipeline, treat the gas to remove contaminants and heavy hydrocarbon components, liquefy the treated gas by cooling it to -256 ºF to create LNG, transport the LNG in cryogenic pipelines to the existing LNG storage tanks for storage prior to export. Gulf LNG would pump the LNG from the storage tanks into cryogenic pipelines that lead to the marine berth where it would be loaded onto LNG carriers. The expanded Terminal would retain the ability to import LNG, regasify it, store it, and transport it to inter- and intrastate pipelines through the existing Gulf LNG Pipeline.

LNG carriers would follow the currently approved transit to the berthing facility and load LNG while discharging ballast water. LNG carriers would also use water from Bayou Casotte for engine cooling. Estimated intake rates and volumes of cooling and ballast water are addressed in section 4.3.2.

Gulf LNG would operate its Terminal Expansion facilities consistent with federal requirements for LNG facilities (see table 1.5-1), which include operation, emergency, and security procedures. Gulf LNG would update all current manuals as necessary to include the expanded Terminal Expansion operations and submit amendments to the agencies prior to commissioning the Terminal Expansion facilities.

Gulf LNG would modify its maintenance regime, which includes corrective and preventative maintenance plans, to include the expanded Terminal facilities. The plans include written procedures consistent with corporate policy and federal standards, including DOT regulations at 33 CFR 127.401 and 49 CFR 193 (G). Gulf LNG would train its operators to respond to potential hazards associated with the liquefaction process and the proper operations and maintenance of all equipment.

Gulf LNG would design, construct, operate, and maintain safety controls in accordance with DOT federal safety standards for LNG facilities at 49 CFR 193. The Terminal Expansion facilities would also meet NFPA 59A LNG Standards.

2.7.1.2 Spill Containment System

Gulf LNG would construct separate containment systems for refrigerant and LNG to contain the materials in the event of an accidental release. The refrigerant containment system would be sited, sized, and designed in accordance with the requirements of API 2510 and NFPA 30, and the LNG containment system would be sited, designed, and constructed in accordance with the requirements of 49 CFR 193.2149 through 193.2185. Spill containment system operation, maintenance, and safety information is presented in section 4.12.

2.7.1.3 Hazard and Fire Detection System

The existing Terminal system provides alarm signaling and notification when a hazardous condition is present. Gulf LNG would expand the fire and gas detection system for the existing Terminal to protect the Terminal Expansion and hardwire it to the main alarm control system. The following are design and operating features of the hazard detection system that would be installed throughout the expanded Terminal:

- low temperature detectors;
- ultraviolet/infrared flame detectors to indicate ignition of flammable vapors;
- high temperature detectors;
- combustible gas detectors;
- smoke detectors; and
- closed circuit television systems.

2.7.1.4 Firewater System

As noted above, the firewater delivery system would be expanded to meet the firefighting needs of the expanded Terminal. The expanded firewater system would be designed in accordance with the requirements of the NFPA 59A.

Gulf LNG would obtain water from the Port of Pascagoula's Industrial Water Supply for the firewater system. The existing firewater storage tank would be decommissioned and a new carbon steel firewater storage tank would be installed. The new firewater storage tank would provide a minimum of 1,100,000 gallons of firewater. According to Gulf LNG, the firewater tank would be internally inspected every 5 years to determine if tank cleaning/draining would be needed. If the firewater tank required cleaning, Gulf LNG would lower the water level over a 10 day period. The firewater tank water would drain to the ground and collect at Outfall 2 where Gulf LNG would visually inspect the water for solids and sheens and collect pH measurements prior to discharge. Gulf LNG estimates that the firewater tank would not require cleaning more than once over a 20-year period.

2.7.1.5 Emergency Shutdown System

The existing Terminal has an emergency shutdown system to allow for the safe termination of operations in the event of an incident. Initiation of the shutdown sequence is either manual, by means of hand-operated stations throughout the facility, or automatic, based on information originating from the various hazard detectors positioned at critical locations in the facility. The emergency shutdown system allows for the shutdown of the entire facility or individual sections, depending on the particular incident. Alarms are provided in the control room to notify operating personnel, should a potentially hazardous condition be detected by the field instrumentation.

Gulf LNG would modify the emergency shutdown system to extend the emergency shutdown measures to the expanded Terminal. Additional information on the shutdown system of the expanded Terminal is presented in section 4.12.

2.7.1.6 Emergency Response Plan

The existing Terminal has an ERP that conforms to the requirements of 49 CFR 193.2509 and the FERC's Order for the existing Terminal (FERC, 2007). The key elements for the ERP are listed below:

- identification, assessment, and mitigation of the hazards;
- prompt notification and mobilization of emergency response resources; and
- development and maintenance of appropriate emergency response capabilities.

The ERP and operating procedures are used by Terminal personnel, as well as for developing emergency procedures with third-party emergency responders, and in continuing liaison with appropriate agencies, such as local fire departments, police departments, and medical facilities. Prior to commissioning the Terminal Expansion, Gulf LNG would update the existing ERP to incorporate revisions required due to operation of the Terminal Expansion. The updated ERP would include any additional or specialized training or fire response requirements that may be required or recommended to support the addition of new products and components. As part of the update, Gulf LNG would work with local mutual aid organizations as well as emergency response subject matter experts to identify any additional coordination, response equipment, or training that may be anticipated for the additional facilities.

2.7.2 Pipeline Modifications

Gulf LNG would operate and maintain all of its pipeline facilities, including the proposed modifications, in accordance with the DOT regulations in 49 CFR 192, other applicable federal and state regulations, and in accordance with industry standard procedures designed to ensure the integrity of the pipeline and minimize the potential for pipe failure.

3.0 ALTERNATIVES

As required by NEPA and Commission policy, we evaluated alternatives to the Project to determine whether any would be environmentally preferable and/or technically and economically feasible to the proposed actions while still meeting the Project's primary objective of transporting and liquefying domestic natural gas into LNG for export and delivering affordable LNG to foreign markets. The alternatives we considered consisted of the following:

- the No-Action Alternative;
- system alternatives;
- alternative Terminal Expansion sites;
- alternative plot plans for the Terminal Expansion;
- alternative liquefaction technologies;
- supply dock alternatives;
- alternative CSA sites;
- alternative Pipeline Modification sites;
- alternative power source for the refrigeration compressors;
- alternative gas-fired turbine design for the refrigeration compressors; and
- alternative power sources for the Terminal Expansion.

These alternatives were evaluated using a specific set of criteria. The evaluation criteria applied to each alternative included a determination whether the alternative:

- meets the objectives of the proposed action;
- is technically and economically feasible and practical; and
- offers a significant environmental advantage over the proposed action.

Through environmental comparison and application of our professional judgment, each alternative is considered to a point where it becomes clear if the alternative could or could not meet the three evaluation criteria. Our environmental analysis and this evaluation consider quantitative data (e.g., acreage) and use common comparative factors, such as total length, amount of collocation, and land requirements.

In recognition of the competing interests and different nature of impacts resulting from an alternative that sometimes exist (i.e., impacts on the natural environment versus impacts on the human environment), we also consider other factors that are relevant to a particular alternative and discount or eliminate factors that are not relevant or may have less weight or significance.

The alternatives were reviewed against the evaluation criteria in the sequence presented above. The first consideration for including an alternative in our analysis is whether it could satisfy the stated purpose of the Project. An alternative that cannot achieve the purpose for the Project cannot be considered as an acceptable replacement for the Project.

Many alternatives are technically and economically feasible. Technically practical alternatives, with exceptions, would generally require the use of common construction methods. An alternative that would require the use of a new, unique, or experimental construction method may not be technically practical because the required technology is not available or is unproven. Economically practical alternatives would result in an action that generally maintains the price competitive nature of the proposed action. Generally, we do not consider the cost of an alternative as a critical factor unless the added cost to design, permit, and construct the alternative would render the Project economically impractical.

Alternatives that would not meet the Project's objective or were not feasible were not brought forward to the next level of review (i.e., the third evaluation criterion). Determining if an alternative provides a significant environmental advantage to the proposed action requires a comparison of the impacts on each resource as well as an analysis of impacts on resources that are not common to the alternatives being considered. The determination must then balance the overall impacts and all other relevant considerations. In comparing the impact between resources, we also considered the degree of impact anticipated on each resource. Ultimately, an alternative that results in equal or minor advantages in terms of environmental impact would not compel us to shift the impacts from the current set of landowners to a new set of landowners.

Gulf LNG participated in our pre-filing process during the preliminary design stage for the Project (see section 1.3). This process emphasized identification of potential stakeholder issues, as well as identification and evaluation of alternatives that could avoid or minimize impacts. Our analysis of alternatives is based on Project-specific information provided by the applicant, affected stakeholders, those comments received during Project scoping, publically available information, our consultations with federal and state agencies, and our own research regarding the siting, construction, and operation of the LNG facilities and their impacts on the environment (i.e., our alternatives analysis are comment and resource driven). Unless otherwise noted, we used the same desktop sources of information (e.g., aerial photographs, U.S. Geological Survey [USGS] topographic maps, National Wetland Inventory [NWI] maps, agency consultations, and other publicly available information) to standardize comparisons between the Project and each alternative. As a result, some of the information presented in this section relative to the Project may differ from information presented in section 4.0, which is based on Project-specific data derived from field surveys and engineered drawings.

3.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, the objectives of the Project would not be met, Gulf LNG would not provide LNG for export, and the potential adverse and beneficial environmental impacts identified in section 4.0 of this EIS would not occur. However, development of and production from conventional and unconventional natural gas formations are occurring throughout many areas of the United States and are projected to continue for many years. With or without the No-Action Alternative, other LNG export projects will likely be developed elsewhere in the Gulf Coast region or in other areas of the United States, resulting in both adverse and beneficial environmental impacts. Selection of the No-Action Alternative could result in expansions of other existing terminals and pipeline systems to meet the objectives of the Project, which in turn would likely result in magnitudes and durations of potential adverse environmental impacts that would be similar to those of the Project. Development of any new LNG export terminals on previously undeveloped sites would likely result in greater environmental impacts, in both magnitude and duration, than those of the Project because they would require construction of LNG storage tanks, LNG berthing facilities, and associated facilities that already exist at Gulf LNG's existing Terminal.

The No-Action Alternative could also require that potential end users make other arrangements to obtain natural gas service, make use of alternative fossil fuel energy sources (e.g., coal or fuel oil), or possibly make use of other traditional long-term fuel source alternatives (such as nuclear power) and/or renewable energy sources (e.g., solar power) to compensate for the reduced availability of natural gas that would otherwise be supplied by the Project. However, each of these are beyond the scope of this analysis, as this would not meet the Project objective. Therefore, they are not evaluated further. We have dismissed the No-Action Alternative as a reasonable alternative to meet the Project objectives.

3.2 SYSTEM ALTERNATIVES

We reviewed system alternatives to evaluate the ability of existing, modified, or proposed facilities to meet the stated objectives of the Project. Our analysis of the systems alternatives is presented in section 3.2.1 for the Terminal Expansion and section 3.2.2 for the Pipeline Modifications. The purpose of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with the construction and operation of the Project could be avoided or reduced. By definition, implementation of a system alternative would make it unnecessary to construct all or part of the Project, although modifications or additions to the system alternative may be required to increase capacity or provide receipt and delivery capability consistent with that of the Project. Such modifications or additions may result in potential environmental impacts that would be less than, comparable to, or greater than those associated with construction and operation of the Project.

3.2.1 Terminal Expansion System Alternatives

For a system alternative to be viable, it must meet the purpose of the Terminal Expansion, be technically and economically feasible, and offer a significant environmental advantage over the Terminal Expansion. The system alternatives considered in this analysis are identified in table 3.2-1 and depicted in figure 3.2-1. Although we considered each of the planned, proposed, or authorized LNG export projects[1] as potential system alternatives, the market will ultimately decide which and how many of these facilities would be built.

As identified in table 3.2-1, there are five operating LNG terminal sites along the Gulf Coast in the southeastern United States with approved, proposed, and/or planned expansion(s) to export to free trade agreement (FTA) countries (eight expansion plans total). We also identified 15 stand-alone[2] LNG liquefaction terminals approved, proposed (i.e., filed an application with the FERC), and/or planned (i.e., in the pre-filing process with the FERC). Liquefaction and export facilities are under construction at the Cameron LNG, Freeport LNG, and Sabine Pass LNG terminals and may be constructed at each of the other import terminals pending completion of regulatory review and permitting.

Each of the 8 expansion projects and 15 stand-alone projects were evaluated as potential system alternatives for the Project. All of the projects are authorized to export to FTA countries, or have submitted applications to the DOE to receive authorization to do so. The NGA, as amended, has deemed FTA exports to be in the public interest; therefore, we will not speculate or conclude that excess capacity is available to accommodate the purpose and need of the Terminal Expansion. Consequently, the proposed export capacity at any other existing or proposed LNG facility would require an expansion or new facility similar to the facilities proposed for the Terminal Expansion, resulting in environmental impacts similar to the Project. These systems alternatives, therefore, offer no significant environmental advantage over the proposed Project and are not considered to be preferable.

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1 Proposed projects are projects for which the proponent has submitted a formal application with the FERC, or for deepwater port projects, with the DOT's Marine Administration (MARAD) and the USCG; planned projects are projects that are either in pre-filing or have been announced but have not been proposed.

2 "Stand-alone" liquefaction projects are not associated with existing LNG import projects and are typically greenfield projects; i.e., they are constructed in areas that are undeveloped at the time of construction.

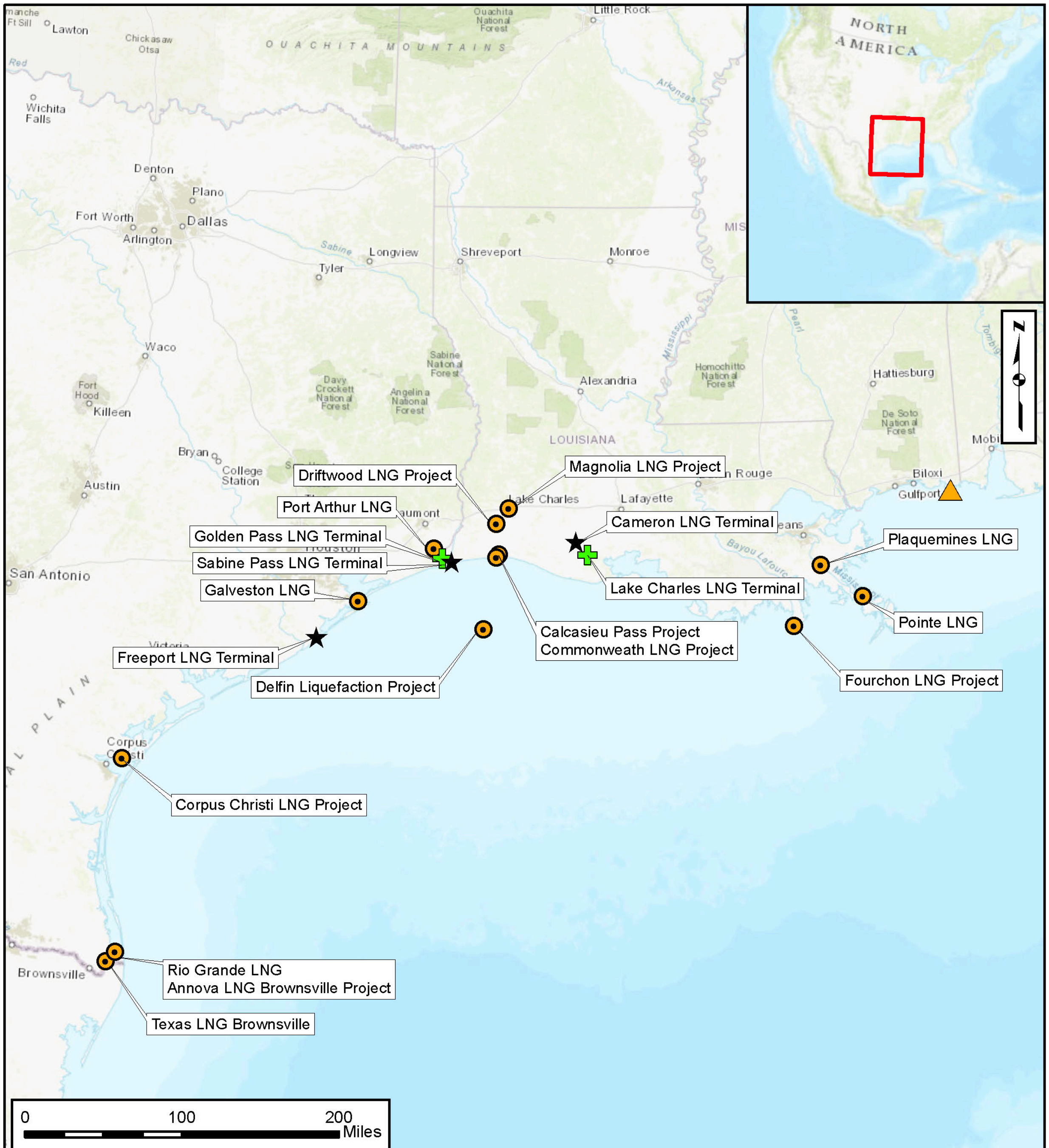
TABLE 3.2-1

Summary Profiles of Potential System Alternatives – Currently Planned, Proposed, or Approved Liquefaction Projects along the Gulf Coast

Project	MTPA	FERC Status	In-Service Target Date a/
EXISTING LNG TERMINAL EXPANSIONS			
Approved Projects			
Cameron LNG	14.9	Under construction	2018-2019
Cameron LNG Expansion Trains 4, 5	9.9	Approval received May 5, 2016	2019
Freeport LNG	13.2	Under construction	2018-2019
Golden Pass LNG	15.6	Initial site preparation approved by the FERC in September 19, 2017; however, construction has not yet started	2022
Lake Charles / Trunkline LNG	15.0	Construction awaiting Federal Communications Commission permit issuance	2019-2020
Sabine Pass LNG – Trains 1-4	16.0	Operational, first cargo shipped February 2016 (currently under a partial shut-down)	2016
Sabine Pass LNG – Trains 5, 6	9.0	Under construction	2019
Proposed Projects			
Freeport LNG Expansion Train 4	5.1	Application filed June 29, 2017	2020
NEW LNG TERMINALS			
Approved Projects			
Corpus Christi LNG	15.0	Under construction	2018
Magnolia LNG	8.0	Approval received April 15, 2016	2024
Proposed Projects			
Annova LNG	6.9	Application filed July 13, 2016	2023
Corpus Christi LNG Stage 3	10.0	Application filed June 28, 2018	2018-2019
Delfin LNG Deepwater Port	12.0	Approval received from the FERC on September 28, 2017 for onshore facilities; project approval from DOT's Marine Administration and the USCG for offshore facilities still pending	2021
Driftwood LNG	26.0	Application filed March 31, 2017	2022
Port Arthur LNG	10.0	Application filed November 29, 2016	2023
Rio Grande LNG	27.0	Application filed May 5, 2016	2023
Texas LNG	4.0	Application filed March 31, 2016	2022
Venture Global Calcasieu Pass LNG	12.0	Application filed September 4, 2017	2022
Venture Global Plaquemines LNG	20.0	Application filed March 1, 2017	2022
Planned Projects			
Commonwealth LNG	9.0	Pre-filing initiated August 15, 2017	2022
Fourchon LNG	5.0	Pre-filing initiated August 21, 2017	2021
Galveston Bay LNG	5.5	Pre-filing initiated August 31, 2018	2027
Pointe LNG	6.0	Pre-filing initiated September 14, 2018	2025

Sources: FERC, 2018a; FERC, 2018b.

a In-Service Target Dates are those provided in the respective project applications; the FERC recognizes many of the facilities may not achieve in service by the targeted dates.



Proposed Gulf LNG Terminal Expansion

Existing Terminals with LNG Liquefaction and Export Capability Authorized for Construction

Existing Terminals with LNG Liquefaction and Export Capability Currently Under Construction

Authorized, Proposed, and Planned Stand-Alone LNG Export Terminals

Figure 3.2-1

Gulf LNG Liquefaction Project

System Alternatives for the Terminal Expansion

3.2.2 Pipeline Modification System Alternatives

To serve as a viable system alternative to the Pipeline Modifications, the system would have to (1) transport all or a part of the volume of natural gas required for liquefaction at the Terminal Expansion, and (2) cause significantly less impact on the environment than the proposed Pipeline Modifications. Gas provided by a system alternative must connect to either the existing Terminal or directly to the Terminal Expansion.

Because the potential impacts of the Pipeline Modifications would be negligible, installation of a new pipeline to either the existing Gulf LNG Pipeline or the Terminal Expansion would not provide a significant environmental advantage. Therefore, we did not consider pipeline system alternatives.

3.3 TERMINAL EXPANSION ALTERNATIVES

3.3.1 Alternative Terminal Expansion Sites

3.3.1.1 Siting Criteria

We evaluated the feasibility of constructing the Terminal Expansion at alternative sites. Proximity to the existing Terminal was a criterion in the evaluation to allow Gulf LNG to use the existing infrastructure, including the LNG storage tanks, the LNG carrier berths, and associated facilities. Use of the existing facilities would avoid the impacts of constructing all new facilities. The construction and operation of all new facilities would substantially increase the impacts of the Project as compared to the proposed use of the major LNG infrastructure and facilities at the existing Terminal. Proximity to the existing Terminal would also minimize the length of cryogenic pipelines needed to transport LNG to the existing LNG storage tanks at the Terminal creating additional impacts and siting concerns. Therefore, we evaluated alternative sites for the Terminal Expansion within upland areas in a 4-mile radius of the existing Terminal.

Selection of an alternative Terminal Expansion site near the existing Terminal would require sufficient land (about 231 acres) to construct (1) a natural gas supply pipeline to the site, (2) gas treating facilities, (3) liquefaction facilities, (4) associated support facilities (e.g., power and utilities), (5) a haul road from a supply dock; and (6) one or more cryogenic pipelines from the alternative site to the existing LNG storage tanks.

3.3.1.2 Alternative Site Assessment

Figure 3.3-1 depicts the area within a 4-mile radius of the existing Terminal. Mississippi Sound and the Gulf of Mexico are south of the Terminal. Lands to the east and northeast of the existing Terminal are within the Grand Bay National Estuarine Research Reserve (Grand Bay NERR), which includes extensive wetland areas, and is not available for development of the Project. The majority of the area north and west of the existing Terminal is heavily developed, including industrial and residential areas, and there is not sufficient land within those areas for a 231-acre project. Undeveloped areas north of the existing Terminal adjacent to about Milepost 4 of the existing Gulf LNG Pipeline were eliminated from consideration because they include about 90 acres of temporarily flooded, needle-leaved evergreen-forested palustrine wetlands and would not be large enough for the Terminal Expansion facilities. The FERC did not receive any comments from the public or federal and/or state agencies requesting an alternative site. In addition, development of the Terminal Expansion in this area would be farther from the existing Terminal and closer in proximity to populated areas and the Chevron Refinery (as compared to the proposed Project). A site farther removed from the existing Terminal would result in additional piping and equipment that could increase the overall likelihood of an incident occurring, and a closer proximity to populated areas may require reliance on additional or more drastic mitigation measures to prevent flammable vapors from extending offsite and impacting populated areas. Additional or larger equipment to handle the larger distances separating the two sites and closer proximity to populated areas could also increase air an noise impacts (if not mitigated) and more drastic mitigation measures (e.g., taller vapor barriers) could negatively affect visual impacts.

As a result of the above considerations, we could not identify a reasonable alternative to the proposed site of the Terminal Expansion that is within an upland area and would provide a significant environmental advantage.

3.3.2 Alternative Plot Plans for the Terminal Expansion

3.3.2.1 Criteria for Alternative Layouts of Terminal Expansion Facilities

Gulf LNG provided an assessment of alterative layouts for the Terminal Expansion, which initially focused on the following criteria:

- adequate security for liquefaction trains, tanks, loading facilities, and operational facilities;
- COE requirements for minimizing use of the existing BCDMMS;
- prevailing wind directions at the site, which would influence thermal efficiency;
- maintaining access for construction equipment;
- suitable land for expanding the storm surge protection system; and
- site access that would allow construction of the second liquefaction train while the first train is in operation.

During the pre-filing process, we also requested that Gulf LNG provide a comparison of wetland impacts among the layouts considered.

3.3.2.2 Potential Plot Plans

Based on the initial criteria, Gulf LNG developed a series of layouts for the site that were on the existing Terminal property and on property adjacent to the existing Terminal. As discussed in section 3.3.1.2, due to the land constraints around the existing Terminal for each layout, the majority of the additional property was within the BCDMMS, with the remaining portion consisting of a small amount of the COE wetland mitigation area south of the Project boundary.

Gulf LNG's original layout, which was developed without stakeholder input, extended along the shoreline to the north and west. However, this layout would impact the marsh areas directly north of the existing Terminal as well as the wetland mitigation area in the northwest portion of the property. After further review and coordination with engineering and environmental consultants, Gulf LNG refined its preliminary layout to narrow the northwestern area to its current boundaries to reduce impacts on the marsh. Gulf LNG then identified and reviewed configurations for the liquefaction trains within the area adjacent to the existing Terminal. The objective of this review was to develop a configuration for the facilities that would minimize impacts on wetlands adjacent to the existing Terminal, use the smallest possible area of the BCDMMS, and optimize efficiency for operation of the liquefaction facilities.

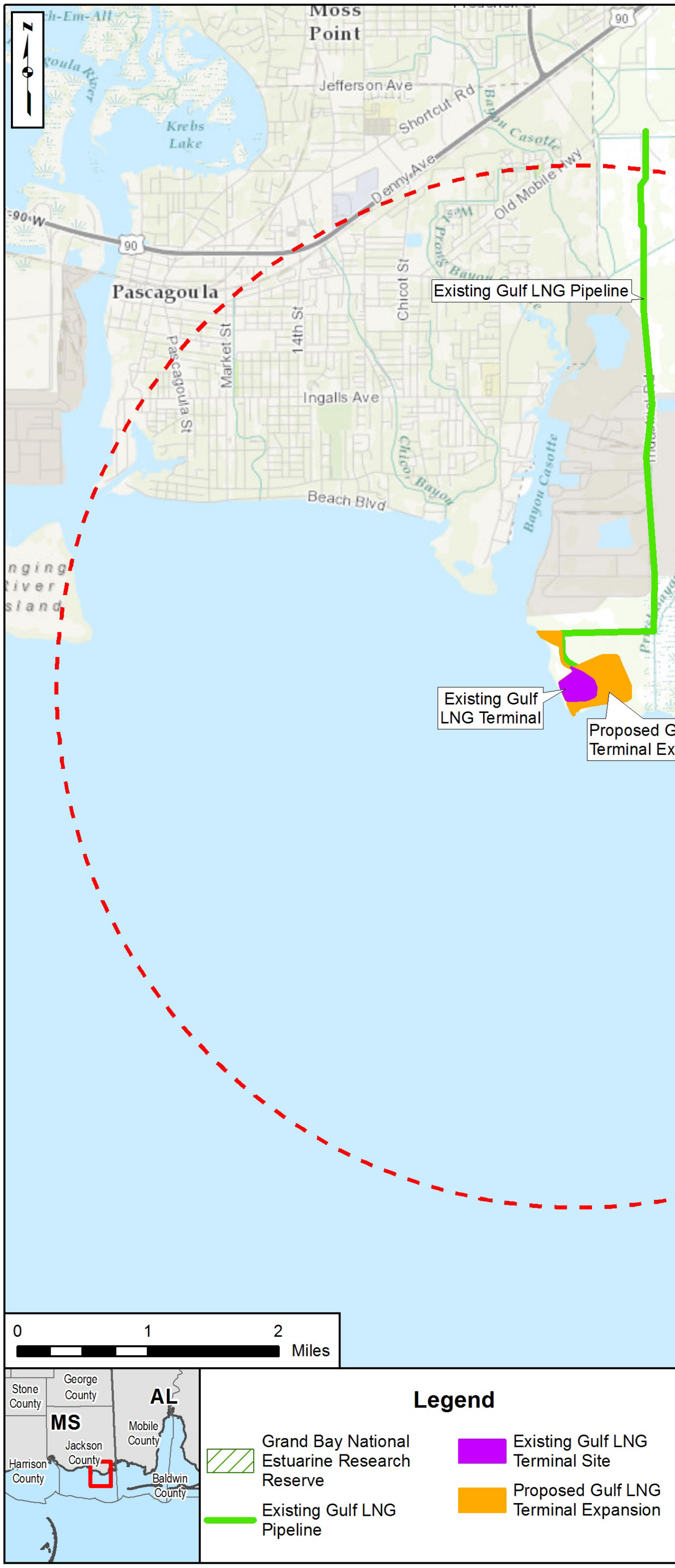


Figure 3.3-1
Gulf LNG Liquefaction Project
Area Within 4 Miles of the Existing Gulf LNG Import Terminal

After consulting with the COE, Gulf LNG developed a revised configuration; however, the COE's review of the new configuration determined that it impacted more of the BCDMMS than desired and the COE requested that the footprint within the BCDMMS be reduced to allow for future dredge material storage and dike construction. In response to that request, Gulf LNG altered the southeastern site boundary to remove about 2.8 acres of the BCDMMS from the Terminal Expansion site, which resulted in the proposed site boundaries.

Gulf LNG identified six different conceptual layouts within the proposed site boundaries, with the two liquefaction trains configured (1) parallel and adjacent to each other, or (2) set in tandem (i.e., end-to-end). These layouts were further refined to three basic "Plot Options:" Plot Option 1 (parallel configuration); Plot Option 2 (tandem configuration); and the Proposed Layout (parallel configuration). The land impacts of each option are listed in table 3.3-1. As noted in the table, each of the three configurations impacted about the same area of wetlands (between 30.7 and 31.5 acres). The proposed configuration affects the least area of the BCDMMS and the least total land area.

TABLE 3.3-1

Areas Impacted by Terminal Expansion Plot Options

	Area Impacted (acres)			
Plot Option	**Existing Industrial, Roadway, and Open Space**	**Marsh/Wetland**	**BCDMMS**	**Total Acreage**
Plot Option 1 (Parallel configuration)	44.5	31.5	48.6	124.6
Plot Option 2 (Tandem configuration)	51.2	30.7	60.3	142.2
Proposed Layout	44.5	31.5	45.8	121.8

3.3.2.3 Agency Preferred Alternative

The proposed configuration meets the COE requirement of minimizing the area of the BCDMMS used by the Project, and none of the alternative configurations offer a significant environmental advantage regarding wetland or land use impacts.

3.4 SUPPLY DOCK ALTERNATIVES

3.4.1.1 Need for One or More Supply Docks

The existing Terminal can be accessed by roadway only by traveling south on SH-611 to Industrial Road and then to the Terminal entrance road. However, near the Chevron Refinery, which is just north of the existing Terminal, there is a coke conveyor facility that crosses the highway and restricts the height of vehicles using the roadway. As a result, large equipment cannot be transported to the Terminal Expansion site by truck. Further, there are no rail spurs in the vicinity of the Terminal Expansion site and transportation by rail would require construction of a new rail line. Therefore, deliveries of large, overweight equipment and materials would require transport via marine vessel to a shoreline offloading area in the vicinity of the Terminal and south of the coke conveyor facility. As a result, Gulf LNG proposes to construct two supply docks (the North and South Supply Docks) for the delivery of bulk materials via barge. Details regarding the proposed North Supply Dock and South Supply Dock are provided in section 2.2.1.5.

3.4.1.2 One Supply Dock Alternative

One alternative to the proposed two supply docks would be to construct and operate only one supply dock. The North Supply Dock would be sited where barge deliveries were made for construction of the existing Terminal.[3] However, Gulf LNG determined that with the anticipated deliveries during construction – including more than 19,000 pilings, components of the flare tower, pipe, and other large equipment such as storage containers – would exceed those that were delivered during construction of the existing Terminal and that the use of only one supply dock would serve as a constraint to construction of the facility in a timely manner. As a result, Gulf LNG proposed to construct and use the South Supply Dock during construction of the first liquefaction train and the flare tower. The South Supply Dock would provide access to the southern portion of the construction area, increasing accessibility for offloading fill materials and aggregate. It would also be used for delivery of the flare tower, which would be installed near to and north of the dock. The South Supply Dock would be removed after construction is complete, and the impacted areas restored to pre-construction conditions to the extent practicable. The North Supply Dock would remain after construction and Gulf LNG would transfer ownership to the JCPA Port of Pascagoula who may use the dock for activities such as layberthing of barges, a base of operation for harbor tugs, and/or handling of project cargoes for local industries.[4]

3.4.1.3 Use of the Existing LNG Carrier Berthing Facility

An alternative to the construction and use of supply docks would be delivery of materials and equipment to the existing marine berthing facility of the existing Terminal. However, the existing marine berthing facility was designed for berthing and offloading LNG from LNG carriers. It was not designed and is not suitable for offloading heavy equipment and other materials needed for construction. Further, Gulf LNG anticipates that during part of the time that the second liquefaction train is being constructed, the first train would be in service, and the berthing facility would be in use by LNG carriers and often not available for delivery of construction materials and equipment. As a result, use of the existing berthing facility for delivery of equipment and materials during construction is not a reasonable alternative.

3.4.1.4 Alternative Sites for the Supply Docks

Alternative sites for the supply docks would have to be reasonably close to the Terminal Expansion site for two primary reasons: (1) they must be sited south of the coke conveyor belt that crosses SH-611 and limits truck delivery of large equipment from north of the conveyor belt, and (2) to minimize construction of new haul roads, which would likely impact additional wetlands.

As indicated on figure 3.3-1, essentially all of the area adjacent to Mississippi Sound and the Bayou Casotte Navigation Channel in the vicinity of the Terminal Expansion site is either wetlands or is heavily developed. Nearby marine shorelines to the east are within the BCDMMS or the Grand Bay NERR, neither of which are available for installation of a supply dock. Nearby marine shorelines to the north and west are either wetlands or developed Chevron property. As a result, we did not identify any reasonable alternative sites for either supply dock.

3.4.1.5 Agency Preferred Alternative

As a result of these considerations, we conclude that the construction of two supply docks at the proposed sites for use during construction is the preferred alternative. This preferred alternative also

[3] A supply dock was not constructed for barge deliveries during construction of the existing Terminal; construction equipment was offloaded from the barges using cranes.

[4] Accession number 20180820-5167.

includes removal of the South Supply Dock after construction, restoration of the impacted area to pre-construction conditions, and use of the North Supply Dock during operation of the Project.

3.5 ALTERNATIVE CONSTRUCTION SUPPORT AREA SITES

Gulf LNG selected CSA sites that were previously used for similar activities and committed to specific measures to avoid impacts on sensitive resources on all but one of those sites, including avoidance of wetlands that are present in portions of some sites (see section 4.4.2). After construction is completed, Gulf LNG would return the sites to pre-construction conditions.

CSA-5 is a 34.5-acre site that is adjacent to and north of the existing Terminal. Gulf LNG would lease the property, which is a partially developed industrial site that includes about 7.6 acres of freshwater wetlands. The wetlands were surveyed and identified as being fragmented and disturbed due to the placement of fill that has altered the hydrology and vegetation; surrounding industrial activities, berms, ditches, and roads also contributed to the degradation of the wetlands. Gulf LNG proposes to clear and fill the site to maximize the useable area for construction support and to provide additional access points to the Project. After construction is complete, Gulf LNG would restore the site to meet owner specifications and terminate the lease. In addition, in section 4.4 we are recommending that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the *FERC Procedures*. Therefore, we conclude that impacts on the wetlands associated with CSA-5 would be temporary and not significant, with revegetation likely occurring within 1 to 3 years of construction (in accordance with our Procedures).

We do not consider the other direct impacts on the proposed CSA sites or the impacts due to use of the sites (such as transportation, air quality, and noise impacts) to be significant and, therefore did not assess alternative CSA sites.

3.6 ALTERNATIVE PIPELINE MODIFICATION SITES

The Pipeline Modifications would be made at existing metering facilities. As noted in section 1.0, there would also be modifications at the interconnection of the Gulf LNG Pipeline to the Transco/FGT Pipeline System that would be constructed by Transco and reviewed by the FERC under its blanket certificate process. In addition, Gulf LNG would connect the Gulf LNG Pipeline to the gas treatment facilities of the liquefaction trains within the Terminal Expansion site. With one minor exception, the Pipeline Modifications outside of the Terminal Expansion site would be constructed within existing fenced and graveled facilities that are within natural gas pipeline rights-of-way. At the interconnection of the Gulf LNG Pipeline to the Gulfstream Pipeline System, about 0.1 acre of temporary workspace would be required outside of the fenced area, but within the pipeline right-of-way. We did not identify any environmental concerns with the Pipeline Modifications that would require the identification and evaluation alternative sites, nor were any alternatives suggested during the public scoping period.

3.7 ALTERNATIVE POWER SOURCES

As proposed, each liquefaction train would have two gas-fired turbines to provide the power required to operate the refrigeration compressors. FERC staff assessed whether using purchased electrical power would be a suitable alternative. To provide the power necessary to operate the remainder of the Project, Gulf LNG would purchase electric power from the grid. As an alternative to that design, we also assessed the use of only on-site power generation.

3.7.1 Alternative Power Source for the Refrigeration Compressors

A total of 405 MW would be required to power the two liquefaction trains. Of that amount, approximately 387 MW would be provided by the four gas turbines, with the remaining 18 MW provided by four 4.5 MW electric-driven "helper" motors (one per gas turbine) which would obtain power from MPC's regional electrical transmission grid. The alternative of using electric power to operate the compressors would require that Gulf LNG obtain 387 MW of electrical power from the regional transmission grid. The use of electric power from the grid would avoid on-site emissions from the Terminal Expansion site but would result in additional emissions from the generators supplying power to the grid. MPC stated that the additional electricity required would be obtained from multiple generation sources on the regional electrical transmission grid.

A comparison between the emissions associated with the gas-driven turbines of the refrigeration compressors and the emissions associated with imported power from the grid is complicated because grid power would be obtained from a variety of power sources (such as fossil fuel and renewable fuels). Further, there would be differences in the contributing fossil fuel-fired generating stations: they may use gas, oil, or coal for fuel; they would have different plant configurations (simple cycle or combined cycle power generation); and the plants would likely have different emission control systems. However, it is possible to estimate the emissions of grid power using EPA's emission factors for grid-supplied power for the region (EPA, 2018). These emission factors address GHGs, expressed as carbon dioxide equivalent (CO_{2e}), and the priority pollutants oxides of nitrogen (NOx) and sulfur dioxide (SO_2). A comparison of GHG, NOx, and SO_2 emissions from the gas-driven turbines of the refrigeration compressors and the generation plants providing power to the regional transmission grid is provided in table 3.7-1 for full operation of the two trains (i.e., 387 MW of power provided by each method).

TABLE 3.7-1

Emission Estimates for Alternative Power Sources for the Refrigeration Compressors

	Emissions a/			
Power Option	**Units**	**GHGs**	**NOx**	**SO_2**
Gas-fired Turbines b/	Tons Per Year	1,844,601	145	0.04
Purchased Power c/	Tons Per Year	1,855,301	847	678

a Emission estimates are for the 386.8 MW of power required for full operation of two liquefaction trains.

b NOx emissions for the gas-fired turbines are based on incorporation of dry-low NOx combustors and Selective Catalytic Reduction (SCR) emission control technology; SO_2 emission estimates are based on the use of treated gas.

c The emission estimates from purchased power for GHGs, NOx, and SO_2 are based on EPA grid data for 2016 (EPA, 2018), which are the latest such data available. Current emissions may be lower due to changes in plant operation and fueling as a result of EPA regulatory changes after 2016. The EPA data are reported as pound/MW Hour; they are converted to tons per year in this table to allow a direct comparison to the emissions of the gas-fired turbines.

It is likely that the electrical power generation facilities would have to provide more than the required 387 MW due to line loss in the electrical transmission system. This would result in an increase in the emissions from the generators beyond that required for the Project and further increase the emission estimates for purchased power listed in table 3.7-1.

In addition, redesigning the Project with electric motor refrigeration compressors would require alternative methods of dealing with the BOG that would otherwise be used to fuel the gas turbines. Gulf LNG stated that minimizing BOG would require either (1) sub-cooling the LNG, which would increase the electric power required to operate the refrigeration compressors, or (2) compressing the BOG and recycling it to the plant feed gas, which would require a larger BOG Recycle Compressor and greater electric power demand than that of the gas turbine design. In either case, the power required would be greater than the 387 MW generated by the gas turbines and increase the emission estimates for purchased power listed in table 3.7-1.

Emissions modeling was not conducted for the alternative. However, based on the available data, we conclude that the use of purchased power would likely result in a substantial increase in emissions compared to those of the gas-fired turbines, particularly for SO_2. As a result, we conclude that the alternative of using purchased power does not offer a significant environmental advantage over the proposed use of gas-fired turbines with emission control equipment, and that the proposed power source of gas-fired turbines for the refrigerant compressors is the preferred alternative.

3.7.2 On-Site Power Generation

In addition to the power required to operate the refrigeration compressors, Gulf LNG would require about 100 MW of power to operate the remainder of the Terminal Expansion. As proposed, this power would be provided by a non-jurisdictional project: MPC would construct and operate two new 115-kV electrical transmission lines and an on-site substation (see section 1.4.1). The on-site substation is included in the environmental analysis presented in this EIS.

We considered the alternative of installing and operating gas-fired turbines to provide the required power. The on-site gas turbine generators could be driven by either industrial or aero-derivative gas turbines; the latter are lighter weight variations of industrial gas turbines and are typically more efficient than industrial gas turbines. As noted in section 3.7.1, a comparison between the emissions associated with gas-driven turbines and the emissions associated with imported power from the grid is complicated because grid power would be comprised of a variety of power sources (such as fossil fuel and renewable fuels). Further, there would be differences in the contributing fossil fuel-fired generating stations: they may use gas, oil, or coal for fuel; they would have different plant configurations (simple cycle or combined cycle power generation); and the plants would likely have different emission control systems. However, it is possible to estimate the emissions of grid power using EPA's emission factors for grid-supplied power for the region (EPA, 2018). A comparison of GHG, NOx, and SO_2 emissions from the gas-driven turbines and the generation plants providing power to the regional transmission grid is provided in table 3.7-2 for operation of the Terminal Expansion, exclusive of the refrigeration compressors (i.e., 100 MW of power).

It is likely that the electrical power generation facilities would have to provide more than the required 100 MW due to line loss in the electrical transmission system. This would result in an increase in the emissions from the power generators beyond that required for the Project and further increase the emission estimates for purchased power listed in table 3.7-2.

TABLE 3.7-2 **Emission Estimates for Alternative Power Sources for Operation of the Terminal Expansion**				
		Emissions a/		
Power Option	**Units**	**GHGs**	**NOx**	**SO_2**
Gas-fired Turbine Generators b/				
Industrial-Driver	Tons Per Year	640,186	504	0.01
Aero-derivative Driver	Tons Per Year	474,212	374	0.01
Purchased Power c/	Tons Per Year	479,654	219	175

a Emission estimates are for the 100 MW of power required for operation of the Terminal Expansion, not including the refrigeration compressors of the liquefaction trains.

b NOx emissions for the gas-fired turbines are based on incorporation of dry-low NOx combustors without SCR emission control technology; due to the size of the turbines, the emissions criteria for New Source Performance Standards can be met without SCR. SO_2 emission estimates are based on the use of treated gas.

c The emission estimates from purchased power for GHGs, NOx, and SO_2 are based on EPA grid data for 2016 (EPA, 2018), which are the latest such data available. Current emissions may be lower due to changes in plant operation and fueling as a result of EPA regulatory changes after 2016. The EPA data are reported as pound/MW Hour; they are converted to tons per year in this table to allow a direct comparison to the emissions of the gas-fired turbines.

The data in table 3.7-2 indicate that emissions of GHGs for purchased power are about 25 percent lower than those of industrial-driver gas-fired turbines. The GHG emissions for purchased power are about 1 percent higher than those of aero-derivative driver gas-fired turbines, or about 5,442 more tons per year (tpy) of CO_{2e}, though this is likely in the margin of error for the emissions estimates. NOx emissions for purchased power are about 57 percent lower than those of industrial-driver gas-fired turbines, and about 41 percent lower than those of aero-derivative driver gas-fired turbines. Conversely, the SO_2 emissions for purchased power are substantially greater than those from both of the gas-fired turbine alternatives, at about 175 more tons per year. Ultimately, attempting to include on-site power generators would be problematic from a space-availability standpoint at the Project site and would increase Project emissions of "criteria pollutants" included in the National Ambient Air Quality Standards. The National Ambient Air Quality Standards are established by the EPA to be protective of human health and public welfare. Added emissions resulting from the on-site power generators would likely cause the Project to surpass mandated limits associated with the National Ambient Air Quality Standards (see sections 4.11.1.2 and 4.11.1.5). Therefore, we conclude that using purchased power would be the preferred alternative with all factors considered.

3.8 ALTERNATIVES CONCLUSION

We assessed a range of alternatives for the Gulf LNG Liquefaction Project that could achieve the Project objectives. The alternatives analyzed included the No-Action Alternative, system alternatives, alternative Terminal Expansion sites, alternative plot plans for the Terminal Expansion, supply dock alternatives, alternative CSA sites, alternative Pipeline Modification sites, an alternative power source for the refrigeration compressors, and an alternative power source for the Terminal Expansion. However, none of the alternatives evaluated would provide a significant environmental advantage. Therefore, we conclude that the proposed Project, as modified by our recommended mitigation measures (see section 5.2), is the preferred alternative to meet the Project objectives.

4.0 ENVIRONMENTAL IMPACT ANALYSIS

In this section, we discuss the affected environment as it currently exists, general construction and operational impacts, and proposed mitigation measures for each resource. The applicant, as part of its proposal, agreed to implement certain measures to reduce impacts on environmental resources. We evaluated the proposed mitigation measures to determine whether additional measures would be necessary to reduce impacts. Where we identified the need for additional mitigation, the measures appear as bulleted, boldfaced paragraphs in the text. We will recommend that these measures be included as specific conditions to authorizations that the Commission may issue to the applicant.

The environmental consequence of constructing and operating the Project would vary in duration and significance. Four levels of impact duration were considered: temporary, short-term, long-term, and permanent. A temporary impact would generally occur during construction, with the resource returning to pre-construction conditions almost immediately afterward. A short-term impact could continue for up to 3 years following construction. An impact was considered long-term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of an activity that modifies a resource to the extent that it would not return to pre-construction conditions during the life of the Project, such as the construction and operational impact of a liquefaction train. We considered an impact to be significant if it would result in a substantial beneficial or adverse change in the physical environment and the relationship of people with the environment.

Conclusions in this EIS are based on our analysis of the environmental impact and the following assumptions:

- the applicant would comply with all applicable federal laws and regulations;
- the proposed facilities would be constructed as described in section 2.0 and the recommendations listed in section 5.2 of this document; and
- the applicant would implement the mitigation measures included in its application and supplemental filings to the FERC, and other applicable permits and approvals.

4.1 GEOLOGIC CONDITIONS, RESOURCES, AND HAZARDS

4.1.1 Geologic Setting

The Project lies within the Gulf Coastal Plain Physiographic Division of Mississippi and within the EPA Gulf Barrier Islands and Coastal Marshes ecoregions, which are characterized by brackish marshes, dunes, beaches, and barrier islands (Chapman et al., 2004). Surficial sediment deposits in the general area of the Project consisting of gravel, sand, silt, and clay were deposited during the Holocene and Pleistocene epochs of the Quaternary period [the last 2.6 million years] (Champlin et al., 1994; Bicker, 1969; Bates and Jackson, 1984). In Jackson County, Mississippi, these deposits are underlain by older marine and alluvial sediments from the Quaternary and Tertiary Periods. Cretaceous age (> 66 million years) bedrock occurs at depths greater than 5,000 feet in the Project area. Elevations range from sea level at the Gulf coast to 200 feet above msl in northern Jackson County, with existing site elevations in the area of the Terminal Expansion averaging 4 feet above msl. Topography in the Project area is generally flat, with no significant slopes (Strom and Oakley, 1996).

4.1.1.1 Terminal Expansion

The land at the Terminal Expansion site was previously submerged under the waters of the Mississippi Sound but was reclaimed by the placement of dredge material from Bayou Casotte in the 1950s and 1960s (Fugro, 2007). The overlying dredge material was identified through soiling borings conducted by Gulf LNG during construction of the existing Terminal and extends to a depth of approximately 35 to 50 feet below msl. The dredge materials consist of very soft to soft clays and very loose to loose sands and silts. A large portion of the Project would be within the boundaries of the BCDMMS.

Bedrock was not encountered during the soil borings conducted by Gulf LNG but is estimated to be about 5,000 feet deep (Oivanki, 1994). Due to the significant depth to bedrock, blasting is not anticipated for the Project.

4.1.1.2 Pipeline Modifications

The geologic setting in the areas of the Pipeline Modifications is similar to that of the proposed Terminal Expansion site.

4.1.2 Mineral Resources

In Jackson County, the major minerals being exploited include construction sand, gravel, and sulfur (USGS, 2014a). Other economically viable mineral resources located in Mississippi include bauxite, glauconite, salt, kaolinite, bentonite, heavy minerals, lime, petroleum, iron, and carbon dioxide (Booth and Schmitz, 1983).

4.1.2.1 Terminal Expansion

Except for oil and gas, there are no currently known exploitable mineral resources in the general vicinity of the Terminal Expansion. Coastal deposits of sand are known to contain heavy minerals such as kyanite, staurolite, limonite, tourmaline, and zirconium but there is no current or planned extraction of these potential resources (Booth and Schmitz, 1983; USGS, 2014a; USGS, 2014b). No known mining operations exist within a 1-mile radius of the Terminal Expansion site.

Oil and gas exploration and production have occurred about 8 miles to the north of the existing Terminal. Six former oil wells are in this area, the last of which was plugged and abandoned in 2011 (Mississippi Oil and Gas Board, 2010). The closest onshore oil and gas fields are about 50 miles west and northwest, and the closest offshore well is about 13 miles from the proposed Project (Thompson, 2009; GSA-SOGB, 2014). Therefore, we conclude that the Terminal Expansion would not affect mining or oil and gas exploration activities.

4.1.2.2 Pipeline Modifications

No mineral resources or mineral extraction activities are known to be within close proximity of the Pipeline Modifications. Therefore, we conclude that the Pipeline Modifications would not affect mining or oil and gas activities.

4.1.3 Geologic Hazards and Mitigation Measures for the Terminal Expansion

As part of the permitting of the existing Terminal, Gulf LNG conducted a geotechnical investigation in the winter of 2005 (Fugro, 2007). This initial investigation consisted of five soil borings to depths of about 104 to 130 feet below msl. In October 2007, additional borings were conducted to a depth of 30 feet and 16 cone penetration tests to depths of 99 to 130 feet below msl where refusal was encountered at a very dense silty sand/sand layer.

Gulf LNG's geotechnical consulting firm, Geosyntec, conducted additional geotechnical investigations in July and August of 2014 to supplement existing geotechnical data for areas that were not surveyed during construction of the existing Terminal. These investigations confirmed the presence of a stiff to very stiff clay layer between approximately 60 and 123 feet below msl, and a very dense sand layer 117 feet below msl, with a thickness greater than 29 feet. The Terminal Expansion site would be cleared, graded, and filled to achieve a general site grade of 10 to 13 feet above NAVD. Because of the presence of very soft, compressible soils, Gulf LNG would support all settlement sensitive structures on deep foundations. Lightly loaded structures or equipment insensitive to settlement may be founded on shallow piles or concrete pads if appropriate.

Natural hazards including seismicity, soil liquefaction, landslide susceptibility, flooding, storm surge, tsunami, settlement, scour, and erosion for the Terminal Expansion are discussed in detail in section 4.12.1 of this EIS.

4.1.4 Geologic Hazards and Mitigation Measures for the Pipeline Modifications

Geologic hazards are defined by the American Geological Institute as "geologic conditions or phenomena that present a risk or are a potential danger to life and property, either naturally occurring or man-made" (Bates and Jackson, 1984). Potential geologic hazards in the vicinity of the Pipeline Modifications include seismic ground shaking, faults, soil liquefaction, slope failures/landslides, tsunamis, erosion, flooding, and ground subsidence. Neither volcanism nor karst topography occurs within the vicinity of the Pipeline Modifications and these geologic hazards were excluded from further consideration.

4.1.4.1 Seismic Ground Shaking Hazards

The majority of significant earthquakes around the world are associated with tectonic subduction zones, where one crustal plate is overriding another (e.g., the Japanese islands), where tectonic plates are sliding past each other (such as in California), or where tectonic plates are converging (e.g., the Indian Sub-Continent). Unlike these highly active tectonic regions, the Gulf coast of the United States is not a tectonically active area. No significant active or major inactive faults were identified through a review of structural feature maps of Mississippi (Thompson, 2009). However, a belt of mostly seaward-facing faults, collectively known as the Gulf-margin normal faults occur along the Gulf of Mexico. These faults exist in sediments and poorly lithified rocks and most of these materials are unable to support the extreme stress required for the propagation of significant seismic events and ground motion (Crone and Wheeler, 2000).

The Pipeline Modifications are in an area of low seismicity. Earthquakes have occurred in Mississippi, but occurrences have been infrequent and of low magnitude, with most having a magnitude of 3.5 to 4.0, too small to have caused serious damage to property or structures (USGS, 2014c; USGS, 2014d). Several significant earthquakes occurred in the New Madrid Seismic Zone near New Madrid, Missouri, about 450 miles northwest of the Pipeline Modifications sites, during the winter of 1811 to 1812. The largest of these earthquakes was estimated to have a magnitude of 7.0 or higher (USGS, 2014c; USGS, 2014e) and resulted in significant damage from ground motion in the New Madrid, Missouri area. These earthquakes also caused some damage in northern Mississippi, more than 250 miles from the Terminal area (Bograd, 2014).

Gulf LNG conducted a review of historical aerial photography, topographic maps, subsurface structural maps, and conducted site reconnaissance in order to document any features that may indicate a potential for surface faulting. The results of Gulf LNG's investigation indicated that there were no reported active seismogenic faults within an approximate 350-mile radius of the Project. There are also many mapped extensional growth faults identified in the northern Gulf of Mexico near Texas and Louisiana. However, these typically normal faults have not been identified in or near Mississippi (Champlin et al., 1994).

Seismic risk can be quantified by motions experienced at the ground surface or by structures during a given earthquake, expressed in terms of the acceleration due to gravity (g). The USGS estimates peak ground accelerations in Southern Mississippi to be in the range of 4 to 6 percent of the acceleration of gravity (0.04 to 0.06 g) and have a 2 percent probability of being exceeded in 50 years (USGS, 2014f).

Pipeline Modifications would take place at the existing Destin Meter Station, Gulfstream Meter Station, and the Transco/FGT Interconnection. Due to the low probability of a significant seismic event in the area and ground disturbing work being limited, we conclude that only a minimal overall hazard would be associated with seismicity and surface faulting at the Pipeline Modifications sites.

4.1.4.2 Soil Liquefaction

Soil liquefaction occurs when a saturated soil loses its load-bearing capability through an increase in pore water pressure that results from seismic ground shaking. Saturated sandy soils with low silt and clay content are susceptible to soil liquefaction during seismic events. Soils must exhibit the three following characteristics in order for soil liquefaction to occur: (1) a clay content of less than 15 percent by weight; (2) a liquid limit less than 35 percent; and (3) a moisture content more than 0.9 times the liquid limit.

Soils within the Pipeline Modification sites are of the type considered to have a moderate to high soil liquefaction potential. However, the risk of strong earthquake ground motions occurring at the site is relatively low. Because the potential for seismic ground shaking in the vicinity of the Pipeline Modifications is low, we conclude the probability of soil liquefaction is also low.

4.1.4.3 Landslide Incidence and Susceptibility

"Landslides" are defined as the movement of rock, debris, or soil down a slope (USGS, 2014g). Given that the topography of the Terminal Expansion site and Pipeline Modifications sites is relatively flat, with very little grade change, the Pipeline Modifications have a low risk of impact caused by landslides.

4.1.4.4 Ground Subsidence

Subsidence hazards involve either the sudden collapse of the ground to form a depression or the slow subsidence or settlement of sediments near the ground's surface. Ground subsidence in the vicinity of the Project could result from natural geologic processes or from man-made processes, such as subsurface mining and removal of fluid from underground reservoirs, such as aquifers or oil fields. The Northeast Petit Bois Pass and Northwest Dauphin Island oil fields are off of the Alabama coast and are 12.5 and 13.5 miles respectively to the southeast.

Work associated with the Pipeline Modifications would be limited to existing facilities. Any subsidence hazards would have been addressed during construction of the existing facilities and land at the facility location was converted to industrial use. We conclude the potential for subsidence hazards to pipeline facilities in areas of Pipeline Modifications would be low.

4.1.4.5 Flooding/Storm Surge/Tsunamis

A flood occurs when the water level in a stream or river channel overflows the natural or man-made bank. Storm surge from tropical cyclones and tsunamis can also cause flooding. There are no records of tsunamis in the vicinity of the Project (Dunbar and Weaver, 2008). Storm surge is a coastal phenomenon associated with low-pressure weather systems, typically intense hurricanes and winter storms. The surge of ocean water inland above the high tide mark is a result of low barometric pressure combined with high winds pushing on the ocean surface, causing the water to "pile up" higher than ordinary sea level. The storm surge effect is enhanced if it occurs at high tide (NWS, 2014).

Flash floods typically result from intense rapid precipitation in upstream areas that leads to extensive short-duration runoff into the stream channel. The 100-year flood represents a river channel water level that, based on an analysis of the historic record, is likely to be equaled or exceeded every 100 years-meaning that there is a 1 percent chance that the water level will be equaled or exceeded in any individual year during a century. The 100-year flood is generally used for planning purposes for buildings within a floodplain to assess the likelihood of inundation over time.

The Pipeline Modification sites are proposed about 3 to 4 miles inland and the work would be limited to modifications to existing facilities with limited ground disturbance. Construction of the Pipeline Modifications would not have any increased risk from flooding, storm surge, or tsunamis.

4.1.4.6 Shoreline Erosion and Localized Scour

The Destin Meter Station, Gulfstream Meter Station, and Transco/FGT Interconnection would not be located directly on the coast or along a major waterbody; therefore, the facilities would not be subjected to direct effects from shoreline erosion.

4.1.5 Paleontology

While fossils along the Gulf coast of Mississippi are generally rare, the dredge material that makes up the majority of the Project area is known to contain fossil fragments (such as shark teeth and whale bones). Holocene marine fossil fragments are sometimes found within sedimentary units deposited in these epochs, but these fragments have little scientific value. The Project facilities would not impact any older underlying geologic formations or the fossils, if any, within them. If any paleontological resources are discovered during construction, they would be treated in accordance with Gulf LNG's Unanticipated Discoveries and Emergency Procedures Plan (see appendix F). We have reviewed Gulf LNG's Unanticipated Discoveries and Emergency Procedures Plan and find it acceptable.

4.2 SOILS

Potential impacts on soil resources during construction and operation of the Terminal Expansion and Pipeline Modifications may be associated with soil limitations, prime farmland, hydric soils, soil compaction, soil erosion, revegetation, and contamination.

4.2.1 Soil Types and Limitations

Soil types and the general attributes and limitations that occur within the Project area were identified through the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), Soil Survey Geographic (SSURGO) (NRCS, 2014a) and Web Soil Survey Application (NRCS, 2014b; NRCS, 2015a; NRCS, 2015b). This section describes the soil series, limitations, and attributes that would be impacted by the proposed Project. Table 4.2.1-1 presents a summary of soils limitations that would be affected by the proposed Project by component and a detail of soils.

4.2.1.1 Terminal Expansion

Soils within the Terminal Expansion site consist of the Axis series that is a mucky sandy clay loam soil, a very small proportion of Udorthents (<1 percent), and water. As discussed, land at the Terminal Expansion site had previously been submerged under the waters of the Mississippi Sound but was reclaimed through the placement of material from Bayou Casotte dredging activities in the 1950s and 1960s (Fugro, 2007). The overlying dredge material is about 35 feet to 50 feet deep and was identified through soiling borings conducted by Gulf LNG during construction of the existing Terminal. Additionally, about 46 acres of the proposed Terminal Expansion site is located within the BCDMMS and this area, although mapped as Axis mucky sandy clay loam by the NRCS, consists of dredge spoils, which may not have the same characteristics as the Axis series. Soils within the BCDMMS are also recent dredge spoils and consist of very soft-to-soft clay surface soils which are underlain by soft and loose sands, silts, sandy clays, and clayey sands. These soils in turn are underlain by a thick layer of soft gray clay, which contains pockets and lenses of fine sands. Dredge materials within the BCDMMS range from thicknesses of 15 to 25 feet (COE, 2000). Gulf LNG would remove about 1,524,600 cy of dredged material from the BCDMMS. Gulf LNG estimates about 7 feet of material would be removed from the BCDMMS. Gulf LNG estimates that 20 percent (304,920 cy) of BCDMMS material and about 770,080 cy of fill (preferably from the COE Tombigbee Project) would be used to raise the grade of the Terminal Expansion site to an elevation of 12 to 13 NAVD. The remaining 1,219,680 cy of BCDMMS material would be disposed of at an approved upland site. About 323,000 cy of fill from the COE Tombigbee Project would be used as fill material for the off-site wetland mitigation site (see section 4.4.3).

Construction of the Terminal Expansion would temporarily impact 0.2 acre of the Axis series. Permanent impacts due to construction of the Terminal Expansion, access roads, and the North and South Heavy Haul Roads would include 112.9 acres of the Axis series, of which about 46.0 acres mapped as Axis series are in fact dredge spoils within the BCDMMS. Expansion of the Terminal, access roads, and North and South Heavy Haul Roads would also permanently impact 0.5 acre of Udorthents and 6.3 acres of Water/Axis series. According to Gulf LNG, the 6.3 acres currently mapped by the NRCS as water was determined during field surveys to be the Axis series that is frequently flooded.

The Terminal Expansion would also include construction of a permanent North Supply Dock and a temporary South Supply Dock. Construction of the North Supply Dock would permanently affect 0.9 acre of the Axis series and 8.2 acres of water, while construction of the South Supply Dock would temporarily affect 4.9 acres of water and 1.5 acres of the Axis series. The water surrounding the supply docks consists of marine sediments, which do not have the same limitations as soils.

Installation of the supply docks would require dredging of about 100,000 cy of sediment for each dock to a depth of 12 feet below msl. Gulf LNG initially planned to dispose of dredge materials from construction of the supply docks at one of two state-approved BU sites: Greenwood Island and Round Island. However, the Round Island is privately owned and not expected to be available. According to Gulf LNG, the Greenwood Island site is expected to reach capacity prior to construction, but will be expanded 250-acres by February 2020. Gulf LNG would prefer to use a BU site for disposal and would work with federal and state agencies to identify a suitable BU site for dredge material disposal. Gulf LNG would utilize an offshore dredged material disposal site if a suitable BU site is not available.

Additionally, Gulf LNG would utilize six CSAs during construction. All of the CSAs have been previously used for industrial activities. However, part of the undeveloped eastern half of CSA-5 would require clearing of upland forested land and the filling of wetland areas to maximize usable space.

TABLE 4.2.1-1

Soils and Soil Limitations Affected by the Gulf LNG Project (acres)

Component	Total Facility Acres	Soil Series/ Complex	Temporary/ Permanent	Hydric Soils	Prime Farmlands a/	Revegetation Potential b/	Compaction Potential c/	Wind Erosion Potential d/	Water Erosion Potential e/	Total Acres
Terminal Expansion f/	120.4	Axis (Mucky Sandy Clay Loams)	Temporary	0.2	0.0	0.0	0.2	0.0	0.0	0.2
		Water/Axis g/	Permanent	6.3	0.0	0.0	6.3	0.0	0.0	6.3
		Udorthents	Permanent	0.0	0.0	0.0	0.0	0.5	0.0	0.5
		Axis	Permanent	113.5	0.0	0.0	113.5	0.0	0.0	113.5
North Supply Dock	9.1	Axis	Permanent	0.9	0.0	0.0	0.9	0.0	0.0	0.9
		Water	Permanent	8.2	0.0	0.0	8.2	0.0	0.0	8.2
South Supply Dock	6.4	Axis	Temporary	1.5	0.0	0.0	1.5	0.0	0.0	1.5
		Water	Temporary	0.0	0.0	0.0	0.0	0.0	0.0	4.9
		Terminal Expansion Impact Total		***130.6***	***0.0***	***0.0***	***130.6***	***0.5***	***0.0***	***135.9***
CSA-1	16.0	Atmore (Loam)	Temporary	7.2 h/	0.0	7.2	7.2	0.0	0.0	7.2
		Ocilla (Loamy Sand)	Temporary	0.0	0.0	0.3	0.0	0.3	0.0	0.3
		Udorthents	Temporary	0.0	0.0	0.0	0.0	8.5	0.0	8.5
CSA-2	1.8	Hyde (Silt Loam)	Temporary	0.1 h/	0.0	0.1	0.1	0.0	0.0	0.1
		Ocilla	Temporary	0.0	0.0	1.7	0.0	1.7	0.0	1.7
CSA-3	7.8	Axis	Permanent	0.8 h/	0.0	0.0	0.8	0.0	0.0	0.8
		Harleston (Fine Sandy Loam)	Permanent	0.0	7.1	7.1	0.0	7.1	0.0	7.1
CSA-4	16.2	Udorthents	Temporary	0.0	0.0	0.0	0.0	16.2	0.0	16.2
CSA-5	34.5	Udorthents	Temporary	0.0	0.0	0.0	0.0	25.6	0.0	25.6
		Axis	Temporary	8.9	0.0	0.0	8.9	0.0	0.0	8.9
CSA-6	18.1	Escambia (Very Fine Sandy Clay Loam)	Temporary	0.0	18.1	18.1	18.1	18.1	0.0	18.1
			CSA Impact Total	***17.0***	***25.2***	***34.5***	***35.1***	***77.5***	***0.0***	***94.4***
Destin Meter Station	1.5	Ocilla (Loamy Sand)	Temporary	0.0	0.0	1.5	0.0	1.5	0.0	1.5

TABLE 4.2.1-1

Soils and Soil Limitations Affected by the Gulf LNG Project (acres)

Component	Total Facility Acres	Soil Series/ Complex	Temporary/ Permanent	Hydric Soils	Prime Farmlands a/	Revegetation Potential b/	Compaction Potential c/	Wind Erosion Potential d/	Water Erosion Potential e/	Total Acres
Gulfstream Meter Station	0.6	Ocilla	Temporary	0.0	0.0	0.6	0.0	0.6	0.0	0.6
Transco/FGT Interconnection	1.5	Ocilla	Temporary	0.0	0.0	1.5	0.0	1.5	0.0	1.5
		Pipeline Modifications Total		***0.0***	***0.0***	***3.6***	***0.0***	***3.6***	***0.0***	***3.6***
Project Total				**146.9**	**25.2**	**38.1**	**165.0**	**81.6**	**0.0**	**233.9 i/**

Source: NRCS, 2015b

a Includes prime farmlands and farmlands of statewide importance.

b Includes soils rated as having a low revegetation potential.

c Includes soils as having a high compaction potential.

d Includes soils rated as having a moderately high-to-high water erosion rating.

e Includes soils rated as having a moderately high-to-high wind erosion rating.

f Includes access roads, the North Heavy Haul Road, and the South Heavy Haul Road, and 3.1 acres of the Flare Exclusion Zone that would only be impacted during operations.

g Permanent impacts areas mapped as water by the NRCS as part of the Terminal Expansion were found to be the Axis series through field reconnaissance conducted by Gulf LNG.

h NRCS (2015b) data shows hydric soils at CSAs-1, 2, and 3 however, field surveys did not identify any wetland habitat at these sites.

i This total includes 3.1 acres associated with impacts on wetlands in the flare exclusion zone located outside the Project footprint. Radiant heat from periodic flare events may impact the wetland vegetation surrounding the flare tower. These events would be associated with maintenance, startup/shutdown, and upset conditions at the Terminal Expansion.

4.2.1.2 Pipeline Modifications

The Pipeline Modifications would temporarily impact a total of 3.6 acres of Ocilla loamy sand. To minimize impacts on soils, Gulf LNG would construct and restore the Pipeline Modifications in accordance with the Gulf LNG Plan, (see appendix D) which includes provisions for erosion control, restoration, and revegetation, as identified in the FERC's Plan.

4.2.2 Prime Farmland Soils

Prime farmland soils have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops (NRCS, 2014c). It is a special classification that receives special protections under the *Federal Surface Mining Control and Reclamation Act of 1977*. In general, prime farmland soils have adequate and dependable precipitation, a favorable temperature and growing season, have acceptable acidity or alkalinity, and have few or no surface stones. They are permeable to water and air. Prime farmland soils are not excessively erodible or saturated with water for long periods of time.

4.2.2.1 Terminal Expansion

There are no prime farmland soils at the Terminal Expansion site. Therefore, there would be no impacts on prime farmland soils in this area.

Only the Harleston fine sandy loam and Escambia very fine sandy loam soil type located at CSA-3 and CSA-6, respectively are considered to be prime farmland soil. CSA-3 contains 7.1 acres of prime farmland soils and CSA-6 contains 18.1 acres of prime farmland soils. CSA-3 is currently used by Gulf LNG for warehousing and equipment storage while CSA-6 is currently being used as a parking lot with a layer of crushed gravel covering the area. Neither CSA contains any active agricultural operations and both are already being used for industrial use; therefore, no new impacts on prime farmland soils is expected.

4.2.2.2 Pipeline Modifications

None of the soils in the areas of the Destin Meter Station, the Gulfstream Meter Station, and the Transco/FGT Interconnection, have been identified to be prime farmland soils. Therefore, no impacts on prime farmlands would occur due to the Pipeline Modifications.

4.2.3 Hydric Soils

Hydric soils are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper soil horizon (NRCS, 2014d). These soils are typically associated with wetlands. Soils that are artificially drained or protected from flooding (e.g., by levees) are still considered hydric if the soil in its undisturbed state would meet the definition of a hydric soil.

4.2.3.1 Terminal Expansion

The Axis soil series present at the Terminal Expansion site, access roads, and North and South Heavy Haul Roads is categorized as hydric due to its high water content. Construction of the Terminal Expansion, access roads, and North and South Heavy Haul Roads would permanently impacted 119.7 acres and temporarily impact 0.2 acre of the Axis series (see table 4.2.1-1). We believe that this would be a significant environmental impact without mitigation; however, these impacts would be reduced to less-than-significant levels from implementation of the wetland mitigation and conservation measures identified in section 4.4.

Construction of the North Supply Dock would permanently affect 0.9 acre of hydric soils while construction of the South Supply Dock would temporarily affect 1.5 acres of hydric soil.

The Atmore, Hyde, and Axis soil series impacted by the CSAs are considered to be hydric soils. Use of the CSAs would temporarily impact 7.2 acres of the Atmore series at CSA-1, 0.1 acre of the Hyde series at CSA-2, and 8.9 and 0.8 acres of the Axis series at CSA-5 and CSA-3, respectively. NRCS (2015b) data shows hydric soils at CSAs-1, 2, and 3 however, field surveys did not identify any wetland habitat at these sites. Permanent impacts totaling 9.7 acres of the Axis series would occur at CSA-3 and CSA-5. However, both these CSAs are currently used as commercial/industrial sites. In addition, implementation of the measures contained in the *Gulf LNG Procedures* (see appendix E) which incorporates the *FERC's Procedures*, would adequately minimize potential impacts on hydric soils during construction.

4.2.3.2 Pipeline Modifications

Modifications to the Destin Meter Station, the Gulfstream Meter Station, and the Transco/FGT Interconnection would not affect any hydric soils. Therefore, no impacts on hydric soils would occur due to the Pipeline Modifications.

4.2.4 Compaction Potential

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of the soil. The degree of soil compaction during construction depends on moisture content and soil texture. Fine-textured soils with poor internal drainage and high shrink-swell potential are the most susceptible to compaction. Construction equipment traveling over wet soils could disrupt soil structure, reduce pore space, increase runoff potential, and cause rutting. Moist or saturated soils are more likely to compact or rut.

4.2.4.1 Terminal Expansion

All of the soils at the Terminal Expansion site, access roads, and North and South Heavy Haul Roads are susceptible to compaction and rutting. During construction, loss of soil productivity is likely to occur from compaction and damage to soil structure from heavy equipment. However, these areas would be developed; replaced by structures, paving, and gravel; and not used to support vegetation. Therefore, compaction is not a concern.

About 7.2 acres at CSA-1 (7.2 acres), 0.1 acre at CSA-2, the 0.8 at CSA-3, and 18.1 acres at CSA-6 have a compaction potential rating of high (see table 4.2.1-1). The CSAs would be restored as per owner's specifications except for CSA-3, which would remain in use by Gulf LNG during operation of the proposed Project. Additionally wetland impacts at CSA-5 would be permanent. However, we have determined that Gulf LNG has not adequately justified permanently filling the wetlands at CSA-5. Therefore, in section 4.4 we are recommending that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the *FERC Procedures*. If an area requires decompaction, Gulf LNG would use the most practical method, such as deep tilling, to decompact the soils.

4.2.4.2 Pipeline Modifications

The Destin Meter Station, the Gulfstream Meter Station, and the Transco/FGT Interconnection do not have a high soil compaction potential or soil rutting potential rating. Therefore, we conclude no compaction potential would occur due to the Pipeline Modifications.

4.2.5 Erosion

Erosion is a continuing natural process that can be accelerated by human disturbance. Factors that influence erosion potential include soil characteristics, climate, topography, vegetative cover, soil texture, surface roughness, percent slope, and length of slope. Water erosion typically occurs on loose, exposed soils with a low permeability on moderate to steep slopes. Wind erosion generally occurs in an arid climate with soils containing little vegetative growth and high wind conditions.

Clearing, grading, and equipment movement could accelerate the erosion process and, without adequate protection, result in discharge of sediment into waterbodies and wetlands. Soil loss due to erosion could also reduce soil fertility and impair revegetation rates.

4.2.5.1 Terminal Expansion

The erosion potential of soils at the Terminal Expansion site, access roads, and North and South Heavy Haul Roads is minimal because of the cohesive nature of the soils and the flat topography of the site. None of the soils at the facility, access roads, and North and South Heavy Haul Roads are listed as being highly erodible by water. Only 0.5 acre of soils in the Terminal Expansion site, access roads, and North and South Heavy Haul Roads are identified as being highly erodible by wind (see table 4.2.1-1). Due to the low potential for erosion associated with these soils and implementation of the *Gulf LNG Plan* during construction, restoration, and operation, we conclude that the potential for erosion at expanded Terminal, access roads, and North and South Heavy Haul Roads is low.

The erosion potential of soils at the CSAs is relatively minimal due to the level nature of the site, limited amount of proposed ground disturbance, and the erosion ratings of the soils in these areas. CSA-2, CSA-3, and CSA-6 are currently surfaced with gravel, and therefore would not be susceptible to soil erosion. In addition, all CSAs are currently or previously have been commercial/industrial sites. CSA-1 contains 8.8 acres, CSA-4 consists 16.2 acres, CSA-5 contains 25.6 acres, and CSA-6 contains 18.1 acres of soils which are classified moderate to highly wind erodible (see table 4.2.1-1).

To limit the effects of erosion, Gulf LNG would implement the erosion control measures in the *Gulf LNG Plan*. Gulf LNG would implement and maintain erosion and sedimentation control measures, such as silt fencing and hay bales, during construction and through restoration. The CSAs would be restored as per landowner's specifications, except for CSA-3, which would remain in use by Gulf LNG during operation of the Project. Implementation of these measures during construction and restoration would minimize overall soil erosion.

4.2.5.2 Pipeline Modifications

The erosion potential of soils at the Pipeline Modification areas is relatively minimal due to the level nature of the sites, limited amount of proposed ground disturbance, and the erosion rating of the soils in these areas. Gulf LNG would further minimize the erosion potential of these soils by adhering to the erosion protection measures in the *Gulf LNG Plan* during construction and restoration of the Pipeline Modifications. Additionally these areas are already in industrial use and disturbances would be limited to graveled areas and a 0.1 acre of temporary workspace within the existing pipeline right-of-way at the

Gulfstream Meter Station. We conclude Gulf LNG's implementation of its *Gulf LNG Plan* during construction, restoration, and operation would minimize erosion.

4.2.6 Revegetation Potential

Successful restoration and revegetation of areas that would be temporarily disturbed during construction is important to maintain ecosystem productivity and to protect the underlying soils from potential damage, such as erosion.

Gulf LNG would cover much of the Terminal Expansion site with pavement, gravel, major structures, and other Project facilities; however, Gulf LNG would revegetate limited areas within the Terminal Expansion site. Gulf LNG would follow the requirements in its *Gulf LNG Plan* for revegetation of disturbed areas following construction. This would include seeding disturbed areas with native vegetation as recommended by soil conservation authorities.

The CSAs would temporarily impact 34.5 acres of soils that have been identified as having a low revegetation potential. No or very limited clearing, grading, or surface improvement is expected at the CSA locations. CSA-2, CSA-3, and CSA-6 are currently surfaced with gravel and CSA-1, CSA-4, and CSA-5 are currently or have recently been used for industrial purposes. The CSAs would be restored to landowner specifications at the completion of construction except for CSA-3, which would continue to be used by Gulf LNG throughout operation of the Project. In addition, wetlands located at CSA-5 would be filled and not restored to preexisting conditions (see section 4.4.3 for discussion of wetland mitigation). However, in section 4.4 we are recommending that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the FERC Procedures.

We conclude that if upland vegetation is restored in those areas not graveled, paved, or covered with permanent facilities, in accordance with the *Gulf LNG Plan*, the areas disturbed by construction would be successfully revegetated to pre-construction conditions and the impacts on soils would be minor and short-term.

Pipeline Modifications

Construction of the metering modifications would require excavation adjacent to the existing facilities within the existing fenced and graveled areas, with the exception of 0.1 acre of temporary workspace outside the fence line of the existing Gulfstream Meter Station but within the existing pipeline right-of-way. At the Destin Meter Station and Transco/FGT Interconnection, only limited clearing and grading activities would be necessary, and site cleanup would involve replacing gravel on previously graveled areas and restoring surface contours. Vegetation within the 0.1 acre at the Gulfstream Meter Station would be restored in accordance with the *Gulf LNG Plan*. Therefore, revegetation would not be required at the Destin Meter Station, the Gulfstream Meter Station, and the Transco/FGT Interconnection.

4.2.7 Soil Contamination

Contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment could adversely affect soils.

4.2.7.1 Terminal Expansion

According to Gulf LNG, contaminated soil was not encountered during construction of the existing Terminal and Gulf LNG does not anticipate any previously contaminated soils at the Terminal Expansion site.

Gulf LNG conducted sediment sampling of the North Supply Dock (eight sediment samples) and the South Supply Dock (eight sediment samples) on March 16, 2015 and March 17, 2015. Sediment sampling was also conducted at the BCDMMS (ten sediment samples and one elutriate sample) on March 18, 2015 and March 19, 2015. Petroleum aromatic hydrocarbons, polychlorinated biphenyls, pesticides, semi-volatile organic compounds, dioxins, and cyanide were not identified within the samples obtained from the BCDMMS, the North Supply Dock, or the South Supply Dock. No heavy metal concentrations were found to exceed EPA screening levels and the levels of aluminum and iron were found to be comparable to estuarine sediments found in the region. NOAA's Sediment Quality Guidelines - Ecological Effects Range Low (ERL) screening criteria for arsenic (8.2 milligrams per kilogram [mg/kg]) was exceeded at eight of the ten BCDMMS sample locations (concentrations above the ERL ranged from 10.2 to 14.3 mg/kg) and ERL screening criteria for cadmium (1.2 mg/kg) was exceeded at nine of the ten BCDMMS sample locations (concentration ranged from 1.25 to 1.65 mg/kg). It was later determined that the results for arsenic and cadmium could be artificially elevated due to matrix and/or instrument interference. Results of the analytical and toxicity testing conducted by Gulf LNG confirmed that sediment from nine of the BCDMMS sample locations and all of the North and South Supply Dock sample locations could be used for beneficial use. Station 10 sediment bioassay tests with the amphipod *L. plumulosus* had survival rates of 84 percent while the remaining nine stations showed survival rates of 96 to 100 percent. According to Gulf LNG, about 10.4 acres of sediments around station 10 may have elevated contaminant levels of arsenic and cadmium. Because these sediments would meet the permissible concentration requirements for ocean disposal, Gulf LNG proposes to blend these sediments with the other sediments removed from the BCDMMS. Gulf LNG would consult with the MDEQ and the COE prior to construction to determine if the blended sediments would be appropriate for use at the Terminal Expansion site. Any sediment not used would be transported to an approved site for upland disposal. See section 4.4.3 for additional information regarding wetland mitigation.

Gulf LNG has amended its *Spill Prevention, Control, and Countermeasure Plan* (*SPCC Plan*) to incorporate the Terminal Expansion (see appendix G). This plan identifies cleanup procedures to be implemented in the event of soil contamination from spills or leaks from Project construction equipment of fuel, lubricants, coolants, or solvents.

No known spills, releases, or leaks have occurred at the CSAs and construction activities at the proposed CSAs would involve little to no soil disturbance. If previously unknown contaminated soil or hazardous materials are discovered during construction of the Project, Gulf LNG would follow the procedures outlined in its *Plan for Unanticipated Discovery of Hazardous Materials* (see appendix H) to minimize potential impacts.

4.2.7.2 Pipeline Modifications

Contaminated soil was not encountered during the construction of the existing facilities and modifications to the meter stations and interconnection would involve limited soil disturbance. Additionally modifications to these facilities would be completed in areas already used for industrial purposes. If unanticipated contaminated soil is discovered within the site, Gulf LNG would follow its *Plan for Unanticipated Discovery of Hazardous Materials* to minimize potential impacts. Additionally, Gulf LNG would implement its *SPCC Plan* in the event of a spill during construction. Therefore, we conclude that impacts on soils from contamination due to Project construction, if any, would not be significant.

4.2.8 Conclusions

Given the minimization and mitigation measures described above we conclude that impacts on soils due to construction and operation of the Terminal Expansion would be permanent but minor and impacts on soils due to construction and operation of the Pipeline Modifications would be minor.

4.3 WATER RESOURCES

4.3.1 Groundwater

4.3.1.1 Existing Groundwater Resources

The Project is above the Coastal Lowlands Aquifer System, which underlies portions of southeast Texas, southern and central Louisiana, southern Mississippi, southern Alabama, and the western part of the Florida panhandle. Comprised of discontinuous wedge-shaped sediment beds, the Coastal Lowlands Aquifer System overlies the Vicksburg-Jackson confining unit, which separates the Coastal Lowlands Aquifer System from the underlying Mississippi embayment aquifer system. The Coastal Lowlands Aquifer System consists of five permeability zones: permeable Zones A through E. These permeability zones consist of unconsolidated beds of sands and clay, ranging in age from Oligocene to Holocene. Sediment beds of the Coastal Lowlands Aquifer System dip and thicken as the system extends toward the Gulf of Mexico.

In the Coastal Lowland Aquifer system, total dissolved solids (TDS) concentrations are directly related to groundwater flow paths (USGS, 1998). The aquifer is recharged in up-dip areas where TDS concentrations are low. Groundwater becomes increasingly saline as it moves south toward the coast. This increase in salinity is a result of dissolution of aquifer minerals and mixing with seawater. Near the coast, groundwater movement is sluggish and not sufficient to flush saltwater from the aquifer. In coastal areas, water may have TDS concentrations of more than 1,000 milligrams per liter, reaching the lower limits of TDS concentrations of brackish waters. At these levels, groundwater typically requires treatment prior to industrial and residential use. The Coastal Lowlands Aquifer System is a major source of water for public consumption as well as for domestic, commercial, industrial, and agricultural uses. Most groundwater withdrawals are concentrated in New Orleans, Baton Rouge, and southwestern Louisiana.

In the immediate vicinity of the Project, superficial alluvial deposits comprise the uppermost, unconfined aquifer. These deposits locally comprise permeable Zone A and the uppermost portion of permeable Zone B of the Coastal Lowlands Aquifer System. The Citronelle Formation underlies these deposits, forming much of the permeable Zone B, and the uppermost portion of permeable Zone C. The water in the Citronelle Formation, like the Coastal Lowlands Aquifer System as a whole, is saline due to saltwater intrusion. At a depth of about 200 to 300 feet below ground surface, the Graham Ferry Formation underlies the Citronelle Formation. This formation is comprised of Pliocene and Miocene sediments. Groundwater from the Graham Ferry Formation is the source of roughly 60 percent of the groundwater used in Jackson County, Mississippi (USGS, 1965).

According to the MDEQ, no sites with known contaminated groundwater are within 1 mile of the existing Terminal; the nearest active site with known groundwater contamination is a USCG facility, about 3.5 miles west of the existing Terminal.

Protected Groundwater and Springs

<u>Sole Source Aquifers</u>

The EPA defines a sole or principal source aquifer as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer and for which no alternative drinking water sources exist that could physically, legally, and economically supply all those who depend on the aquifer for drinking water (EPA, 2012a). The Project does not cross any EPA-designated sole source aquifers. Therefore, no impacts are anticipated. Additionally, no aquifers within the state of Mississippi have been designated with a special significance.

Protected Watersheds

MDEQ Source Water Assessment Program (SWAP) mapping depicts three Source Water Protection Areas (SWPA) in the vicinity of the Project (MDEQ, 2014a). Table 4.3-1 summarizes the SWPAs in the vicinity of the Project. The SWPAs were established for wells registered to Mississippi Phosphates Corporation, Jackson County East Port Authority, and the City of Pascagoula. Well data from installation of water wells associated with the SWPAs indicate that the water in these wells is screened in the Graham Ferry Formation at depths ranging from 330 feet to 374 feet bgs. According to the MDEQ SWAP mapping data, the water in each of these wells comes from a confined aquifer. Although the MDEQ has implemented the SWAP, no restrictions or protective measures have been established for SWPAs.

TABLE 4.3-1

Source Water Protection Areas in the Vicinity of the Project

Feature	Feature Owner	Nearest Project Facility	Approximate Distance of SWPA from Project area
PWS_ID300012	Mississippi Phosphates Corp.	CSA-4	Within the boundaries of the SWPA
PWS_ID300013	Jackson County East Port Authority	CSA-4	Within the boundaries of the SWPA
PWS_ID300006	City of Pascagoula	CSA-3	Adjacent
		Destin Meter Station and Transco/FGT Interconnection	Within the boundaries of the SWPA
		CSA-1	230 feet

Source: MDEQ, 2014a

Springs

No springs have been identified on, or within 150 feet of, the Terminal Expansion or Pipeline Modifications.

Public and Private Water Supply Wells

The EPA (2014a) defines a public water system (PWS) as "a system that provides water via piping or other constructed conveyances for human consumption to at least 15 service connections or serves an average of at least 25 people." The MDEQ SWAP mapping indicates that there are no PWSs within the boundaries of or near the Terminal Expansion or the Pipeline Modifications. There are 10 public water supply wells in the vicinity of the CSAs. The nearest non-community public water supply is 914 feet north of CSA-4. The nearest community public water supply is over 0.5 mile northwest of CSA-2. Additionally, there are eight private water supply wells within 500 feet of the CSAs. There is also one private well, owned by the Airport Authority, at CSA-1.

Table 4.3-2 summarizes the public and private water supply wells in the vicinity of the CSAs.

TABLE 4.3-2							
Public and Private Water Supply Wells in the Vicinity of the Project							
Feature	**Designation**	**Feature Owner**	**Nearest Project Facility**	**Approximate Distance from Project area (feet)**	**Cardinal Direction**	**Well Depth (feet)**	**Aquifer**
PWS300012-01	Non-community Public Water Supply	Mississippi Phosphates Corp.	CSA-4	914	North	313-363	Graham Ferry
PWS300013-01	Non-community Public Water Supply	Jackson County East Port Authority	CSA-4	922	West-Northwest	336-377	Graham Ferry
PWS300006-10	Community Public Water Supply	City of Pascagoula	CSA-2	2,790	Northwest	240-346	Graham Ferry
PWS300011-01	Non-community Public Water Supply	Chevron USA	CSA-4	3,245	East	260-340	Graham Ferry
PWS300006-06	Community Public Water Supply	City of Pascagoula	CSA-6	3,552	West	633-678	Graham Ferry
PWS300006-07	Community Public Water Supply	City of Pascagoula	CSA-6	3,732	West	636-680	Graham Ferry
PWS300006-06	Community Public Water Supply	City of Pascagoula	CSA-3	3,785	Southwest	633-678	Graham Ferry
PWS300011-02	Non-community Public Water Supply	Chevron USA	CSA-4	3,835	Northeast	260-340	Graham Ferry
PWS300006-05	Community Public Water Supply	City of Pascagoula	CSA-3	3,841	West-Southwest	613-661	Graham Ferry
PWS300006-07	Community Public Water Supply	City of Pascagoula	CSA-3	4,585	Southwest	636-680	Graham Ferry
059Q0443	Private Water Supply	Airport Authority	CSA-1	0	Not Applicable	223	Graham Ferry
059Q0101	Private Water Supply	Chevron Products Company	CSA-5	4	North	374	Graham Ferry
059Q0395	Private Water Supply	Equipment Inc.	CSA-2	36	East	308	Graham Ferry
059Q0120	Private Water Supply	Jackson County Airport	CSA-1	104	East	1,094	Not Available

TABLE 4.3-2 **Public and Private Water Supply Wells in the Vicinity of the Project**							
Feature	**Designation**	**Feature Owner**	**Nearest Project Facility**	**Approximate Distance from Project area (feet)**	**Cardinal Direction**	**Well Depth (feet)**	**Aquifer**
059Q0599	Private Water Supply	U D Group	CSA-1	289	North	170	Not Available
Unnamed	Private Water Supply	Chevron Products Company	CSA-5	302	North	377	Graham Ferry
059Q0117	Private Water Supply	Jackson County	CSA-2	408	Northeast	1,102	Pascagoula
059Q0145	Private Water Supply	Chevron	CSA-5	410	North	360	Graham Ferry
Source: MDEQ, 2014a							

4.3.1.2 Groundwater Impacts and Mitigation

Impacts on groundwater resources could result from construction and operation of the Project. These potential impacts are discussed below.

Terminal Expansion

Gulf LNG would drive pilings to support the liquefaction facilities and create the supply docks. Pilings could create conduits for contaminants to potentially impact surficial groundwater. Additionally, deep pile formations can act as a transport mechanism for surficial contamination into deeper, previously uncontaminated aquifers. About 19,000 piles, driven to depths of 115 to 125 feet bgs, would be used at the Terminal Expansion site. Sheet piles for the supply docks would be driven to a depth of 32 feet below msl with a top elevation of 8 feet above msl.

The deepest pilings would extend no more than 125 feet bgs, within the surficial aquifer and the underlying Citronelle Formation. The Graham Ferry Formation, which is the primary source of water supply (see table 4.3-2), lies beneath the Citronelle Formation at about 200 to 300 feet bgs. The closest wells to the Terminal are completely within the Graham Ferry Formation, and, at these wells, the top of the Graham Ferry Formation is at a depth of about 260 feet bgs, separating the bottom of the pilings by about 135 feet of alluvial deposits (clay, silt, sand, and gravel). The depth of all pilings is expected to be within the permeable zone of the surficial aquifer, minimizing the potential for cross-contamination with the Graham Ferry Formation. No known groundwater contamination currently exists at the site; therefore, we do not anticipate any adverse impacts by known contaminated sites on groundwater.

Potential impacts on groundwater quality could also result from dredging activities. Gulf LNG would dredge about 100,000 cy from each supply dock basin. Based on maintenance dredging required for the existing marine berth, Gulf LNG would conduct maintenance dredging about every 3 years at the supply docks to maintain depths of 12 feet below msl. Gulf LNG anticipates that about 10,000 cy of sediment would accumulate annually at each basin (see figure 2.2-1 and figure 2.2-2). The South Supply Dock would only be used during construction and would be removed after construction. Dredging has the potential to affect the groundwater quality of surficial alluvial aquifer systems and the underlying Citronelle Formation by facilitating a direct pathway for saltwater intrusion into fresh groundwater supplies. However, dredging would be to a depth of 12 feet below msl, which is not of sufficient depth to reach the Citronelle Formation and provide a pathway for saltwater intrusion into the aquifer. In addition, groundwater resources in the area of the supply docks are seaward of the Coastal Lowlands Aquifer in areas where aquifers would contain high salinity levels; therefore, dredging would not affect fresh groundwater resources. The water in the Citronelle Formation, like the Coastal Lowlands Aquifer System as a whole, is already saline due to saltwater intrusion.

Impacts on groundwater resources could occur due to an accidental spill, leak, or other release of a hazardous substance during construction or operation of the expanded Terminal. Should a release occur, Gulf LNG would adhere to the measures outlined in its *SPCC Plan* to minimize potential impacts on groundwater resources.

The Terminal Expansion would result in the conversion of about 77 acres of previously vegetation land to industrial land in the Project area, thereby reducing groundwater infiltration in the area of the Terminal site. Groundwater in the Project area is classified as brackish to saline and is not suitable as a source of potable water, the quality of the groundwater, and its use would not be adversely affected as a result of loss of surficial infiltration from the permanent conversion of this area to an industrial land use. Gulf LNG would comply with its *Gulf LNG Plan*, *Gulf LNG Procedures*, and *SPCC Plan* which include measures to prevent and minimize impacts on water quality. Therefore we conclude that there would not be impacts on groundwater. In addition, impacts associated with the increase of impervious surface would be addressed in the NPDES permit which Gulf LNG must obtain.

Groundwater would not be used for hydrostatic testing; therefore, no impacts on groundwater as a result of hydrostatic testing are expected. Additional information regarding hydrostatic testing can be found in section 4.3.2.2.

Dewatering activities associated with construction of the Terminal Expansion has the potential to alter groundwater quality. Discharge of water removed from excavations would be directed to vegetated land surfaces (where available) to control erosion and runoff. If adequate vegetation is not present during construction, discharge water would be filtered through filter bags or straw bale lined dewatering structures. If the dewatering location is not proximal to the existing Terminal during construction, it is anticipated that Gulf LNG would discharge water from dewatering activities over the seawall and into Mississippi Sound through the existing permitted Outfall 002 location. Because water removed from excavations would be reintroduced to the aquifer in the immediate proximity of excavations, potential dewatering impacts would be localized and temporary, resulting in temporary and not significant impacts on groundwater.

The CSAs would be developed for staging, laydown areas, contractor yards, and parking. Only minor modifications would be made to the sites. The CSAs would not be paved and would be established consistent with the requirements of the Gulf LNG Project-specific Plans and Procedures. CSA-3 is currently used by Gulf LNG for staging and laydown, and after construction, the current use would continue. The remaining CSAs would be returned to pre-construction conditions after construction is completed and would not be used further for the Project. As previously discussed, the nearest non-community public water supply is 914 feet north of CSA-4. The nearest community public water supply is over 0.5 mile northwest of CSA-2. The nearest private well is 141 feet from CSA-1. CSA-4 is within the boundaries of two SWPAs. Because the disturbances to the sites would be minor and temporary, and Gulf LNG would implement its SPCC Plan, we conclude impacts on groundwater resources would not occur as a result of Project-related activities at the CSAs.

Water wells within 150 feet of CSAs may be susceptible to damage from construction activities and could be susceptible to impacts from inadvertent spills. Four private water supply wells would be located within 150 feet of a CSA. The location of the private water supply well at CSA-1 would be clearly marked and refueling and the storage of hazardous materials would be restricted within a 200-foot buffer of its location. Gulf LNG would also conduct pre- and post-construction monitoring of water quality and yield for the private well with the Airport Authority's permission. To ensure that potential impacts on groundwater resources are minimized, Gulf LNG would identify and mark any undocumented water wells and confirm the location of documented wells within 150 feet of prior to construction. As a result, we conclude that impacts on groundwater wells due to development or use of the CSAs would not be significant. In addition, to confirm that there are no impacts on these wells, Gulf LNG has committed to conducting baseline and post-construction water sampling, chemical analysis, and yield testing on public and private water wells within 150 feet of the Project in order to detect construction impacts on groundwater quality and/or yield. If construction resulted in temporary impacts on a private water well, Gulf LNG would provide an alternative water source or compensate the owner. If permanent damage to the well were to occur, Gulf LNG would either compensate the owner or drill a new well.

To avoid or minimize potential groundwater impacts during both construction and operation, Gulf LNG would implement the measures presented in its *Gulf LNG Plan* and *Gulf LNG Procedures* (see section 2.6 for a description of the Project-specific Plan and Procedures).

Using the measures discussed above, we believe that impacts on groundwater resources during construction and operation of the Terminal Expansion would be minimized and would not be significant.

Pipeline Modifications

Gulf LNG would modify two existing pipeline facilities, the Destin Meter Station and the Gulfstream Meter Station, to enable bi-directional flow capability. Gulf LNG would construct the modifications within the existing fenced and graveled areas, or on land associated with the existing pipeline right-of-way. To avoid or minimize potential groundwater impacts during construction of the modifications, Gulf LNG would implement the measures presented in its *Gulf LNG Plan* and *Gulf LNG Procedures*. In addition, Gulf LNG would implement its *SPCC Plan* to protect groundwater resources in the event of an inadvertent spill or leak of hazardous material.

Transco would also make modifications to the existing and jointly owned Transco/FGT Interconnection to permit bi-directional flow. These modifications would be constructed by Transco and would be reviewed by the FERC under its blanket certificate process.

Gulf LNG would hydrostatically test the Destin and Gulfstream Meter Stations prior to placing them into service. Groundwater would not be used for hydrostatic testing; therefore, no impacts on groundwater as a result of hydrostatic testing are expected. Additional information regarding hydrostatic testing can be found in section 4.3.2.2.

Therefore, we conclude that no impacts on groundwater would occur as a result of construction or operation of the Pipeline Modifications.

4.3.2 Surface Water

4.3.2.1 Existing Surface Water Resources

Terminal Expansion

The Terminal Expansion site is adjacent to the southern end of Bayou Casotte at the edge of Mississippi Sound (see figure 4.3-1). Mississippi Sound is an estuarine body of water extending about 90 miles from Lake Borgne, Louisiana on the west, to Mobile Bay, Alabama on the east, with a distance from 6 to 12 miles from the shoreline. Mississippi Sound is relatively shallow, with an average mean low water depth of 10 feet and is bordered on the north by small bays, marshes, bayous, rivers, and coastal beaches (Gulfbase.org, 2014). In the vicinity of the Project, the Barrier Islands, a series of narrow islands and sandbars, separate the sound from the Gulf of Mexico.

Bayou Casotte is an estuary fed by two freshwater tributaries, the East Prong and the West Prong, which drain the Bayou Casotte watershed. Within Bayou Casotte, the federally maintained Bayou Casotte Navigation Channel extends northward from its origin near the southern shore of Jackson County, Mississippi (see figure 4.3-2). This channel provides shipping access to the existing Terminal as well as the Bayou Casotte Inner Harbor. At its southern end, the navigation channel merges with the Upper Pascagoula Navigation Channel to form the Lower Pascagoula Navigation Channel (COE, 2014).

The Project facilities are in the Mississippi Coastal watershed, also known as the Coastal Streams Basin. The Mississippi Coastal watershed is in the South Atlantic Gulf Region, Pascagoula Sub-region, and Pascagoula Mississippi Accounting Unit (USGS, 2014h). Agriculture and silviculture (forestry) are the major land uses throughout the upper watershed, while the lower watershed, where the Project would be constructed, is heavily industrialized with extensive urban and recreational developments (MDEQ, 2000).

The Mississippi Coastal watershed, which begins in Lamar County (80 miles from the Terminal Expansion site) and extends toward the Gulf coast, is a relatively flat area (MDEQ, 2000). The northern portion of the watershed is comprised of extensive pine forests and low rolling hills. As it extends southward, it gradually changes to low-lying flatlands and salt marshes (MDEQ, 2000). In the northern portion of the watershed, streams are shallow and clear, with moderate flow; they become wider and deeper with a more sluggish flow as they move toward the coast due to tidal influence and flatter landscape (MDEQ, 2000). Major waterbodies in the Mississippi Coastal watershed include Bayou Casotte, Wolf River, Rotten Bayou, De Lisle Bayou, Bayou La Croix, Jourdan River, Bernard Bayou, Biloxi River, and Tuxachanie Creek (MDEQ, 2008).

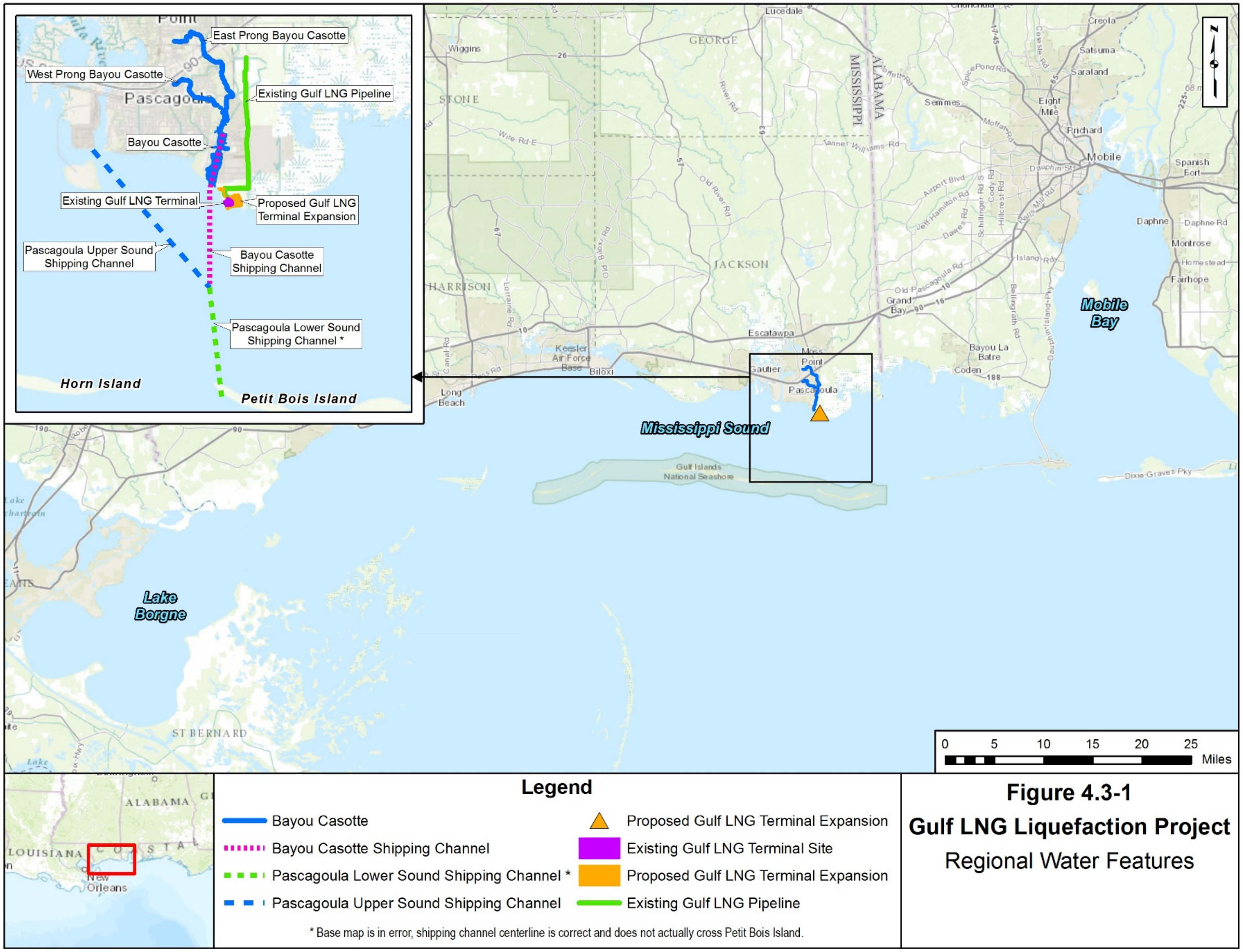


Figure 4.3-1
Gulf LNG Liquefaction Project
Regional Water Features

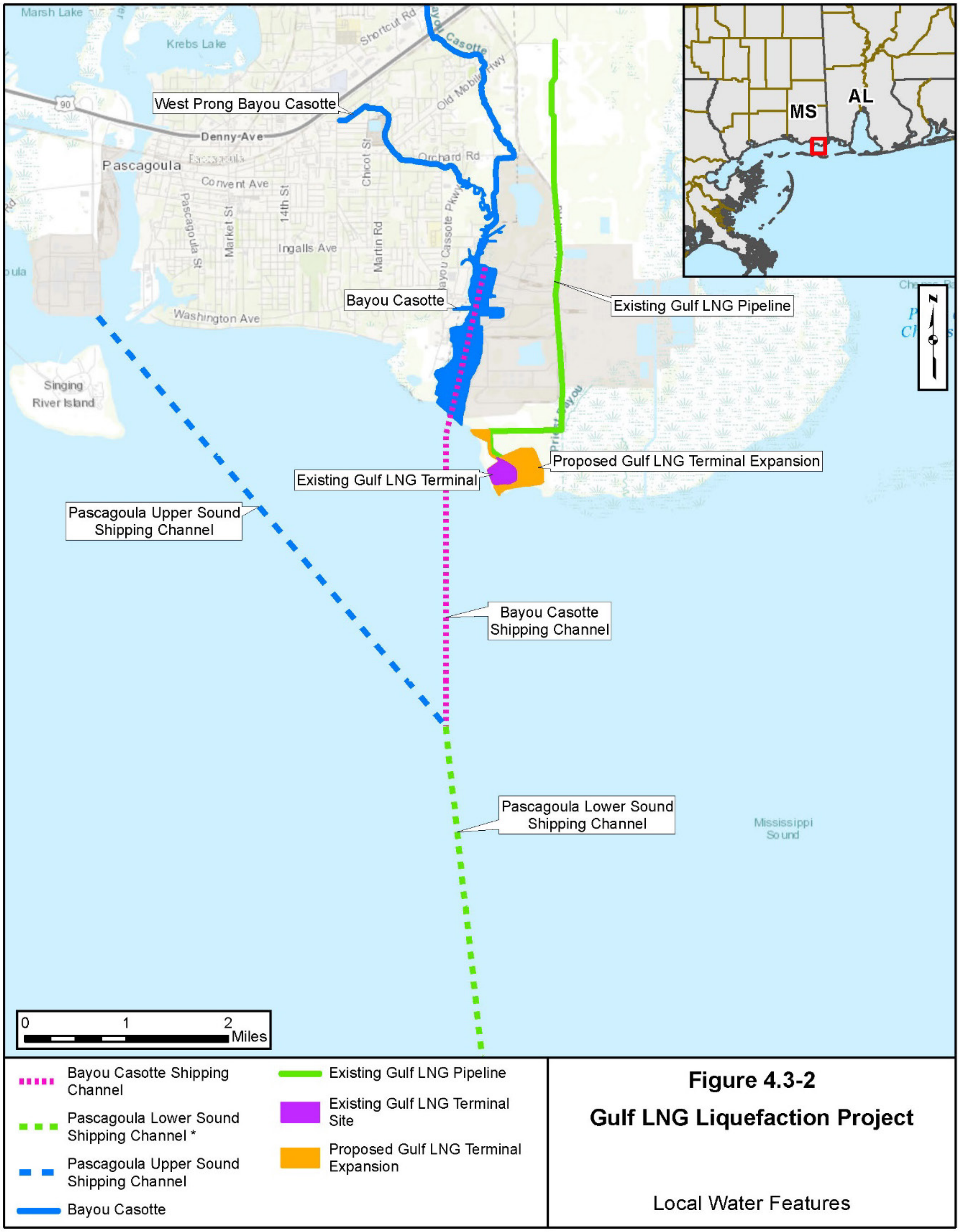


Figure 4.3-2

Gulf LNG Liquefaction Project

Local Water Features

Sensitive Surface Waters

Sensitive waterbodies include those that are designated as national or state wild and scenic rivers, are state-designated high-quality or outstanding natural resource waters, provide habitat for threatened and endangered species or critical habitat, are in sensitive and protected watershed areas or in SWPAs, or have impaired segments or contaminated sediments.

Designated water quality criteria and special use classifications for waterbodies are listed in the State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters (MDEQ, 2007). According to MDEQ criteria, Mississippi Sound is estuarine and a designated recreational waterway. It is not listed as an impaired waterbody according to Section 303(d) of the CWA (MDEQ, 2012). Many inlets near the Terminal Expansion site, including Bayou Casotte, are designated for fish and wildlife use.

Designated Wild and Scenic Waterbodies

No Nationwide Rivers or Wild and Scenic Rivers would be affected by the Project (National Wild and Scenic Rivers System, 2017).

Critical Habitat

According to the *Endangered Species Act of 1973*, waterbodies containing threatened or endangered species or critical habitat are protected. Mississippi Sound has been designated as critical habitat for the federally threatened and state endangered Gulf sturgeon (*Acipenser oxyrinchus desotoi*); this designation extends to adjacent open bays, including Pascagoula Bay, Point aux Chenes Bay, Grand Bay, and Sandy Bay (NMFS, 2014). Threatened and endangered species are discussed in section 4.7.

Contaminated Sediments

Chemical contaminants can accumulate in the sediments of waterbodies. Contaminated sediments have the potential to cause acute and chronic effects on aquatic life. Waterbodies known to have contaminated sediments are listed on their respective state's 303(d) List of Impaired Waters. Mississippi Sound is not listed on Mississippi's 303(d) list (MDEQ, 2012). Results of sediment sampling conducted by Gulf LNG at the supply docks and the BCDMMS are discussed in section 4.2.7.1.

Potable Water Intakes

Water for the Terminal Expansion would be obtained through the existing Port of Pascagoula's industrial water supply which provides water to the existing Terminal. The intake for this system is about 14 miles north-northwest of the existing Terminal on the Pascagoula River The port treats water to contain less than 1 part per million of total particulate matter and buffers the water using caustic injection to achieve a pH of 7.0. Gulf LNG would use a reverse osmosis system to further treat the water.

Public Watersheds

Public watersheds supply drinking water to the public. No public watershed areas are in the vicinity of the proposed Project. The closest waterbody to the Project that is designated for public water supply use is the Pascagoula River, about 14 miles north of the City of Pascagoula (MDEQ, 2007).

Pipeline Modifications

The Destin Meter Station, the Gulfstream Meter Station, and the Transco/FGT Interconnection are within the Mississippi Coastal watershed. Gulf LNG would construct the modifications within the existing fenced and graveled areas, or on land associated with the existing pipeline right-of-way. No waterbodies would be impacted by construction or operation of the Pipeline Modifications.

4.3.2.2 Surface Water Impacts and Mitigation

Direct impacts on surface water resources are defined as those Project-related impacts that occur on waterbodies in the construction workspace that are temporarily or permanently disturbed and for which the acreage of impacts can be calculated. Direct impacts could include turbidity and sedimentation associated with construction activities (such as pile driving and installation of the supply docks) and alterations to the depth of the waterbody (e.g., filling or dredging). Indirect impacts on surface water resources occur outside of the construction workspace and could include potential changes in flow regime or water quality. Noise impacts on aquatic resources are discussed in section 4.6.

Terminal Expansion

As previously stated, Mississippi Sound is the only waterbody that would be affected by the Terminal Expansion.

Dredging

The primary impact on the Mississippi Sound from construction of the Terminal Expansion would be dredging about 200,000 cy of sediment for the North and South Supply Docks. During operation of the Terminal Expansion, the North Supply Dock would undergo maintenance dredging in accordance with applicable MDMR and COE permits. As owner of the North Supply Dock, the JCPA would be responsible for obtaining permits and clearances for dredging operations and for issuing notifications to agencies and Port of Pascagoula users regarding dredging activities. Gulf LNG would remove the South Supply Dock following construction.

Gulf LNG initially planned to dispose of dredge materials from construction of the supply docks at one of two state-approved BU sites: Greenwood Island and Round Island. However, the Round Island is privately owned and not expected to be available. According to Gulf LNG, the Greenwood Island site is expected reach capacity prior to construction, but it would be expanded by 250-acres by February 2020. Gulf LNG would prefer to use a BU site for disposal and would work with federal and state agencies to identify a suitable BU site for dredge material disposal. Gulf LNG would utilize an offshore dredged material disposal site if a suitable BU site is not available.

As further discussed in section 4.4, additional dredging would be associated with the construction of the proposed wetland mitigation site. Gulf LNG would require dredging to allow barges to access the marsh creation area. To protect the wetland mitigation site from erosion of the fill material and wave activity, Gulf LNG would install about 19,000 cy of riprap along the seaward limits of the site. During construction, a temporary channel would be dredged from the South Supply Dock along the outer perimeter of the proposed wetland mitigation site. Barges would use the temporary channel to install the perimeter riprap. The sediment removed for creation of the channel would be temporarily placed within the proposed wetland mitigation site. All of the dredge material would be replaced in the temporary channel or contained within the marsh creation area, so no off-site disposal would be necessary.

Because the sediments within the area are anticipated to consist primarily of fine particles, dredging would result in temporary and local suspension of sediments and minor increased turbidity levels that would be limited to the period of dredging and a short time after dredging ceases. Increases in suspended sediments and turbidity from dredging may have adverse effects on marine animals and plants by reducing light penetration into the water column and by physical disturbance (see section 4.6.2.1 for a discussion of impacts of turbidity on marine species). The total area to be dredged (18.4 acres) is relatively small, particularly in comparison to the maintenance dredging of the nearby Bayou Casotte Navigation Channel (>129 acres [COE, 2014]). The dredging would be completed in a short period of time (about 7 to 21 days for each dock). Maintenance dredging would be substantially shorter in duration than the initial dredging. According to Gulf LNG's *Dredging and Disposal Plan* turbidity curtains would be installed and maintained around the area being excavated to limit the transport of turbid water beyond the vicinity of the dredging operations. Although dredging would result in increased turbidity, the increase would be relatively small and localized. Commercial shipping operations, bottom fishing, or severe storms often generate as much increased suspended sediments as dredging activities; therefore, it is often challenging to distinguish the environmental effects of dredging from normal navigation activities or natural processes such as storms, floods, and large tides (Pennekamp et al., 1996). According to Gulf LNG, it would monitor turbidity, as required by the COE certification, suspending operations if unusual conditions occur and/or during severe weather.

Dredging could release contaminants contained in sediments into the water column, such as heavy metals, oil, PCBs, and pesticides, making them available to be taken up by animals and plants (McNair, 1994). Waterbodies known to have contaminated sediments are listed on their respective state's CWA 303(d) List of Impaired Waters. Mississippi Sound is not on the 303(d) list for Mississippi. As discussed in section 4.2.7, Gulf LNG conducted sediment sampling of the North Supply Dock, the South Supply Dock, and the BCDMMS in March 2015. Results of the analytical and toxicity testing conducted by Gulf LNG confirmed that sediment from nine of the BCDMMS sample locations and all of the North and South Supply Dock sample locations can be used for beneficial use. One sampling location within the BCDMMS, station 10, had slightly elevated contaminant levels of arsenic and cadmium. Gulf LNG proposes to blend these sediments with the other sediments removed from the BCDMMS. See section 4.2 for additional information regarding blended sediments.

Gulf LNG would minimize impacts from dredging by adhering to the mitigation measures provided its revised *Dredging and Disposal Plan*.[1] Gulf LNG is working with the COE to finalize its *Dredging and Disposal Plan*. As stated previously, no contamination has been identified in the sediments in the Project area. As a result, we conclude that the impacts of construction of the supply docks on water quality would be minor and temporary and turbidity would return to pre-dredging levels soon after construction is completed.

<u>Marine Traffic and Ballast Water Management</u>

As part of the original EIS for the existing Terminal, potential impacts related to Terminal operations, including the use of LNG carriers (including traffic, transit, and ballast discharges, and LNG spills) were assessed (FERC, 2006). Gulf LNG is not proposing to change the frequency of LNG carriers analyzed in the EIS for the existing Terminal; however, Gulf LNG is proposing to increase the size of the LNG carriers that could call upon the existing Terminal. Impacts associated with LNG carriers generally are not expected to change. Unless there is the potential for an impact to increase, it is not addressed in this EIS. We note that ballast water management would be modified and that ballast water management requirements have changed since those reviews were conducted. During construction, barges and other vessels delivering materials to the Terminal Expansion may use ballast pumps to maintain the barge level during loading and unloading. Future LNG export would require that LNG carriers discharge ballast

[1] See Attachment No. 3 of accession number 20180829-5060.

water while loading LNG instead of taking in ballast during LNG offloading. The discharge of ballast water into Mississippi Sound could affect water quality by changing the salinity, pH, temperature, and dissolved oxygen level. Discharge volumes would range between about 9.7 million gallons and 23.0 million gallons, depending on the size of the vessel. The ballast water discharges would typically occur over a non-continuous period of about 30 hours at a rate of about 29 cubic feet per second (cfs). The composition of ballast water would vary as compared to the water in Mississippi Sound depending on its origin and the conditions in Mississippi Sound at the time of discharge. However, it is expected that open ocean ballast water would have a salinity between 33 and 37 parts per thousand, which is similar to the salinity in Mississippi Sound. The pH of ballast water would be indicative of seawater, and would therefore be similar to the pH in Mississippi Sound, which receives tidal flow from the Gulf of Mexico. Ballast water is stored in the ship's hull below the waterline; as a result, discharged water temperatures are not expected to deviate markedly from ambient water temperatures. Dissolved oxygen is dependent on many factors, including water temperature, water depth, phytoplankton, wind, and current. Water that is collected within the ballast tanks of a ship would lack many of these important influences and could suppress dissolved oxygen levels. Ballast water is expected to be anoxic (i.e., lacking all oxygen), but could contain dissolved oxygen levels; if so, levels would be lower than the surface water of Mississippi Sound. The discharged ballast water would be expected to mix with the surrounding water column relatively quickly given the proximity of the marine berth to the mouth of the Pascagoula River, which has an average outflow of about 14,746 cfs, and its exposure to outflow from Bayou Casotte and wind and tidal driven currents of the Mississippi Sound (COE, 2014). Furthermore, estuarine species common to coastal Mississippi are generally tolerant of fluctuating environmental conditions (Elliott and Quintino, 2007). Overall impacts on salinity, pH, temperature, and dissolved oxygen levels from ballast water discharges would be negligible. Because vessels would be required to comply with U.S. laws and regulations governing ballast water discharges, we conclude that impacts on surface water quality resulting from ballast water discharge would be minor.

Based on current requirements, LNG captains would comply with revised ballast water requirements, found in 33 CFR 151 (Vessels Carrying Oil, Noxious Liquid Substances, Garbage, Municipal or Commercial Waste and Ballast Water), 46 CFR 162.060 (Ballast Water Management Systems), and the USCG's Navigation and Vessel Inspection Circular 07-04. Effective December 19, 2013, the EPA promulgated an NPDES Vessel General Permit that sets numeric limits for ballast water discharges from certain large commercial vessels and includes maximum discharge limitations for biocides and residues. Additional information about impacts of Project-related ballast water on aquatic resources is provided in section 4.6.2.

Barges and support vessels would deliver large equipment and construction materials to the supply docks, which would increase ship traffic in Mississippi Sound and the navigation channel. Barge and support vessel traffic may result in some suspension of bottom sediments and temporarily increase turbidity. The increase in turbidity could result in localized, minor, and temporary decreases in dissolved oxygen (URS, 1997).

Similarly, propeller action from boats used during Project construction could temporarily suspend and re-suspend material that has entered the waterbody as a result of shoreline erosion. While commercial vessels would mobilize greater amounts of sediment than recreational vessels, the depth of sediment mobilized per passage would be negligible (less than 2 millimeter depth per passage) (AMOG, 2010). This could lead to localized increases in turbidity in the Mississippi Sound; however, these minor impacts would be limited to the duration of in-water construction activities. The turbidity caused by vessels would be intermittent and the times for settlement are relatively short (AMOG, 2010).

Some barges and support vessels would take in cooling water for vessel boilers while in transit and would discharge the cooling water after use. The cooling water would be circulated in a closed system, withdrawing water from and returning to the surrounding seawater at the berthing dock;

chemicals would not be added to the cooling water. Discharge of the cooling water would potentially result in highly localized and temporary increases in water temperature in Mississippi Sound and the navigation channel. However, based on an analysis of larger marine vessels conducted for a similar project, the temperature change would be insignificant (generally would dissipate to a change of temperature of 1 °C or less warmer than ambient conditions 15 to 30 meters from the discharge source) given the total volume of water within the discharge area (FERC, 2009).

Because vessels would be required to comply with U.S. laws and regulations governing ballast water discharges and turbidity from vessels would be intermittent and short-term, we conclude that impacts on surface water quality resulting from ballast water discharge and vessel traffic would not be significant.

Hydrostatic Testing

Water needed for other construction-related activities, such as drinking, sanitation, dust control, fill material soil stabilization, concrete mixing, would be obtained from the existing Terminal's connection to the Port of Pascagoula's industrial water supply (see table 4.3-3). Gulf LNG would require about 1,640,000 gallons for hydrostatic testing of storage tanks (e.g., the refrigerant and NGL tanks) and about 1,970,000 gallons for testing of piping for the Terminal Expansion. Gulf LNG would use a reverse osmosis system to further treat the water from the JCPA. During operation of the Project, the estimated average water usage for full load operation is 173,520 gallons per day and would be obtained from the Port of Pascagoula's industrial water supply. Correspondence from the JCPA states it has the supply and permit authority to meet the Project's industrial (operational) water requirements.

TABLE 4.3-3

Water Requirements for Construction of the Project

Description of Use		Approximate Volumes (total gallons)	Water Source
Hydrostatic testing	Leak Testing of Storage Tanks	1,440,000	Port of Pascagoula Industrial Water Supply
	Pressure/Leak Testing of Piping	1,970,000	
	Subtotal	***3,410,000***	
Human Use a/	Human consumption, utilities, and demineralization	47,845,000	Port of Pascagoula Industrial Water Supply
	Subtotal	***47,845,000***	
Other	Dust Control	27,000,000	Port of Pascagoula Industrial Water Supply
	Concrete b/	6,593,800	Port of Pascagoula Industrial Water Supply
	Fill Material c/	26,874,925 d/	
	Subtotal	***60,468,725***	
TOTAL		**111,723,725**	

a Refers to water required for drinking (2.5 gal/day), facilities (12.5 gal/man-day), and sinks (3 gal/man-day) plus a 3 gal/man-day allocation for waste.
b Refers to concrete required for two LNG trains and common utilities area.
c Refers to water required for fill material soil stabilization needed to raise grade and construct the earthen berm.
d Volume provided is an estimated value. Specific soil stabilization requirements and the associated water demands would be determined during final detailed design.

Hydrostatic test water would be discharged into the Mississippi Sound in accordance with its Gulf LNG Procedures and MDEQ NPDES discharge permit MSG13. Gulf LNG does not anticipate any treatment of hydrostatic test water prior to discharge. We conclude that hydrostatic testing of the Terminal Expansion would not result in a significant impact on surface water.

Dewatering Activities

Dewatering activities may be required during construction of the Project. As previously discussed, Gulf LNG would use vegetation, as available, to function as a filter medium, discharging directly to the vegetated land surface to control erosion. If adequate vegetation is absent in the vicinity of waterbodies or wetlands during construction, water would be filtered through filter bags or straw bale structures prior to release. Minor changes to the water table may occur from dewatering activities; however, impacts would be temporary and localized.

Erosion and Stormwater Runoff

Asphalt- and concrete-covered surfaces are considered to be impervious surfaces through which water cannot drain. Vegetation-covered areas and gravel-covered surfaces are considered to be pervious (porous) surfaces through which water can pass. The less pervious surface there is in an area, the farther stormwater has to travel in order to either soak into the ground or to flow directly into a waterbody. Construction of the Terminal Expansion would permanently reduce the amount of pervious surface, thereby increasing the potential frequency and volume of stormwater runoff into the Mississippi Sound. Stormwater runoff from Terminal Expansion would be integrated into the existing Terminal's stormwater runoff system. This discharge would be in accordance with the requirements of Gulf LNG's *SPCC Plan*, *Gulf LNG Plan,* and *Gulf LNG Procedures* to minimize impacts. In addition, Gulf LNG would obtain a Mississippi Storm Water Construction General Permit for the Project. Gulf LNG would also adhere to the measures in its *Stormwater Pollution Prevention Plan* (SWPPP); the current version is provided in appendix I and would be updated as part of its *Implementation Plan*. The SWPPP describes the BMPs to be followed to minimize wash-off of sediment throughout construction.

During operation, stormwater runoff from the Terminal Expansion area would be integrated into the existing Terminal's stormwater runoff outfall (Outfall 002). Two new stormwater outfalls (Outfall 003 and 004) are planned for the Terminal Expansion; these outfalls would drain in proximity to the existing stormwater outfall (Outfall 002) in the LNG carrier berthing area. The existing facility's stormwater collection system would remain intact. Runoff from the existing Terminal is currently routed to an existing sump located at the western edge of the LNG storage tank area. From the sump, the stormwater is pumped over the storm surge protection system and discharged into Mississippi Sound. The sump is fitted with a low temperature sensor to stop the pump in the event of an LNG release, thereby preventing the discharge of LNG. With implementation of these measures and Gulf LNG's design of the Project, we conclude that erosion and runoff from construction and operation would be minimized and would not be significant.

Inadvertent Spills

In areas where surface contamination could occur due to potential leaks or spills from construction equipment, Gulf LNG would grade the area so that stormwater runoff would only drain to oily-water sumps. The oily-water sumps would then flow to oil-water separators where oil would be removed from the stormwater runoff. The stormwater would then flow to one of two main transfer sumps prior to being pumped outside of the facility.

Stormwater collected in the main stormwater sumps would be released after visual inspection for the presence of floating and suspended materials, oil and grease, discoloration, turbidity, odor, or foam. If visual inspection indicates that stormwater in the sumps is not suitable for discharge, Gulf LNG would collect the stormwater and dispose it in accordance with regulatory requirements. If there is no visual sheen, no floating solids, or foam other than trace amounts, and if the pH is between 6.0 and 9.0, the stormwater would be discharge into Mississippi Sound through the outfall structures. A pH meter in the west sump automatically tests the stormwater's pH and does not allow the discharge pump to engage if the pH is less than 6.0 or more than 9.0. In addition, the sump is fitted with a low temperature sensor to stop the pump in the event of an LNG release.

To minimize the potential for a release of hazardous materials and to avoid or minimize the impacts of a release if one were to occur, Gulf LNG would adhere to the measures outlined in its *Gulf LNG Plan, Gulf LNG Procedures,* and its *SPCC Plan* during construction and operation of the Terminal Expansion. With implementation of the measures discussed above, impacts on surface water resources from spills at the Terminal Expansion would be minimized to the extent practicable and would not be significant.

<u>Construction Support Areas</u>

Gulf LNG would not disturb or cross any waterbodies at the proposed CSAs. Portions of the CSAs are currently graveled and have been or are in use as industrial sites. Gulf LNG would permanently clear wetland vegetation, including Chinese tallow tree, Chinese privet, cogon grass, and false willow, from CSA-5. The increase of impervious surface at CSA-5 may increase stormwater runoff. However, we have determined that Gulf LNG has not adequately justified permanently filling the wetlands at CSA-5. Therefore, in section 4.4 we are recommending that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the FERC Procedures. In addition, to avoid or minimize impacts on water quality at the CSAs, Gulf LNG would comply with the requirements of *Gulf LNG Plan* and *Gulf LNG Procedures*. As a result, construction and use of the CSAs would not result in a significant impact on surface waters.

Pipeline Modifications

<u>Hydrostatic Testing</u>

Hydrostatic test water would be required to test new piping at the Destin Meter Station and the Gulfstream Meter Station. Hydrostatic test water would be delivered via truck from the Port of Pascagoula industrial water supply to the Destin and Gulfstream Meter Stations. Gulf LNG estimates that the Destin Meter Station would require 57,450 gallons of hydrostatic test water and the Gulfstream Meter Station would require 44,060 gallons. According to Gulf LNG, no biocides would be added to the test water, which would be withdrawn and discharged in July 2020. Gulf LNG would discharge hydrostatic test water onto vegetated lands (where available) to control erosion and runoff. If adequate vegetation is absent during construction, water would be filtered through filter bags or straw bale lined dewatering structures.

Any hydrostatic testing needed for the Transco/FGT Interconnection would be completed by Transco and would be reviewed by the FERC under its blanket certificate process.

We conclude that hydrostatic testing of the Pipeline Modifications would be temporary and would not result in a significant impact on surface water.

<u>Inadvertent Spills</u>

To avoid or minimize the potential impacts of inadvertent spills from refueling of vehicles and storage of fuel, oil, or other hazardous materials near surface waters, Gulf LNG would implement the measures provided in its *SPCC Plan*. These measures include restricting refueling and storage of potentially hazardous materials to upland areas at least 100 feet from waterbodies, where practicable, and provisions to handle stormwater that may carry spilled materials. If a spill were to occur, immediate downstream users of the water could experience degradation in water quality, and acute and chronic toxic effects on aquatic organisms could occur. However, Gulf LNG would not store large volumes of fuel, oil, or other hazardous materials at the Pipeline Modification sites; and we conclude that it is not likely that significant long-term impacts would result if a spill were to reach a waterbody.

Impact Summary

As a result of proposed activities and implementation of the measures discussed above, we conclude that impacts on surface waters due to construction and operation of the Project would be minimized to the extent practicable and that significant impacts on surface waters would not occur.

4.4 WETLANDS

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (EPA, 2012b). Wetlands can be a source of substantial biodiversity and serve a variety of functions that include providing wildlife habitat, recreational opportunities, flood control, and naturally improving water quality.

Section 404 of the CWA establishes standards to evaluate and reduce total and net impacts on wetlands under the regulatory jurisdiction of the COE. These standards require avoidance of wetlands where possible and minimization of disturbance where impacts are unavoidable, to the degree practicable. Gulf LNG must also demonstrate that it has taken appropriate and practicable steps to minimize wetland impacts in compliance with the COE's Section 404(b)(1) guidelines that restrict discharges of dredged or fill material where less environmentally damaging alternatives exist. The COE Mobile District has authority under Section 404 of the CWA to review and issue permits for Project-related activities that would result in the discharge of dredged or fill material into waters of the United States, including wetlands.

Section 401 of the CWA requires that proposed dredge and fill activities under Section 404 be reviewed and certified by the COE or its designated state agency (in this instance, the MDEQ) to ensure that the Project would meet state water quality standards for discharges into waters of the United States.

All Project facilities would be entirely within the Mississippi Coastal Zone. The MDMR permits wetland activities in the Mississippi Coastal Zone and provides guidance on mitigation requirements for unavoidable losses of coastal wetland function and value due to permitted activities.

The Project proposes activities in wetlands and the erection of structures for water dependent industries in Jackson County, both of which require permits. Gulf LNG filed their Joint application for permits administered through the MDMR, the MDEQ (Office of Pipeline Construction), and the COE on July 10, 2015. The Joint Permit Application is first filed with the MDMR and is then forwarded by the MDMR to the COE Mobile District and to the MDEQ. The permits would cover the Section 404 and Section 10 permits, Section 401 Water Quality Certificate, and the CZMA consistency determination. Gulf LNG would be required to comply with the CWA and CZMA conditions of the permits issued by the COE, the MDEQ, and the MDMR, including the provisions of required compensatory wetland mitigation. In email correspondence dated October 16, 2015, the Mississippi Secretary of State requested that Gulf LNG's Section 401 permit, if granted, include the MDMR's standard condition requiring the permittee to obtain a Tidelands Lease from the Mississippi Secretary of State. Finalization of the lease would be required prior to commencing construction of the Project (see also table 1.5-1).

4.4.1 Existing Environment

Gulf LNG reviewed available NWI maps and soil surveys and conducted wetland field surveys within the Project footprint in June of 2014 through March of 2015. Wetland field surveys were conducted at the Terminal Expansion site, Pipeline Modification sites, and the CSAs. Wetland boundaries were delineated in accordance with the COE's *Wetland Delineation Manual* requirements (Environmental Laboratory, 1987) and the COE's *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region* (COE, 2010).

Wetlands identified at the Terminal Expansion and the CSA sites were classified into the following types according to Cowardin et al. (1979):

- estuarine emergent (EEM) wetlands;
- palustrine (freshwater) emergent (PEM) wetlands; and
- palustrine forested (PFO) wetlands.

Table 4.4-1 lists the Cowardin classification for wetlands occurring within the Project area and includes a description of each.

TABLE 4.4-1

Classifications of Wetlands in the Gulf LNG Liquefaction Project Area

Estuarine Emergent Wetland (EEM)	Wetlands adjacent to the subtidal area that are exposed and flooded by tides periodically; includes wetlands not normally flooded associated with the splash zone
Palustrine (freshwater) Emergent Marsh (PEM)	Vegetation standing in up to 3 feet of water; dominated by erect, rooted herbaceous freshwater hydrophytic vegetation
Palustrine Forested (PFO)	Areas dominated by woody vegetation at least 20 feet (6 meters) tall

Source: Cowardin et al., 1979

Using the criteria above, Gulf LNG would impact wetlands at the Terminal Expansion site and the CSAs. No wetlands were observed during surveys of the Pipeline Modification sites; therefore, these sites are not discussed further in this section.

4.4.2 Wetland Impacts and Mitigation

4.4.2.1 Terminal Expansion

Construction and operation of the Terminal Expansion would permanently impact 27.8 acres of EEM wetlands and 3.3 acres of PEM wetlands as a result of construction of the Terminal Expansion including impacts on wetlands within the flare exclusion zone. Table 4.4-2 lists temporary and permanent impacts on wetlands that would occur during construction and operation of the Project (see figure 4.4-1[2]). The COE requested that the emergent wetland system be addressed as a whole for the purposes of mitigation analysis (this means that PEM and EEM wetland acreages were combined in calculations

[2] Figure 4.4-1 depicts the NWI dataset within the Project area. Wetlands in the Project area may have changed since the NWI dataset was created. The wetland categories discussed in this EIS are based on actual field surveys.

because of similar environmental functions). Using a hydrogeomorphic approach helps the COE to assess a wetland's function over a range of different habitat types (Brinson, 1993; Smith, 1995). Gulf LNG would mitigate all of the wetland impacts (31.1 acres) associated with construction and operation of the Terminal Expansion and related facilities through on-site, in-kind compensatory mitigation with the creation of a 50-acre estuarine emergent marsh located south of the existing Terminal on the Mississippi Sound (see section 4.4.3).

TABLE 4.4-2

Wetlands Affected by the Project

	Wetland Areas Affected (Acres)							
	EEM		**PEM a/**		**PFO**		**Total**	
Project Component	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**
Terminal Expansion	24.7 b/	24.7 c/	3.3	3.3	0.0	0.0	28.0	28.0
Flare Exclusion Zone	0.0	3.1 d/	0.0	0.0	0.0	0.0	0.0	3.1
CSA-5	0.0	0.0	1.3	1.3	6.3	6.3	7.6	7.6
Total e/	**24.7**	**27.8**	**4.6**	**4.6**	**6.3**	**6.3**	**35.6**	**38.7**

a The COE requested that the emergent wetland system be addressed as a whole for the purposes of mitigation analysis (this means that PEM and EEM wetland acreages were combined in calculations because of similar environmental functions). However, they are separated in this table.

b Consists of the Terminal Expansion site (which includes all access roads), the North and South Supply Docks, and the North and South Heavy Haul Roads.

c Includes 0.8 acre of EEM wetlands at the Terminal construction staging area (see figure 2.0-1) that would be restored following construction but is considered permanent for mitigation purposes.

d The 3.1 acres associated with this portion of the flare exclusion zone are related to impacts on wetland vegetation located outside the Project footprint in the adjacent COE-created mitigation wetland. The area of the flare exclusion zone located within the Project boundary is included in the Terminal Expansion acreage. Radiant heat from periodic flare events may impact the wetland vegetation surrounding the flare tower. These events would be associated with maintenance, startup/shutdown, and upset conditions at the Terminal Expansion.

e Only Project facilities that would impact wetlands are represented in the table.

Gulf LNG would convert 28.0 of the 31.1 acres of permanently impacted wetlands at the Terminal Expansion site to industrial use. An additional 3.1 acres of adjacent COE-created mitigation wetland are in the flare exclusion zone outside of the Terminal Expansion boundary (see figure 2.0-1). Potential impacts associated with episodic flaring of a 430-foot-tall flare stack on ground-level vegetation are unknown; therefore, we are employing a conservative approach of considering impacts on vegetation within the flare exclusion zone (including the portion outside the Terminal Expansion site) as permanent impacts and would require compensatory mitigation.

Included in the Terminal Expansion acreage (24.7 acres), construction would impact 0.8 acre of EEM wetlands at an area adjacent to the South Supply Dock that would be used as a Terminal Expansion construction staging area. This construction staging area would be restored to as close to its original condition as possible following the removal of the South Supply Dock. However, due to uncertainty regarding successful restoration and for mitigation purposes, these impacts would be conservatively considered permanent.

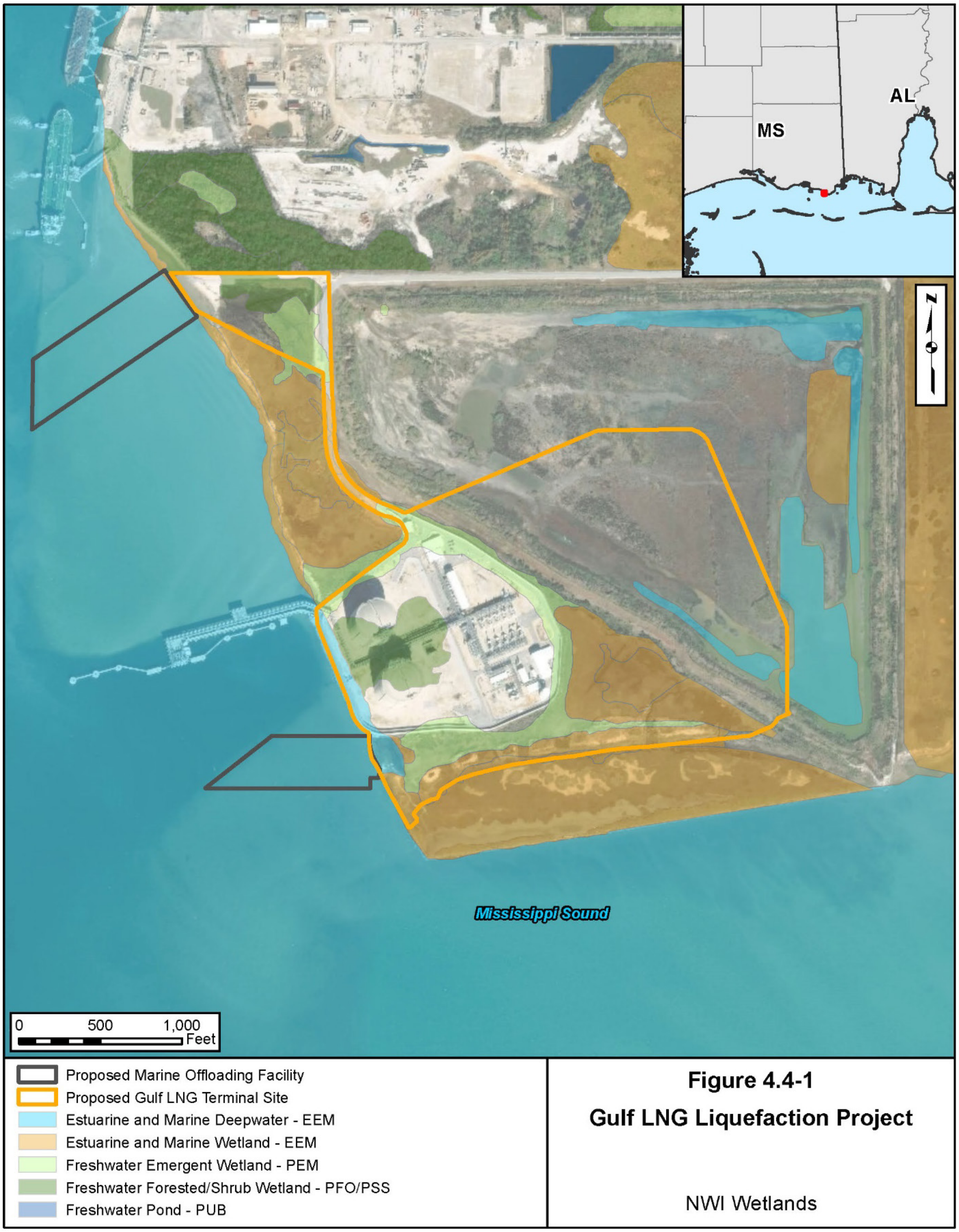


Figure 4.4-1

Gulf LNG Liquefaction Project

NWI Wetlands

Of the total wetland area affected by construction of the Terminal Expansion, 5.5 and 3.5 acres would be within the existing North and South Marsh Mitigation Areas respectively. These mitigation areas were created to offset wetland impacts associated with construction of the existing Terminal (see figure 4.4-2). Of the 6.0 acres created at the North Marsh Mitigation Area for the existing Terminal, 5.5 acres would be filled for use as a construction staging area, administration building, and a parking lot (see figure 4.4-2). All of the 3.5 acres created at the South Marsh Mitigation Area, as well as an additional 22.1 acres of wetlands in the South Marsh (25.6 acres total), would be impacted by the construction of the liquefaction facility, South Supply Dock, and the flare tower.

Affected wetland vegetation would include smooth cordgrass, saltmeadow cordgrass, alkali bulrush, saltwort, saltgrass, southern cattail, black needlerush, marsh elder, eastern false-willow, and common cane. A large number of non-native plant species were observed in the marsh habitats and adjacent upland areas, including cogongrass and Chinese tallow, which are listed on Mississippi's Noxious Weed List (MDAC, 2014). The prevalence of invasive plants and the industrial nature of the area in the vicinity of the Project are indicative of disturbed uplands and wetlands. Exotic and invasive vegetation species are discussed further in section 4.5.

Permanent wetland impacts would be mitigated through the COE compensatory wetland mitigation process. Compensatory wetland mitigation for the Terminal Expansion is discussed in section 4.4.3.

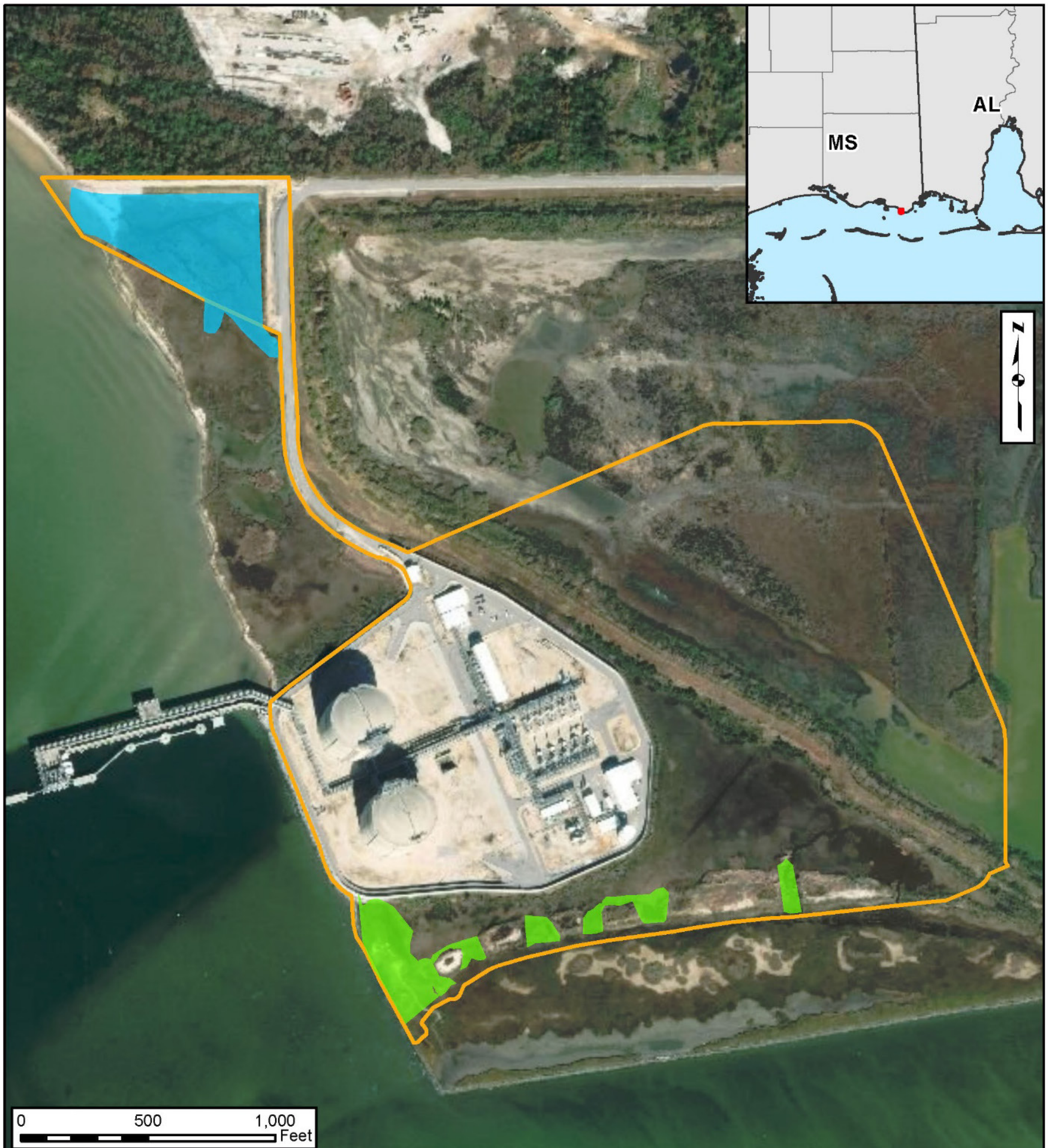
4.4.2.2 Construction Support Areas

Gulf LNG identified a 0.4-acre tidal marsh at CSA-3 and 7.6 acres of fragmented freshwater wetlands within CSA-5. The EEM wetland identified at CSA-3 would not be impacted by the Project; only upland areas would be used at that site. The wetland would be protected through the use of appropriate best management practices (BMP) as described in *Gulf LNG Procedures* (see section 4.4.2.3).

CSA-5 is approximately 35.0 acres in total and was partially developed (western half) for use as an equipment storage yard during construction of the existing Terminal. Gulf LNG would require more land at the site than was previously developed and would impact the 7.6 acres of wetlands (6.3 acres of PFO and 1.3 acres of PEM) present on the site. The wetlands at CSA-5 are disturbed due to their proximity to fill materials and as evidenced by a prevalence of invasive vegetation species and those indicative of disturbed site conditions, such as Chinese tallow tree, Chinese privet, cogongrass, and false-willow. However, Sections VI.C.2 and VI.C.5 of the Commission's *Procedures* state Gulf LNG must restore pre-construction wetland contours, maintain original wetland hydrology, and develop a project-specific wetland restoration plan which includes measures for re-establishing wetlands. Based on Gulf LNG's proposed permanent filling of CSA-5 for construction only and our experience with natural gas facility construction, we have determined that Gulf LNG has not adequately justified permanently filling the wetlands at CSA-5. Therefore, **we recommend that:**

- **<u>Prior to the end of the draft EIS comment period</u>, Gulf LNG should file with the Secretary a commitment to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with Sections VI.C2 and VI.C.5 of the Commission's *Wetland and Waterbody Construction and Mitigation Procedures*.**

No wetlands were observed during surveys of CSA-1, CSA-2, CSA-4, or CSA-6.



Proposed Gulf LNG Terminal Site

North Marsh Mitigation Area

South Marsh Mitigation Area

*The North and South Marsh Mitigation Areas were created as mitigation for wetland impacts due to construction of the existing Terminal.

Figure 4.4-2

Gulf LNG Liquefaction Project

Existing Wetland Mitigation Areas

4.4.2.3 Project-wide Impacts

The Project would permanently affect 38.7 acres of wetlands (see table 4.4-2). Of these impacts, 27.8 acres would occur in EEM wetlands, 6.3 acres would occur in PFO wetlands, and 4.6 acres would occur in PEM wetlands. The majority of wetland impacts, 31.1 acres, would be due to the Terminal Expansion and flare exclusion zone and would involve permanent conversion to industrial-use land in order to provide a safe and stable working surface during facility operations, allow addition of necessary infrastructure, or would be impacted during operation of the flare.

The remaining 7.6 acres of wetlands, 6.3 acres of which would be PFO wetlands, would be filled and graded for use as parking, storage, and other related construction activities at CSA-5. Gulf LNG would mitigate the wetland impacts through the purchase of freshwater wetland mitigation credits. However, we have determined that Gulf LNG has not adequately justified permanently filling the wetlands at CSA-5. Therefore, in section 4.4.2.2 we are recommending that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the FERC Procedures.

Gulf LNG would use only the upland portions of CSA-3 for Project activities. Of the 6.0 acres of wetland created at the existing North Marsh Mitigation Area for construction of the existing Terminal, about 0.5 acre would be outside the footprint of the Project and the remaining 5.5 acres would be permanently impacted. Gulf LNG would protect the wetland area in CSA-3 and the 0.5 acre at the existing North Marsh Mitigation Area through the use of exclusion fencing and implementation of the *Gulf LNG Procedures*. Those measures would include clearly marking the wetlands and their buffers with signs and/or highly visible flagging and preventing any sediment from entering wetlands until construction-related ground disturbance is complete. Gulf LNG would also adhere to its *SPCC Plan* to avoid spills or leaks of fuel, lubricants, coolants, or solvents in adjacent wetlands, and in the case that a spill did occur, minimize the impacts to the greatest extent practicable. As a result, there would not be impacts on the wetlands at CSA-3 and the 0.5 acre at the existing North Marsh Mitigation Area.

4.4.3 Compensatory Mitigation

The COE requires that project proponents offset all unavoidable wetland impacts by the creation, restoration, enhancement, or preservation of at least equal amounts of wetlands, depending on the quality of the wetlands affected and the type of wetlands created, restored, enhanced, or preserved (COE, 2017). Direct, long-term effects on wetlands that would occur as part of Project construction and operation would be subject to compensatory mitigation. There are three mechanisms for providing compensatory wetland mitigation: permittee-responsible compensatory mitigation, mitigation banks, and in-lieu fee mitigation.

Gulf LNG consulted with the COE, the MDMR, the MDEQ, the FWS, and the NMFS, as well as non-profit organizations such as The Nature Conservancy and the Conservation Fund, to develop acceptable wetland mitigation for this Project. Gulf LNG initially considered many mitigation alternatives, such as mitigation banks, in-lieu fees, and wetland expansion into Public Trust Tidelands. After the initial assessments of potential mitigation alternatives, Gulf LNG focused its evaluations on screening potential sites for new mitigation. In conjunction with agency and non-profit consultations, Gulf LNG considered the following sites for the compensatory mitigation:

- Gulf LNG Mitigation Site – creation of an on-site, in-kind salt marsh of about 50 acres of estuarine emergent marsh that would expand an existing COE-created wetland mitigation site south of the existing Terminal on Mississippi Sound (see figure 4.4-3). The seaward limits of the proposed site would need to be armored with riprap to prevent erosion of the fill material and protect the created marsh from wave activity. Fill material would be added to an appropriate marsh elevation to support native EEM wetland vegetation (estimated to be 0.8 foot NAVD), and tidal channels would be created to establish a hydrologic connection with Mississippi Sound. This site would provide all required compensatory mitigation;

- Former International Paper Site – creation of an off-site, in-kind salt marsh by filling an existing 80-acre pond and planting native marsh vegetation on the south shore of the Escatawpa River. The pond has contaminated sediments which are currently contained by a sediment cap.[3] Groundwater has likewise been impacted by hydrocarbon contamination. This site would provide all required compensatory mitigation but was not preferred by Gulf LNG or the agencies because of the contamination issues;
- Dutch Bayou/Moss Point Site – restoration of an off-site, in-kind EEM wetland in the Escatawpa watershed through the placement of fill material in 32 acres of open water in order to restore it to its previous EEM wetland status. Riprap would be placed at the site to protect the fill against river erosion. This site would provide all required compensatory mitigation, but was not preferred by Gulf LNG due to construction challenges and a high potential for erosion during storm events;
- Tennessee Gas Pipeline Canal – restoration of an off-site, in-kind salt marsh in Hancock County, Mississippi (two counties from Jackson County, about 50 miles west of the Terminal Expansion site). Access to the site is limited, complicating constructability and the ability to attain and transport additional fill material beyond that which is available from cutting down the sidecast berms from the construction of the original canal. This site would provide all required compensatory mitigation, but due its distance from the Terminal Expansion site and the potential risks of the existing buried pipeline, it was not preferred by Gulf LNG; and
- Conservation Fund (CF) Sites – creation and restoration of an off-site, in-kind salt marsh by filling and planting channelized marsh in the Mississippi Coastal watershed. These non-contiguous properties were restrictive in their restoration capabilities and were not further considered by Gulf LNG for mitigation purposes.

Other agencies and non-profits were consulted, and additional potential mitigation sites were considered, as further described in the *Gulf LNG Liquefaction Project Mitigation Plan Jackson County, Mississippi.*[4] The preferred mitigation option was selected based on quality of the site, potential for ecological uplift, constructability, location relative to the Terminal, and ultimately, agency preference for on-site, in-kind mitigation. For these reasons, the Gulf LNG Wetland Mitigation Site was selected as Gulf LNG's preferred option.

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3 Sediment capping involves covering contaminated sediment, which remains in place, with clean material. Caps are generally constructed of clean sediment, sand, or gravel. A more complex cap can include geotextiles, liners, and other permeable or impermeable materials in multiple layers (EPA, 2017a).

4 See Attachment No. 9 of accession number 20180829-5060.

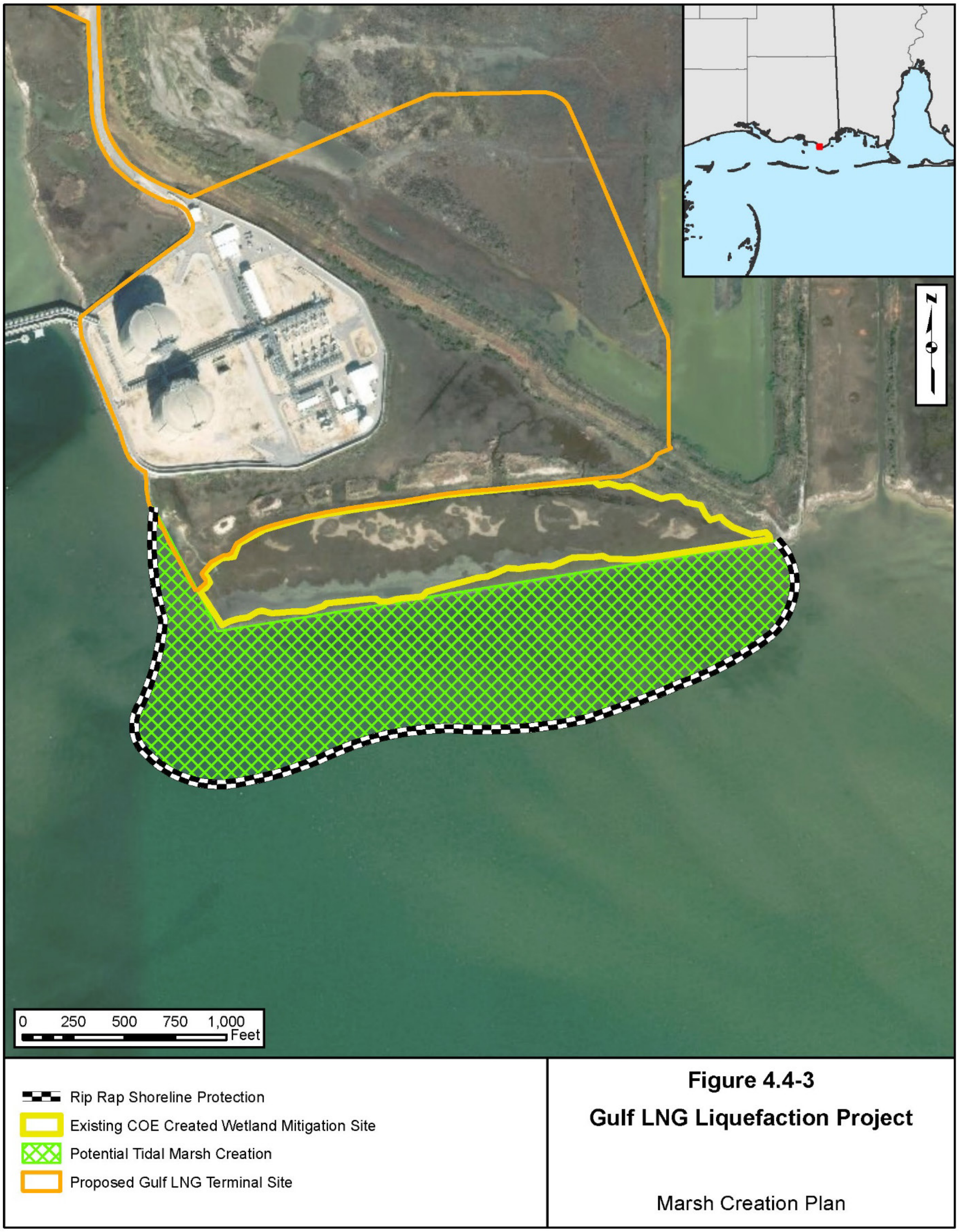

Figure 4.4-3
Gulf LNG Liquefaction Project

Marsh Creation Plan

Gulf LNG's permittee-responsible compensatory mitigation would create and restore a 50-acre tidal marsh wetland habitat. The compensatory mitigation acreage was calculated using a hydrogeomorphic model that took into account both the amount of land involved, as well as what ecological functions the affected wetlands provided. The created wetland habitat would expand the existing COE-created wetland mitigation site into the Mississippi Sound just south of the existing Terminal (see figure 4.4-2). An about 50-acre area would be enclosed, armored with riprap, filled with sediments from the COE Tombigbee Project, and planted with native EEM wetland vegetation, primarily smooth cordgrass and black needlerush. Gulf LNG would plant native species, from nearby EEM wetlands and/or nursery-bought, to achieve a minimum of 4,050 plants per acre. Plants taken from nearby wetlands would be collected at a rate of less than or equal to 1 square foot per 1 square yard of wetland. About 323,000 cy of fill material would be transported from the COE Tombigbee Project into the mitigation area to appropriate marsh elevations suitable for planting and revegetation.

To protect the site from erosion of the fill material and wave activity, about 19,000 cy of riprap would be placed along the seaward limits of the site, set to an estimated height of 2.5 feet above msl to allow for overtopping of the waves. During construction, a temporary barge access channel would be dredged from the South Supply Dock along the outer perimeter of the proposed wetland mitigation site (dredging of about 200,000 cy of material). Barges would use the temporary channel to install the perimeter riprap. The sediment removed for the channel would be temporarily placed within the proposed wetland mitigation site and then replaced in the temporary channel after the riprap is installed. All of the dredge material would be replaced in the temporary channel or contained within the marsh creation area, so off-site disposal would not be necessary. Tidal channels would be created to provide a hydrologic connection and fishery access between the site and the Mississippi Sound.

Appropriate BMPs as documented in *Gulf LNG Procedures*, such as sediment and erosion control and swamp mats, would be used to minimize the temporary impacts and avoid permanent impacts on the existing COE-created wetland mitigation site. Mitigation activities at the wetland mitigation site would provide the necessary acreage of anticipated compensatory mitigation required. The created marsh would be monitored by Gulf LNG in accordance with the COE's hydrogeomorphic (HGM) method for fringing tidal marsh in the northeastern Gulf coast for up to 5 years following Project completion. Monitoring marsh vegetation would consider HGM measures of functional value including: wave energy attenuation, nekton utilization potential, habitat provision for tidal marsh dependent wildlife species, and maintenance of plant community composition and structure. Gulf LNG's regular monitoring of the wetland mitigation site could identify needed corrective actions, including the control of invasive exotic and/or noxious vegetation, which would be physically removed and/or sprayed with habitat-appropriate herbicide by a certified licensed professional. Data collected from the created marsh would be compared to that of a reference marsh and submitted in an annual report to the COE Mobile District.

Gulf LNG would complete mitigation for all jurisdictional wetland impacts from construction and operation of the Terminal Expansion as required by the permits issued by the COE and the MDMR. In accordance with recommendation 10 in support of their Joint Application for the Section 10, Section 404, and Section 401 permits. Since filing the wetland mitigation plan, Gulf LNG has continued coordinating with federal and state agencies, (including the COE, the MDMR, the FERC, the EPA, the Mississippi Secretary of State, the FWS, the NOAA, the NMFS, and the MDEQ) to develop a final compensatory wetland mitigation plan for the Project. Gulf LNG participated in meetings with agencies in September and October of 2015, and again on August 23, 2016, to provide a summary of the proposed mitigation plan, to discuss methods used to assess the quality of existing wetlands at the proposed mitigation site, and to identify and address agency questions and concerns. Gulf LNG would finalize the design details and construction plan during final design. Agency coordination and final design is currently ongoing.

4.4.4 Conclusion

Permanent impacts on 31.1 acres of tidal wetlands associated with construction and operation of the Terminal Expansion and related facilities would be mitigated under the compensatory mitigation stipulations of the Section 404 and Section 10 permits issued by the COE, the MDMR, and the MDEQ. Impacts on 7.6 acres of freshwater wetlands (1.3 acres of PEM and 6.3 acres of PFO) within CSA-5 would be mitigated through the purchase of freshwater wetland mitigation credits, as stipulated in the Section 404 and Section 10 permits. However, we have determined that Gulf LNG has not adequately justified permanently filling the wetlands at CSA-5. Therefore, in section 4.4.2.2 we are recommending that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the FERC Procedures. Further, Gulf LNG would implement the mitigation measures included in its *Gulf LNG Procedures*. Based on implementation of the mitigation measures and our recommendation, discussed above, we conclude impacts on wetlands due to construction and operation of the Project would not be significant.

4.5 VEGETATION

4.5.1 Vegetation Resources

The Project would affect 230.8 acres of land during construction; 94.1 acres of this total affected area is vegetated. Non-vegetated land cover types, such as open water and industrial lands, are discussed in more detail in sections 4.3 and 4.8, respectively. Field surveys of the Project area, conducted in 2014 and 2015, identified five vegetation cover types: EEM wetlands, PEM wetlands, PFO wetlands, forested uplands, and open uplands. Wetlands are described in section 4.4. The majority of the vegetated land that would be affected by the Project include EEM wetlands (24.7 acres), followed by forested uplands (8.5 acres), PFO wetlands (6.3 acres), PEM wetlands (4.6 acres), and open uplands (3.5 acres). Vegetated land also includes 46.4 acres of the BCDMMS, which was not surveyed because of safety concerns associated with the unstable terrain (i.e., deep, unconsolidated sediment with varying water levels). The BCDMMS is actively used as a dredge material disposal site. Regular disturbance at the site precludes the existence of well-established vegetation.

The forested uplands canopy is dominated by live oak, water oak, and Chinese tallow, with an understory of eastern false-willow, wax myrtle, and Hercules' club (BVA, 2014; BVA, 2015). Within the proposed Project area, open upland habitat is adjacent to the South Marsh Mitigation area on mounded dredge spoil. Dominant vegetation includes cogongrass and beach vitex. Of the above-mentioned dominant vegetative species, cogongrass, Chinese tallow, and Chinese privet are identified as exotic, invasive, and/or noxious plant species, further described in section 4.5.3.

Other than wetlands (discussed in section 4.4), no vegetative communities regulated by federal or state agencies were identified in the Project area. Potential habitat for special-status plant species is discussed in section 4.7.

4.5.1.1 Terminal Expansion

The Terminal Expansion would be constructed on about 77.9 acres of vegetated land, which includes 3.5 acres of open upland habitat, 3.3 acres of PEM wetlands, 24.7 acres of EEM wetland, and 46.4 acres of the BCDMMS.[5] There are no vegetative communities within the existing Terminal site; all of the land was previously cleared of vegetation and is classified as industrial-use (see figure 2.0-1). Sparse vegetation at the BCDMMS is low quality and frequently disturbed. The annual placement of 4 to

[5] Numbers are rounded to the nearest tenth of a decimal point. As a result, the totals may not reflect the sum of the addends.

5 feet of dredged material at the BCDMMS followed by dewatering activities to reduce volume has resulted in the degradation of vegetation and wildlife habitat at the site. Dredge disposal activities at the BCDMMS are expected to continue at this rate for more than 50 years (COE, 2014). Therefore, any vegetation that is able to grow in the area between disposal events would be destroyed during the next event. Open water habitat at the supply dock areas do not contain submerged aquatic vegetation (SAV); the nearest SAV beds to the Project are about 3 miles east of the proposed Terminal Expansion site (Grand Bay NERR, 2015).

As evidenced by the presence of invasive/exotic vegetation (cogongrass) along with the visible ground disturbance (spoil mounds), vegetated land within the proposed Terminal Expansion site is generally disturbed. Additional invasive and/or exotic species at the site include Chinese tallow, camphortree, and torpedo grass. The disturbed character of this site is largely due to industrial activity that has occurred within the last 50 years in the surrounding areas and use of the BCDMMS as a dredge material placement area.

Gulf LNG would use sediments from the BCDMMS (304,920 cy) and the COE Tombigbee Project (770,080 cy) to raise the grade of the Terminal Expansion site. Of the 31.5 acres of wetlands and open upland vegetation at the proposed Terminal Expansion site, Gulf LNG would permanently grade and fill 24.7 acres of EEM wetlands, 3.3 acres of PEM wetlands, and 3.5 acres of open upland to provide a stable work surface during Project construction and operations. An additional 3.1 acres of EEM wetlands that are part of an existing COE-created wetland mitigation area south of the Terminal Expansion site would be within the Project's flare exclusion zone. Although these 3.1 acres are outside of the Terminal Expansion site, they would be impacted by periodic flare events, which would be considered permanent impacts for mitigation purposes (see section 4.4.2.1). The remaining 0.8 acre, which includes the South Heavy Haul Road and an area adjacent to the South Supply Dock that would be used as a construction staging area, would be restored to as close to its original condition as possible following the removal of the South Supply Dock. However, due to uncertainty regarding successful restoration and for mitigation purposes, these impacts would also be conservatively considered permanent. Table 4.5.1-1 lists the Project-related construction and operational impacts on vegetation community types for all Project components.

Cutting, clearing, and/or removal of existing vegetation would be the primary cause of impacts on vegetation from construction of the Terminal Expansion. Gulf LNG would mechanically remove all vegetation at the site prior to filling the area to raise the grade of the site. Tree stumps would be removed, as necessary, and the vegetation would be disposed of at an appropriate facility that accepts vegetative waste. Once Gulf LNG removes vegetation and permanently fills the Terminal Expansion with gravel or asphalt, it would apply herbicide, as necessary, to prevent the regrowth of vegetation. Herbicide application would be regulated by the Mississippi Department of Agriculture and Commerce. All impacts on vegetative communities at the Terminal Expansion site would be permanent (or considered permanent for mitigation purposes).

TABLE 4.5.1-1

Acreages of Impacts on Vegetative Community Types Associated with the Project a/, b/

Project Component	EEM Wetland c/		PEM Wetland		PFO Wetland		Forested Upland		Open Upland		BCDMMS		All Vegetative Community Types	
	Cons d/	Oper e/	Cons d/	Oper e/	Cons d/	Oper e/	Cons d/	Oper e/	Cons d/	Oper e/	Cons d/	Oper e/	Cons d/	Oper e/
Terminal Expansion f/	24.7	27.8	3.3	3.3	0.0	0.0	0.0	0.0	3.5	3.5	46.4	46.4	77.9	81.0
Pipeline Modifications	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0
Construction Support Areas	0.0	0.0	1.3	1.3	6.3	6.3	8.5	8.5	0.0	0.0	0.0	0.0	16.1	16.1
Total	**24.7**	**27.8**	**4.6**	**4.6**	**6.3**	**6.3**	**8.5**	**8.5**	**3.6**	**3.5**	**46.4**	**46.4**	**94.1**	**97.1**

a Project-related impacts on unvegetated lands (industrial/commercial and open water) are not included in this table.
b The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.
c Operations acreage includes 3.1 acres of EEM wetlands located outside of the Terminal Expansion site but within the flare exclusion zone as well as 0.8 acre of EEM wetlands at a construction staging area (see figure 2.0-1). Affected wetlands at the construction staging area would be restored to extent practicable, but impacts would be considered permanent for mitigation purposes.
d Cons = impacts from construction.
e Oper = portion of construction impacts that would be permanently maintained following construction.
f Terminal Expansion includes all access roads (including the North and South Heavy Haul Roads) and the North and South Supply Docks.

Additional operational impacts could occur on vegetation within the flare exclusion zone, but outside the Terminal Expansion boundary (see figure 2.0-1). The Terminal Expansion and flare exclusion zone would impact EEM wetlands dominated by smooth cordgrass, saltgrass, and saltwort, as well as PEM wetlands, which contain common cane and southern cattail. The majority of the flare exclusion zone is within the Terminal Expansion boundary and would be permanently converted to industrial-use land. A portion of the flare exclusion zone, 3.1 acres, is adjacent to the Project boundary in an existing COE-created wetland mitigation site. Potential impacts associated with episodic flaring of a 430-foot-tall flare stack on ground-level vegetation are unknown; therefore, we are employing a conservative approach, and are considering impacts on vegetation within the flare exclusion zone (including the portion outside the Terminal Expansion site) as permanent impacts. Section 4.4 provides additional information on wetland impacts.

Construction Support Areas

Vegetative community types present at the CSAs include EEM, PEM, and PFO wetlands as well as upland forest. CSA-1, CSA-2, CSA-4, and CSA-6 are entirely on unvegetated industrial-use land. CSA-3 contains 0.4 acre of EEM wetland and 0.6 acre of upland forest; both habitat types would be avoided during Project construction and operation through the use of appropriate BMPs, including the installation of exclusion fencing and the use of erosion control devices.

Project-related impacts on vegetation at the CSAs would be limited to impacts at CSA-5. All of CSA-5 would be cleared to provide adequate space for construction support activities, resulting in the removal of 1.3 acres of PEM wetlands, 6.3 acres of PFO wetlands, and 8.5 acres of upland forest. The removal of upland forest vegetation at CSA-5 would be a permanent impact that would last throughout the life of the Project. The presence of invasive and exotic forested vegetation (Chinese tallow tree, Chinese privet, false-willow) at CSA-5 is indicative of disturbed sites (this area was previously used for industrial or commercial activities) (see section 4.8.1.1).

Based on Gulf LNG's proposed permanent filling of CSA-5 for construction only and our experience with natural gas facility construction, we have determined that Gulf LNG has not adequately justified permanently filling the wetlands at CSA-5. Therefore, in section 4.4 we are recommending that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the FERC Procedures.

4.5.1.2 Pipeline Modifications

Gulf LNG would modify two existing pipeline facilities to enable bi-directional (north/south) flow capability. Gulf LNG would construct the majority of modifications within the existing fenced and graveled areas. Construction of the Gulfstream Meter Station would require extra workspace within adjacent existing right-of-way that would impact 0.1 acre of open upland. Vegetation within the existing right-of-way consists primarily of bahiagrass, Bermuda grass, and other volunteer vegetation. Gulf LNG would restore the area once construction is completed in accordance with the *Gulf LNG Plan*. Therefore, no permanent impacts on vegetative communities would occur as a result of the Pipeline Modifications.

Transco would also make modifications to the existing and jointly owned Transco/FGT Interconnection to permit bi-directional flow. These modifications would be constructed by Transco and would be reviewed by the FERC under its blanket certificate process.

4.5.2 Mitigation Measures

Gulf LNG would implement erosion control and other mitigation methods to minimize indirect effects on vegetative communities during construction of the Project. Gulf LNG prepared a Project-specific *Gulf LNG Plan* and *Gulf LNG Procedures* which incorporate measures in *FERC's Plan* and *Procedures*. Revegetation of temporarily disturbed areas would depend on the feasibility and effectiveness of restoration and natural factors such as local climate and soil types. Some of the restoration and best management practices identified for implementation by Gulf LNG include the following:

- use of at least one environmental inspector at all times during construction and restoration;
- acquisition of written recommendations from the local soil conservation authorities or land management agencies regarding revegetation specifications;
- installation of temporary and permanent erosion control measures, such as slope breakers, sediment barriers, and mulch;
- commencement of cleanup and restoration, including restoring contours, within 20 days of the completion of construction (weather permitting);
- grading temporarily affected Project areas to their original contours;
- testing and mitigation for soil compaction;
- preparing seedbeds in disturbed areas at a depth of 3 to 4 inches;
- application of herbicides regulated by the Mississippi Department of Agriculture and Commerce;
- prohibiting the use of herbicides within 100 feet of a wetland or waterbody; and

- inspecting all disturbed areas, as necessary (and at least after the first and second growing seasons) to determine revegetation success.

Gulf LNG has proposed compensatory wetland mitigation to offset permanent wetland impacts at the Terminal Expansion. The proposed mitigation wetland would be located offshore and adjacent to the southern portion of the Terminal Expansion site (see section 4.4.3). The 50-acre mitigation wetland would convert approximately 46 acres of open water habitat to EEM wetlands (see section 4.6).

Gulf LNG proposes to purchase credits from a wetland mitigation bank to mitigate for impacts on PFO and PEM wetlands at CSA-5 (see section 4.4.3).

In general, although the majority of the Project-related impacts on vegetation would be permanent, the disturbed nature of the Project area and the proposed mitigation measures, including Gulf LNG's *Compensatory Wetland Mitigation Plan* to create a 50-acre tidal marsh, leads us to conclude that impacts from construction and operation of the Terminal Expansion on vegetation communities would be minimized to the extent practicable and would therefore not be significant.

4.5.3 Exotic or Invasive Plant Communities and Noxious Weeds

Exotic plant communities, invasive species, and noxious weeds can out-compete and displace native plant species, thereby negatively altering the appearance, composition, and habitat value of affected areas. Exotic plant species are plants that were introduced (either intentionally or unintentionally) and subsequently became established in an area other than that from which their species originated. Invasive plant species are a subset of exotic species whose introduction can cause harm to the environment, human health, or economic interests (UG, 2009). A noxious weed is any plant designated by a federal, state, or county government as injurious to public health, agriculture, recreation, wildlife, or property (Sheley et al., 1999). Invasive plants can be noxious weeds, but they also include plants that are not native to this country or the area where they are growing (DOI, 2010). There were 20 exotic, invasive, and/or noxious plant species identified within the Project area during field surveys in 2014; these are listed in table 4.5.3-1.

Regulation of invasive species is conducted at the federal level by the USDA's Natural Resource Conservation Service and at the state level, by the Mississippi Bureau of Plant Industry. Both of the aforementioned agencies publish unique Noxious Weeds Lists. Of the 20 exotic plant species identified within the Project area, two are on Mississippi's Noxious Weed List (cogongrass and Chinese tallow). Cogongrass is also listed on the Federal Noxious Weed List due to its aggressive weedy habit in other countries (Byrd and Bryson, 1999; MDAC, 2014; USDA, 2014).

TABLE 4.5.3-1 **Exotic Plants, Invasive Species, and Noxious Weeds Identified within the Project Area**	
Common Name	**Scientific Name**
Annual bluegrass	*Poa annua*
Annual rabbit's-foot grass	*Polypogon monspeliensis*
Bermuda grass	*Cynodon dactylon*
Black medick	*Medicago lupulina*
Brazilian vervain	*Verbena brasiliensis*
Camphortree	*Cinnamomum camphora*
Chinese privet	*Ligustrum sinense*
Chinese tallow **a/**	*Triadica sebifera*
Cogon grass **a/**, **b/**	*Imperata cylindrica*
Little hogweed	*Portulaca oleracea*
Marsh parsley	*Cyclospermum leptophyllum*
Matted sandmat	*Chamaesyce serpens*
Perennial ryegrass	*Lolium perenne*
Prostrate knotweed	*Polygonum aviculare*
Rough cocklebur	*Xanthium strumarium*
Scarlet pimpernel	*Lysimachia arvensis*
Spiny sow-thistle	*Sonchus asper*
Sweetclover	*Melilotus officinalis*
Torpedo grass	*Panicum repens*
Variable flatsedge	*Cyperus difformis*

Sources: MDAC, 2014; USDA, 2014; USDA, 2015
a Included on the Federal Noxious Weeds List
b Included on the Mississippi Noxious Weeds List

Within the Project area, cogongrass was observed growing on mounded dredge spoil south of the existing Terminal. Cogongrass is native to tropical and subtropical areas of the eastern hemisphere and is common throughout the coastal regions of the southeastern United States, including Mississippi (Brown, 1944; Hubbard, 1944; Byrd and Bryson, 1999). It produces numerous, tall stems that form thick stands. Its dense stems and rooting systems allow it to choke out other nearby vegetation (Bryson and Carter, 1993; Byrd and Bryson, 1999).

Chinese tallow was observed along the northern edges of the existing North Marsh Mitigation Site (see figure 4.4-2). Chinese tallow grows quickly, is drought resistant due to its deep tap root, and produces large quantities of seeds that are spread by water, birds, and mammals. This species can re-sprout quickly from crown and root buds when top growth is mechanically removed. Native species are crowded out once Chinese tallow is established (UF, 2014).

Invasive and/or exotic vegetation can also be introduced to an area by ballast water, and ship hulls, anchors, and chains. To prevent this from occurring, ships using the Terminal would adhere to the guidelines listed in the USCG Office of Operation and Environmental Standards *Mandatory Practices for All Vessels with Ballast Tanks on All Waters of the U.S.* These guidelines were developed to implement the provisions of the *Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990* as amended by the *National Invasive Species Act of 1996*. The guidelines require vessel operators to:

- clean ballast tanks regularly;
- rinse anchors during retrieval to remove organisms and sediments at their place of origin;
- remove fouling organisms from hull, piping, and tanks on a regular basis and dispose of any removed substances in accordance with federal, state, and local regulations;
- maintain a vessel-specific ballast water management plan; and
- train vessel personnel in ballast water management and treatment procedures.

The guidelines also include reporting and record-keeping requirements regarding their implementation. Copies of the reports must be send to the USCG and maintained on the vessel for at least 2 years (COE, 2015).

There is also the potential for a Project-related spread of invasive and/or exotic species during the creation of the tidal marsh as part of the proposed compensatory wetland mitigation. Sediment fill to create the wetland would be excavated from the COE Tombigbee Project. Sediments could contain nuisance vegetation; however, Gulf LNG would monitor the site for the establishment of nuisance vegetation during and after development of the site in a manner consistent with the guidelines and recommendations from the COE, the MDMR, and other applicable regulatory agencies. If needed, Gulf LNG would develop a plan to remove the nuisance species using mechanical or chemical methods. The use of herbicides would be subject to the approval from the Mississippi Department of Agriculture and Commerce.

Gulf LNG would also work with the COE to monitor the overall success of marsh establishment. The marsh's success would be monitored and assessed according to *Gulf LNG's Procedures* and *Gulf LNG's Project Mitigation Plan Jackson County, Mississippi,* which require annual site inspections for five years and a report at the end of those five years documenting the success of revegetation. Should any of the wetlands not be revegetated, Gulf LNG would consult a professional wetland ecologist and implement a remediation plan. In addition, mitigation success and monitoring requirements would be requirements of and stipulated in any COE-approved mitigation plan. If problems with vegetation were observed at the site during monitoring, Gulf LNG would develop a solution and take corrective actions as soon as practicable. Corrective actions could include removal of nuisance vegetation by physical removal or other approved removal methods, replanting dead or dying vegetation, sand replenishment, and improved signage to deter people from disturbing the site.

Based on adherence with the vessel guidelines regarding ballast water and noxious weeds, implementation of *Gulf LNG's Procedures* and *Gulf LNG's Project Mitigation Plan Jackson County, Mississippi* at the proposed wetland mitigation site, we conclude that the potential spread of noxious or invasive weed would be effectively minimized or mitigated.

4.5.4 Vegetation Communities of Special Concern

A population of Carolina grasswort was observed within the Project area at the existing North Mitigation Area. Carolina grasswort is listed as a species of concern in Mississippi, but is not regulated at the federal or state level. The area in which this population is located would be permanently filled for Project operations; therefore, unless it is protected from Project activities, or moved to a different location, this population would be eliminated during the vegetation removal phase of Project construction. On August 27, 2018, the Mississippi Museum of Natural Science (MMNS) recommended the Carolina grasswort populations be transplanted to a location containing similar habitat prior to construction activities. Therefore, in section 4.7 we are recommending Gulf LNG work with MMNS to develop protocol to transplant the Carolina grasswort populations to a location containing similar habitat prior to construction activities. Potential impacts on plants of special concern and their habitats are further discussed in section 4.7.2.

4.6 WILDLIFE AND AQUATIC RESOURCES

4.6.1 General Wildlife Resources

The wildlife habitat types in the Project area are characteristic of the vegetative communities and land use types present and include open uplands, upland forest, EEM wetlands, PEM wetlands, PFO wetlands, the BCDMMS, open water, and industrial/commercial land. We identified wildlife habitat types based on interpretation of aerial photography and Gulf LNG's field reconnaissance that was conducted in 2014 and 2015.

4.6.1.1 Terminal Expansion

Existing Wildlife Habitat

Wildlife habitats at the Terminal Expansion site, which includes the North and South Supply Docks and associated heavy haul roads, consist of EEM wetlands, PEM wetlands, the BCDMMS, open upland, and open water. Aquatic wildlife resources are discussed in section 4.6.2. Federal and state protected species are discussed in section 4.7.

Wetland habitats at the Terminal Expansion site can provide habitat for waterfowl, wading birds, raptors, mammals, reptiles, and amphibians. Typical wildlife associated with these wetland types include muskrat, American mink, raccoon, opossum, several species of heron, great egret, clapper rail, purple gallinule, belted kingfisher, northern harrier, Mississippi diamondback terrapin, American alligator, Gulf salt marsh snake, cottonmouth, American green tree frog, American bullfrog, and southern leopard frog (BVA, 1985; Gulf of Mexico Research Laboratory, 1973). Invasive species, such as nutria, also occur in these wetland types (USDA, 2017). Some of the affected wetlands at the Terminal Expansion site are portions of two existing mitigation areas that were created as part of the mitigation for wetland impacts due to construction of the existing Terminal. The North and South Marsh Mitigation Areas are components of tidal marsh systems (see figure 4.4-2). During the biological surveys conducted by Gulf LNG, several species of exotic and/or invasive vegetative species were observed in marsh habitat within the boundaries of the Terminal Expansion site. Section 4.4 provides a more detailed discussion of affected wetlands, and section 4.5.3 addresses exotic and/or invasive plant species.

Gulf LNG would use about 46 acres of the 135-acre BCDMMS for the Terminal Expansion. Gulf LNG did not perform wildlife and habitat surveys at the BCDMMS due to safety concerns. However, the BCDMMS does not contain any established wildlife habitat due to its use as a dredged material placement site. Therefore, while marginal wildlife habitat may establish itself between disposal events, it would be destroyed during the next sediment deposition event. Typical animal species that could occur on the BCDMMS include rock pigeons, mourning doves, house sparrows, brown rats, mice, raccoons, and opossums.

Open upland consists primarily of mixed species of grasses, forbs, and shrubs. Wildlife associated with these areas includes mammals such as the white-tailed deer, cotton rat, cottontail rabbit, raccoon, opossum, and harvest mouse. Bird species include the northern mockingbird, northern cardinal, brown thrasher, blue jay, song sparrow, Carolina wren, and northern bobwhite. Reptiles and amphibians include several species of tree frogs, the southern toad, southern black racer, gray ratsnake, eastern diamondback rattlesnake, and eastern box turtle.

Open water habitat at the Terminal Expansion site includes nearshore areas as well as deeper, offshore waters that would be crossed by vessels calling on the Terminal. Several species of shorebirds, wading birds, and waterfowl have been observed in and along open water habitat at the Terminal Expansion site, including the American oystercatcher, killdeer, tri-colored heron, snowy egret, greater scaup, and blue-winged teal (BVA, 1985; FERC, 2006).

Much of the habitat at the Terminal Expansion site has been previously disturbed. About 10.6 acres of the Terminal Expansion site would be sited on previously developed industrial/commercial land within the existing Terminal's footprint. The majority of the Terminal Expansion site that is outside the existing Terminal footprint would be within the BCDMMS and was previously disturbed by placement of dredged material. Nearshore and offshore open water habitat associated with the Terminal Expansion is subject to regular disturbance due to anthropogenic activities (e.g., construction activities, shipping, fishing) and severe weather (e.g., hurricanes).

Some species of terrestrial wildlife at the Terminal Expansion site have commercial, recreational, and/or aesthetic value. Hunting, trapping, and bird watching all involve wildlife species found at the site. However, these activities are not typically conducted at the Project site due to low-quality habitat and restricted or prohibited access. Therefore, the Project is not expected to impact these wildlife values.

Wildlife Resources Impacts and Mitigation

Construction and operation of the Terminal Expansion would result in permanent alteration of the wildlife habitat types listed above. Construction of the Terminal Expansion facilities would affect 132.2 acres and operation would affect 129.7 acres. Of the affected acreage, about 81 acres are potential terrestrial wildlife habitat, including 31.1 acres wetlands (including 3.1 acres within the flare exclusion zone), 46.4 acres of the BCDMMS, and 3.5 acres of open upland.[6] Land uses at the Terminal Expansion site are discussed in section 4.8. Gulf LNG would convert 77.9 acres of terrestrial wildlife habitat affected during construction of the Terminal Expansion to industrial land (see table 4.5.1-1).

During construction of the Terminal Expansion, Gulf LNG would clear vegetation and grade and fill the site, including the heavy haul roads, to the design specifications. This would reduce cover, nesting, and foraging habitat for some species and may result in mortality of less mobile forms of wildlife, such as small rodents and reptiles. Other more mobile wildlife, such as birds and larger mammals, would be expected to leave the area as construction activities approach. These animals may relocate into similar habitats nearby; however, if there is a lack of adequate habitat to support the additional animals adjacent to or near the site, they may be forced into suboptimal habitat and/or increased densities, which could lower reproductive success and survival.

Of the 81 acres that would be affected by the Project, 3.1 acres of EEM wetlands would be located outside of the Project boundary but within the flare exclusion zone (see figures 2.0-1 and 4.4-1). Potential impacts on all wetlands within the flare exclusion zone would occur only when flaring occurs, but the impact would be considered permanent for mitigation purposes. As stated in the August 2018 *Gulf LNG Liquefaction Project Mitigation Plan Jackson County, Mississippi*, Gulf LNG proposes on-site, in-kind mitigation of about 50-acres of open water located to the south of the existing Terminal adjacent to Bayou Casotte. The area would be filled using sediment from the COE Tombigbee Project to create tidal marsh wetland, which would mitigate the loss of wetland wildlife habitat. A more detailed discussion of compensatory mitigation for wetland impacts is provided in section 4.4.3.

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[6] Numbers are rounded to the nearest tenth of a decimal point. As a result, the totals may not reflect the sum of the addends.

The 430-foot-high flare tower at the southeast corner of the Terminal Expansion site could pose a hazard to birds (see figure 2.0-1). The primary hazard is the potential for avian collision with the structure, especially at night when the tower would be lighted. To the extent practicable, Gulf LNG would use measures from the *2013 U.S. Fish and Wildlife Revised Voluntary Guidelines for Communication Tower Design, Siting, Construction, Operation, Retrofitting, and Decommissioning* (FWS Communication Tower Guidelines; FWS, 2013) to develop a design that would reduce the likelihood for avian collisions while minimizing potential impacts associated with light pollution. Gulf LNG's design would include the installation of lights that only meet the minimum requirements for obstruction avoidance and pilot warning, and omitting the use of guy wires. There is also the potential for some bird species to use the flare tower as perching and/or nesting sites, which could result in mortality during a flare event. However, the design of typical flare towers is not conducive to nest building, because they lack closely spaced support bracings (such as those present on transmission line towers). In contrast, flare towers have a more open surface with more widely spaced bracings, which makes them less attractive as nesting sites. Further, for some species that are known to nest on tall structures (e.g., bald eagle and brown pelican), the flare towers are significantly taller than their preferred nesting sites, and it is therefore unlikely they would attempt to build nests there. Should it be identified that birds are attempting to nest on the flare tower, Gulf LNG would work with the MDWFP and the FWS to develop appropriate mitigation.

As part of the Terminal Expansion, Gulf LNG would construct and use two supply docks (see figures 2.2-1 and 2.2-2). The North Supply Dock would be a permanent structure used during construction by Gulf LNG and transferred to the Jackson County Port Authority after construction (see section 1.4.3). The South Supply Dock would be a temporary, shallow-draft barge loading area, which would be removed after construction. Both supply docks would require initial dredging to a depth of 12 feet below msl and may require maintenance dredging as often as every 3 years. Open water adjacent to the supply docks would remain as open water, although public use of the water would be prohibited. In addition, there is a large amount of similar open water habitat to the west, south, and east of the Terminal Expansion site to which mobile open water wildlife could relocate. Section 4.6.2 addresses potential impacts on open water aquatic species.

The majority of the habitats at the Terminal Expansion site have been previously disturbed and provide limited productive wildlife habitat. Areas adjacent to the Terminal Expansion site are also largely disturbed with limited wildlife habitat. Some wildlife species may move away from the area during construction due to the increased noise and activity levels. However, due to current industrial activities within and around the Terminal Expansion area, most wildlife species in the area are acclimated to these activities. Therefore, impacts due to operational noise and light, and human activity would not be significant.

Gulf LNG would conduct all construction activities in accordance with the *Gulf LNG Plan* and *Gulf LNG Procedures* to minimize impacts to the extent practicable. In addition, high-quality tidal marsh areas would be created as compensatory mitigation for wetland impacts associated with construction and operation of the Terminal Expansion. The mitigation area would provide habitat for wildlife to offset the habitat lost due to Project construction and operation. Further, Gulf LNG would incorporate the FWS-recommended mitigation methods for the flare tower to minimize the potential collision impacts on birds. Therefore, with adherence to the proposed mitigation measures and given the abundance of suitable habitat in adjacent areas, we conclude that construction and operation of the Terminal Expansion would be adequately minimized on wildlife and these impacts would not be significant.

4.6.1.2 Construction Support Areas

Existing Wildlife Habitat

Gulf LNG would establish six CSAs. Five of the CSAs would be used for parking, staging, contractor yards, and laydown areas. One CSA, CSA-3 (currently used by Gulf LNG), would be used for warehousing and equipment storage only; Project-related activities that involve heavy traffic would not be conducted on this property. All proposed CSAs are in industrial areas that were previously developed and used for similar activities, either entirely or partially. CSA-3 and CSA-5 contain upland forest and wetlands. There are 0.4 acre of EEM wetlands and 0.6 acre of upland forest habitat at CSA-3; however, these areas would be avoided during Project construction and operation. CSA-5 contains 1.3 acres of PEM wetlands, 6.3 acres of PFO wetlands, and 8.5 acres of upland forest. CSA-1, CSA-2, CSA-4, and CSA-6 are entirely on developed, industrial/commercial land. Therefore, impacts on wildlife, if any, would be minimal.

The PEM and PFO wetlands at proposed CSA-5 are at least partially dominated by invasive and exotic vegetation (BVA, 2014; BVA, 2015). Wildlife species that may occur in these wetlands are the same as those described in section 4.6.1.1 for wetland habitats at the Terminal Expansion. PFO wetlands at CSA-5 could also provide habitat for several tree-nesting bird species (e.g., the common yellowthroat, eastern towhee, and swamp sparrow) and other non-avian animals that use trees to meet various life requirements (e.g., the gray squirrel and bobcat). Wetlands at CSA-5 are disturbed and fragmented as a result of irregularly placed fill.

The upland forest at proposed CSA-5 is dominated by slash pine, loblolly pine, and water oak. Invasive species, such as Chinese tallow, Chinese privet, and cogongrass, were observed during field surveys. Reptiles and amphibians that may use these areas include several species of tree frogs and salamanders, the southern toad, black racer, gray ratsnake, eastern diamondback rattlesnake, ground skink, and eastern box turtle. Mammals include white-tailed deer, bobcat, raccoon, opossum, and gray fox. A variety of birds may also use these habitats, including the northern mockingbird, northern cardinal, brown thrasher, and blue jay.

Impacts and Mitigation

The CSA-3 site (which is currently in use by Gulf LNG) would be used ‘as-is’ (i.e., in its existing condition), and no trees would be cleared. Gulf LNG would use BMPs to avoid and protect the wetlands and would incorporate the mitigation methods presented in the *Gulf LNG Procedures*. This would include installation of exclusion fencing and identification of exclusion boundaries using signage to keep construction personnel away from the wetlands. As a result, we conclude wetlands at CSA-3 would not be affected. Because the site is already in use by Gulf LNG as an industrial-use area and no additional upland forested vegetation would be removed for the Project, it is unlikely that impacts on upland forest wildlife would occur. Any wildlife present at the site prior to Project activities would have acclimatized to an industrial setting and would not be significantly impacted by similar activity occurring at the site.

Gulf LNG would remove all vegetation within CSA-5 to permanently convert the site to upland, industrial/commercial land. This would reduce cover, nesting, and foraging habitat for some species and may result in mortality of less mobile forms of wildlife, such as small rodents and reptiles. Other more mobile wildlife, such as birds and larger mammals, would be expected to leave the area during construction. These animals may relocate into similar habitats nearby; however, if there is a lack of adequate habitat to support the additional animals adjacent to or near CSA-5, they may be forced into suboptimal habitat and/or increased densities, which could lower reproductive success and survival. Gulf LNG would mitigate for the loss of PEM and PFO wetlands at CSA-5 by purchasing freshwater wetland mitigation credits (see section 4.4). Therefore, impacts on local wildlife populations during construction of the CSAs would not be significant.

4.6.1.3 Pipeline Modifications

The proposed sites of the Pipeline Modifications are entirely industrial/commercial land. All construction activities would be confined to previously disturbed areas, and the modifications would not result in additional permanent impacts on natural habitat. Construction of the Gulfstream Meter Station would require extra workspace within adjacent existing right-of-way that would impact 0.1 acre of open upland. Gulf LNG would restore the area once construction is completed in accordance with the *Gulf LNG Plan*. Therefore, impacts on wildlife habitat would not occur as a result of construction or operation of the Pipeline Modifications.

4.6.1.4 Unique and Sensitive Wildlife Species

Unique or sensitive wildlife species, such as colonial nesting waterbirds and migratory birds, may be present in the vicinity of the Project. Federally and state-listed threatened and endangered species and other species of concern are discussed in section 4.7.

Migratory Birds and Birds of Conservation Concern

Migratory birds are protected under the MBTA and Executive Order 13186. Bald and golden eagles are also protected under the BGEPA. Bald eagles are further discussed in section 4.7. Executive Order 13186 was enacted, in part, to ensure that environmental analyses of federal actions evaluate the impacts of actions and agency plans on migratory birds. It also states that emphasis should be placed on species of concern, priority habitats, and key risk factors, and it prohibits the take of any migratory bird without authorization from the FWS. The destruction or disturbance of a migratory bird nest that results in the loss of eggs or young is also a violation of the MBTA. Many migratory bird species, including colonial nesting waterbirds, waterfowl, and neotropical songbirds, could be present in the vicinity of the Project.

On March 30, 2011, the FWS and the Commission entered into an MBTA Memorandum of Understanding that focuses on avoiding or minimizing adverse impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration between the two agencies. This voluntary MBTA Memorandum of Understanding does not waive legal requirements under the MBTA, BGEPA, ESA, NGA, or any other statutes, and does not authorize the take of migratory birds.

Migratory birds follow broad routes called “flyways” between summer breeding grounds in Canada and the United States and winter feeding grounds in Central and South America, and the Caribbean. In addition, several species migrate from breeding areas in the north to winter along the Gulf Coast and remain throughout the non-breeding season. Migratory flyways are usually along major rivers, coastlines, and mountain ranges. The Project is proposed in the Mississippi Flyway, which generally follows the Mississippi River (National Wildlife Federation, 2014).

In North America, the Mississippi Flyway terminates at the Gulf of Mexico coastline. Almost half of North America’s bird species spend at least part of their lives along the Mississippi Flyway, making it one of the continent’s most important waterfowl areas (Audubon, 2015). The Gulf Coast provides wintering and migration habitat for significant numbers of continental duck and goose populations that use the Mississippi Flyway. The coastal marshes of Louisiana, Alabama, and Mississippi regularly hold half of the wintering duck population of the Mississippi Flyway (Manlove et al., 2002).

Because much of the vegetation in the vicinity of the Project has been previously disturbed, the area provides marginal habitat for migratory birds. The primary migratory birds using the wetland and open water habitats include many species of waterfowl and water birds such as greater scaup, lesser scaup, gadwall, blue-winged teal, green-winged teal, mallard, American widgeon, northern pintail, American coot, wood duck, mottled duck, hooded merganser, red-breasted merganser, and several species of egrets and herons (Turcotte and Watts, 1999). Migratory bird species that use upland open and forest habitats in the vicinity of the Project include the swallow-tailed kite, wood thrush, black-throated green warbler, and rusty blackbird (FWS, 2008). However, the use of these habitats in the vicinity of the Project by migratory birds is likely limited due to the proximity to and activity associated with the existing Terminal and the BCDMMS.

Direct impacts on migratory birds would primarily occur during construction and would result from clearing, cutting, and removal of existing vegetation at the Terminal Expansion and CSA sites. If Gulf LNG plans to initiate site preparation at the Terminal Expansion site during the migratory bird nesting season, potential impacts could include the removal of nesting habitat and the loss of nests, loss of birds, reduction in productivity, or loss of secondary nesting opportunities. Gulf LNG is working with the FWS to develop a plan to avoid nesting birds, which could include the use of pre-construction nesting surveys, nest removal prior to construction, or a combination of the two. In August 2018, Gulf LNG submitted an updated draft of its *Migratory Bird Impact Assessment and Conservation Plan* (*Migratory Bird Plan*) to the FWS (see appendix J) for additional FWS review and comments. The *Migratory Bird Plan* identifies migratory birds likely to be found in the Project area, discusses potential impacts on these species, and provides impact mitigation strategies such as pre-construction surveys, following FWS measures for construction of the flare tower, and creation of a wetland mitigation site. However, because Gulf LNG is continuing consultations with the FWS, **we recommend that:**

- **<u>Prior to construction</u>, Gulf LNG should file with the Secretary its final *Migratory Bird Impact Assessment and Conservation Plan* developed in consultation with the FWS.**

In response to a 1998 amendment to the *Fish and Wildlife Conservation Act*, the FWS established a list of Birds of Conservation Concern (BCC) that, without conservation action, were expected to become candidate species for listing under the ESA (FWS, 2008). The BCC list includes species of concern at national, the FWS region, and Bird Conservation Region (BCR) geographic scales. The Terminal Expansion is located within BCR 27, also known as the Southeastern Coastal Plain habitat (FWS, 2008). In 2008, the FWS Migratory Bird Management Program provided a complete list of breeding and non-breeding birds present in this region. There are 54 BCC species included on the FWS' BCR 27 list, of which 19 are non-breeding in the BCR (FWS, 2008).

The loss of nesting habitat in forested areas at CSA-5 would be avoided if vegetation clearing at this site was not scheduled to begin until after the nesting of migratory bird and BCC. Should this schedule be delayed to begin clearing of the site during the nesting season, Gulf LNG would conduct pre-construction nesting surveys to identify active nests. If active nests are discovered, Gulf LNG would postpone clearing activities until after the nesting season is complete. We conclude the Project would not significantly impact nesting migratory birds and BCC. Implementation of the *Migratory Bird Impact Assessment and Conservation Plan* and Gulf LNG's proposed nest avoidance at CSA-5 would further minimize potential impacts.

Construction and operation of the 430-foot-high flare tower could cause mortality to migratory bird and BCC due to collisions with the flare tower. Gulf LNG would use measures from the FWS Communication Tower Guidelines (FWS, 2013) to reduce the likelihood for avian collisions. As a result of incorporating these measures, we conclude that potential impacts on migratory birds and BCC due to avian collisions and would be minimized and not significant.

Flaring may be required to dispose of excess gases during Project construction, maintenance, startup/shutdown, and upset activities. During a warm startup, flaring may be required for up to 16 hours. A scheduled shutdown would require a lower level of flaring for several days. It is expected that there would be one shutdown and one startup each year. We conclude that the temporary and occasional flaring during construction and the occasional flaring during operation would not result in a significant impact on migratory birds and BCC passing through the area.

Although construction and operation of the Terminal Expansion would result in the loss of 31.1 acres of wetlands, impacts associated with construction and operation of the Terminal Expansion and related facilities would be mitigated under the compensatory mitigation stipulations of the Section 404 and Section 10 permits issued by the COE, with separate authorizations and approvals by the MDMR, the MDEQ, and the Mississippi Secretary of State (see section 4.4.3). The wetland mitigation site would provide habitat for migratory and BCC waterfowl and wading/water bird species. Although the wetland mitigation site may not provide useful habitat for a few years, we anticipate that Gulf LNG would comply with the stipulations of the Section 404 and Section 10 permits, and the mitigation wetlands would eventually offset the loss of wetland habitat due to construction and operation of the Project. Therefore, impacts on the abundance of migratory and BCC waterfowl and other water birds due to the permanent conversion of these habitats would not be significant.

Managed and Sensitive Wildlife Areas

Federal and state reserves and preserves occur in the vicinity of the Project, including the Grand Bay Savanna Preserve, Grand Bay NERR, Grand Bay National Wildlife Refuge (Grand Bay NWR), and the Gulf Islands National Seashore. The western boundary of the Grand Bay Savanna Preserve abuts the eastern edge of the BCDMMS; the Project footprint is about 700 feet west of the boundary. The Grand Bay NERR and Grand Bay NWR are about 1.5 and 9.0 miles east of the Terminal Expansion site, respectively. The Gulf Islands National Seashore is a chain of islands about 6.5 miles south of the Terminal Expansion site. These special status areas provide habitat for wildlife that is similar to that of the Terminal Expansion site (FERC, 2006). Due to the distances of these special status areas, they would not be directly affected by construction or operation of the Project.

Currently, there is industrial activity at the Chevron refinery adjacent to and north of the Grand Bay Savanna Preserve as well as at the BCDMMS adjacent to and west of the Preserve, and at the existing Terminal. As a result, wildlife within the reserve is likely accustomed to the noise and human activity associated with those sites, and we do not anticipate that wildlife using the habitats of the reserve would be affected by the noise and human activity of the Terminal Expansion. However, some wildlife species may move away from the area during construction due to the increased noise and activity levels. Gulf LNG would implement the *Gulf LNG Plan* and *Gulf LNG Procedures* to further minimize impacts.

4.6.1.5 Conclusion

We conclude that constructing and operating the Project would not significantly affect wildlife at population levels. Gulf LNG would minimize impacts on wildlife and habitat by following the measures outlined in the *Gulf LNG Plan* and *Gulf LNG Procedures* and other BMPs. Gulf LNG would further minimize impacts by implementing their *Migratory Bird Plan,* which we recommended above that Gulf LNG finalize prior to construction.

4.6.2 Aquatic Resources

4.6.2.1 Terminal Expansion

Existing Aquatic Resources

Surface waters that would be affected by construction of the Terminal Expansion (which includes the two supply docks and associated heavy haul roads) consist of subtidal and intertidal estuarine environments that support an estuarine fishery. Table 4.6.2-1 lists the typical commercial and recreational fish species that may exist at or near the Terminal Expansion site. Impacts on sensitive fisheries, such as brown and white shrimp, red drum, reef fishes, and EFH are described in section 4.6.3. Impacts on surface waters due to construction and operation of the Terminal Expansion are discussed in section 4.3.2. Impacts on commercial and recreational fishing as a result of Project construction and operation are discussed in section 4.8.4.

TABLE 4.6.2-1

Commercial and Recreational Fish Species Likely to Occur in the Vicinity of the Project

Common Name	Scientific Name	Classification a/
Blue crab	*Callinectes sapidus*	Estuarine/ Recreational/ Commercial
Brown shrimp	*Farfantepenaeus aztecus*	Estuarine/ Commercial
White shrimp	*Litopenaeus setiferus*	Estuarine/ Commercial
Atlantic croaker	*Micropogonias undulatus*	Estuarine/ Recreational/ Commercial
Gulf menhaden	*Brevoortia patronus*	Estuarine/ Commercial
Sand seatrout	*Cynoscion arenarius*	Estuarine/ Recreational/ Commercial
Spot	*Leiostomus xanthurus*	Estuarine/ Recreational/ Commercial

a As classified by BVA, 2012.

The aquatic habitat near the proposed supply docks comprises mainly shallow estuarine bottom, such as unconsolidated subtidal sand flats mixed with silt, clay, and gravel, and is devoid of submerged aquatic vegetation or oyster reefs. Subtidal soft sediments provide feeding habitat for bottom-dwelling fish and benthic invertebrates (i.e., invertebrates living on and within the bottom substrate). Additionally, unconsolidated subtidal habitat has been designated as EFH for brown and white shrimp, red drum, and reef fishes, which are managed by the Gulf of Mexico Fisheries Management Council (GMFMC) to promote sound management and harvest of shellfish and fish resources under the MSA (GMFMC, 1998; see section 4.6.3).

Aquatic Resources Impacts and Mitigation

The Terminal Expansion would include potential impacts associated with the following Project components: construction and operation of the North and South Supply Docks, including pile driving, dredging, and noise and light impacts; fill of coastal marsh and creation of the wetland mitigation area; hydrostatic testing; construction barge operations; ballast water discharge from LNG carriers; alterations to stormwater drainage; and the potential for an inadvertent release of hazardous materials (such as petroleum). Gulf LNG is not proposing to increase the currently authorized number of LNG carriers, and the associated impacts of LNG carrier operation would not change from those addressed in the EIS for the existing Terminal (FERC, 2006), except for the discharge of ballast water that would be necessary with the change from an import terminal to an export terminal. Vessels that previously arrived at the existing Terminal laden with LNG for import would now arrive at the Terminal filled with ballast water that would need to be discharged as the vessel is loaded with LNG for export. Therefore, in relation to LNG vessels, only the potential impacts of ballast water discharge are addressed in this EIS. Those impacts are addressed below under "Vessel Activity." Gulf LNG would impact about 15.3 acres of open water, 3.3 acres of PEM wetlands, and 24.7 acres of EEM wetlands during construction, of which 9.1 acres of open water and all 28 acres of wetlands would be permanently impacted. The COE requested that the emergent wetland system be addressed as a whole for the purposes of mitigation analysis (this means that PEM and EEM wetland acreages were combined in calculations because of similar environmental functions). An additional 3.1 acres of EEM wetlands located in an existing COE-created wetland mitigation area adjacent to and south of the Terminal Expansion site would be within the flare exclusion zone and would be impacted by flare activities during operations; these impacts are considered permanent and would be mitigated as such (see section 4.4.3).

Pile Driving

The North Supply Dock would be T-shaped, measuring 280 feet along the shoreline and containing a 310-foot-long by 110-foot-wide span extending into Bayou Casotte and oriented perpendicular to the shoreline (see figure 2.2-1). The South Supply Dock would be trapezoidal-shaped, measuring 200 feet along the shoreline and extending 40 feet into Bayou Casotte at the dock's northern end and 100 feet into Bayou Casotte at the dock's southern end (see figure 2.2-2). The supply docks would be constructed in segments beginning at the shoreline. First, Gulf LNG would create an access berm of granular fill material along the perimeter of the supply docks. The access berm would be used to support the pile driving crane. The pile driving crane would move from the shoreline onto the access berm in order to install steel sheet piles that would make up the perimeter of the North and South Supply Docks. The granular fill material used to create the access berms would remain inside the sheet piles and become part of the supply docks. Gulf LNG would use an impact-hammer pile driver to install the steel sheet piling for each supply dock. The sheet piling would be driven to a depth of 31 feet below msl, with a top elevation of 8 feet above msl. Installation of sheet piling would take place at the same time for both supply docks (i.e., Gulf LNG would use two pile-drivers concurrently), but installation at the North Supply Dock would take longer. It is estimated that installation would take 120 days at the North Supply Dock and 65 days at the South Supply Dock. No mooring dolphins or other pilings would be installed.

Pile driving near and within the Bayou Casotte waters could cause rapid concussive noise and generate underwater sound pressure waves that could adversely affect nearby marine organisms, including fish, sea turtles, and marine mammals. Underwater noise levels are commonly referred to as a ratio of the underwater sound pressure to a common reference pressure of 1 micropascal (μPa) root mean-square pressure, which is expressed in decibels (dB) of sound intensity as dB referenced to 1 μPa (i.e., dB re: μPa). According to the currently established standard practice, noise levels are measured at a distance of 10 meters and within the line of sight of the source (NOAA, 2012). There are insufficient peer-reviewed reliable data available for determining the noise level that would trigger the onset of behavior disturbance in fish; however, as a conservative measure, NMFS generally uses 150 dB re: μPa at 10 meters as the threshold for behavior effects on fish species of particular concern, citing that noise levels in excess of 150 dB re: 1 μPa can cause temporary behavior changes (startle and stress) that could decrease a fish's ability to avoid predators. The current interim thresholds protective of injury to fish are 206 dB re: 1 μPa (peak) and 187 dB re: 1 μPa (cumulative) sound exposure levels for fish 2 grams or greater, and 183 dB re: 1 μPa (cumulative) sound exposure level for fish of less than 2 grams (WSDOT, 2017).

Recent studies suggest an impact hammer installing steel sheet pile would produce a peak sound pressure level of about 205 dB re: μPa at 10 meters and cumulative sound exposure levels of 178 dB re: μPa at 10 meters (ICF Jones & Stokes and Illingworth and Rodkin, Inc., 2009). The noise levels would startle, stress, and potentially cause injury to aquatic organisms in the vicinity. Gulf LNG would follow

NMFS-recommended BMPs to reduce pile driving-related noise impacts on aquatic organisms, including the following:

- conduct visual assessments for sea turtles and marine mammals prior to each time pile driving begins;
  - all construction personnel would be responsible for observing water-related activities to detect the presence of protected species;
  - if a sea turtle or marine mammal was seen within 100 yards of the active construction, operation, or vessel movement, Gulf LNG would implement all appropriate precautions to ensure its protection, including ceasing operation of any moving or mechanical construction equipment closer than 50 feet from a sea turtle or marine mammal and remaining on operational stand-down until the protected species has departed the Project area of its own volition.
- employ a soft-start technique, wherein pile driving begins with low-impact hammering to produce noise levels above 150 dB re: 1 µPa but below the injury thresholds to drive mobile aquatic organisms away from the area;
- conduct in-water acoustic noise monitoring to determine the noise impact zone where sound pressure levels would result in injury to aquatic resources; and
- report any injury to a sea turtle or sturgeon immediately to the NMFS' Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

These practices would reduce the likelihood that fish or protected species would be exposed to injury-causing sound levels (Savery and Associates, 2010). Upon completion of the sound-causing activities, individuals would no longer avoid the area and would likely return. However, because Gulf LNG has not provided specific details regarding its proposed in-water acoustic monitoring to ensure that actual noise levels from pile driving would not result in injury to aquatic resources, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Gulf LNG should file with the Secretary a *Pile Driving Mitigation Plan* that outlines specific mitigation measures, including acoustical in-water monitoring, that would be implemented to limit underwater noise impacts to no more than 183 dB re: 1 µPa.**

<u>Dredging</u>

The current depth of the portions of Bayou Casotte proposed for the supply dock basins is too shallow to safely accommodate barge deliveries. During construction, Gulf LNG would dredge both supply dock basins to a depth of 12 feet below msl (which would total about 200,000 cy of sediment) to allow for safe maneuvering and docking of barges and would conduct maintenance dredging as needed to maintain the dredged depth of the supply dock basins for the duration of Project construction. Based on sediment accumulation at the existing marine berth, Gulf LNG anticipates maintenance dredging of the supply dock basins would be necessary about every 3 years. Gulf LNG anticipates that about 10,000 cy of sediment would accumulate annually at each basin. A hydraulic or clamshell dredge would be used to remove the sediments, dredging would be of limited duration (7 to 21 days per basin), and Gulf LNG would consult with NMFS to determine the most appropriate times of year for dredging at the supply docks to minimize impacts on aquatic organisms. The North Supply Dock would remain in use during operation. The Port of Pascagoula would take ownership of the North Supply Dock after construction and would be responsible for maintenance dredging of the dock's basin during operation. After construction is completed, Gulf LNG would completely remove the South Supply Dock, including all bulkhead backfill materials. The shoreline would be restored and the associated basin would be allowed to revert to natural bathymetric conditions.

As with pile driving, dredging equipment would cause underwater noise. Depending for dredging of the supply docks and the access channel for wetland mitigation. The dredged channel would comprise the footprint of the perimeter berm. Barges would use the dredged channel to access the wetland mitigation site to deliver rock for the containment berm proposed for its perimeter. Gulf LNG would store the dredged sediment from the channel in the proposed mitigation site and then replace it in the dredged channel as the perimeter berm was constructed (i.e., the channel would be filled and rock would be placed over the just-filled portion of the channel).

Dredging of the supply dock basins and the wetland mitigation site channel would likely increase turbidity and suspension of solids within the water column. Increases in turbidity can affect the physiology and behavior of marine organisms. Potential physiological effects include mechanical abrasion of surface membranes, delayed larval and embryonic development, reduced bivalve pumping rates, and interference with respiratory functions. Possible behavioral effects from increased turbidity include interference with feeding for sight-foraging fish and area-avoidance (Berry et al., 2003; COE, 2014; Wenger et al., 2017). Conversely, the reduced visibility of predatory fish could lower vulnerability to predation for prey species. Turbidity also interferes with light penetration and thus reduces photosynthetic activity by phytoplankton. Such reductions in primary production would be localized around the immediate vicinity of the area being actively dredged and would be limited to immediately following completion of the dredging activities (COE, 2014). The COE (2014) reports that the effects of temporarily increased levels of suspended sediments due to dredging are comparable to the common passage of a storm front with high winds and heavy wave action. Increased turbidity is typically confined to the time during dredging and about 2 to 3 hours after dredging ceases, after which suspended solids settle to background levels and the water column habitat would be expected to revert to normal conditions (COE, 2014).

Another potential impact resulting from the suspension of solids in the water column due to dredging may be the mobilization of contaminated sediments. Contaminants generally adhere to fine-grained particles, which, when re-suspended, can be ingested by organisms and have potentially toxic effects (EPA, 1999a; Schoellhamer, 2007). Gulf LNG sampled sediments in the proposed dredging areas at both supply docks. Analytical testing revealed that the sediments had either no or very low levels of chemical contaminants (see section 4.2.7). Therefore, adverse impacts on aquatic organisms due to the resuspension of contaminated sediments are not anticipated.

Excessive nutrient loading from sediment resuspension could have an adverse impact on Bayou Casotte, because it could cause pronounced increases in the productivity of planktonic algal populations (Dzialowski et al., 2008; Corbett, 2010). However, because any high-density patches of planktonic organisms would be readily dispersed by currents (COE, 2014), the effects of additional nutrient loading would be temporary and restricted to the immediate dredging area.

Generally, the MDEQ accepts that there are no feasible technologies or management practices to effectively moderate turbidity levels at the dredge source; therefore, the MDEQ allows for a 750-foot mixing zone surrounding the dredging operation where increased turbidity levels would be expected to occur (MDEQ, 2007). Beyond the mixing zone, turbidity levels may not exceed background turbidity levels by more than 50 Nephelometric Turbidity Units (ntu). Background turbidity levels in the vicinity of the Project are about 15 to 20 ntu (COE, 2014). The COE (2014) reported that dredging conducted during the construction of the berthing slip for the existing Terminal[7] and other historical dredging operations in Mississippi Sound did not have turbidity exceedances beyond the mixing zone. Additionally, Gulf LNG filed a draft *Dredging and Disposal Plan* with the Commission on August 29, 2018[8] in which Gulf LNG states it would install and maintain turbidity curtains around the area being excavated to limit the transport of turbid water beyond the vicinity of the dredging operations. Gulf LNG is currently engaging in consultations with the COE and the MDEQ as part of the CWA Section 401 application process. As part of this process, Gulf LNG would discuss with the COE and the MDEQ the practicality and effectiveness of methods for reducing turbidity in the vicinity of dredging operations. Additionally, the *Dredging and Disposal Plan* notes that Gulf LNG would monitor dredging-induced turbidity in accordance with any MDEQ Section 401 certification requirements and report any turbidity levels that exceeded the limits provided in the permit.

Dredging activities would remove the estuarine bottom sediments used as habitat by some aquatic species. Benthic organisms, such as mollusks and crustaceans, may experience direct mortality during dredging, while other more mobile species, such as blue crab, may experience temporary displacement. Although the dredging-related impacts would be greatest on the benthic community within the dredging area, impacts on saltwater fish species, such as red drum and spotted seatrout, would also occur, but would be localized and temporary. Due to the relatively small area of direct impact resulting from the dredging of the supply dock basins and the access channel between the South Supply Dock and the compensatory wetland mitigation site (16.4 acres) and the short duration of dredging (less than 6 months), these species and other similar species would be temporarily displaced and could return upon completion of dredging. We believe that recolonization in the Project area would commence in a matter of days or weeks, and these areas would become functional benthic communities similar to pre-dredge conditions or to adjacent reference locations in about 12 to 18 months (FERC, 2006). Likewise, the Minerals Management Service (MMS, 2004) reported that although the benthic community would be directly affected by dredging, these communities generally re-populate within 1 year; therefore, we conclude that the impacts on the benthic community due to the initial and maintenance dredging of the supply dock basins would be temporary and minor. We discuss the impacts from the dredging of the compensatory wetland mitigation site in the Fill of Coastal Marsh section below.

Light

Construction and operation of the supply docks would generate additional light at the Terminal Expansion. Construction lighting would be temporarily installed at specific locations where ongoing construction is occurring, and would be removed upon completion. Gulf LNG would direct any nighttime lighting on the activity being conducted to ensure the safety of workers, which would minimize impacts on aquatic species. Generally, construction and operational lighting of the supply docks and adjacent areas would be situated as close as possible to the location needing illumination and directed downward to minimize light impacts on adjacent areas.

Aquatic species in the area are likely acclimated to the current ambient light, due to the industrial nature of Bayou Casotte, including light from the existing marine berths in the Project area. Therefore, impacts on aquatic species due to nighttime lighting during construction and operation would not be significant when taking into account the proximity of the existing Terminal to the supply docks, the existing industrial nature of the area, and the lighting that would be used.

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[7] Gulf LNG dredged about 2.96 million cy for the berthing slip and maneuvering basin for the existing Terminal. About 400,000 cy would be dredged for both supply docks and the barge access channel for the wetland mitigation site.

[8] See Attachment No. 3 of accession number 20180829-5060.

Wetland Impacts

As noted in section 4.4.2.1, construction and operation of the Terminal Expansion would permanently impact 31.1 acres of wetlands, or coastal marsh, located adjacent to the North and South Supply Docks and south and east of the existing Terminal. Aquatic habitat within the affected wetland areas consists mainly of shallow estuarine bottom, such as unconsolidated sand and mud flats, and tidal wetland vegetation. Subtidal and intertidal substrates provide important foraging habitat for fish and benthic (bottom-dwelling) organisms that live on and within the sediments (epifauna and infauna), while wetland vegetation serves as a nursery and source of protection from predation for many aquatic species.

Large benthic species known to inhabit these marshes include the ribbed mussel, American oyster, hooked mussel, gray-common rangia clam, little surf clam, river snail, marsh periwinkle, salt marsh snail, mysid shrimp, mud crab, Harris mud crab, heavy marsh crab, stone crab, and lesser blue crab. Smaller species include nematodes, harpacticoid copepods, kinorhynchs, ostracods, small polychaetes, and some insect larvae. Fish species commonly found in tidal marshes include the striped mullet, menhaden, sheepshead minnow, bay anchovy, bayou killifish, inland silverside, chain pipefish, spotted seatrout, black drum, red drum, and code goby (BVA, 1985).

As noted above and discussed in section 4.4.3, Gulf LNG proposes in-kind compensatory mitigation for impacts on the wetlands on the Terminal Expansion site. We anticipate that the compensatory wetland mitigation site, when fully developed, would provide sufficient habitat to offset the impacts on the habitats of the affected coastal marsh. In addition, there is a substantial amount of coastal marsh in the vicinity of the affected area, particularly within the nearby Grand Bay Savanna Preserve. As a result, we conclude that during the development of the compensatory wetland mitigation site, there would be a localized short-to long-term impact on the aquatic species that use the affected coastal marsh habitat; however, we expect that it would not be a significant impact, as once the compensatory mitigation site would be successfully established, the impact on aquatic species would be offset by the habitat created at the mitigation site. Construction of the compensatory mitigation site would consist of covering the 50-acre footprint of shallow estuarine bottom with about 323,000 cy of fill and 19,000 cy of stone. This would contribute to the cumulative loss of shallow water habitat in the Mississippi Sound and mortality of immobile benthic species within the site footprint would be likely. However, we conclude that the successful completion of the compensatory wetland mitigation site would adequately offset these impacts and that impacts would not be significant.

Hydrostatic Testing

Gulf LNG would hydrostatically test non-cryogenic piping and storage tanks to ensure the integrity of the installed facilities prior to initiating operations. Gulf LNG would use water from the Port of Pascagoula's Industrial Water Supply with no additional treatment such as biocides.

Upon completion of hydrostatic testing, Gulf LNG would discharge the hydrostatic test water into Bayou Casotte through the existing Terminal's current outfall at the existing berthing area. Discharging hydrostatic test water could cause localized turbidity and differences in pH and salinity at the end of the outfall pipe. However, to minimize such potential impacts, Gulf LNG would monitor the hydrostatic test water prior to discharge and, if necessary, treat it to meet the requirements of Gulf LNG's NPDES permit (MSG13). We therefore conclude that impacts on aquatic resources from the discharge of hydrostatic test water would be temporary and negligible. Hydrostatic testing is discussed in more detail in section 4.3.2.2.

Vessel Activity

Gulf LNG would use barges and marine support vessels during construction, and occasionally during operation, to transport equipment and material to the Terminal Expansion. During operation, LNG carriers would berth at the existing marine berth, take on LNG while discharging ballast water, and transport the LNG to customers. The total number of LNG carriers calling on the Terminal would not exceed the number currently authorized for the existing Terminal. The impacts of LNG carrier transit were assessed in the EIS for the existing Terminal (FERC, 2006) and are not addressed in this EIS. Although Gulf LNG has requested authorization to increase the size of LNG carriers permitted to call upon the Terminal, the existing berthing facility was designed and constructed to accommodate LNG carriers of the increased size requested by Gulf LNG and the impacts addressed in the EIS for the existing Terminal and in this EIS would not be substantially affected by vessel size. The potential impacts of ballast water discharge are addressed below.

Use of the supply docks for delivery of equipment and materials would increase vessel traffic in the vicinity of the Project (see section 4.9.6 for a discussion of the potential marine traffic impacts). The barges and support and supply vessels during construction of the Terminal Expansion are slow moving and do not create substantial wakes and are not expected to substantially increase shoreline erosion, benthic sediment disturbance, or propeller scouring in the immediate area. However, some benthic sediment disturbance or propeller scouring could occur as a result of propeller wash from tugboats maneuvering barges as they approach or depart from the supply docks. We expect these effects would be intermittent and temporary.

Underwater noise generated by large vessels calling on the supply docks is estimated to be between 180 and 190 dB re: 1 µPa at 1 meter and would attenuate rapidly with distance (CEDA, 2011). Noise would be greatest during vessel transport to and from the supply docks. However, noise would attenuate rapidly as the vessels pass, and aquatic species would be subjected to the noise for only a short period of time. Vessels moored at the docks would produce noise during engine start-up and idling. Idling noise would be lower as the propeller would not be in use. Noise levels of vessels calling on the supply docks would be similar to the noise currently generated by vessels transiting Bayou Casotte. Based on these considerations, we conclude that adverse impacts of increased noise on aquatic species due to barge and support vessel traffic would be intermittent and consistent with current vessel traffic noise occurring in proximity to the Terminal Expansion and would not be significant. Therefore, we conclude that impacts on aquatic species due to increased barge and support vessel traffic during construction and operation would be short-term and minor.

Although non-native species are not uncommon in the Mississippi Sound, barges and support vessels using the supply docks during construction and operation could inadvertently introduce new invasive species to the area. However, those vessels would not discharge ballast water and would primarily be local vessels and the potential for invasive species introduction via hull attachment on these vessels would be negligible. Therefore, we do not anticipate impacts associated with the introduction of invasive species during construction of the Terminal Expansion.

During operation of the Terminal Expansion, LNG carriers would need to discharge ballast water at the existing marine berth while taking on LNG. Discharge volumes would range between about 9.7 million gallons and 23.0 million gallons, depending on the size of the vessel. As noted in section 4.3.2.2, the impact of the discharge on water quality would be localized and temporary. Likewise, the effects of the localized changes in water quality on fish and invertebrate species would also be minimal (FERC, 2015). The ballast water discharges would typically occur over a non-continuous period of about 30 hours at a rate of about 29 cfs. The discharged ballast water would be expected to mix with the surrounding water column relatively quickly given the proximity of the marine berth to the mouth of the Pascagoula River, which has an average outflow of about 14,746 cfs, and its exposure to outflow from

Bayou Casotte and wind and tidal driven currents of the Mississippi Sound (COE, 2014). Furthermore, as estuarine species, fishes and invertebrates common to coastal Mississippi are generally tolerant of fluctuating environmental conditions (Elliott and Quintino, 2007). Therefore, we conclude that impacts on local fish and invertebrate populations would be minimal and temporary, but would occur for the life of the Project.

Ballast water is regarded as a major source for introducing invasive species to coastal areas (Bailey, 2015). Consequently, LNG captains must comply with the ballast water management and discharge requirements of both the USCG (33 CFR 151.2030; see also section 4.5.3) and the EPA (EPA, 2013b). All LNG carriers would use a USCG-approved Ballast Water Management System, which may include either ballast water exchange in the open ocean or ultra-violet light or chemical treatments (biocides) to destroy aquatic organisms in the ballast water. These regulations offer several options for ballast water management and are intended to limit the concentrations of organisms in ballast water discharges. In addition, the EPA regulates effluent discharge and requires actions such as training, management plans and practices, treatment measures, and monitoring, testing, and reporting requirements. All LNG carriers calling on the Terminal Expansion would be required to obtain a Vessel General Permit from the EPA, which, in part, regulates ballast water discharges under the authority of the NPDES permitting program (EPA, 2013b). Therefore, we conclude that the introduction of exotic species due to the discharge of ballast water from the LNG carriers would be minimized.

Further, if biocides were included as part of a ballast water management technique, the concentration of residual biocides in the ballast water discharge would be required by the Vessel General Permit to meet or exceed regulatory limits for environmental compliance; therefore, we conclude that impacts on aquatic resources from residual biocides in ballast water discharges, if used, would be minor.

Scouring of the benthic surface is another potential impact of ballast water discharge. Ballast water would be discharged by pumps regulated to maintain proper equilibrium with the volume of LNG being loaded onto the LNG carrier and would not be rapidly discharged. In addition, ballast water would be discharged horizontally, either through fittings located near the bottom of each side of the hull of the LNG carrier or through valves located above the waterline. In either instance, based on conservative calculations following Ervine and Flavey (1987), the force of the discharged water would be expected to dissipate prior to reaching the benthic surface at 42 feet below msl (the depth of the existing marine berth).

LNG carriers would also withdraw water at the marine berth periodically to cool their boilers. Depending on the engine type, LNG carriers would take in between 15 and 42 million gallons of water for engine cooling while at the berth. The withdrawn water would be subsequently discharged back into Bayou Casotte. The potential impacts of a localized increase in water temperature due to the discharging of cooling water and entrainment of aquatic resources (e.g., the larvae of blue crab, white, brown, and pink shrimp, and assorted fish species) were assessed in the EIS for the existing Terminal (FERC, 2006) and are therefore not addressed in this EIS.

Stormwater Management

During construction, Gulf LNG would manage stormwater in accordance with its SWPPP and updated *SPCC Plan* (see section 4.3.2.2). During operation, the conversion of land to impervious surface areas at the Terminal Expansion site would result in an increased volume of stormwater runoff. Stormwater runoff from Terminal Expansion would be integrated into the existing Terminal's stormwater runoff system plus the two new stormwater outfalls (Outfall 003 and 004) which are planned for the Terminal Expansion. The new outfalls would drain in close proximity to the existing stormwater outfall (Outfall 002) in the LNG carrier berthing area. Stormwater runoff from areas with a likelihood of oil contamination (e.g., rotating equipment, lubrication consoles, or transformers) would be curbed or diked and the runoff treated through an oil-water separator prior to discharge. As required by Gulf LNG's existing NPDES permit, stormwater would be observed and tested prior to discharge. If there is no visible oil sheen, floating solids, or foam other than trace amounts, and if the pH is between 6.0 and 9.0, the stormwater would be discharged into Bayou Casotte through the stormwater outfall structure. A pH meter at the outfall structure automatically tests the stormwater's pH and does not allow the discharge pump to engage if the pH is less than 6.0 or more than 9.0. In addition, the sump is fitted with a low temperature sensor to stop the pump in the event of an LNG release.

During operation, stormwater would be discharged through the existing stormwater outfall and two new outfalls that would be installed in the vicinity of the existing outfall. The stormwater would be discharged into Bayou Casotte. The discharges would be similar to but greater in volume than the discharges from the existing Terminal. The discharges could create temporary and localized changes in salinity and/or temperature in the area of the outfalls; however, operations would not produce contaminants such as nutrients or other oxygen demanding elements that would contribute to decreased dissolved oxygen. All stormwater discharge would be conducted in compliance with Gulf LNG's NPDES permit. Impacts from increased stormwater runoff are expected to occur only during storm events and result in a negligible impact on aquatic resources.

<u>Inadvertent Releases</u>

As described in section 4.3.2.2, Gulf LNG would update the Terminal's existing *SPCC Plan* to include the Terminal Expansion operations, including the supply docks. Gulf LNG would implement the revised *SPCC Plan* and the *Gulf LNG Plan* and *Gulf LNG Procedures* to minimize the potential for petroleum or hazardous materials spills from land equipment or vessels berthed at the supply docks during construction and operation and to avoid or minimize impacts if a spill were to occur. Based on the implementation of these procedures by Gulf LNG, we conclude that it is not likely that there would be a significant impact on aquatic species due to an inadvertent release from the Terminal Expansion.

4.6.2.2 Construction Support Areas

One of the six construction support areas, CSA-3, would be adjacent to tidal wetlands connected to Bayou Casotte. However, Gulf LNG would follow appropriate BMPs, such as installing exclusion fencing, to avoid any impacts on the wetlands and any aquatic resources that may be using them during Project activities. Impacts on the wetlands could result from an inadvertent spill at the site but, as noted in section 4.4.2.3, Gulf LNG would implement its revised *SPCC Plan* and its *Gulf LNG Plan* and *Gulf LNG Procedures* to minimize the potential for petroleum or hazardous materials spills from equipment at the site and to avoid or minimize impacts if a spill were to occur. Based on the implementation of these procedures by Gulf LNG, we conclude that it is not likely that there would be a significant impact on aquatic species related to the use of the CSAs.

4.6.2.3 Pipeline Modifications

Existing Aquatic Resources

Gulf LNG would not impact waterbodies by constructing and operating the Pipeline Modifications.

4.6.3 Essential Fish Habitat

The MSA, as amended in 1996, was established, along with other goals, to promote the protection of EFH for projects requiring federal permits, licenses, or other authorities and that affect or have the potential to affect such habitat. EFH is defined in the MSA as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. All estuaries and estuarine habitats in the northern Gulf of Mexico are considered EFH (GMFMC, 1998).

Federal agencies that authorize, fund, or undertake activities that may adversely impact EFH must consult with NMFS. Although absolute criteria have not been established for conducting EFH consultations, NMFS recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as NEPA and the ESA, to reduce duplication and improve efficiency. Generally, the EFH consultation process includes the following steps:

- Notification – The action agency should clearly state the process being used for EFH consultations (e.g., incorporating EFH consultation into the EIS);
- EFH Assessment – The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH should include a description of the proposed action; an analysis of the effects (including cumulative effects) of the proposed action on EFH, the managed fish species, and major prey species; the federal agency's views regarding the effects of the action on EFH; and proposed mitigation, if applicable;
- EFH Conservation Recommendations – After reviewing the EFH Assessment, NMFS would provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH; and
- Agency Response – The action agency must respond to NMFS within 30 days of receiving recommendations from NMFS. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH.

Only impacts associated with the proposed construction and operation of the Terminal Expansion are discussed in this section. The FERC staff previously prepared an EIS and BA to assess construction and operation impacts from the existing Terminal on EFH and EFH species (FERC, 2006). As a part of those environmental documents, the FERC staff consulted with NMFS regarding dredging the berthing area, accidental releases of LNG, and the number of LNG carriers and transit routes. We determined and NMFS agreed that based on the implementation of conservation measures and the compensatory mitigation plan developed by Gulf LNG, no substantial adverse impacts on EFH or EFH species would occur due to construction and operation of the existing Terminal. With the exception of impacts caused by ballast water discharge from the LNG carriers, the impacts of LNG carriers and their transit on EFH and EFH species were addressed in that assessment. Therefore, they are not addressed in this EIS. Impacts on EFH and EFH species due to ballast water discharge are discussed in section 4.6.3.

The FERC proposes to incorporate EFH consultations for the Terminal Expansion with the interagency coordination procedures required under NEPA. As such, we are requesting that NMFS consider the EIS as initiation of EFH consultation.

4.6.3.1 Characterization of Essential Fish Habitat

Construction and operation of the Project could impact EFH for brown shrimp, white shrimp, gray snapper, lane snapper, red drum, Spanish mackerel, Atlantic sharpnose shark, blacknose shark, blacktip shark, bonnethead shark, bull shark, finetooth shark, giant hammerhead shark, scalloped hammerhead shark, spinner shark, and tiger shark (see table 4.6.3-1) (GMFMC 1998; GMFMC, 2004; GMFMC, 2005; NMFS 2009).

A full EFH Assessment has been prepared for the Project, which outlines life history information, and relative abundance of all species with EFH identified in the Project area. Potential impacts and conservation measures to avoid and/or minimize impacts are also included in the assessment. The EFH Assessment has been included as appendix C.

TABLE 4.6.3-1

Essential Fish Habitat Species Potentially Affected by the Terminal Expansion a/

Common Name	Scientific Name	Life Stages in Estuarine Habitat
Brown shrimp	*Penaeus aztecus*	Post-larval, early juvenile
White shrimp	*Penaeus setiferus*	Post-larval, early juvenile
Gray snapper	*Lutjanus griseus*	Adult
Lane snapper	*Lutjanus synagris*	Adult
Red drum	*Sciaenops ocellatus*	Larval , post-larval, early juvenile, adult
Spanish mackerel	*Scomberomorus maculatus*	Early juvenile, late juvenile, adult
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*	Neonate, juvenile, adult
Blacknose shark	*Carcharhinus acronotus*	Adult
Blacktip shark	*Carcharhinus limbatus*	Neonate, juvenile, adult
Bonnethead shark	*Sphyrna tiburo*	Neonate, juvenile, adult
Bull shark	*Carcharhinus leucas*	Neonate, juvenile, adult
Finetooth shark	*Carcharhinus isodon*	Neonate, juvenile, adult
Great hammerhead shark	*Sphyrna mokarran*	Neonate, juvenile, adult
Scalloped hammerhead shark	*Sphyrna lewini*	Neonate, juvenile, adult
Spinner shark	*Carcharhinus brevipinna*	Juvenile
Tiger shark	*Galeocerdo cuvieri*	Juvenile

a Data from GMFMC, 1998; GMFMC, 2004; GMFMC, 2005; NMFS, 2009

4.6.3.2 Essential Fish Habitat Impacts and Mitigation

Sixteen EFH species could potentially be affected by construction and operation of the Terminal Expansion (see table 4.6.3-1). Dredging and constructing the supply dock basins, filling the tidal marsh, dredging the wetland mitigation site access channel, and covering soft bottom sediment to construct the wetland mitigation site have the potential to affect EFH or EFH species.

Dredging would temporarily increase suspended sediment and thus turbidity in the water column, which would result in a temporary lowering of the water quality within a localized area surrounding dredging activities (see section 4.3.2.2). As discussed in section 4.6.2, increases in turbidity can adversely affect fish physiology and behavior, resulting in less healthy individuals, reductions in fertility, and reduced foraging (Berry et al., 2003; COE, 2014; Wenger et al., 2017). However, turbidity levels are not expected to rise substantially above ambient conditions or exceed MDEQ limits relative to ambient conditions (COE, 2014). Further, the COE (2014) reported that the effects of temporarily increased levels of suspended sediments due to dredging would be comparable to the common passage of a storm front with high winds and heavy wave action. The COE (2014) also reported that increased turbidity is typically confined to the time during dredging and about 2 to 3 hours after dredging ceases; after that time period, suspended solids settle to background levels and the water column habitat would be expected to revert to normal conditions. Nonetheless, Gulf LNG filed a draft *Dredging and Disposal Plan* with the Commission on August 29, 2018[9] in which Gulf LNG states it would install and maintain turbidity curtains around the area being excavated to limit the transport of turbid water beyond the vicinity of the dredging operations. Additionally, the *Dredging and Disposal Plan* notes that Gulf LNG would monitor dredging-induced turbidity in accordance with any COE Section 401 permit requirements and report any turbidity levels that exceed limits provided in the permit. Therefore, we conclude the increase in turbidity due to dredging of the supply docks would be minor, temporary, and localized to the area immediately surrounding the supply docks.

One or more life stages of any of the 16 managed EFH species may be present during the period of active dredging. However, a hydraulic or clamshell dredge would be used to remove the sediments, dredging would be of limited duration (less than 6 months), and Gulf LNG would consult with NMFS to determine the most appropriate times of year for dredging at the supply docks to minimize impacts on EFH. Based on those measures and the ambient conditions of marine waters in the area to be dredged, we conclude that the impacts of dredging on EFH or EFH species in the water column would be temporary and minor.

Dredging of the supply dock basins and the wetland mitigation site access channel may also affect EFH or EFH species through removal of the upper portion of estuarine benthic habitat. After completion of dredging, the direct mortality of the benthic community in the dredged area would result in reduced species richness, species abundance, and biomass in the area. This would reduce the amount of prey available for EFH species within the area of the supply docks. However, aquatic invertebrates common to this habitat would rapidly recolonize the disturbed areas after completion of dredging, as these species take advantage of unoccupied space in newly exposed sediments through natural processes and rapid population growth (MMS, 2004). We conclude that, based on published data (e.g., Applied Biology, Inc., 1979; Blake et al., 1996; MMS, 2004; Hammer et al., 2005) both the initial dredging and the maintenance dredging would result in temporary to short-term impacts on the benthic community that would not be substantial and that the EFH species could forage in other nearby EFH areas and return to the supply dock areas after repopulation of the prey base. As a result, the impacts on EFH species would be minor, localized, and temporary.

The Terminal Expansion would permanently impact intertidal vegetated habitat through the fill of about 28 acres of EEM/PEM wetlands and the inclusion of 3.1 acres of EEM wetlands within the flare exclusion zone. Brown and white shrimp, gray snapper, and red drum may all be present in the vegetation and tidal channels of the wetlands. Brown and white shrimp may also serve as prey for other EFH species, such as coastal pelagic fish (e.g., shark and mackerel). Tidal wetlands also provide foraging and nursery habitat for ecologically and economically important fisheries species such as the blue crab and Gulf menhaden. We do not anticipate significant adverse impacts on the EFH species at the population level given the presence of unaffected tidal wetlands in the vicinity of the Terminal Expansion, including between the existing marine berth and the North Supply Dock and as part of the Grand Bay Savanna Preserve immediately to the east. In addition, completion of the compensatory wetland mitigation site adjacent to the Terminal Expansion site would offset the loss of wetland function caused by the filling of the tidal marsh. As a result, we conclude that impacts on intertidal vegetative EFH would be short- to long-term and would not be significant.

Construction of the wetland mitigation site would result in the permanent loss of about 50 acres of soft bottom sediment EFH. It is likely that benthic fauna such as polychaetes and oligochaetes would be buried during construction, resulting in a loss of prey available for EFH species in the vicinity of the mitigation site. However, we do not anticipate substantial adverse impacts on the EFH species given the

[9] See Attachment No. 3 of accession number 20180829-5060.

abundance of soft bottom habitat that is characteristic of the Mississippi Sound east and west of the mitigation site, which is inhabited by the same types of prey species that would be lost as a result of the construction of the wetland mitigation site. In addition to prey species, one or more life stages of any of the 16 managed EFH species may be present in the vicinity of the mitigation site during the period of construction when the habitat would be filled. However most of these species are mobile enough to avoid the construction activities. As a result, we conclude that there would be no substantial adverse impacts on EFH species. Additionally, the mitigation site itself is intended in part to compensate for any impacts on EFH and EFH species that may result as part of its creation.

Dredging and the installation of the pilings for the supply docks would also cause underwater noise. Depending on the sound frequency and intensity associated with these activities, this could cause a change in aquatic species behavior in proximity to each supply dock area or could cause species to avoid the area. As discussed in section 4.6.2, underwater noise levels are commonly referred to as a ratio of the underwater sound pressure to a common reference (i.e., dB re: 1 µPa). Peak noise levels underwater during dredging would be expected to be between 171 and 186 dB re: 1 µPa at 1 meter and would attenuate rapidly with distance (CEDA, 2011). Peak noise levels underwater during impact pile driving would be expected to be about 205 dB re: 1 µP. These levels could exceed the threshold for startle, stress, injury, and mortality on species. Gulf LNG would follow NMFS-recommended BMPs to reduce noise impacts on aquatic species; however, EFH species behavior may still be impacted. The NMFS BMPs would likely prompt these species to move out of the area temporarily during construction and return once underwater noise-generating activities cease (FERC, 2016). In section 4.6.2.1, we recommend that Gulf LNG file a *Pile Driving Mitigation Plan* that outlines specific mitigation measures, including acoustical in-water monitoring, that would be implemented to limit underwater noise impacts to no more than 183 dB re: 1 µPa. In addition, aquatic resources within the Project area are likely accustomed to regular fluctuations in noise from nearby industrial activity and maintenance dredging. Therefore, we conclude that adverse impacts on EFH species due to noise would be temporary, localized, and minor.

The increase in barge and barge-support vessel traffic at and near the supply docks during construction would result in a short-term increase in vessel traffic and noise in the area. During operation, barges and their support vessels would only deliver supplies when necessary or to facilitate maintenance dredging at the supply docks. Barge movements and the movements of support vessels and other supply vessels are not expected to substantially increase shoreline erosion, benthic sediment disturbance, or prop scarring in the immediate area, primarily because the vessels are slow moving and do not create substantial wakes (FERC, 2016). Some benthic sediment disturbance could occur when the barges are offloading at the supply docks; however, the major increase in barge traffic would be short-term. Underwater noise generated by large vessels calling on the supply docks is estimated to be between 180 and 190 dB re: 1 µPa at 1 meter and would attenuate rapidly with distance (CEDA, 2011). Noise would be greatest during vessel transport to and from the supply docks (i.e., when the vessels were underway with propellers engaged). However, noise would attenuate rapidly as the vessels passed and aquatic species would be subjected to the noise for only a short period of time. Vessels moored at the docks would produce noise during engine start-up and idling. Idling noise would be lower as the propeller would not be in use. Noise levels of vessels calling on the supply docks would be similar to the noise currently generated by vessels transiting Bayou Casotte. Based on these considerations, we conclude there would be no adverse impacts of increased noise on EFH and EFH species, given that barge and support vessel traffic would be consistent with current vessel traffic noise occurring in proximity to the Terminal Expansion.

During construction and operation of the supply docks, lighting would be installed to illuminate work areas and for the safety of workers. Gulf LNG would direct lighting at the supply docks on the construction activity being conducted and the general safety lighting would consist of down-lighting to minimize impacts on aquatic species. Artificial lighting over coastal waters has been shown to attract both juvenile fishes and larger predators (Keenan et al., 2007; Becker et al., 2013). Illumination of waters adjacent to the supply docks may be detrimental to juvenile fishes that may otherwise be able to avoid predation under natural circumstances. However, aquatic species in the area are likely acclimated to the current ambient light from the existing Terminal, including lighting on the existing marine berth, and the industrial nature of Bayou Casotte. Therefore, adverse impacts on EFH species due to nighttime lighting would not be substantial. Although the juvenile EFH fish species present in the area could be drawn to light that shines on waters outside the work areas and may thereby be subject to increased predation, we conclude that there would not be substantial adverse impacts at the population level.

Hydrostatic testing of the Terminal Expansion non-cryogenic piping and storage tanks would use water withdrawn from the Port of Pascagoula's Industrial Water Supply and not directly from Bayou Casotte; therefore, no impacts on EFH would result from water intake for this purpose. Discharge of the freshwater hydrostatic test water could cause minor localized turbidity and changes in salinity and temperature at the end of the outfall pipe. Gulf LNG would not add any chemicals or biocides to the test water and would conduct discharges in accordance with its NPDES permit (MSG13). As a result, we do not anticipate that there would be any substantial adverse impacts on EFH or EFH species due to these discharges. Section 4.3.2 provides additional information on hydrostatic testing for the proposed Terminal Expansion.

Gulf LNG would implement the revised *SPCC Plan* and the *Gulf LNG Plan* and *Gulf LNG Procedures* to minimize the potential for petroleum or hazardous materials spills from land equipment or vessels berthed at the supply docks during construction and operation and to avoid or minimize impacts if a spill were to occur. Implementation of these procedures would minimize response time and ensure appropriate cleanup actions are taken in the event of a spill. Therefore, we conclude there would not likely be a substantial adverse impact on EFH or EFH species.

During operation, the conversion of land to impervious surface areas at the Terminal Expansion site would result in an increased volume of stormwater runoff. Stormwater runoff from the Terminal Expansion would be discharged through the existing stormwater outfall and two new outfalls that would be installed in the vicinity of the existing outfall. The stormwater would be discharged into Bayou Casotte. Stormwater runoff from areas with a likelihood of oil contamination would be curbed or diked and the runoff treated through an oil-water separator prior to discharge. Stormwater runoff with a low likelihood of oil contamination would be discharged directly. As required by the existing NPDES permit, stormwater would be observed and tested prior to discharge. If there were no visible oil sheen, floating solids, or foam other than trace amounts, and if the pH was between 6.0 and 9.0, the stormwater would be discharged into Bayou Casotte through the stormwater outfall structure.

Discharge volumes would be similar to but greater than discharge volumes from the existing Terminal. The discharges could create temporary and localized changes in salinity and/or temperature, in the area of the outfalls; however, these changes would be similar to those from the discharges from the existing Terminal, and it is likely that the EFH species and prey in the vicinity of the Project are acclimated to such conditions. Operations would not produce contaminants such as nutrients or other oxygen demanding elements that would contribute to decreased dissolved oxygen. As a result, we conclude that there would be no substantial adverse impact on EFH or EFH species as a result of the discharge of stormwater runoff.

During operation of the Terminal Expansion, LNG carriers would discharge ballast water at the existing marine berth while taking on LNG. Impacts on water quality, such as changes in salinity, temperature, or dissolved oxygen, resulting from the discharged ballast water would be localized and temporary. Likewise, the effects of the localized changes in water quality on EFH species and prey would also be minimal (FERC, 2015). The discharged ballast water would be expected to mix with the surrounding water column relatively quickly given the proximity of the marine berth to the mouth of the

Pascagoula River and its exposure to outflow from Bayou Casotte and wind and tidal driven currents of the Mississippi Sound (COE, 2014). Furthermore, as estuarine species, fishes, and invertebrates common to coastal Mississippi are generally tolerant of fluctuating environmental conditions (Elliott and Quintino, 2007). Therefore, we conclude that there would be no substantial adverse impacts on EFH or EFH species as a result of the ballast water discharge.

Ballast water is regarded as a major source for introducing invasive species to coastal areas (Bailey, 2015). Consequently, LNG captains must comply with the ballast water management and discharge requirements of both the USCG (33 CFR 151.2030) and EPA (EPA, 2013b). These regulations offer several options for ballast water management and are intended to limit the concentrations of organisms in ballast water discharges. EPA regulates effluent discharge and requires actions such as training, management plans and practices, treatment measures, and monitoring, testing, and reporting requirements. All LNG carriers calling on the Terminal Expansion would be required to obtain a Vessel General Permit from EPA, which, in part, regulates ballast water discharges under the authority of the NPDES permitting program. Therefore, we conclude that there would be no significant adverse impacts on EFH or EFH species due to the introduction of exotic species resulting from the discharge of ballast water. Further, if biocides were included as part of a ballast water management technique, the concentration of residual biocides in the ballast water discharge would be required by the Vessel General Permit to meet or exceed regulatory limits for environmental compliance; therefore we conclude there would be no substantial adverse impacts on EFH or EFH species due to residual biocides in ballast water discharges.

Scouring of the benthic surface is another potential impact of ballast water discharge. Ballast water would be discharged by pumps regulated to maintain proper equilibrium with the volume of LNG being loaded onto the LNG carrier and would not be rapidly discharged. In addition, ballast water would be discharged horizontally, either through fittings located near the bottom of each side of the hull of the LNG carrier or through valves located above the waterline. In either instance, based on conservative calculations following Ervine and Flavey (1987), the force of the discharged water would be expected to dissipate prior to reaching the benthic surface at 42 feet below msl. Therefore, we conclude there would be no substantial adverse impacts on EFH.

4.6.3.3 Essential Fish Habitat Conclusions

Construction of the Terminal Expansion and the wetland mitigation site would involve permanent conversion of about 9.4 acres and short-term conversion of about 6.2 acres of shallow estuarine benthic habitat to deeper subtidal habitat and permanent conversion of about 50 acres of shallow estuarine habitat to intertidal vegetation habitat. This would result in direct mortality to benthic organisms. Construction and operation of the Terminal Expansion would also result in the permanent loss of 27.8 acres of EEM wetlands and 3.2 acres of PEM. However, the relatively small areas of estuarine water column and benthic habitat EFH impacted by construction and operation of the supply docks and construction of the mitigation site would be minor in consideration of the amount of similar habitat available in the vicinity of the Project, and Gulf LNG would offset the function of the impacted intertidal vegetative habitat by establishing the wetland mitigation site adjacent to the Terminal Expansion.

The depth to which the shallow estuarine benthic habitat would be dredged (12 feet below msl) would be generally shallow enough to prevent the onset of hypoxic conditions and subsequent permanent changes to benthic species diversity and total biomass (COE, 2014). At 12 feet below msl, the supply dock basins would be expected to recolonize with soft bottom benthic organisms soon after completion of dredging, thus providing a similar prey base for EFH species as the adjacent and nearby non-dredged areas (MMS, 2004). This temporary impact, as well as elevated water column turbidity levels, would re-occur with maintenance dredging, which would likely occur every 3 years. These events represent a minor increase in the already episodic nature of impacted benthic habitat and elevated turbidity due to relatively frequent maintenance dredging throughout Bayou Casotte and at the existing marine berth (the COE [2014] noted that maintenance dredging occurs within Bayou Casotte every 12 months).

Potential impacts on brown and white shrimp would be primarily limited to the post-larval and juvenile stages, as both stages occur in estuaries similar to the habitat present at the supply docks and wetland mitigation site. Adult stages of the species may also be present, but as most shrimp species approach adulthood, they migrate to deeper offshore waters. White shrimp may be present in inshore estuaries year-round, while brown shrimp are generally only present in estuaries between March and November. Direct mortality could occur during active dredging or during the creation of the wetland mitigation site; however, individuals are mobile and many could avoid the dredging and construction areas. Until conditions are conducive for repopulation after completion of dredging, individuals could use areas with suitable EFH in the vicinity of the Terminal Expansion. Impacts from each of the construction activities discussed above are expected to be localized and temporary to short-term, as would impacts on the prey species of brown and white shrimp and their EFH. We do not anticipate any substantial adverse impacts on white or brown shrimp.

Various life stages of the gray snapper, lane snapper, red drum, Spanish mackerel and Atlantic sharpnose, blacknose, blacktip, bull, bonnethead, finetooth, hammerhead, spinner, and tiger sharks could be present in the vicinity of the Terminal Expansion during construction and operation. Direct mortality could occur during active dredging, pile driving, or creation of the wetland mitigation site, but individuals would likely avoid the area during construction. Prey of these species in the water column or in the benthos may be impacted by construction activities; however, as discussed above, the impacts would be temporary to short-term, as prey species would be expected to return to the water column after construction, and benthic prey would be expected to rapidly recolonize the dredged areas. In the interim, given the mobility of each of these managed species, individuals would be able to readily use other suitable EFH in the vicinity of the Terminal Expansion. In addition, potential impacts from each of the construction activities discussed above and potential impacts due to use of the North Supply Dock during operation would be temporary to short-term or, in the case of the wetland mitigation site, would result in new EFH. Therefore, we do not anticipate any substantial adverse impacts on gray snapper, lane snapper, red drum, Spanish mackerel, or Atlantic sharpnose, blacknose, blacktip, bull, bonnethead, finetooth, hammerhead, spinner, or tiger sharks.

Based on this information, we conclude that effects on EFH and EFH species in and near the construction area of the Terminal Expansion would be localized and temporary to short-term, particularly with respect to the regular industrial use of Bayou Casotte and Mississippi Sound in the vicinity of the Terminal Expansion. Further, creation of new tidal marsh on Mississippi Sound as mitigation for the tidal wetlands that would be lost due to the Terminal Expansion would provide additional habitat for EFH species. Therefore, the Terminal Expansion would not have a substantial adverse impact on EFH or EFH species in the area.

4.7 THREATENED, ENDANGERED, AND OTHER SPECIAL STATUS SPECIES

Special status species are those species for which federal or state agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species that are protected under the ESA, as amended, or are considered as candidates for such listing by the FWS or the NMFS, and those species that are state-listed as threatened, endangered, or other special status.

Federal agencies, in consultation with the FWS, are required by Section 7(a)(2) of the ESA to ensure that any action authorized, funded, or carried out by the agency would not jeopardize the continued existence of a federally listed threatened or endangered, or a species proposed for listing. As the lead federal agency, the FERC is responsible for the Section 7 consultation process with the FWS. The lead agency is required to consult with the FWS and/or the NMFS to determine whether any federally listed endangered or threatened species or any of their designated critical habitats are in the vicinity of the Project, and to determine the proposed action's potential effects on those species or critical habitats. 'Critical habitat' is a term used in the ESA to refer to specific geographic areas that are essential for the conservation of a threatened or endangered species and that may require special management and protection (FWS, 2014).

For actions involving major construction activities with the potential to affect listed species or critical habitats, the federal agency must prepare a BA for those species that may be affected. As the lead agency, the FERC must submit its BA to the FWS and/or the NMFS and, if it is determined that the action may adversely affect a federally listed species, the FERC must submit a request for formal consultation to comply with Section 7 of the ESA. In response, the FWS and the NMFS would issue a Biological Opinion as to whether or not the federal action would likely adversely affect or jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat. To comply with Section 7 of the ESA, we prepared a BA for this Project (see appendix B). Gulf LNG does not propose to change the currently authorized number of LNG carriers for Project operations, and we addressed the effect of LNG carrier transit on threatened and endangered species in our EIS for the existing Terminal (FERC, 2006).

To assist in compliance with Section 7 of the ESA, Gulf LNG, acting as the FERC's non-federal representative, initiated informal consultation with the FWS (Mississippi Ecological Services Field Office) and the NMFS (Habitat Conservation Division, Panama City, Florida[10]) on April 18, 2014, regarding federally listed and other special status species. Gulf LNG also consulted with the MDWFP regarding state-listed or other special status species or habitat with the potential to be affected by construction and operation of the Project.

These consultations, along with information collected by Gulf LNG during literature reviews and field surveys of the Project area, were used to create a list of 42 federal or state-protected, listed, candidate, or special status species with the potential to occur within the vicinity of the Project, including parts of the Gulf of Mexico that would be traversed by Project shipping traffic (see table 4.7-1). Pedestrian wildlife and protected habitat surveys were conducted concurrently with wetland delineations between June 2014 and August 2014; open water habitat was not surveyed. No federal or state-listed threatened, endangered, candidate, or special status species were observed during field surveys. However, two piping plovers were observed incidentally during a separate site visit in December 2014. Gulf LNG submitted the results of its field surveys to the FWS and the NMFS.

[10] NMFS consultations were initiated with the Panama City, Florida office in 2014. However, due to staffing changes the Southeast Regional Office located in St. Petersburg, Florida is reviewing the Project.

TABLE 4.7-1

Federal, Candidate, and State-listed Species with the Potential to Occur in within the Vicinity of the Project a/

Common Name	Scientific Name	Survey Method	Federal Status	State Status	State Rank	Jurisdiction (Agency) b/	Determination and Comments
Amphibians							
One-toed Amphiuma	*Amphiuma pholeter*	Pedestrian	NL	E	S1	MDWFP	*No Impacts* Suitable habitat is not present within the Project area. No individuals were observed during surveys.
Dusky (Mississippi) Gopher Frog	*Rana sevosa*	Pedestrian	E	E	S1	FWS	*No Effect.* Suitable habitat is not present within the Project area. No individuals were observed during surveys.
Terrestrial Reptiles							
Rainbow Snake	*Farancia erytrogramma*	Pedestrian	NL	E	S2	MDWFP	*No Impacts.* Suitable habitat is not present within the Project area. No individuals were observed during surveys.
Gopher Tortoise	*Gopherus polyphemus*	Pedestrian	T	E	S2	FWS	*No Effect.* Suitable habitat is not present within the Project area. No individuals were observed during surveys.
Black Pine Snake	*Pituophis melanoleucus lodingi*	Pedestrian	T	E	S2	FWS	*No Effect.* Suitable habitat is not present within the Project area. No individuals were observed during surveys.
Eastern Indigo Snake	*Drymarchon couperi*	Pedestrian	T	E	SX	FWS	*No Effect.* Suitable habitat is not present within the Project area. No individuals were observed during surveys.
Yellow-blotched Map Turtle	*Graptemys flavimaculata*	Pedestrian	T	E	S2	FWS	*No Effect.* Suitable habitat is not present within the Project area. No individuals were observed during surveys.
Alabama Red-bellied Turtle	*Psuedemys alabamensis*	Pedestrian	E	E	S1	FWS	*Not Likely to Adversely Affect.* Suitable habitat is present within the Project area, but no individuals were observed during surveys.
Birds							
Snowy Plover	*Charadrius nivosus*	Pedestrian	NL	E	S2	MDWFP	*Impacts Would Not be Significant.* Suitable habitat is present within the Project area, but no individuals were observed during surveys.
Rufa Red Knot	*Calidris canutus rufa*	Pedestrian	T	NL	S2N	FWS	*Not Likely to Adversely Affect.* Suitable foraging habitat is present at the Terminal Expansion site. No individuals were observed during surveys.
Piping Plover	*Charadrius melodus*	Pedestrian	E	E	S2N	FWS	*Not Likely to Adversely Affect.* Suitable foraging habitat is present within the Project area, and two foraging individuals were observed at the Terminal Expansion site in December 2014.
Peregrine Falcon	*Falco peregrinus*	Pedestrian	DL	E	S1N	MDWFP	*Impacts Would Not be Significant.* Suitable foraging habitat may be present at the Terminal Expansion site, but no individuals were observed during surveys.
Mississippi Sandhill Crane	*Grus canadensis pulla*	Pedestrian	E	E	S1	FWS	*No Effect.* Suitable habitat is not present within the Project area. No individuals were observed during surveys.

TABLE 4.7-1

Federal, Candidate, and State-listed Species with the Potential to Occur in within the Vicinity of the Project a/

Common Name	Scientific Name	Survey Method	Federal Status	State Status	State Rank	Jurisdiction (Agency) b/	Determination and Comments
Bald Eagle c/	*Haliaeetus leucocephalus*	Pedestrian	DL	NL	NL	FWS	*Impacts Would Not be Significant.* Suitable habitat is present at the Terminal Expansion site, but no individuals were observed during surveys.
Wood Stork	*Mycteria americana*	Pedestrian	T	E	S2N	FWS	*Not Likely to Adversely Affect.* Suitable foraging habitat may be present within the Project area, but no individuals were observed during surveys.
Brown Pelican	*Pelicanus occidentalis*	Pedestrian	DL	E	S1N	MDWFP	*Impacts Would Not be Significant.* Suitable roosting and loafing habitat is present within the Project area, but no individuals were observed during surveys.
Red-cockaded Woodpecker	*Picoides borealis*	Pedestrian	E	E	S1	FWS	*No Effect.* Suitable habitat is not present within the Project area. No individuals were observed during surveys.
Least Tern	*Sternula antillarum*	Pedestrian	E	NL	NL	FWS	*Not Likely to Adversely Affect.* Suitable foraging habitat may be present within the Project area, but no individuals were observed during surveys.
Interior Least Tern d/	*Sterna antillarum athalassos*	Pedestrian	E	E	S2B	FWS	*Not Likely to Adversely Affect.* Suitable foraging habitat may be present within the Project area. No individuals were observed during surveys.
Bewick's wren	*Thryomanes bewickii*	Pedestrian	NL	E	S2S3B	MDWFP	*No Impacts.* Suitable habitat is not present within the Project area. No individuals were observed during surveys.
Mammals							
West Indian Manatee	*Trichechus manatus*	Pedestrian	T	E	S1N	FWS	*Not Likely to Adversely Affect.* Suitable habitat is not present within the Project area, but this species could occur as a transient.
Louisiana Black Bear	*Ursus americanus luteolus*	Pedestrian	T	E	S1	FWS	*No Effect.* Suitable habitat is not present within the Project area. No individuals were observed during surveys.
Blue Whale	*Balaenoptera musculus*	NA	E	NL	NL	NMFS	*Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is unlikely to occur in the Gulf of Mexico.
Bryde's Whale	*Balaenoptera edeni*	NA	UR	NL	NL	NMFS	*Project would not contribute to a trend toward federal listing.* Suitable habitat is present within the Project area.
Sperm Whale	*Physeter macrocephalus*	NA	E	NL	NL	NMFS	*Not Likely to Adversely Affect.* Suitable habitat is present within the Project area.
Fin Whale	*Balaenoptera physalus*	NA	E	NL	NL	NMFS	*Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is unlikely to occur in the Gulf of Mexico.

TABLE 4.7-1

Federal, Candidate, and State-listed Species with the Potential to Occur in within the Vicinity of the Project a/

Common Name	Scientific Name	Survey Method	Federal Status	State Status	State Rank	Jurisdiction (Agency) b/	Determination and Comments
Humpback Whale	*Megaptera novaeangliae*	NA	E	NL	NL	NMFS	*Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is unlikely to occur in the Gulf of Mexico.
Sei Whale	*Balaenoptera borealis*	NA	E	NL	NL	NMFS	*Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is unlikely to occur in the Gulf of Mexico.
North Atlantic Right Whale	*Eubalaena glacialis*	NA	E	NL	NL	NMFS	*No Effect.* Suitable habitat is not present within the Project area. Records of this species occurring in the Gulf of Mexico are attributed to anomalies, occasional animals, or the use of historic data that are no longer accurate.
Fish							
Gulf Sturgeon	*Acipenser oxyrinchus desotoi*	NA e/	T	E	S1	FWS and NMFS	*Not Likely to Adversely Affect.* Critical habitat would be impacted by wetland mitigation.
Saltmarsh Topminnow	*Fundulus jenkinsi*	NA	UR	NL	NL	FWS	*Project would not contribute to a trend toward federal listing.* Suitable habitat is present at the Terminal Expansion site.
Pearl Darter	*Percina aurora*	NA	T	E	S1	FWS	*No Effect.* Suitable habitat is not present within the Project area.
Smalltooth sawfish	*Pristis pectinata*	NA	E	NL	NL	FWS and NMFS	*Not Likely to Adversely Affect.* Suitable habitat is not present within the Project area, but juveniles of this species could occur as transients.
Sea Turtles							
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	NA	E	E	S1N	FWS and NMFS	*Not Likely to Adversely Affect.* Suitable foraging habitat is present within the Project area. There is no known nesting habitat in Mississippi.
Green Sea Turtle f/	*Chelonia mydas*	NA	T	E	SNA	FWS and NMFS	*Not Likely to Adversely Affect.* Suitable foraging habitat is present within the Project area. There is no known nesting habitat in Mississippi.
Loggerhead Sea Turtle	*Caretta*	NA	T	E	S1B, SNA	FWS and NMFS	*Not Likely to Adversely Affect.* Suitable foraging habitat is present within the Project area.
Leatherback Sea Turtle	*Dermochelys coriacea*	NA	E	E	SNA	FWS and NMFS	*Not Likely to Adversely Affect.* Suitable foraging habitat is present within the Project area. There is no known nesting habitat in Mississippi.
Hawksbill Sea Turtle	*Eretmochelys imbricata*	NA	E	E	SNA	FWS and NMFS	*Not Likely to Adversely Affect.* Suitable foraging habitat is not present within the vicinity of the Terminal Expansion site, but the species could occur along LNG vessel transit routes.

TABLE 4.7-1

Federal, Candidate, and State-listed Species with the Potential to Occur in within the Vicinity of the Project a/

Common Name	Scientific Name	Survey Method	Federal Status	State Status	State Rank	Jurisdiction (Agency) b/	Determination and Comments
Plants							
Louisiana Quillwort	*Isoetes louisianensis*	Pedestrian	E	E	S2	FWS	*No Effect.* Suitable habitat is not present within the Project area. No individuals were observed during surveys.
Coastal Groundcherry	*Physalis angustifolia*	Pedestrian	NL	NL	S3S4	MDWFP	*No Impacts.* Suitable habitat is not present within the Project area. No individuals were observed during surveys.
Bottlebrush Threeawn	*Aristida spiciformis*	Pedestrian	NL	NL	S1	MDWFP	*No Impacts.* Suitable habitat may be present within the Project area. However, no individuals were observed during surveys, and this species is listed as 'extirpated' or 'potentially extirpated' in Jackson County.
Carolina Grasswort	*Lilaeopsis carolinensis*	Pedestrian	NL	NL	S2S3	MDWFP	*Impacts Would Not be Significant.* A population is located at the Terminal Expansion.

Sources: FWS, 2018; MNHP, 2011; MNHP, 2015; NatureServe, 2015; MDWFP, 2018

a The area being considered includes offshore portions of the Gulf of Mexico through which LNG carriers would typically travel for Project-related activities.

b All species with a state rank are also under the jurisdiction of the MDWFP.

c This species is protected under the BGEPA.

d The federal and state listing information for the interior least tern applies to interior populations nesting along the Mississippi River only.

e Gulf sturgeon habitat surveys were conducted in 2005 at the existing Terminal site.

f The green sea turtle is federally threatened, with the exception of breeding colony populations in Florida and the Pacific coast of Mexico, which are federally endangered.

E – Endangered

NL – Not Listed

T – Threatened

DL – Delisted due to Recovery

UR – Under Review

S1 – Critically imperiled in Mississippi because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it vulnerable to extirpation

S2 – Imperiled in Mississippi because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it vulnerable to extirpation

SX – Presumed extinct

S3 – Vulnerable in Mississippi (about 21 to 100 occurrences)

S4 – Apparently secure

N – Non-breeding

B – Breeding

SNA – State rank is not applicable, because the element is not a suitable target for conservation

SZ – Zero occurrences in the state

We have reviewed the information submitted by Gulf LNG, performed our own research, and consulted directly with the FWS and the NMFS. Of the 42 initially identified species, 16 would not be affected by the Project and thus are not addressed further in this EIS. The remaining 26 species with the potential to occur in the Project area are listed in table 4.7-1 and discussed below.

4.7.1 Federally Listed Threatened and Endangered Species

A total of 19 federally protected species, and 2 species that are under federal review, have the potential to occur in the vicinity of the Project (see table 4.7-1). Of these 21 species, 8 are under the jurisdiction of the FWS, 6 are under the jurisdiction of the NMFS, and 7 (Gulf sturgeon, smalltooth sawfish, and 5 sea turtles species) live in habitats that fall within an area where both services manage the species.

A full BA has been prepared for the Project, which outlines life history information, and relative abundance of species with the potential to occur in the Project area. Potential impacts and conservation measures to avoid and/or minimize impacts are also included in the BA. The BA has been included as appendix B of this EIS.

Based on the limited amount of available habitat in the area, the temporary or short-term nature of the construction impacts for the Project, and the mitigation measures proposed, we believe that the Project is *not likely to adversely affect* the 19 federally listed species and would *not contribute to a trend toward federal listing* for the 2 species under federal review. However, as we have not completed Section 7 ESA consultation with FWS/NMFS, **we recommend that:**

- **Gulf LNG should not begin construction activities until:**
  - **a. FERC staff receives comments from the FWS and NMFS regarding the proposed action;**
  - **b. FERC staff completes ESA Section 7 consultation with the FWS and NMFS; and**
  - **c. Gulf LNG has received written notification from the Director of OEP that construction or use of mitigation may begin.**

4.7.2 State-listed and Special Status Species

In addition to the federally listed species above, three birds (snowy plover, peregrine falcon, and brown pelican), one plant species of state concern (Carolina grasswort), and one special status species (bald eagle) occur within 2 miles of the Project facility sites and could be affected by the Project (MDWFP, 2014; see table 4.7-1). The life histories and potential impacts on these species are discussed below. The MDWFP identified eight species of state concern during correspondence in 2014 that have since been removed from the agency's Listed Species of Mississippi publication (MNHP, 2015). Because these species are not federally or state-protected and are no longer ranked as Mississippi species of concern, they are not included in this discussion. Based on review of available literature, the results of field surveys, and coordination with agency personnel, it is not likely that any of the other state-listed or special status species for Jackson County would frequently inhabit the Project sites.

4.7.2.1 Snowy Plover

The snowy plover is a small shorebird that prefers barren to sparsely vegetated sand beaches, dry salt flats in lagoons, dredge spoils deposited on beach or dune habitat, levees and flats at salt-evaporation ponds, river bars, reservoirs, and ponds. It is present across several continents, but in North America, it occurs only along the Gulf of Mexico and Pacific coastlines and scattered inland sites from Saskatchewan to California and Texas. Breeding populations have likely decreased on the Gulf of Mexico coast since late 1800s due to habitat alteration and increased recreational use of beaches. They are year-round residents along the Mississippi shoreline (Ridgely et al., 2003; NatureServe, 2015). This species has a Mississippi state ranking of S2, which indicates that the species is imperiled in Mississippi, making it vulnerable to extirpation (see table 4.7-1).

Suitable foraging and nesting habitat exists at the Terminal Expansion site, but no individuals were observed during field surveys. This species is highly mobile and would likely avoid the area during construction, unless it is nesting. Gulf LNG has committed to working with the FWS and MDWFP to develop a plan to avoid nesting birds, which would include the use of pre-construction nesting surveys, nest removal prior to construction, or a combination of the two. Due to the mobility of this species, Gulf LNG's commitment to avoid nesting birds, and the lack of sightings in the Project area, we believe the Project *would not significantly impact* the snowy plover.

4.7.2.2 Peregrine Falcon

The peregrine falcon is the largest falcon in North America. It is a migratory species that feeds on medium-sized birds and typically nests on ledges or the faces rocky cliffs (Cornell, 2015; NatureServe, 2015). It is designated as "critically imperiled" in Mississippi (MNHP, 2015).

The peregrine falcon formerly bred from Alaska and Greenland south to Georgia and Baja California, southern South America, Eurasia, Africa, and Australia. It was at one time absent from much of the eastern United States and Europe, although populations in eastern North American have rebounded. There are no records of the peregrine falcon breeding in Mississippi. The species migrates along the Gulf Coast of Mississippi and may occasionally winter on some of the offshore barrier islands (MDWFP, 2001).

Cornell (2015) reported that peregrine falcons could forage on shorebirds and waterfowl along shorelines such as those in the vicinity of the Project. While foraging may be interrupted temporarily as a result of some construction activities, this is a mobile species, and adjacent habitat provides adequate alternative foraging habitat. Peregrine falcons perch and nest on tall structures, and it is possible that the flare tower would be attractive as a perching site. However, the species occurs in the vicinity of the Project in winter and does not breed in the area (Cornell, 2015); therefore, it is unlikely the flare tower would be used as a nesting site. Based on these factors, we conclude that the Project *would not significantly impact* the peregrine falcon.

4.7.2.3 Brown Pelican

The brown pelican was federally listed as endangered in 1970, because the widespread use of dichlorodiphenyltrichloroethane (DDT) had thinned eggshells of the brown pelican to the point that survivorship of eggs was severely decreased. The species was delisted from the FWS Threatened and Endangered Species list in 2009 due to species recovery; however, it remains state-listed as endangered in Mississippi (MNHP, 2015). Pelicans usually occur in small flocks in bays, estuaries, and along the coast.

Although suitable brown pelican habitat and foraging areas were observed in the vicinity of the Project, no rookeries or high quality nesting habitat are present. Potential foraging areas for the brown pelican exist near the Project area, but Defenders of Wildlife (2010) reported that there were no known nesting records of brown pelicans in Mississippi, and the MDWFP (2001) reported that pelicans do not nest in Mississippi but are seen fairly regularly along the Gulf Coast and near the barrier islands. During biological resources surveys, no pelicans were observed using the habitats of the Terminal Expansion site; however, brown pelicans were observed foraging close to the existing South Marsh Mitigation Area (see figure 4.4-2). That area would not be available as habitat during construction of the proposed wetland mitigation site and during the early phases of establishment of vegetation on the mitigation site. However, there is considerable foraging habitat in the vicinity and it is likely that pelicans would use that habitat during construction of the Terminal Expansion and the wetland mitigation site. As a result of these considerations, we conclude that the Project *would not significantly impact* the brown pelican.

4.7.2.4 Bald Eagle

The bald eagle was federally listed as endangered in 1967 primarily because the use of DDT caused thinning of eggshells and a decrease in egg survivorship. A recovery plan was put in place and the use of DDT was curtailed, which allowed the bald eagle population to increase significantly. It was subsequently delisted in 2007 but is still federally protected by the BGEPA, which prohibits the "taking" of bald eagles, including their parts, nests, or eggs. "Taking" includes disturbance, which means to bother or agitate a bald eagle to the point of injury, decrease in productivity, or nest abandonment (FWS, 2010). Bald eagles are not threatened, endangered, or special status species by the state of Mississippi (MNHP, 2015).

The species winters and breeds throughout the United States along waterbodies from Alaska and northern and western Canada, south to Florida, the Gulf Coast, and Arizona. Pairs nest along the Gulf Coast near the Mississippi River in the west-central part of the state. During the 1999 nesting season, at least 25 pairs of bald eagles were monitored in Mississippi (MDWFP, 2001). In Jackson County, bald eagles are known to nest on Horn Island, Cat Island, and East Ship Island, which are all offshore barrier islands between about 9 to 34 miles from the Project sites (COE, 2014).

The Mississippi Sound provides suitable foraging habitat, and it is possible that bald eagles may occasionally forage in the vicinity of the Terminal Expansion. However, no nesting sites were observed during surveys, and no suitable nesting habitat can be found in the Project area. It is not likely that bald eagles would forage during construction or when there is human activity on or near the water during operation. They would most likely move to nearby areas where there is ample foraging habitat. Bald eagle nests are typically 50 to 125 feet above the ground and away from heavily developed areas (Cornell, 2015). There is no documentation of bald eagles nesting at greater heights, other than on cliffs, and is therefore not likely that they would nest on the flare tower (at about 433 feet above msl). Therefore, we conclude the Project *would not significantly impact* the bald eagle.

4.7.2.5 Carolina Grasswort

Carolina grasswort is a perennial forb with a native range along the Gulf of Mexico coast and along the Atlantic coast from Florida, north to Virginia. This species almost always occurs in wetlands (USDA, 2015). MDWFP (2014) designated it as "vulnerable to imperiled" in Mississippi. During biological surveys, Gulf LNG observed a small area of Carolina grasswort along the northern edge of the existing North Marsh Mitigation Area (see figure 4.4-2). Gulf LNG would use this site for parking and administrative buildings and it would therefore be permanently impacted unless the population of grasswort on the site is relocated. On August 27, 2018 the MMNS recommended that the Carolina grasswort populations be transplanted to a similar habitat prior to construction activities.[11] We believe this is a reasonable measure that Gulf LNG could implement to minimize and mitigate for impacts on this population. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Gulf LNG should transplant the Carolina grasswort population along the northern edge of the existing North Marsh Mitigation Area to a similar habitat using protocols determined in consultation with the MMNS.**

[11] Accession no. 20180829-5060

We conclude with implementation of our recommendation, the Project *would not significantly impact* the Carolina grasswort.

4.7.2.6 State-Listed and Special Status Species Conclusion

A small population of Carolina grasswort may be impacted by construction and operation of the Terminal Expansion. However, we recommend Gulf LNG transplant the Carolina grasswort population to a similar habitat using protocols determined in consultation with the MMNS.

Based on review of available literature, the results of field surveys, and coordination with agency personnel, it is not likely that any of the other, state-listed or special status species for Jackson County would frequently inhabit the Project sites.

4.8 LAND USE, RECREATION, AND VISUAL RESOURCES

4.8.1 Land Use

Land use in the vicinity of the Project is generally classified within the following categories: forested, open land, open water, wetlands, industrial/commercial lands, and the BCDMMS. The definitions of these land use types are as follows:

- forested – includes upland forests;
- open land – existing utility rights-of-way and upland scrub-shrub;
- open water – water crossings greater than 100 feet;
- wetlands – emergent, scrub-shrub, and forested wetlands;
- industrial/commercial – all developed areas, such as roads, railroads, and industrial areas; and
- BCDMMS – land used by the COE Mobile District for placement of dredged materials.

Construction of the Project would require disturbance of about 230.8 acres of land. After construction, the permanent footprint would encompass about 172.1 acres. The remaining 58.7 acres would return to pre-construction conditions and uses. Table 4.8.1-1 summarizes the acreages of each land use type that Gulf LNG would affect during construction and operation of the Project.

4.8.1.1 Terminal Expansion

The Terminal Expansion site is adjacent to the Bayou Casotte Navigation Channel on the Mississippi Sound at the south end of SH-611 near Pascagoula, Mississippi. Gulf LNG would construct the Terminal Expansion within and adjacent to its existing Terminal, which abuts the western end of the Terminal Expansion site. Land uses surrounding and within the expansion site are primarily industrial, non-forested wetlands, open land, open water, and the BCDMMS. Construction of the facilities (excluding access roads and heavy haul roads) would require about 112.7 acres, including 2.7 acres of open land, 24.8 acres of wetlands, 40.3 acres of the BCDMMS, 29.5 acres of industrial land (of which 22.7 acres are within the existing Terminal boundaries), and 15.3 acres of open water. During operation, the Terminal Expansion would permanently affect 109.6 acres.

TABLE 4.8.1-1

Land Use Acreages Affected by the Gulf LNG Liquefaction Project a/

Facility	Forested		Open Land		Wetlands		Open Water		Industrial/ Commercial		BCDMMS b/		Total	
	Cons	Oper	Cons	Oper	Cons	Oper	Cons	Oper	Cons	Oper	Cons	Oper	Cons	Oper
Terminal Expansion c/	0.0	0.0	2.7	2.7	24.8	28.0 d/	15.3	9.1	29.5	29.5	40.3	40.3	112.7	109.6
Access Roads e/	0.0	0.0	0.7	0.7	3.2	3.2	0.0	0.0	10.2	10.2	6.1	6.1	20.1	20.1
Construction Support Areas f/	8.5	8.5	0.0	0.0	7.6	7.6	0.0	0.0	78.3	26.3	0.0	0.0	94.4	42.4
Transco/FGT Interconnection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	1.5	0.0
Gulfstream Meter Station	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.6	0.0
Destin Meter Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	1.5	0.0
Total	**8.5**	**8.5**	**3.6**	**3.5**	**35.6**	**38.7**	**15.3**	**9.1**	**121.5**	**65.9**	**46.4**	**46.4**	**230.8**	**172.1**

a The numbers in this table have been rounded to the nearest tenth. As a result, the totals may not reflect the sum of the addends.
b This land is used by the COE Mobile District for placement of dredged materials.
c Includes impacts from the supply docks.
d Includes 3.1 acres of emergent wetlands that are outside of the Project boundary, but within the flare exclusion zone.
e The access road impacts include the North and South Heavy Haul Roads; all new access roads would be constructed within the boundaries of the Terminal Expansion site.
f About 0.4 acre of wetlands and 0.6 acre of forested land in CSA-3 are not included in these totals as these areas would not be impacted and would be avoided during construction.

Access Roads

Gulf LNG would use existing public roadways and access roads during construction of the Terminal Expansion, except for new access roads that would be constructed within the boundaries of the Terminal Expansion site. In addition, Gulf LNG would demolish a segment of an existing access road within the boundaries of the existing Terminal. Gulf LNG would also construct heavy haul roads from the North Supply Dock (0.8 acre) and the South Supply Dock (0.4 acre). When the South Supply Dock is removed after construction is completed, a portion of the heavy haul road leading to it (0.2 acre) would be removed, but not fully restored to pre-construction conditions. Construction and use of all access roads would impact about 20.1 acres during construction and operation.

Construction Support Areas

The Project would require the temporary use of six CSAs for staging, laydown areas, contractor yards, and parking (see figure 2.2-3). Overall, the use of the CSAs would require a total of 94.4 acres of land during construction. All CSAs are previously disturbed sites that would utilize existing industrial/commercial land to the greatest extent possible. Gulf LNG currently uses CSA-3 as part of operation of the existing Terminal; Gulf LNG would continue the current use of CSA-3 during operation of the Project, which would affect the same 7.8 acres of industrial/commercial land currently affected. Both CSA-3 and CSA-5 include wetlands and forested lands within their boundaries. Gulf LNG would not disturb or alter the wetlands or forested areas within CSA-3. A total of 7.6 acres of wetlands and 8.5 acres of upland forest within CSA-5 would be disturbed during construction to maximize the amount of useable area. Impacts on forested vegetation would be considered permanent. Additionally, while Gulf LNG proposes to permanently fill the wetlands at CSA-5, in section 4.4 we are recommending that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the FERC Procedures.

4.8.1.2 Pipeline Modifications

Construction of the Project would require modifications to the Destin Meter Station, Gulfstream Meter Station, and the Transco/FGT Interconnection. Gulf LNG would install two bypass pipelines at the Destin and Gulfstream Meter Stations along with the necessary switching valves to allow the existing metering stations to meter natural gas flow to the Terminal Expansion while retaining the capability to meter natural gas flow from the existing Terminal. Transco would make modifications to the existing and jointly owned Transco/FGT Interconnection to permit bi-directional flow. These modifications would be constructed by Transco and would be reviewed by the FERC under its blanket certificate process.

The Pipeline Modifications would result in 3.5 acres of construction impacts on industrial land and 0.1 acre of impacts on open land in the existing right-of-way. Impacts would be limited to the currently fenced areas of the sites or the existing pipeline right-of-way. The areas impacted have gravel surfaces (with the exception of the 0.1 acre of open land), and after construction, Gulf LNG and Transco would return all impacted land to pre-construction conditions. Gulf LNG and Transco would use existing roadways to gain access to the Pipeline Modification sites and would not establish new access roads.

4.8.1.3 Land Use Impacts and Mitigation

Impacts on and mitigation of wetlands are described in section 4.4, while impacts on upland forest and open land are described in section 4.5 (vegetation). The sections below focus on land uses not discussed in detail elsewhere in the EIS.

Existing Rights-of-Way

Terminal Expansion

The existing Terminal is a 33.3-acre facility, of which about 10.6 acres would be modified during construction of the Project. The remaining 22.7 acres would be used during construction but would remain unchanged.

Gulf LNG would access the Terminal Expansion site using existing public roadways to access SH-611 and SH-611 up to the point where it abuts the existing entrance road to the existing Terminal. No other rights-of-way would be affected by construction or operation of the Terminal Expansion. Gulf LNG would video all public road access routes to the site before and after construction to ensure all roads are returned to their pre-existing conditions. No significant impacts on roadways are expected due to construction or operation of the Project.

Pipeline Modifications

The entire 3.6 acres required for the Pipeline Modifications would be within existing aboveground facilities or rights-of-way. About 1.5 acres would be within the footprint of the Destin Meter Station, 0.5 acre would be within the existing footprint of the Gulfstream Meter Station, 0.1 acre would be within an adjacent existing right-of-way, and about 1.5 acres would be in the footprint of the Transco/FGT Interconnection.

Open Water

Terminal Expansion

Construction of the Terminal Expansion would impact 15.3 acres of open water during construction, all of which would be within the Mississippi Sound along the Bayou Casotte Navigation Channel. The open water impacts would be associated with dredging activities for the North and South Supply Docks (see section 4.3). Each supply dock may require annual maintenance dredging during construction, which would result in a periodic impact on open water at the Terminal Expansion.

Once construction is complete, the South Supply Dock would be removed and the 6.2 acres of open water used for this area would be allowed to revert to its pre-construction condition. The North Supply Dock would continue to be used during operation of the Terminal Expansion, resulting in periodic maintenance dredging to maintain the appropriate depth. This would result in a periodic impact on the 9.1 acres of open water associated with the North Supply Dock. As discussed in section 1.4.3, following construction, ownership of the North Supply Dock would be transferred to the JCPA.

Pipeline Modifications

Construction and operation of the Pipeline Modifications would not affect open water.

Bayou Casotte Dredge Material Management Site

Terminal Expansion

Construction and operation of the Terminal Expansion would impact 46.4 acres of the BCDMMS, including construction of access roads within the Terminal Expansion site. As discussed in section 2.2, the BCDMMS is currently used by the COE for placement of dredged materials from maintenance dredging of the Bayou Casotte Navigation Channel. Gulf LNG would remove material from the remaining portion of the BCDMMS to use as fill material to bring the elevation of the Terminal Expansion site up to the appropriate grade (together with fill from the COE Tombigbee Project) and to construct the new earthen berm along the northeastern border of the Terminal Expansion site. Excavated material that would not be satisfactory for use as fill would be disposed of at an authorized disposal site. Following initial construction of the berm by Gulf LNG, the COE, in order to expand capacity of the BCDMMS, would extend the berm to a height of 39.2 feet NAVD. The impact on the BCDMMS would be minor but would last for the duration of the Project.

Pipeline Modifications

Construction and operation of the Pipeline Modifications would not impact the BCDMMS.

Residential Lands

No residential lands occur within 50 feet of the Project. The closest residential areas to the Terminal Expansion site are about 4.0 miles to the north and about 2.0 miles to the northwest. CSA-3 is on Louisa Street, a two-lane road adjacent to a residential neighborhood (see figure 2.2-3). The site would be used for warehousing and equipment storage, which would be similar to its current use and use during construction of the existing Terminal and pipeline and would not directly impact any residential properties. The site would not be used for activities that would require heavy traffic, such as parking and fabrication. Gulf LNG would adhere to all posted weight limits. No impacts are anticipated to residents in the area of CSA-3. The next closest CSA to a residential area is CSA-6, which is 421 feet from the Cherokee Forest Park Subdivision. CSAs 1, 2, 4, and 5 are located 3,204 feet; 1,996 feet; 4,104 feet; and 6,228 feet from residential areas respectively. No impacts are anticipated on residential areas from those CSAs.

4.8.2 Landowner and Easement Requirements

4.8.2.1 Terminal Expansion

The existing Terminal and much of the Terminal Expansion are lands owned by the Port of Pascagoula and leased from the Port by Gulf LNG. All but 46.4 of the 132.2 acres required for construction of the Terminal Expansion is being leased from the Port. The remaining 46.4 acres is the BCDMMS, and Gulf LNG is working with the COE Mobile District and the JCPA to negotiate transfer of the necessary portion of the BCDMMS to Gulf LNG. At the time of Gulf LNG's August 29, 2018 filing, the lease was in draft form.[12] Gulf LNG anticipates executing the lease agreement once the final investment decision is taken for the Project.

4.8.2.2 Pipeline Modifications

All modifications that would be completed would be within land currently owned by third parties and within the Gulf LNG easements for the existing Gulf LNG Pipeline facilities. As a result, Gulf LNG would not require additional easements for the Pipeline Modifications. At the Gulfstream Meter Station, about 0.1 acre outside the current fence line would be needed for temporary workspace, but this area would be within the existing right-of-way.

4.8.3 Planned Developments

There are no existing or known planned developments at or near the sites of Project facilities.

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12 Accession number 20180829-5060.

As discussed further in section 4.13, construction of the Wood Pellet Export Terminal project has the potential to overlap with parts of the Project. If there would be concurrent construction of the Wood Pellet Export Terminal, Gulf LNG would not utilize CSA-6 and would pursue the use of another previously disturbed (in-kind) use site, resulting in no cumulative impacts and no overlap.

4.8.4 Recreation and Special Interest Areas

4.8.4.1 Terminal Expansion

The Terminal Expansion would not directly affect any designated recreational or special interest areas during construction or operation.

There are several recreational and special use areas in the vicinity of the Terminal Expansion site. These include the Grand Bay Savanna Preserve, Grand Bay NERR, Grand Bay NWR, Pascagoula River Coastal Preserve, Gulf Islands National Seashore, Gulf Islands Wilderness, Shepard State Park, Pascagoula Beach Park, and Singing River Yacht Club (see table 4.8.4-1).

TABLE 4.8.4-1

Recreation and Special Use Areas within the Vicinity of the Project Area

Recreation or Special Use Area	Approximate Distance From Project (miles)	Direction from Project
Grand Bay Savanna Preserve	0.1	E
Grand Bay NERR	1.1	E
Singing River Yacht Club	2.0	NW
Pascagoula Beach Park	2.3	NW
Grand Bay NWR	4.6	NE
Pascagoula River Coastal Preserve	6.2	NW
Gulf Islands National Seashore	6.2	NW
Gulf Islands Wilderness	6.2	NW
Shepard State Park	8.3	NW
Oak Grove Trail (part of Grand Bay NERR)	8.3	E

Recreational uses of the Grand Bay Savanna Preserve, 0.1 mile from the Terminal Expansion, are primarily boating and fishing. No direct impacts are anticipated to the Grand Bay Savanna Preserve due to construction or operation of the Project. However, any indirect impacts on wildlife could impact users of the Grand Bay Savanna Preserve. Wildlife impacts due to the Project are discussed in section 4.6.1. Due to the distance and location of the Grand Bay NWR, Gulf Islands Wilderness, Pascagoula River Coastal Preserve, and the Shepard State Park, no direct or indirect impacts are anticipated. A portion of the Gulf Islands National Seashore is about 6 miles south of the Terminal Expansion site. The Pascagoula Beach Park is adjacent to Beach Drive, about 2.3 miles northwest of the facility, across Mississippi Sound. No direct impacts are anticipated to users of the park or the national seashore. Construction and operation of the Project could result in visual impacts and are discussed in section 4.8.6. The Singing River Yacht Club is about 2 miles northwest of the Terminal Expansion. The yacht club is on an inlet of the Mississippi Sound and would not be directly affected by the increase in barge traffic during construction or operation of the Terminal Expansion. A portion of the Grand Bay NERR is about 1.1 miles from the Project site. The Grand Bay NERR is about 18,000 acres and recreationalists use the area for paddling, nature photography, hunting, fishing, boating, and birding (including the Oak Grove birding trail). No direct impacts are anticipated to the Grand Bay NERR due to construction or operation of the Project. However, any indirect impacts on wildlife could impact users of the Grand Bay NERR. Wildlife impacts due to the Project are discussed in section 4.6.1.

During construction of the Terminal Expansion, barge traffic within Mississippi Sound would increase. All barges would use the North and South Supply Docks. Gulf LNG estimates that between 25 and 60 barge arrivals per month (for about 30 months) would be needed, depending on the stage of construction. Although recreational and commercial boat traffic is present within Mississippi Sound, we believe the impacts on marine traffic during construction, including recreational marine traffic, would be minor (see section 4.9.6). Similarly, the impacts of barge traffic on fishing in the channel would be minor. To help minimize impacts on other users of the sound, Gulf LNG would communicate barge traffic plans with various industry groups, such as the Port of Pascagoula Advisory Group and the Propeller Club of Pascagoula and the barge deliveries would be coordinated using the Port of Pascagoula's daily ship schedule. Overall, construction of the Terminal Expansion would result in minor, temporary impacts on recreational boating and fishing in the channel and the waterway.

Construction of the Terminal Expansion would require dredging between the North Supply Dock and the Bayou Casotte Navigation Channel and at the South Supply Dock (also see section 4.9.6). Gulf LNG would not dredge within the channel, thus avoiding impacts on vessels using the channel during dredging.

Gulf LNG has not requested an increase in the number of LNG carriers calling on the Terminal Expansion beyond the number currently authorized for the existing Terminal. The potential impacts of LNG carrier traffic on recreational boating and fishing was addressed in the EIS for the existing Terminal (FERC, 2006).

4.8.4.2 Pipeline Modifications

There are no recreational or special use areas in the vicinity of the Pipeline Modifications.

4.8.5 Conservation Lands

The Project would not impact either wetland reserve program or conservation reserve program lands.

4.8.6 Visual Resources

4.8.6.1 Terminal Expansion

The primary existing structures in the viewshed of the proposed Terminal Expansion site include the existing Terminal, Chevron Pascagoula Refinery, and Mississippi Phosphates Corporation plant. The viewshed also includes the Mississippi Sound, Bayou Casotte Navigation Channel, the BCDMMS, and wetlands in the vicinity of the Terminal Expansion site.

Gulf LNG would construct its expansion adjacent to the existing Terminal, and views would be consistent with the existing industrial area. The impact on visual resources during construction due to the presence of workers and equipment for the about 64 month construction period would be minor due to the limited number of viewers, and temporary, lasting only for the period of construction.

The expanded Terminal would include many aboveground structures that could result in a visual resource impact. These include two liquefaction trains, two supply docks (only one would be retained after construction is complete), support facilities, administrative buildings, and a flare tower housing four flares. Most of these structures would require lighting for safe access at night or to meet Federal Aviation

Administration requirements. About 17 percent of the Terminal Expansion would be within the existing Terminal site, with the remaining portions constructed east and south of and adjacent to the existing Terminal. Table 4.8.5-1 lists the heights of the primary equipment and structures of the Terminal Expansion.

TABLE 4.8.5-1

Major Structures of the Terminal Expansion

Structure	Number	Length (feet)	Width (feet)	Height (feet)
Storage Tanks				
Existing LNG Storage Tanks	2	250 (Dia)	250 (Dia)	126
Firewater/Service Water Storage Tank	1	75 (Dia)	75 (Dia)	60
Aqueous Ammonia Storage Drum	1	12 (Dia)	12 (Dia)	58
Solvent Storage Tank	1	28 (Dia)	28 (Dia)	29
Diesel Storage Tank	1	30 (Dia)	30 (Dia)	26
Hot Oil Storage Tanks	2	33 (Dia)	33 (Dia)	23
Potable Water Storage Tank	1	16 (Dia)	16 (Dia)	16
Walls or Dikes				
Earthen Berm	1	3,475	12	27
Storm Surge Concrete Wall	1	2,100	2	27
Other				
Flare Tower	1	64 (Tri)	64 (Tri)	433
Main Cryogenic Heat Exchanger	1	16 (Dia)	16 (Dia)	178
Air Cooler Structure	2	810	123	118
Acid Gas Absorber	1	15 (Dia)	15 (Dia)	90
Debutanizer	1	3 (Dia)	3 (Dia)	61
Deethanizer	1	3 (Dia)	3 (Dia)	34
Scrub Column	1	16 (Dia)	16 (Dia)	27
Admin Building	1	180	150	20
Maintenance Building and Warehouse	1	300	250	20

Dia = diameter
Tri = triangular

The tallest structure to be constructed would be the 433-foot-tall flare tower at the southwest corner of the site. The flares would be operated only during startup and when incidents require releases. The second tallest structure would be the Main Cryogenic Heat Exchanger, which would be 178 feet tall, but only 16 feet in diameter. All remaining structures would have a height that is less than the existing storage tanks, which are the most dominant visual features at the existing Terminal. In addition, the area from the north end of the Terminal Expansion to the nearest residential community, about 4 miles, is heavily industrialized as well, including a large refinery with multiple flares, storage tanks, and buildings. We believe the proximity of the Terminal Expansion to the existing industrialized area would lessen the overall impact.

The closest visual receptors to the Terminal Expansion site would be residents, motorists, and recreationalists along Beach Boulevard, about 2 miles northwest of and across Mississippi Sound from the Terminal Expansion site. Beach Boulevard is a two-lane road that includes homes as well as Pascagoula Beach Park and Pascagoula Beach Pier. During construction, some viewers may be able to see an increase in marine traffic traveling to and from the Terminal Expansion site as well as some large construction equipment. This would result in a minor, temporary impact on visual resources in the viewshed. The closest community north of the Terminal Expansion is about 4 miles from the site and the intervening topography and industrial structures block views of the Terminal Expansion from that area. In addition, there is no through traffic on the entrance road to the existing facility or along the southern portion of SH-611. Therefore, there would not be visual impacts on roadway travelers along the highway.

Overall, we believe the Terminal Expansion would result in minor impacts on the viewshed during construction and operation. Beach Boulevard travelers and residents would experience the greatest visual impacts, although we believe that the new facilities of the Terminal Expansion would not be distinctly different from the existing views of the industrial area in the vicinity. As a result, we believe that operation of the Terminal Expansion would not result in a significant impact on visual resources.

Lighting during construction and operation may result in visual impacts on nearby viewsheds. During construction of the Terminal Expansion, 40 percent of the workforce would work during nighttime hours which would require additional lighting. Gulf LNG would use the minimum amount of lighting necessary to complete the work safely. Impacts from lighting during construction would be a minor temporary impact. The existing Terminal includes outdoor lighting that consists primarily of downlighting for safety and lights on tall structures for aircraft warnings. Gulf LNG would operate similar lighting during operation of the Terminal Expansion. To meet industry standards and regulations, Gulf LNG would install high-masted floodlights. These lights would be used to illuminate large areas and are designed to have no direct uplight and instead focus light to the intended area within the property limits of the facility. Typically, these lights are 100 feet high and there would be approximately three to four of them within the liquefaction train and two or three more in the utility area. Recommendations from the FWS to help avoid impacts on migratory birds would be incorporated into the lighting design of the flare tower where they would not interfere with safety and operation of the Terminal Expansion. Flaring would be occasional, occurring only during startup and upset conditions. Most of the viewers of night lights in that area would consist of motorists and residents along Beach Boulevard, boaters in Mississippi Sound and the navigation channel, and viewers from a few other locations in the viewshed. However, the lighting of the expanded Terminal would appear similar to that of the existing Terminal, although across a greater area. Viewers familiar with the nighttime appearance of the existing Terminal may notice a larger lit area. Although the lighting would be slightly different in size than the currently lit area, it would be similar to the lighting of industrial facilities throughout the area. We conclude the impact of night lighting on visual resources would not be significant.

4.8.6.2 Pipeline Expansion

All Pipeline Modifications would be completed within an existing meter station and an existing pipeline interconnection. There are few viewers of these existing facilities and Gulf LNG and Transco would not be making major aboveground changes to the facilities. As a result, we conclude that there would not be more than minor visual impacts due to construction and operation of the modifications.

4.8.7 Coastal Zone Management

The Mississippi CZMP is administered by the MDMR. The MDMR evaluates activities or development affecting land within Mississippi's coastal zone for compliance with the CZMA through a process called "federal consistency." The Terminal Expansion site is within the designated coastal zone.

A determination from the MDMR that the Project is consistent with the Mississippi CZMP has not yet been obtained by Gulf LNG. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Gulf LNG should file documentation of concurrence from the MDMR that the Project is consistent with the Mississippi CZMP.**

The FERC would not approve construction until all federal authorizations, including a consistency determination with the CZMA, have been granted.

4.8.8 Conclusions for Land Use, Special Interest Areas, and Visual Resources

A total of 230.8 acres would be impacted during construction of the Terminal Expansion and 172.1 acres would be impacted during operation. The largest portion of these impacts would be on industrial land, land used for depositing dredged material, and wetlands. With implementation of agency-approved compensatory mitigation, the land use impacts of the Terminal Expansion would be minor.

Grand Bay Savanna Preserve, the nearest recreation or special interest area, is about 0.1 mile from the Terminal Expansion. Primary recreational uses of the Grand Bay Savanna Preserve are boating and fishing. No direct impacts to the Grand Bay Savanna Preserve are anticipated due to construction or operation of the Project. However, indirect impacts on wildlife (as discussed in section 4.6.1) could impact users of the Grand Bay Savanna Preserve.

Views of the Terminal Expansion would generally be similar to those of the adjacent existing Terminal and the surrounding industrial areas. The tallest structure to be constructed would be the 433-foot-tall flare tower at the southwest corner of the site. The flares would be operated only during startup and when incidents require releases. Overall, we conclude the Terminal Expansion would result in only minor impacts on the viewshed during construction and operation.

Construction and operation of the Pipeline Modifications would result in 3.5 acres of construction impacts on industrial land and 0.1 acre of impacts on open land. All of which would be within the currently fenced areas of the meter stations and interconnection sites or the associated pipeline right-of-way. There are few viewers of these existing facilities and Gulf LNG and Transco would not be making major aboveground changes to the facilities. As a result, we believe that there would not be more than minor visual impacts due to construction and operation of the modifications.

4.9 SOCIOECONOMICS

Socioeconomic conditions in the area may be affected by construction and operation of the Project. Both the Terminal Expansion and Pipeline Modifications would be in Jackson County, Mississippi. Construction and operation may affect population levels, employment levels, tax revenues, ongoing local expenditures by the operator, housing availability, demand for public services, or transportation in the area. For the socioeconomic analysis, Jackson County is considered the "Project area."

4.9.1 Population

The population of Jackson County was estimated at 142,152 people in 2017 by the U.S. Census Bureau (U.S. Census Bureau, 2017a). The population density was 196.7 people per square mile. The average population density for the state of Mississippi was 63.6 people per square mile. Table 4.9.1-1 lists selected population and demographics information in the Project area.

Gulf LNG estimates that the average workforce for construction of the Project would be 1,950 workers. The estimated number of construction workers for each year of construction are listed in table 4.9.1-2. During construction, Gulf LNG anticipates that the peak workforce would be 4,300 workers. The workforce would include about 10 workers for construction of the Pipeline Modifications and the remaining workforce would be used for construction of the Terminal Expansion. About 40 percent of the workforce is expected to be hired from within the population of the city of Pascagoula and the surrounding areas. The other 60 percent of the workers would be hired from outside the area and would temporarily relocate during construction. While it is unlikely that most of the non-local workforce would relocate with their families, as a conservative estimate Gulf LNG assumed that 1,950, or roughly 75 percent of the peak non-local workforce, would bring their families and 630 non-local workers would relocate without families. Assuming an average household size in the United States of 2.64 people (U.S. Census Bureau, 2017a), the 1,950 non-local workers would bring 3,198 family members. The total of the 630 non-local workers that would relocate without bringing families, the 1,950 non-local workers that bring families, and the 3,198 family members that would relocate, the total population increase would be 5,778 people at the peak of construction. This would result in a 4.1 percent increase in the Jackson County population. The increase would represent a temporary impact on the local population.

Operation of the Terminal Expansion would require 113 new permanent jobs, with many of the workers expected to be local hires. However, even if all 113 positions were to be filled by workers from outside the Project area and they all brought their families, the population increase would be less than 300 people, which is less than 1 percent of the population of Jackson County.

There would be no new permanent positions required for operation of the Pipeline Modifications.

TABLE 4.9.1-1

Existing Socioeconomic Conditions in the Project Area

State/ County	Population		Population Density (per square mile)		Per Capita Income	Civilian Labor Force	Unemployment Rate (percent)	Top Two Major Industries a/
	2010 b/	2017 b/	2010 b/	2017 b/	2017 c/	2017 c/	June 2018 d/	2011-2015 b/
Mississippi	2,967,297	2,984,100	63.2	63.6	$23,121	1,3,29,899	4.8	1. Manufacturing 2. Retail trade
Jackson County	139,668	142,152	193.2	196.7	$25,990	70,191	6.4	1. Manufacturing 2. Entertainment e/

a Excludes the educational services, and health care and social assistance industry.
b U.S. Census Bureau, 2017a
c U.S. Census Bureau, 2017b
d BLS, 2018
e Entertainment refers to the Arts, Entertainment, Recreation, Accommodation and Food Services industry.

TABLE 4.9.1-2 **Estimated Workforce Numbers by Construction Year**						
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Total Workforce	1,000	2,500	3,500	4,300	3,800	1,500
Local Workers **a/**	400	1,000	1,400	1,720	1,520	600
Non-Local Workers **b/**	600	1,500	2,100	2,580	2,280	900
Workers that would Relocate without Families ***c/***	146	366	512	630	556	220
Workers that would relocate with a Family ***d/***	454	1,134	1,588	1,950	1,724	680
Additional Family Members ***e/***	744	1,860	2,604	3,198	2,822	1,116
(Students) ***f/***	279	698	977	1,200	1,060	419
Total Population Gain g/	**1,344**	**3,360**	**4,704**	**5,778**	**5,107**	**2,016**

a Equal to 40 percent of total workforce.
b Equal to 60 percent of total workforce.
c Equal to 24.4 percent of non-local workers. Based on Gulf LNG's estimate that 1,950 of 2,580 non-local workers bringing families during the peak of construction.
d Equal to 75.6 percent of non-local workers. Based on Gulf LNG's estimate that 1,950 of 2,580 non-local workers bringing families during the peak of construction.
e Equal to Workers that would relocate with a family x 1.64 (2.64 people per household minus the one worker which is already counted) (U.S. Census Bureau, 2015).
f Equal to (Workers that would relocate with a family + Additional Family Members) x Percent of population 17 and under (23.3) (U.S. Census Bureau, 2017).
g Equal to Non-local Workers + Additional Family Members.

4.9.2 Economy and Employment

Table 4.9.2-1 lists employment and income information for the Project area. After the educational services, and health care and social assistance industry, manufacturing employs the most people in Mississippi. In Jackson County, manufacturing is the largest employer, followed by the educational services, and health care and social assistance industry (U.S. Census Bureau, 2017b).

TABLE 4.9.2-1 **Employment and Income Characteristics of the Project Area**		
Characteristic	**Mississippi**	**Jackson County**
Major Industry 2012 - 2016 **a/**, **b/**	Manufacturing	Manufacturing
2017 Civilian Labor Force **a/**	1,319,719	70,191
2017 Per Capita Income **a/**	$23,121	$25,990
2017 Population below Poverty Level **a/**	19.8%	13.8%
June 2018 Unemployment Rate **c/**	4.8%	6.4%

a U.S. Census Bureau, 2017b
b Excludes the educational services, and health care and social assistance industry
c BLS, 2018

The civilian labor force is defined as the total of employed persons and those searching for work. In Jackson County, the civilian labor force in 2017 was 70,191 people and the per capita income was $25,990. The per capita income is higher than the overall average for Mississippi which is $23,121 (U.S. Census Bureau, 2017b). The unemployment rate for June 2018 was 6.4 percent for Jackson County and 4.8 percent for Mississippi (BLS, 2018). The average poverty rate for Jackson County in 2017 was 13.8 percent, and the overall state poverty rate for the same period was 19.8 percent (U.S. Census Bureau, 2017b).

Construction jobs for the Project would add temporary employment opportunities in the area. Gulf LNG has estimated that they would hire 1,720 workers from the local area during the peak of construction. This would result in a minor, temporary decrease in the unemployment rate for the Project area. Gulf LNG estimated that the total construction expenditures for the Project would be about $7 billion. Based on an assessment conducted by Gulf LNG's economics contractor, Navigant Economics, about $1.5 billion would be spent within a 75-mile radius of the Project, and employee earnings in Jackson County would increase by $450.8 million (Navigant Economics, 2012). In addition to direct construction employment, other employment (indirect) may increase in the Project area due to the newly created demand for goods and services in the area. As construction workers spend money on food, housing, and other goods, local businesses would benefit. Overall, this would result in a beneficial, but temporary, increase in the local economy.

Operation of the Terminal Expansion would require up to 113 permanent new positions, with many of these positions expected to be filled by local hires. Expenditures by the permanent workers would result in a negligible permanent economic benefit to the Project area.

4.9.3 Local Taxes and Government Revenue

Gulf LNG estimates it would spend $7 billion on the Project during construction (Navigant Economics, 2012). This includes construction worker wages, materials and equipment, and services. Payroll taxes and sales taxes on purchases (such as materials and equipment) would generate increased federal, state, and local tax revenues. In addition to direct Project-related expenditures, additional economic benefits would accrue due to expenditures by construction workers, and in some cases their families, and by some businesses that may make additional investments to meet additional demand. Total federal tax revenues are expected to be $1.7 billion and total state and local tax revenues would be about $910.1 million over the total construction period (Navigant Economics, 2012). In Jackson County, the total federal tax revenues generated would be $132.0 million, and the state and local taxes generated would be $60.6 million (Navigant Economics, 2012). Included within those estimates would be roughly $90 million per year in income taxes and a total of $40 million in state sales and use taxes during construction. In addition, the Jackson County property taxes from the Terminal are expected to total $104.1 million over the total construction period (Navigant Economics, 2012). The increased tax benefits for the federal, state, and local governments would be a temporary, beneficial impact.

Gulf LNG estimated that during operation of the Project, federal tax revenues would be $516.0 million per year and the state and local tax revenues would be $318.9 million per year. This includes the taxes on Gulf LNG's operating expenditures and the purchase of LNG by Gulf LNG's customers. Navigant Economics (2012) estimated that the state and local tax for Jackson County would be $13.2 million and the Jackson County property tax would be as much as $65 million per year. Gulf LNG estimates that workers would pay at least $500,000 per year in income taxes. This would result in a permanent beneficial impact on federal, state, and local tax revenues.

4.9.4 Housing

According to the U.S. Census Bureau (2017c), there were 10,771 vacant housing units in Jackson County in 2016, 2,202 of which were available for rent, and a rental vacancy rate of 12.1 percent. In 2017, there were also 65 hotels and motels and 13 campgrounds and recreational vehicle (RV) parks (see table 4.9.4-1). Assuming there are about 114 rooms per hotel (Statistic Brain, 2017), there are an estimated 7,410 hotel/motel rooms within Jackson County. The average occupancy rate for Mississippi's non-casino hotels is 57.1 percent (Visit Mississippi, 2016). The Project's peak construction workforce would be about 4,300 workers, of which 2,580 would be non-local and require temporary housing (see table 4.9.1-2). The remaining 1,720 workers would be from the Project area local labor pool and would not require temporary housing.

TABLE 4.9.4-1

Housing Characteristics of the Project Area

State/ County	Vacant Housing Units b/	Vacant Housing Units For Rent b/	Rental Vacancy Rate (percent) a/	For Seasonal, Recreational, or Occasional Use a/	Hotels/ Motels c/	Number of Campgrounds and RV Parks d/
Mississippi	196,439	36,392	9.2	42,836	1,225	249
Jackson County	10,771	2,202	12.1	1,547	65	13

a U.S. Census Bureau, 2017a
b U.S. Census Bureau, 2017c
c HotelMotels, 2017
d Yellow Pages for Business, 2017

The influx of construction workers in the Project area would result in a temporary increase on the demand for housing. If the entire non-local workforce relocated to Jackson County, they would occupy about 25 percent of the available housing in the county (vacant housing units for rent and hotel/motel rooms). However, taking into account the rental vacancy rate and hotel occupancy rate, the workforce could occupy almost 70 percent of the available housing in Jackson County. Seasonal tourism may have additional effects on the availability of housing, as vacancy rates may be lower during peak tourism months. However, larger nearby tourism destinations are roughly 20 miles to the west in the Biloxi/Gulfport, Mississippi area and in Mobile, Alabama, roughly 35 miles northeast. Each of these areas has a large numbers of hotels, with an estimated 86 hotels/motels in Biloxi and 125 hotels/motels in Mobile (HotelMotels, 2017). Because these areas are within easy commuting distance from the Project area, it is likely that a portion of the workforce would relocate to these areas. Therefore, while housing may be limited in Jackson County, there are sufficient numbers of hotel rooms in surrounding areas to absorb any overflow of workers. Therefore, we conclude that impacts from Project construction on housing would not be significant.

Operation of the Project would require up to 113 new positions. The housing requirements of these permanent staff members would have a minor impact on the local housing market.

4.9.5 Public Services

Jackson County had 46 public schools with a total enrollment of 24,464 students in the 2014-2015 school year and six private schools with a total of 886 students in the 2013-2014 school year (see table 4.9.5-1) (National Center for Education Statistics, 2015). In 2017 there were five police departments (USA Cops, 2017), 12 fire departments (U.S. Fire Administration, 2017), and two hospitals with a total of 571 beds (Jackson County Economic Development, 2017).

TABLE 4.9.5-1

Public Service Data for the Gulf LNG Export Project Area

County, State	Education			Public Safety		Healthcare	
	Number of Public Schools (enrollment) a/	Number of Private Schools (enrollment) a/	Total Enrollment a/	Number of Police Departments b/	Number of Fire Departments c/	Number of Hospitals d/	Number of Hospital Beds d/
Jackson County, Mississippi	46 (24,464)	6 (886)	25,350	5	12	2	571

a National Center for Education Statistics, 2015 (Public School data for 2014-2015 school year. Private School data for 2013-2014 school year.)
b USA Cops, 2017
c U.S. Fire Administration, 2017
d Jackson County Economic Development, 2017

Gulf LNG estimates that at the peak of construction around about 1,720 local workers would be hired and another 630 non-local workers would relocate without their families. If the remaining 1,950 non-local workers relocated with their families, there would be an additional 3,198 people moving to the area, based on an average of 2.64 people per household (U.S. Census Bureau, 2015). About 1,200 of these individuals would be school aged, based on the U.S Census Bureau (2015) estimate that 23.3 percent of the U.S. population is under the age of 18. Assuming all 1,200 children would enroll in schools in Jackson County, this would result in a temporary increase of 4.7 percent in the total student enrollment in Jackson County during the peak year of construction. However, because a portion of the workforce would likely relocate to areas outside of Jackson County, the increase in enrollment would be spread out among several districts, schools, and grade levels decreasing the overall impact on Jackson County schools. Therefore, we conclude the increase in school aged children would not have a significant impact on the local schools.

Gulf LNG provided the Pascagoula Police Department and the Pascagoula Fire Department with its ERP for the existing Terminal and would provide a revised ERP for the Terminal Expansion. As mentioned in section 4.9.1 construction could result in a roughly 4.1 percent increase in the population of Jackson County and this would likely result in an increase in demand on police and fire services during the peak of construction. Gulf LNG would continue to coordinate training needs or capabilities associated with the Terminal Expansion with the local service providers. Overall, the construction may result in a minor impact on local services. Operation of the Project is not expected to result in a significant impact on the local police and fire services.

Gulf LNG anticipates hiring local individuals to fill many of the 113 permanent positions associated with operation of the Terminal Expansion. Even if all the positions are filled from outside the Project area, the impact on public services would be minor but would last for the life of the Project.

4.9.6 Transportation

Highway access to the construction areas would be via SH-611. The entrance to the existing Terminal is at the southern end of SH-611. An access road leads from that point to the main gate of the existing Terminal. A project to widen SH-611 to five lanes from Old Mobile Avenue south to the Chevron refinery was completed in 2016. According to Gulf LNG's *Traffic Impact Analysis*, 2013 daily traffic volumes were estimated to be 11,000 trips on the north end of SH-611 and 5,000 trips on the south end. Traffic levels would increase from construction worker vehicle trips and deliveries to the site.

At the peak of the construction labor force, Gulf LNG estimates roughly 6,880 vehicle trips for workers commuting to and from work. During the first year of construction of the Terminal Expansion, dirt hauling for the Project is expected to be at its peak with an estimated 170 truck trips per day for hauling dirt away from the Project site expected. Material deliveries during this same period would peak at about 20 truck trips per day. As a result, during this period there would be an average of 190 truck trips per day to and from the site. The addition of truck and commuter trips from the Project are estimated to result in a traffic increase of 53.6 percent to 68.2 percent on the north end of SH-611 and 150 percent on the south end.

To help distribute impacts of vehicle trips by workers, Gulf LNG would have two daytime shift start times and 40 percent of the workforce would work on the night shift. Estimated construction traffic shift volumes are shown in table 4.9.6-1. During the morning, each shift would result in about 1,032 workers arriving on-site, and 115 workers leaving the site. To minimize vehicle trips to the Terminal Expansion site, Gulf LNG has identified six CSAs for staging, laydown areas, contractor yards, and parking. The primary parking area for construction workers would be at CSA-6, which is proposed along the Bayou Casotte Parkway. Gulf LNG would require most construction workers to park at CSA-6 and take Gulf LNG shuttle busses to the construction area. Up to four of the other CSAs may also be used for construction worker parking with the exception of CSA-3. Because CSA-3 is proposed along a residential road, it would only be used as a material staging area in order to minimize traffic impacts in the residential neighborhood. Gulf LNG would use a total of 430 bus trips per day to transport workers between the CSAs and the construction site at the peak of the construction workforce. Gulf LNG would provide traffic control personnel to coordinate the traffic flows in and out of the CSAs and construction site, as needed, to minimize congestion and ensure public safety.

TABLE 4.9.6-1 **Construction Traffic Shift Volumes**						
		Peak Construction Traffic (vehicles per hour)			**Percent of Daily**	
Shift	**Time**	**In**	**Out**	**Total**	**SB**	**NB**
Night Shift - End	4:30	153	1,376	1,529	13.6	6.0
Day Shift 1 - Start	6:30	1,032	115	1,147	18.1	4.2
Day Shift 2 - Start	7:30	1,032	115	1,147	10.0	3.9
Day Shift 1 - End	16:00	115	1,032	1,147	4.8	16.2
Day Shift 2 - End	17:00	115	1,032	1,147	4.8	18.6
Night Shift - Start	18:00	1,376	153	1,529	2.6	5.0
NB = Northbound SB = Southbound						

The *Traffic Impact Analysis* estimated the impact of the Project on several major intersections near the Terminal Expansion site and the CSAs. Traffic levels at the intersections were measured in 2014 and then projected traffic levels were modeled for 2019, when construction was estimated to be at its peak. However, the Project schedule has changed and the peak workforce is no longer anticipated to be in 2019. Therefore, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Gulf LNG should file with the Secretary an updated Traffic Impact Analysis which includes an updated analysis based on current traffic conditions and the currently anticipated construction schedule.**

Table 4.9.6-2 shows the level of service (LOS) change for the morning rush hour and table 4.9.6-3 shows the LOS change for the evening rush hour. The LOS categorizes the estimated traffic flow along roads and highways from best (LOS A) to worst (LOS F). LOS A indicates roads that are free flowing, LOS B are roads that are reasonably free flowing, LOS C is stable flow but drivers are restricted in choosing their own speed, LOS D is approaching unstable flow, LOS E is an unstable flow with short stoppages, and LOS F indicates traffic that requires frequent stopping and slowing (USDOT 2018). The biggest change is at the Bayou Casotte Parkway and Orchard Road Intersection, where workers would be turning to access CSA-6 along the Bayou Casotte Parkway.

TABLE 4.9.6-2

Intersection Level of Service Comparison for Morning Rush Hour

Signalized Intersection	Year	Intersection Level of Service
SH 611/ Old Mobile Ave	2014	B
	2019	C
SH 611/ Orchard Road	2014	A
	2019	A

Unsignalized Intersection	Year	Level of Service a/											
		Northbound			Southbound			Eastbound			Westbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Bayou Casotte Parkway/ Orchard Road	2014	C	C	A	B	B	B	A	-	-	A	-	-
	2019	F	F	A	F	F	F	A	-	-	A	-	-
SH 611/ Hardee Road	2014	A	A	A	A	A	A	A	A	A	A	A	A
	2019	A	-	-	A	-	-	B	B	B	B	B	B

a L=left turn; T= through traffic, R=right turn

TABLE 4.9.6-3

Intersection Level of Service Comparison for Evening Rush Hour

Signalized Intersection	Year	Intersection Level of Service
SH 611/ Old Mobile Ave	2014	B
	2019	C
SH 611/ Orchard Road	2014	A
	2019	B

Unsignalized Intersection	Year	Level of Service a/											
		Northbound			Southbound			Eastbound			Westbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Bayou Casotte/ Orchard Road	2014	E	E	A	B	B	B	A	-	-	A	-	-
	2019	F	F	A	C	C	C	A	-	-	A	-	-
SH 611/ Hardee Road	2014	A	A	A	A	A	A	A	A	A	A	A	A
	2019	A	-	-	A	-	-	C	C	C	B	B	B

a L=left turn; T= through traffic, R=right turn

Even with the distribution of workers over several shifts, the traffic study predicted poor levels of service at traffic intersections near CSA-6. In order to address these issues, we requested that Gulf LNG develop a *Traffic Mitigation Plan* in consultation with the City of Pascagoula and the Mississippi Department of Transportation (MDOT). Gulf LNG focused on traffic entering and leaving the CSA-6 parking area and the intersection of Bayou Casotte Parkway and Orchard Road, which is about 0.5 mile north of CSA-6. As a result of this study, Gulf LNG is proposing to mitigate traffic impacts at the Bayou Casotte Parkway and Orchard Road Intersection by adding signage to clearly identify lane movements, adding raised pavement markers within the intersection, and restriping the intersection. These measures would help improve the functionality of the intersection and improve safety for drivers that are unfamiliar with driving in the area. Gulf LNG would implement these measures prior to starting construction. To improve traffic flow into and out of the parking area at CSA-6, Gulf LNG would prohibit parking along Bayou Casotte Parkway adjacent to the parking area and would stripe the three driveways that access the parking area to ensure the entry lane would be a minimum of 14 feet wide. Additionally, a large business along Bayou Casotte Parkway and south of CSA-6, VT Halter Marine, has reduced its number of employees by around 1,000 since the traffic analysis was conducted, which would lower the traffic volume at the intersection and lessen impacts if this reduction remains in effect during construction. While residents from the area to the west of CSA-6 could access their residences and schools along Bayou Casotte, it is more likely that they would use other, more direct routes such as Martin Street. With the mitigation measures outlined by Gulf LNG, our recommendation for an updated analysis, and the availability of other routes for local residents, construction of the Project would have a temporary and minor impact on traffic in the area of the Project.

Operation of the Terminal Expansion would result in a minor increase in freight and worker traffic. During operation, trucks would deliver refrigerants for use in the liquefaction process and trucks would haul NGLs from the site to third-party customers. Sanitary wastewater would also be trucked from the site for disposal. Gulf LNG estimates that there would be up to 59 trucks per month to and from the expanded Terminal. This equates to roughly four truck trips per day. Along with traffic from the 113 additional permanent employees for the Terminal Expansion, a total of 3,449 vehicles per month, or about 230 additional trips per day would access the expanded Terminal through SH-611. This change in traffic flow and use of the local roads would last for the life of the Project but would be a permanent, but minor impact.

Marine Traffic Impacts

Gulf LNG would construct two supply docks (North Supply Dock and South Supply Dock; see figure 2.2-1 and figure 2.2-2) to support the transfer of construction materials delivered by barge. Marine traffic would access the supply docks from the Bayou Casotte Navigation Channel. The supply docks would be outside of the existing navigation channel, which would minimize impacts on boat traffic within the navigation channel. According to the COE's draft environmental impact statement for the proposed Bayou Casotte Harbor Channel Improvement Project (COE, 2014), there are an estimated 2,900 vessel calls per year to the Port of Pascagoula, or roughly 242 per month. During construction of the supply docks, a total of 133 barge trips would be required to transport dredge material over a 2-month period. The 67 additional vessel calls would be a 27.7 percent increase in vessel traffic over the 2 months. Once the supply docks are completed, Gulf LNG estimates that during construction of the Terminal Expansion, a peak of 16 barges per month would access the supply docks with material deliveries. This represents a 6.6 percent increase to the number of vessel calls to the Port of Pascagoula, resulting in a temporary, but not significant impact on marine traffic in the area.

Gulf LNG would remove the South Supply Dock after completion of construction. It is anticipated that the North Supply Dock would remain in operation after construction, but ownership would be transferred to the JCPA. This would result in a minor impact on marine vessel traffic in the area. During operation of the Terminal Expansion, LNG carriers would use the existing marine berth at the existing Terminal. Gulf LNG has not requested a change in the currently authorized number of LNG carriers calling on the facility or the routes authorized for the carriers. Gulf LNG did request that the maximum size of LNG carriers authorized to use the facility be increased from 170,000 m^3 to 208,000 m^3. The USCG determined that the navigation portion of the original WSA did not account for larger LNG carriers. Therefore, the USCG prepared an updated draft LOR and LOR-A which was provided to the FERC in January 2016. The USCG prepared the final LOR and LOR-A dated May 4, 2016 which was provided to the FERC on August 9, 2017. The USCG concluded that the Bayou Casotte Channel was suitable for LNG marine traffic. Therefore, given that no increase in the number of LNG carriers are anticipated during operation and the USCG conclusions in the LOR and LOR-A, operation of the Project would result in no significant impacts.

4.9.7 Environmental Justice

Environmental justice considers disproportionately high and adverse impacts on minority or low-income populations in the surrounding community resulting from the programs, policies, or activities of federal agencies. Items considered in the evaluation of environmental justice include human health or environmental hazards, the natural physical environment, and associated social, economic, and cultural factors.

The EPA's environmental justice policies (which are directed, in part, by Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations)* focus on enhancing opportunities for residents to participate in decision making. Specifically, meaningful engagement was conducted with local communities, interested individuals, and organizations. As discussed in section 1.3, there have been many opportunities for the public to comment on and provide input about the Project. Gulf LNG met with many different stakeholders during initial development of the Project. Gulf LNG held an open house in the Project area for the affected communities and local authorities.

In addition, Gulf LNG used the FERC's pre-filing process (see section 1.3). One of the major goals of this process is to increase public awareness and encourage public input regarding every aspect of the Project before an application is filed. As part of this process, the FERC staff participated in Gulf LNG's open house to receive input from the public about the Project. Gulf LNG also held a meeting with the community group Cherokee Concerned Citizens during the application process. Interested parties have had, and would continue to be given, opportunities to participate in the NEPA review process. To date, this included the opportunity to participate in the FERC's public scoping meeting in the Project area to identify concerns and issues that should be covered in the EIS, and to submit written comments about the Project to the FERC. During the draft EIS comment period, the public will have an opportunity to comment on the document electronically, in writing, or in person at a comment session to be held in the Project area to receive comments on the draft EIS. All substantive comments on the draft EIS will be responded to in the Final EIS.

All documents that form the administrative record for this Project are available to the public electronically through the internet on the FERC's web page (at www.ferc.gov), using the eLibrary link (under "Documents & Filings"). Anyone, at any time, may comment to the FERC about the Project, either in writing via a letter to the Secretary of the Commission, or electronically using the eComment and eFiling links on the FERC's web page (again under "Documents & Filings").

The EPA provides guidance on determining whether there is a minority or low-income community to be addressed in an analysis. According to this guidance, minority population issues must be addressed when they comprise over 50 percent of an affected area or when the minority population percentage of the affected area is meaningfully greater than the minority percentage in the larger area of the general population.

According to 15 U.S.C. 689(3), the U.S. Department of Housing and Urban Development defines a low-income community as a census block or tract having a poverty rate of greater than 20 percent of the population living below the federal poverty line, among other possible indicators. Table 4.9.7-1 lists information on minority and low-income populations in the Project area.

TABLE 4.9.7-1

Low-Income and Minority Populations in the Project Area

State / County / Census Tract	Block Group	Percent of Population Below Poverty Level a/	Hispanic or Latino Population b/	White b/	Black or African American b/	American Indian and Alaska Native b/	Asian b/	Native Hawaiian and Other Pacific Islander b/	Some other Race or Two or More Races b/	Percent Minority Population c/
Mississippi		**22.3**	**3.2**	**59.2**	**37.8**	**0.6**	**1.1**	**0.1**	**1.3**	**43.3**
Jackson County		**15.6**	**6.5**	**73.3**	**21.8**	**0.5**	**2.4**	**0.1**	**2.0**	**32.3**
420.00	1	**16.9**	**10.0**	56.8	31.0	0.0	0.0	0.0	2.2	43.2
420.00	4	7.7	**12.0**	22.6	61.3	4.1	0.0	0.0	0.0	**77.4**
421.00	1	**31.8**	**13.5**	31.7	49.7	5.1	0.0	0.0	0.0	**68.3**
421.00	4	**44.9**	2.2	66.1	31.7	0.0	0.0	0.0	0.0	33.9
425.00	1	**30.8**	**12.0**	58.9	29.1	0.0	0.0	0.0	0.0	41.1
425.00	3	**17.4**	0.5	91.2	8.2	0.0	0.0	0.0	0.0	8.8
426.00	1	4.8	**6.6**	82.0	10.9	0.0	0.0	0.0	0.0	18.0
426.00	2	2.5	2.5	97.5	0.0	0.0	0.0	0.0	0.0	2.5
426.00	3	4.6	3.3	86.3	10.5	0.0	0.0	0.0	0.0	13.7
427.00	2	**18.9**	0.0	91.2	8.8	0.0	0.0	0.0	0.0	8.8
429.00	1	11.8	**11.8**	84.2	0.0	0.0	1.9	0.0	2.0	15.8

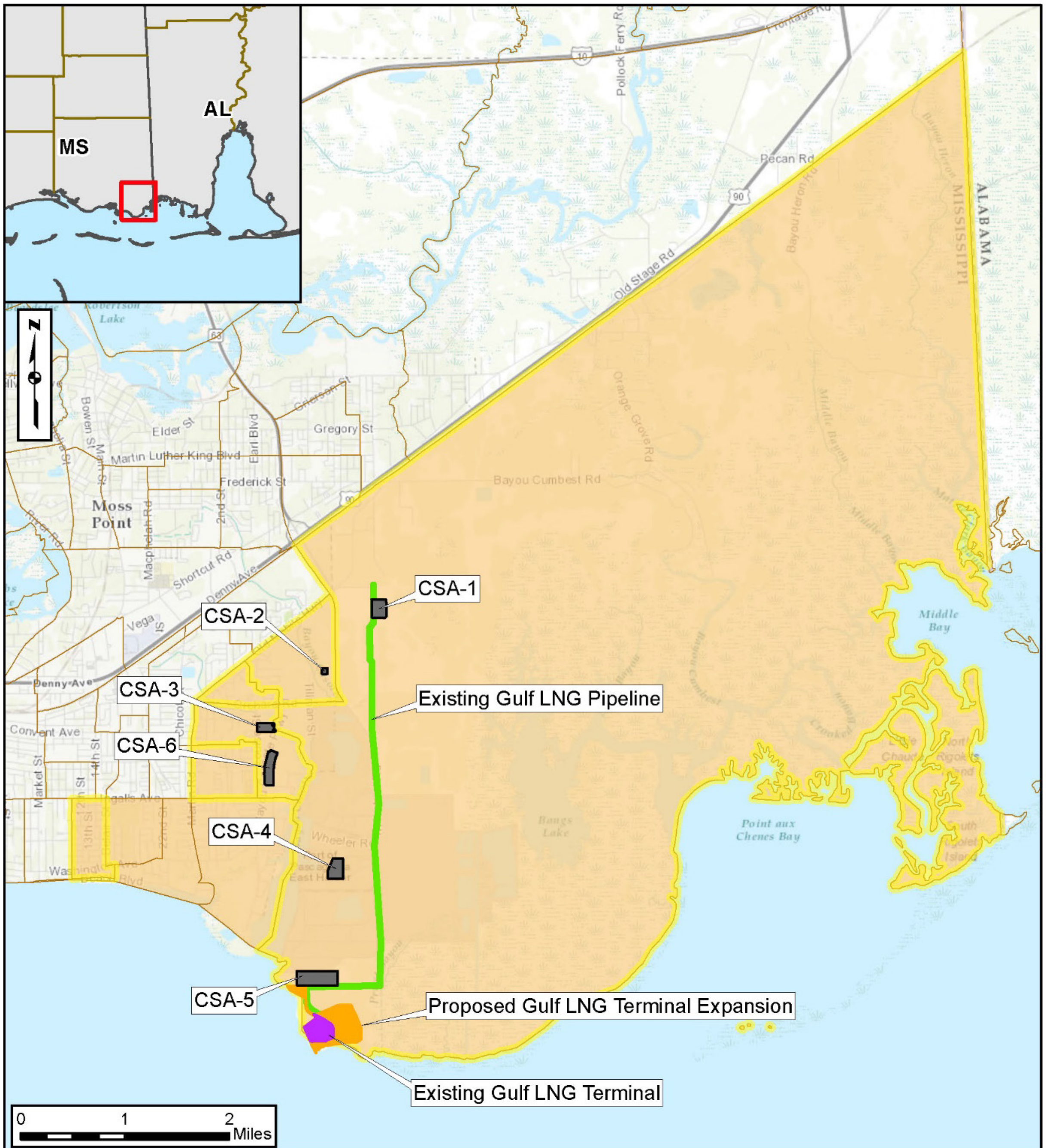
Values above the county numbers are represented with **bold** text.
a U.S. Census Bureau, 2017d
b U.S. Census Bureau, 2017e
c Minority population is either a non-white race or a Hispanic or Latino Ethnicity.

According to the U.S. Census Bureau (2017a), Jackson County has a lower percentage of minority populations than the state of Mississippi and a lower poverty rate than the state (see table 4.9.7-1).

The potential impacts of the Project would be limited to the Terminal Expansion site, the Pipeline Modifications sites, and the immediately adjacent areas. To review potential impacts we have chosen a 2-mile buffer around the Terminal Expansion site and a 500-meter buffer around the Pipeline Modifications sites and CSAs. The 500-meter buffer is consistent with the range used for the traffic proximity score used by the EPA's EJSCREEN (EPA, 2015). The 2-mile buffer around the Terminal Expansion site was chosen to ensure inclusion of potentially impacted communities across Bayou Casotte in Pascagoula. There are nine different census tract block groups within a 2-mile-radius of the Terminal Expansion site and two additional block groups within 500 meters of CSAs (see figure 4.9-1). Of these 11 census tract blocks, five have a poverty level rate over 20 percent, two have a minority population that is more than 50 percent of the overall population, and an additional two have a minority population that is higher than the county (U.S. Census Bureau, 2015). Overall, seven census block groups contained populations that could be considered environmental justice communities.

These communities have the potential to be impacted by excessive noise, dust, emissions from construction equipment, or traffic during construction and they would potentially be impacted by noise, emissions from the Terminal, or impaired viewsheds during operation. As described in section 4.11, impacts from noise, dust, and emissions would be minor for the overall Project. In addition, there are no residences within 4 miles of the proposed Terminal Expansion. Impacts on viewsheds are discussed in detail in section 4.8.6. The view of the Terminal Expansion site would be similar to the existing site, and we conclude that there would not be more than minor visual impacts due to construction and operation of the modifications. Traffic impacts are discussed in detail in section 4.9.6. CSA-6 is located within a potential EJ community. Traffic along the roads within the vicinity of CSA-6 could experience an increase in traffic. However, Gulf LNG is proposing to mitigate traffic impacts at the Bayou Casotte Parkway and Orchard Road Intersection by adding signage to clearly identify lane movements, adding raised pavement markers within the intersection, and restriping the intersection. These measures would help improve the functionality of the intersection and improve safety for drivers that are unfamiliar with driving in the area. Additionally, the residents in the area of that intersection would likely use various other available routes to access their neighborhoods and homes. Those populated areas are anticipated to experience minor traffic impacts due to construction of the Project.

Although there are environmental justice communities within the study area, given the minor impacts from the Project overall and the distance from the Terminal Expansion (the main Project construction) to nearby residences, we conclude the Project would not have a disproportionately high and adverse health or environmental effects on minority or low-income populations.



Existing Gulf LNG Pipeline

Existing Gulf LNG Terminal Site

Proposed Gulf LNG Terminal Expansion

Constructions Support Areas (CSAs)

Potential Environmental Justice Communities

Census Blocks Assessed

Census Blocks

Figure 4.9-1

Gulf LNG Liquefaction Project

Potential Environmental Justice Communities

4.10 CULTURAL RESOURCES

Section 106 of the NHPA, as amended, requires the FERC to take into account the effect of its undertakings on properties listed, or eligible for listing, in the NRHP and to afford the ACHP an opportunity to comment on the undertaking. Gulf LNG, as a non-federal party, is assisting the FERC in meeting our obligations under Section 106 and the implementing regulations in 36 CFR 800 by preparing the necessary information, analyses, and recommendations, as authorized by 36 CFR 800.2(a)(3).

Construction and operation of the Project could affect historic properties (that is, cultural resources listed in or eligible for listing in the NRHP). Historic properties include pre-contact or historic archaeological sites, districts, buildings, structures, and objects, as well as locations with traditional value to Native Americans or other groups. Such historic properties generally must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and must meet one or more of the criteria specified in 36 CFR 60.4.

4.10.1 Terminal Expansion

The Area of Potential Effect (APE) is defined as the area within which direct Project effects could result from ground disturbing activities and indirect Project effects could result from visual, auditory, or atmospheric changes. Direct effects are typically long term and adverse while indirect effects may be temporary or short term.

Gulf LNG completed a records review and a Phase I cultural resources survey of the Terminal Expansion, including the administration building and the six CSAs: the Knight Yards 1 and 2 (CSA-1 and CSA-2), Louise Street (CSA-3), Port Property (CSA-4), Chevron Property (CSA-5), and Bosarge Property (CSA-6). The investigations included archaeological and architectural resources. The record review did not identify any known archaeological or architectural resources within the areas surveyed.

The cultural resources surveys for the Terminal Expansion site, the administrative building, and five of the six CSAs employed pedestrian surface inspection, systematic subsurface shovel testing, and photo documentation. CSA-5 had been previously surveyed in 2005, the findings of which were adopted for this Project and it was not resurveyed. Shovel testing was conducted for the remaining CSAs in all areas unless impeded by existing modern buildings, underground utilities, pavement, or standing water. No cultural materials or evidence of intact cultural soils were identified during the investigation.

Gulf LNG provided the SHPO with final footprints of the proposed supply docks in a letter dated October 21, 2014. In a letter dated November 12, 2014, the SHPO determined that no cultural resources surveys would be required for the proposed supply docks.

No cultural resources were identified within the Terminal Expansion site, administrative buildings, or five of the CSAs, and no additional fieldwork was recommended (Cropley et al., 2014). Gulf LNG submitted the draft Phase I cultural resources survey report on the investigations to the Mississippi SHPO on October 31, 2014 and the final Phase I cultural resources survey report on November 28, 2014. In a letter dated November 20, 2014 and an email dated March 20, 2015, the SHPO concurred that no properties listed in or eligible for listing in the NRHP would be affected by the Project. We also concur.

CSA-6 and an ATWS adjacent to the Gulfstream Meter Station were surveyed subsequent to the submission of the final Phase I cultural resources survey report. The results of the CSA-6 survey were provided in a draft addendum to Phase I cultural resources survey report on April 30, 2015 (Hale and Eberwine, 2015). No properties listed in or eligible for listing in the NRHP were identified during the survey and as such, no historic properties would be affected by the Project. SHPO concurred with this finding in a letter dated June 1, 2015. We also concur.

In a letter dated June 4, 2015, Gulf LNG requested a SHPO determination on the necessity of a cultural resources survey for the wetland mitigation site. In a letter dated July 6, 2016, SHPO determined that no cultural resources were likely to be affected by the undertaking in the wetland mitigation site and they had no objections with the proposed undertaking. We also concur.

4.10.2 Pipeline Modifications

Gulf LNG completed a records review and a Phase I cultural resources survey of the Pipeline Modifications areas at the existing Destin Meter Station, the existing Gulfstream Meter Station, and the existing Transco/FGT Interconnection. The investigations included archaeological and architectural resources. The records review did not identify any known archaeological or architectural resources within the areas investigated.

Gulf LNG completed cultural resources surveys, which examined a total of 3.6 acres for the three sites. The surveys consisted of pedestrian surface inspection and photo documentation. No shovel testing was conducted in these areas due to underground utilities and the presence of gravel. All areas where subsurface disturbance would occur were previously disturbed by construction activities of the existing facilities (not associated with the Project).

No cultural resources were identified within the Pipeline Modifications survey area and no additional fieldwork was recommended. Gulf LNG submitted the results of the investigation to the SHPO on October 31, 2014 as a draft Phase I cultural resources survey report (Cropley et al., 2014). In a letter dated November 20, 2014, the SHPO concurred with this recommendation. We also concur.

An ATWS adjacent to the Gulfstream Meter Station was surveyed subsequent to the submission of the final cultural resources survey report. The results of the ATWS survey was provided in a draft addendum to Phase I cultural resources survey report on April 30, 2015, which also documented the survey of CSA-6 (Hale and Eberwine, 2015). No properties listed in or eligible for listing in the NRHP were identified during the survey and as such, no historic properties would be affected by the Project. SHPO concurred with this finding in a letter dated June 1, 2015. We also concur.

4.10.3 Consultation

The FERC staff consulted with the SHPO and federally recognized Indian tribes (tribes) regarding Project effects to cultural resources.

On July 31, 2014, the FERC sent copies of the NOI for the Project to a wide range of stakeholders, including the ACHP, the Bureau of Indian Affairs, the SHPO, and tribes that may have an interest in the Project and the area in the vicinity of the Project. The NOI contained a paragraph about Section 106 of the NHPA, stated that the notice is used to initiate consultations with the SHPO, and solicited the views government agencies, interested tribes, and the public on the Project's potential effects on historic properties.

On October 10, 2014, the FERC staff sent letters to the following eight tribes, inviting their participation in the review of the Project: the Alabama-Coushatta Tribe of Texas, the Caddo Nation, the Chitimacha Tribe of Louisiana, the Coushatta Tribe of Louisiana, the Jena Band of Choctaw Indians, the Mississippi Band of Choctaw Indians, the Choctaw Nation of Oklahoma, and the Tunica-Biloxi Indians of Louisiana. The FERC letter also requested their assistance in identifying properties of traditional, religious, or cultural importance. No responses have been received to date.

In addition to the FERC's notification process, Gulf LNG contacted the SHPO and tribes that might attach cultural or religious significance to cultural resources in the vicinity of the Project. On May 21, 2014, Gulf LNG sent letters to two tribes requesting cultural resources consultation: the Eastern Band of Cherokee and the Mississippi Band of Choctaw Indians. On October 21, 2014, additional letters were sent to these tribes to identify changes to the Project footprint. No responses have been received to date.

4.10.4 Unanticipated Discoveries and Emergency Procedures Plan

Gulf LNG prepared an *Unanticipated Discoveries and Emergency Procedures Plan* (see appendix F) that would be implemented in the event that cultural resources, burials, and/or human remains are encountered during construction. The plan was submitted to the SHPO as an appendix to the draft and final Phase I cultural resources reports for the Project (Cropley et al., 2014). The SHPO confirmed via email that the plan was sufficient. We have reviewed this plan and find it acceptable.

4.10.5 Compliance with the National Historic Preservation Act

Cultural resource investigations and surveys have been completed for the Terminal Expansion, including the administration building and the six CSAs, and Pipeline Modifications, including an ATWS adjacent to the Gulfstream Meter Station. A cultural resources survey is not necessary for the wetland mitigation site. Therefore, based on the information provided by Gulf LNG and consultations with the SHPO and Native American Tribes, we have determined that no historic properties would be affected by the Project as proposed.

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

Air quality would be affected by construction and operation of the proposed facilities. This section summarizes federal and state air quality regulations that are applicable to the proposed facilities. The section also characterizes the existing air quality and describes potential impacts the facilities may have on air quality regionally and locally. The term *air quality* refers to relative concentrations of pollutants in the ambient air. The subsections below describe well-established concepts that are applied to characterize air quality and to determine the significance of increases in air pollution. This includes metrics for specific air pollutants known as criteria pollutants referred to as National Ambient Air Quality Standards (NAAQS); regional designations to manage air quality known as Air Quality Control Regions (AQCRs); and efforts to monitor ambient air concentrations.

Combustion of natural gas would produce criteria air pollutants such as ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), SO_2, and inhalable particulate matter (PM [$PM_{2.5}$ and PM_{10}]). $PM_{2.5}$ includes particles with an aerodynamic diameter less than or equal to 2.5 micrometers, and PM_{10} includes particles with an aerodynamic diameter less than or equal to 10 micrometers. Combustion of fossil fuels also produces volatile organic compounds (VOC), a large group of organic chemicals that have a high vapor pressure at room temperature; and NO_x. VOCs react with NO_x, typically on warm summer days, to form O_3. Other byproducts of combustion are GHGs and hazardous air pollutants (HAPs). HAPs are chemicals known to cause cancer and other serious health impacts.

GHGs produced by fossil fuel combustion are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The status of GHG as a pollutant is not related to toxicity. GHGs are non-toxic and non-hazardous at normal ambient concentrations. GHG emissions due to human activity are the primary cause of increased levels of all GHGs since the industrial age. These elevated levels of GHGs are the primary cause of warming of the global climate system since the 1950s. These existing and future emissions of

GHGs, unless significantly curtailed, will cause further warming and changes to the local, regional, and global climate systems. Emissions of the GHGs are typically expressed in terms of CO_{2e}.

Other pollutants, not produced by combustion, are fugitive dust and fugitive emissions. Fugitive dust is a mix of $PM_{2.5}$, PM_{10}, and larger particles thrown up by vehicles, earth movement, or wind erosion. Fugitive emissions, in the context of this EIS, would be fugitive emissions of CH_4 (which is a specific VOC and GHG) from operational pipelines, tanks, and aboveground facilities.

Temporary air emissions would be generated during Project construction, and long-term air emissions would be generated during operation. Construction and operational air emissions as well as proposed mitigation measures are discussed in sections 4.11.1.3 and 4.11.1.4.

4.11.1.1 Regional Climate

Mississippi has a humid subtropical climate. Although the potential exists for drought and flood, rainfall is typically spread out consistently over the year. The winters are temperate, and the summers long and hot. Winds are generally southerly, and provide high humidity during the summer season. Thunderstorms occur on an average of 60 days per year (Mississippi State Climatologist, 2014).

Based on 1981 to 2010 climate data from the National Climatic Data Center (NCDC), temperatures at the Pascagoula 3 NE meteorological station usually range from a monthly minimum average of 49.4 °F in January to a maximum average of 80.8 °F in August. Mean annual precipitation is 65.0 inches, while monthly average precipitation ranges from a minimum of 4.2 inches in October to a maximum of 7.3 inches in August. The average annual snowfall is 0.0 inches (NCDC, 2010).

4.11.1.2 Existing Air Quality

Air quality would be affected by construction and operation of the proposed facilities. Gulf LNG would add natural gas liquefaction and export facilities to the existing Terminal in Jackson County, Mississippi. The proposed Project would include a pretreatment facility, two liquefaction trains with ancillary utilities and support facilities, an extension of the existing storm surge protection concrete wall, and a new earthen berm [an extension of the existing COE berm] (Terminal Expansion); and modifications to existing meter stations (Pipeline Modifications). This section describes existing laws and regulations relevant to air quality, and the potential effects related to air quality that would result from implementation of the Project.

Ambient Air Quality Standards

With authority granted by the CAA, the EPA established NAAQS to protect human health (primary standards) and public welfare (secondary standards). The EPA codified NAAQS in 40 CFR 50 for the following "criteria pollutants:" NO_2, CO, O_3, SO_2, lead (Pb), PM_{10}, and $PM_{2.5}$. These NAAQS reflect the relationship between pollutant concentrations and health and welfare effects. The NAAQS are summarized in table 4.11.1-1. While states can promulgate more stringent standards than the NAAQS, the MDEQ has adopted all of the NAAQS as promulgated by the EPA (MDEQ, 2014b).

TABLE 4.11.1-1 **National and Mississippi Ambient Air Quality Standards**				
Pollutant	**Time Frame**	**Primary**	**Secondary**	**Form**
PM_{10}	24-hour	150 μg/m^3	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
$PM_{2.5}$	Annual	12 μg/m^3	15 μg/m^3	Annual mean, averaged over 3 years
	24-hour	35 μg/m^3	35 μg/m^3	98th percentile, averaged over 3 years
SO_2	3-hour	NA	0.5 ppm	Not to be exceeded more than once per year
	1-hour	75 ppb	NA	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
CO	8-hour	9 ppm	NA	Not to be exceeded more than once per year
	1-hour	35 ppm	NA	Not to be exceeded more than once per year
NO_2	Annual	53 ppb	53 ppb	Annual mean
	1-hour	100 ppb	NA	98th percentile of 1-hour daily maximum concentration, averaged over 3 years
O_3	8-hour	0.070 ppm	0.070 ppm	Annual 4th highest daily maximum 8-hour concentration, averaged over 3 years
Pb	3-month rolling	0.15 μg/m^3	0.15 μg/m^3	Not to be exceeded

Sources: EPA, 2016; MDEQ, 2014b

Abbreviations:

NA = not applicable | ppb = part(s) per billion

μg = microgram(s) | ppm = part(s) per million

Air Quality Control Regions and Attainment Status

AQCRs are federally designated areas for air quality planning purposes. Each AQCR, or smaller portion within an AQCR, is designated as attainment, unclassifiable, maintenance, or nonattainment. Areas where ambient air pollutant concentrations are below the NAAQS are designated as attainment, while areas where ambient air concentrations are above the NAAQS are designated as nonattainment. Areas previously designated as nonattainment that have subsequently demonstrated compliance with the NAAQS are designated as "maintenance" for a period of time (normally 20 years after the effective date of attainment); this time period assumes that the area remains in compliance with the standard. Areas that lack sufficient data to determine their designation are designated unclassifiable, and are treated as attainment areas for the purpose of stationary source air permitting.

The proposed Project would be constructed in Jackson County, which is in the Southern Mississippi Interstate AQCR. Jackson County is in attainment or unclassifiable for all criteria pollutants.

There are three attainment air quality classifications within each of the AQCRs of the United States. Class I areas are designated as pristine natural areas or areas of natural significance and receive special protections under the CAA based on good air quality. Class III areas are heavily-industrialized zones that are established only on request and must meet all requirements outlined in 40 CFR 51.166. The remainder of the United States is designated as Class II. Jackson is a Class II attainment area. If a new source or major modification of an existing source is subject to the PSD program requirements and is within 62 miles (100 kilometers [km]) of a Class I area, the facility is required to notify the appropriate federal officials and assess the impacts of the proposed project on the Class I area. The closest designated

Class I area to the Terminal Expansion is Breton National Wildlife Refuge, about 29 miles (47 km) from the proposed site, and therefore a PSD Class I analysis would be required since the proposed Project is subject to PSD review. Gulf LNG supplied the federal land manager and EPA copies of the PSD air quality permit application for the Terminal Expansion, which include a Class I impact analysis (see section 4.11.1.5).

Air Quality Monitoring and Existing Air Quality

Along with state and local agencies, the EPA created a network of ambient air quality monitoring stations that collect data on background concentrations of criteria pollutants across the United States. To characterize the existing ambient air quality for the proposed Project, data were gathered from monitoring stations closest to the proposed Project site. For NO_2, O_3, $PM_{2.5}$, and SO_2, the closest monitoring site is in Pascagoula (Jackson County) on Hospital Road at the County Health Department, about 4 miles from the Project (Site ID 28-059-0006). For PM_{10}, CO, and Pb, the closest site is in Jackson (Hinds County), about 170 miles from 232 East Woodrow Wilson Drive (Site ID 28-049-0020).

Table 4.11.1-2 shows monitoring data for criteria pollutants for 2015 and 2016 from the monitoring sites, along with the appropriate primary NAAQS standard. All monitored values were below the NAAQS.

TABLE 4.11.1-2

Baseline Ambient Air Quality and Ambient Air Quality Standards

Pollutant	Averaging Period	Description of Monitored Value	2015	2016	Primary NAAQS
PM_{10}	24-hour	2nd high	48 μg/m^3	49 μg/m^3	150 μg/m^3
$PM_{2.5}$	Annual	Arithmetic mean	9.0 μg/m^3	7.8 μg/m^3	12 μg/m^3
	24-hour	98th percentile	19 μg/m^3	14 μg/m^3	35 μg/m^3
SO_2	1-hour	99th percentile	24 ppb	6 ppb	75 ppb
CO	8-hour	2nd high	1.5 ppm	1.2 ppm	9 ppm
	1-hour	2nd high	1.8 ppm	1.8 ppm	35 ppm
NO_2	Annual	Arithmetic mean	4 ppb	4 ppb	53 ppb
	1-hour	98th percentile	30 ppb	28 ppb	100 ppb
O_3	8-hour	4th high	0.065 ppm	0.062 ppm	0.070 ppm
Pb	3-month rolling	1st high	0.01 μg/m^3	0 μg/m^3	0.15 μg/m^3

Source: EPA, 2017b

Emissions from the Existing Terminal

Table 4.11.1-3 lists potential-to-emit (PTE) from the existing Terminal as previously permitted under State of Mississippi Air Pollution Control Permit No. 1280-00132. The table also includes fugitive emissions of VOCs (due to component leaks and diesel storage tanks).

TABLE 4.11.1-3 **Potential-to-Emit for the Existing Terminal**								
	Annual Pollutant Emissions (tpy)							
Emission Unit (Quantity)	**NO_X**	**CO**	**SO_2**	**PM_{10}/ $PM_{2.5}$**	**VOCs**	**H_2SO_4**	**HAPs**	**GHGs**
Stationary Source Emissions								
LNG Vaporizers (10)	163.3	131.0	2.4	7.6	42.0	0.2	12.0	489,930
Vent Stack Heater	5.1	4.3	0.03	0.4	0.3	0.00	0.8	6,201
Generator Turbines	14.2	17.2	0.4	0.9	0.1	0.04	1.9	16,662
Essential Diesel Generator	11.7	2.5	0.8	0.8	1.0	0.06	0.02	269
Backup Fire Water Pump 51	9.5	2.0	0.6	0.7	0.8	0.05	0.01	252
Backup Fire Water Pump 53	10.3	2.2	0.7	0.7	0.8	0.05	0.01	240
Backup Air Compressor	4.7	1.0	0.3	0.3	0.4	0.02	0.01	99
Stationary Source Subtotal	***219***	***161***	***5.3***	***11***	***45***	***0.4***	***15***	***513,650***
Fugitive Source Emissions								
Component Leaks	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0
TOTAL	**219**	**161**	**5.3**	**11**	**57**	**0.4**	**15**	**513,650**
Sources: EPA, 1995; MDEQ, 2006 Abbreviations: H_2SO_4 = sulfuric acid mist								

4.11.1.3 Regulatory Requirements for Air Quality

Terminal Expansion

Federal Air Quality Requirements

New Source Review/Prevention of Significant Deterioration. Federal pre-construction review of certain large proposed projects varies for attainment and nonattainment areas. Federal pre-construction review for sources in nonattainment areas is referred to as Nonattainment New Source Review (NNSR), while federal pre-construction review for sources in attainment areas is formally referred to as PSD. The review process aids in preventing new sources and modifications to existing systems from causing existing air quality to deteriorate beyond acceptable levels.

A source is classified as PSD major if it has the PTE more than 100 tpy of a pollutant regulated under the CAA and it is listed in one of the 28 named source categories in Section 169 of the CAA, or if it has the PTE more than 250 tpy and is not listed in one of the 28 named source categories in Section 169 of the CAA. The existing Terminal is considered a minor source with respect to PSD because it does not fall under a listed source category, and has the PTE less than 250 tpy of a pollutant regulated under the CAA. A modification to the Terminal would be subject to PSD if the modification itself resulted in an emission increase above any PSD major threshold. PSD major thresholds[13] are listed below.

[13] This summary reflects July 24, 2014 EPA Guidance indicating that the EPA will no longer treat GHGs as an air pollutant for purposes of determining whether a source is a major source required to obtain a PSD or Title V permit (EPA, 2014b). The MDEQ incorporates federal PSD rules into Mississippi regulations.

- For regulated pollutants other than GHGs, the modification is subject to PSD review if it causes an increase of more than 100 tpy (if classified in one of the 28 named source categories listed in Section 169 of the CAA) of the regulated air pollutant, or 250 tpy of the regulated air pollutant for any other type of source.
- For a modification subject to PSD review for one regulated pollutant, the source is also subject to PSD review for all other pollutants causing a significant increase in emissions level as defined in 40 CFR 52.21 (i.e., SO_2/VOC/NO_x increase of 40 tpy, CO increase of 100 tpy, PM increase of 25 tpy, PM_{10} increase of 15 tpy, $PM_{2.5}$ increase of 10 tpy, hydrogen sulfide [H_2S] increase of 10 tpy, sulfuric acid mist [H_2SO_4] increase of 7 tpy, or GHG increase of 75,000 tpy in terms of CO_{2e}).

Table 4.11.1-4 summarizes the PTE due to the addition of new equipment that would be used for the Terminal Expansion. Emissions from the Terminal Expansion itself are above the PSD major source thresholds for NO_x and CO. For a source subject to PSD review for one regulated pollutant, the source is also subject to PSD review for all other pollutants causing a significant increase in emissions level. Emissions of SO_2, PM_{10}/$PM_{2.5}$, VOCs, sulfuric acid mist, and GHGs are above significant increase thresholds, therefore, the Terminal Expansion would be subject to PSD review for NO_x, CO, SO_2, PM_{10}/$PM_{2.5}$, VOCs, sulfuric acid mist, and GHGs.

Gulf LNG submitted a PSD air quality permit application for the Terminal Expansion in May 2015, with revisions in June 2015 and December 2016. In July 2018, Gulf LNG provided written responses to the MDEQ's questions regarding Gulf LNG's PSD application. While the emissions are expected to be similar to those presented above, Gulf LNG's responses indicated that a revised PSD application is expected to be submitted by the end of 2018. The revised application will include an updated air dispersion modeling report, Class I impact analysis, and potential emissions from the Terminal Expansion which will be incorporated into the final EIS.

TABLE 4.11.1-4

Potential-to-Emit for the Terminal Expansion

Emission Unit (Quantity)	Annual Pollutant Emissions (tpy)							
	NO_X	**CO**	**SO_2**	**PM_{10}/ $PM_{2.5}$**	**VOCs**	**H_2SO_4**	**HAPs**	**GHGs**
Compressor Gas Turbines (4)	144.5	211.1	3.1	52.6	40.2	4.7	16.1	1,836,652
Hot Oil Heaters (2)	48.6	139.7	0.0	12.6	9.2	0.0	3.1	199,410
Thermal Oxidizers (2)	29.6	49.9	161.8	4.5	3.3	12.4	1.1	745,604
Warm Gas Flare	1.5	7.0	0.0	--	0.0	0.0	0.0	2,606
Cold Gas Flare	2.2	10.0	0.0	--	0.0	0.0	0.0	3,202
LP Flare	2.6	11.9	0.0	--	0.0	0.0	0.0	3,557
Spare Flare	0.3	1.5	0.0	--	0.0	0.0	0.0	263
LNG Carrier Flaring	1.5	6.7	0.0	0.0	0.0	0.0	--	2,550
Emergency Diesel Generators (4)	3.7	2.0	0.0	0.1	0.4	0.0	0.0	428
Firewater Pumps (2)	0.2	0.2	0.0	0.0	0.0	0.0	0.0	34
Solvent Storage Tank	--	--	--	--	3.0	--	--	--
Hot Oil Storage Tank	--	--	--	--	0.0	--	--	--
Diesel Storage Tank	--	--	--	--	0.0	--	--	--
Condensate/Off Specification Fuel Storage Tank	0.1	0.4	0.0	--	1.1	--	0.4	264
Truck Loading Fugitives	--	--	--	--	28.4	--	--	--
Truck Loading Control	0.1	0.4	0.0	--	1.3	0.0	--	199
Fugitive Components	--	--	--	--	12.3	--	--	471
Fugitive Road Dust **a/**	--	--	--	0.2	--	--	--	--
Startup, Shutdown, and Maintenance b/								
Gas Turbines (4)	1.5	11.2	--	--	0.6	--	--	--
Cold Flare	52.3	238.6	0.0	--	1.0	0.0	0.1	90,546
TOTAL	**288.8**	**690.6**	**164.9**	**70.1**	**101.0**	**17.2**	**20.9**	**2,885,787**

a Fugitive road dust is PM_{10} only with negligible amounts of $PM_{2.5}$.

b In Mississippi, emissions from startup, shutdown, and maintenance are generally considered for permit applicability (exceptions are specified in 11 Miss. Admin. Code Pt. 2, R. 1.10).

Abbreviations:

LP = low pressure

New Source Performance Standards. The New Source Performance Standards (NSPS), codified in 40 CFR 60, regulate emission rates and provide requirements for new or significantly modified sources. NSPS requirements include emission limits, monitoring, reporting, and record keeping.

Applicable NSPS for the Project, based on the types of emission units and the expected date of installation, would potentially include, but not be limited to, the subparts listed below.

- 40 CFR 60 Subpart A – General Provisions. Subpart A contains the general requirements applicable to all emission units subject to 40 CFR 60.
- 40 CFR 60 Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units. Subpart Db applies to each steam generating unit for which

construction, modification, or reconstruction is commenced after June 19, 1984 and has a maximum design heat input capacity of greater than 29 MW (100 MMBtu/hr [million British thermal units per hour]). Gulf LNG would operate the hot oil heaters at the Terminal Expansion in compliance with Subpart Db.

- 40 CFR Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (including Petroleum Liquid Storage Vessels). This subpart applies to each storage vessel with a capacity greater than or equal to 75 m^3 that is used to store volatile organic liquids for which construction, reconstruction, or modification is commenced after July 23, 1984. This subpart does not apply to storage vessels with a capacity greater than or equal to 151 m^3 storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals (kPa) or with a capacity greater than or equal to 75 m^3 but less than 151 m^3 storing a liquid with a maximum true vapor pressure less than 15.0 kPa. This subpart sets standards for VOC emissions reduction. This subpart applies to the condensate/off specification fuel storage tank at the Terminal Expansion. Gulf LNG would comply with all applicable Subpart Kb standards and requirements for monitoring, recordkeeping, and reporting.
- 40 CFR Subpart IIII – Standards of Performance for Stationary Compression Ignition (CI) Internal Combustion Engines (ICE). Subpart IIII applies to owners and operators of stationary CI ICE as described in the subpart. This subpart sets emission standards for NO_x plus non-methane hydrocarbons, CO, and PM. This subpart applies to the four emergency generators and two emergency firewater pumps at the Terminal Expansion. Gulf LNG would comply with all applicable Subpart IIII standards and requirements for monitoring, recordkeeping, and reporting.
- 40 CFR Subpart KKKK – Standards of Performance for Stationary Combustion Turbines. This subpart applies to stationary combustion turbines that commenced construction, modification, or reconstruction after February 18, 2005 and have a heat input at peak load equal to or greater than 10.7 gigajoules per hour (10 MMBtu/hr). The proposed compressor gas turbines would be subject to NSPS Subpart KKKK as their fuel heat input ratings would exceed 10 MMBtu/hr, and their manufacturing date would be after February 18, 2005. Subpart KKKK regulates emissions of NO_x and SO_2. The turbines would be subject to a NO_x emission limit of 25 parts per million (ppm) at 15 percent oxygen. Gulf LNG would comply with the fuel sulfur requirements by using fuel with sulfur content at or below 0.060 pound of SO_2 per MMBtu. Gulf LNG would comply with all applicable Subpart KKKK standards and requirements for monitoring, recordkeeping, and reporting.

National Emissions Standards for Hazardous Air Pollutants. The National Emissions Standards for Hazardous Air Pollutants (NESHAPs), codified in 40 CFR 61 and 63, regulate the emissions of HAPs from new and existing sources. Part 61, promulgated before the 1990 CAA Amendments, regulates eight hazardous substances: asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride.

The 1990 CAA Amendments established a list of 189 HAPs, resulting in the promulgation of Part 63, also known as the Maximum Achievable Control Technology (MACT) standards. Part 63 regulates HAPs from major sources of HAPs and specific source categories emitting HAPs. Some NESHAPs may apply to non-major sources (area sources) of HAPs. Major source thresholds for NESHAPs are 10 tpy of any single HAP or 25 tpy of total HAPs. Gulf LNG is a major source of HAPs because formaldehyde emissions exceed 10 tpy.

Applicable NESHAPs for the Project, based on the types of emission units and the expected date of installation, would potentially include, but not be limited to, the subparts listed below.

- 40 CFR 63 Subpart A – General Provisions. Subpart A contains the general requirements applicable to all emission units subject to 40 CFR 63.
- 40 CFR 63 Subpart HHH – National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities. Although this subpart applies to the facility, there are no glycol dehydration units and thus no applicable requirements.
- 40 CFR 63 Subpart YYYY – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines. In 2004, the EPA stayed the effectiveness of the emission and operating limitations for lean-premixed gas-fired and diffusion flame gas-fired turbines. These turbines must only comply with the initial notification requirements at this time.
- 40 CFR 63 Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants Reciprocating Internal Combustion Engines (RICE). Subpart ZZZZ applies to any existing, new, or reconstructed stationary RICE located at a major or area source of HAP emissions. For stationary RICE located at an area source of HAP emissions, a stationary RICE is "existing" if construction or reconstruction of the stationary RICE commenced before June 12, 2006. A stationary RICE located at an area source of HAP emissions is "new" if construction of the stationary RICE commenced on or after June 12, 2006. For area sources, this subpart sets operating limitations and emission limitations for CO and formaldehyde, as well as management practices and work practice standards. This subpart applies to the four diesel emergency engines and two diesel firewater pumps at the Terminal Expansion. Gulf LNG would comply with all applicable Subpart ZZZZ standards and requirements for monitoring, recordkeeping, and reporting.
- 40 CFR 63 Subpart DDDDD – National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters. This subpart applies to major source of HAPs. This subpart applies to the hot oil heaters at the Terminal Expansion. Gulf LNG would comply with all applicable Subpart DDDDD standards and requirements for monitoring, recordkeeping, and reporting.

Title V Operating Permit. The required elements of Title V operating permit programs are outlined in 40 CFR 70 and 40 CFR 71. Title V operating permits may be referred to as "Part 70" or "Part 71" permits, or as Title V permits. A Title V permit should list all air pollution requirements that apply to the source, including emissions limits and monitoring, record keeping, and reporting requirements. Regulations also require that the permittee annually report the compliance status of its source with respect to permit conditions to the corresponding regulatory agency.

A Title V major source, as defined in 40 CFR 70.2, is a source or group of stationary sources (including new and existing sources) within a contiguous area and under common control, emitting or with the PTE criteria pollutants or HAPs above the criteria pollutant threshold values. The Title V major source threshold is 100 tpy for any of the criteria pollutants, 10 tpy for any single HAP, and 25 tpy for any combination of HAPs. The existing Terminal is a major source with respect to Title V, and Gulf LNG currently operates it under Title V Permit No. 1280-00132. The proposed Terminal Expansion would require Gulf LNG to submit an application to revise the Title V permit. Gulf LNG submitted a consolidated application for a permit to construct and operate the Terminal Expansion in May 2015, with revisions in June 2015 and December 2016.

General Conformity. The General Conformity Rule was designed to require federal agencies to ensure that federally-funded or federally-approved projects conform to the applicable State Implementation Plan (SIP). Section 176(c) of the CAA prohibits federal actions in nonattainment or PSD maintenance areas that do not conform to the SIP for the attainment and maintenance of NAAQS. General Conformity regulations apply to project-wide direct and indirect emissions of pollutants (and all precursors) for which the project areas are designated as nonattainment or maintenance that are not subject to NSR and that are greater than the significance thresholds established in the General Conformity regulations or 10 percent of the total emissions budget for the entire nonattainment or maintenance area. Federal agencies are able to make a positive conformity determination for a proposed project if any of several criteria in the General Conformity Rule are met. These criteria include:

- emissions from the project that are specifically identified and accounted for in the SIP attainment or maintenance demonstration; or
- emissions from the action that are fully offset within the same area through a revision to the SIP, or a similarly enforceable measure that creates emissions reductions so there is no net increase in emissions of that pollutant.

The existing Terminal and the proposed Terminal Expansion would be entirely within an attainment area and would be subject to PSD permitting, therefore is not subject to General Conformity.

GHG Reporting Rule. In September 2009, the EPA issued the final Mandatory Reporting of Greenhouse Gases Rule, requiring reporting of GHG emissions from suppliers of fossil fuels and facilities that emit greater than or equal to 25,000 metric tpy of GHG (reported as CO_{2e}). In November 2010, the EPA signed a rule finalizing GHG reporting requirements for the petroleum and natural gas industry in 40 CFR Part 98, Subpart W. The industry separates LNG storage facilities from LNG import and export equipment because the former are considered part of the source category regulated by Subpart W. The rule does not apply to construction emissions.

The new LNG facilities associated with the Terminal Expansion would potentially be subject to the GHG Mandatory Reporting Rule. The rule establishes reporting requirements based on actual emissions; however, it does not require emission controls. Gulf LNG would monitor emissions in accordance with the reporting rule. If actual emissions exceed the 25,000 metric tpy CO_{2e} reporting threshold, Gulf LNG would be required to report its GHG emissions to the EPA. Gulf LNG has not reported GHG emissions for the existing Terminal as actual emissions were below thresholds. Gulf LNG would estimate the actual GHG emissions from the Project and report GHGs as necessary for the existing source and the proposed Project, combined.

Applicable State Air Quality Requirements

The Terminal Expansion would be subject to state standards, codified in MDEQ Title 11 (MDEQ, 2015a; MDEQ, 2015b; MDEQ, 2015c). The regulations listed below would apply to the existing facility as well as the new facilities associated with the Terminal Expansion, including governing turbines, flares, generators, fire water pumps, and fugitive emissions.

- 11 Miss. Admin. Code Pt. 2, R. 1.3. Specific Criteria for Source of Particulate Matter.
- 11 Miss. Admin Code Pt. 2, R. 1.4. Specific Criteria for Source of Sulfur Compounds.
- 11 Miss. Admin Code Pt. 2, R. 1.6 and 1.8. New Sources and Provisions for Hazardous Air Pollutants.
- 11 Miss. Admin Code Pt. 2, R. 1.9. Stack Height Considerations.
- 11 Miss. Admin Code Pt. 2. R. 1.10. Provisions for Upsets, Startups, and Shutdowns.
- 11 Miss. Admin. Code Pt. 2, R. 2.1.D. Permitting Requirements.
- 11 Miss. Admin Code Pt. 2, R. 2.2. General Standards Applicable to All Permits.

- 11 Miss. Admin Code Pt. 2, R. 2.3. Application for Permit to Construct and State Permit to Operate New Stationary Source.
- 11 Miss. Admin Code Pt. 2, R. 2.5. Application Review.
- 11 Miss. Admin Code Pt. 2, R. 10. Emission Reduction Schedule.
- 11 Miss. Admin Code Pt. 2, Ch. 5. Administrative Procedures.
- 11 Miss. Admin Code Pt. 2, Ch. 6. Rules of Practice for Formal Evidentiary Hearings.

Gulf LNG would comply with all applicable state requirements.

Pipeline Modifications

Federal Air Quality Requirements

New Source Review/Prevention of Significant Deterioration. The Pipeline Modifications would not cause any emissions during operations; therefore, it would not trigger any additional federal or state NSR/PSD permitting requirements.

New Source Performance Standards/National Emissions Standards for Hazardous Air Pollutants. The Pipeline Modifications would not include addition of any new equipment or cause any new emissions during operation; therefore, it would not trigger NSPS/NESHAPs requirements.

Title V Operating Permit. The Pipeline Modifications would not cause any emissions during operations; therefore, it would not trigger Title V permitting requirements.

General Conformity. The Pipeline Modifications would cause emissions during construction, but it is in an attainment area; therefore, it would not trigger General Conformity requirements.

GHG Reporting Rule. The Pipeline Modifications would not cause any emissions during operations; therefore, it would not trigger GHG reporting requirements.

Chemical Accident Prevention Provisions. The Pipeline Modifications would be regulated by the DOT under 49 CFR 192 (Federal Safety Standards for Transportation of Natural and Other Gas by Pipeline), and therefore, exempt from Chemical Accident Prevention Provisions by definition.

Applicable State Air Quality Requirements

The Pipeline Modifications would not cause any emissions during operations; therefore, it would not trigger state air quality permitting requirements.

4.11.1.4 Construction Air Emissions Impacts and Mitigation

Terminal Expansion

Emissions during Terminal Expansion construction would generally be associated with onshore construction activities conducted using on-road and off-road mobile equipment; and offshore construction activities conducted using marine vessels such as tugboats or barges, and dredging.

Onshore On-road and Off-road Mobile Equipment Emissions

Potential impacts on ambient air quality for construction projects typically include generation of combustion and fugitive dust emissions from mobile construction equipment operation.

Combustion emissions would occur as tailpipe emissions from gasoline or diesel fueled engines in on-road and off-road mobile equipment.

Fugitive dust results from construction activities such as land clearing, grading, excavation, and concrete work, as well as from vehicles traveling on paved and unpaved roads. Fugitive dust generation depends on the area of construction, silt and moisture contents of the soil, wind speed, frequency of precipitation, amount of vehicle traffic, and vehicle and roadway type. Fugitive dust would be produced during all phases of construction. Emissions are typically greatest during drier winter months and in areas of fine-textured soils. The control of fugitive particulate emissions is typically addressed through compliance with state or local nuisance regulations such as 11 Miss. Admin. Code Pt. 2, R. 1.3 (MDEQ, 2015a).

A summary of expected combustion and fugitive dust construction emissions is provided in table 4.11.1-5. As with any fossil fuel-fired activity, construction equipment used for the Terminal Expansion would also contribute GHG emissions, including CH_4, CO_2, and N_2O. Emissions of GHGs are typically estimated as CO_{2e}. Although EPA's reporting rule does not apply to construction emissions, we have included these GHG emissions in table 4.11.1-5 for accounting and disclosure purposes.

TABLE 4.11.1-5

Summary of Terminal Expansion On-road and Off-road Mobile Equipment and Fugitive Dust Construction Phase Emissions

	Annual Pollutant Emissions (tons), by Construction Year						
Year a/	**NO_X**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOCs**	**GHGs**
Year 1	22.5	13.4	0.1	18.4	4.4	3.4	4,898
Year 2	258.4	164.4	0.6	132.2	35.4	41.0	58,533
Year 3	249.9	198.7	0.7	58.6	20.6	44.0	64,186
Year 4	359.3	300.5	1.0	35.4	21.1	66.3	88,687
Year 5	124.4	129.6	0.4	24.5	10.3	25.9	38,833
Year 6	14.9	14.8	0.1	1.3	0.8	3.0	6,012
TOTAL	**1,029.3**	**821.2**	**2.9**	**270.4**	**92.6**	**183.6**	**261,149**

a Construction equipment emissions based on SCAB Fleet Average Emission Factors (Diesel); commuter and delivery vehicle traffic emissions based on EMFAC2007 model; and fugitive dust emissions (inside plant boundary) based on EPA AP-42 Chapters 13.2.1 for paved roads, 13.2.2 for unpaved roads, and 13.2.3 for heavy construction equipment.

Offshore Marine Vessel Emissions

Criteria air pollutant emissions from marine vessel operations are also expected during the construction period. The emissions would come from tugboats and barges carrying materials and equipment needed for construction of the Project traveling to and from the place of origin to the Port of Pascagoula and by barge to the supply docks, and from dredging for the supply docks. Table 4.11.1-6 provides a summary of construction-related emissions from marine vessel operations.

TABLE 4.11.1-6							
Summary of Terminal Expansion Marine Vessel Construction Phase Emissions							
	Annual Pollutant Emissions (tons), by Construction Year						
Year	**NO_X**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOCs**	**GHGs**
Year 1	0.0	0.0	0.0	0.0	0.0	0.0	0
Year 2	534.1	31.5	104.2	8.9	8.9	2.7	23,645
Year 3	26.1	2.0	2.9	0.4	0.4	0.2	1,172
Year 4	16.7	1.2	1.8	0.3	0.3	0.1	747
Year 5	2.3	0.2	0.3	0.0	0.0	0.0	103
Year 6	0.0	0.0	0.0	0.0	0.0	0.0	0
TOTAL	**579.2**	**34.9**	**109.3**	**9.7**	**9.7**	**3.0**	**25,667**

Mitigation Measures

Once the Terminal Expansion construction phase is completed, the fugitive dust and construction emissions would subside; thus, the length of time the area near the site would be exposed to dust and emissions from construction activities would be limited. To minimize impacts on air quality during construction Gulf LNG would:

- install rock aprons or rattle plate or equivalent at dirt road intersections;
- minimize disturbed areas as much as possible;
- require vehicles to comply with maximum speed of 15 miles per hour within construction area;
- apply water to dirt stockpiles;
- maintain a freeboard of 6 inches, or cover loads in haul trucks;
- apply water to sand, dirt, or other loose material before transport; and
- apply chemical dust suppressants or water to disturbed areas.

Vehicular and/or barge exhaust and crankcase emissions from gasoline and diesel engines would comply with applicable EPA mobile source emission regulations (40 CFR 85) by using equipment manufactured to meet these specifications.

The combustion and fugitive dust emissions that would occur during construction of the Terminal Expansion would be primarily limited to the immediate vicinity of the existing Terminal site. These emissions would represent a small portion of Jackson County's yearly emissions inventories and would subside once construction has been completed. Therefore, we conclude the construction-related impact on local air quality during construction of Terminal Expansion would not be significant.

Pipeline Modifications

Emissions during construction of the Pipeline Modifications would generally be associated with onshore construction activities conducted using a backhoe, cherry pickers, and welding machines. A summary of expected construction emissions is provided in table 4.11.1-7.

TABLE 4.11.1-7 **Summary of Pipeline Modification Construction Emissions**							
Meter Station / Year	**Annual Pollutant Emissions (tons)**						
	NO_X	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOCs**	**GHGs**
Gulfstream / Year 5	136.5	143.3	0.2	9.6	9.6	32.3	5,560
Destin / Year 5	136.5	143.3	0.2	9.6	9.6	32.3	5,560
Transco/FGT Interconnect / Year 5 **a/**	136.5	143.3	0.2	9.6	9.6	32.3	5,560
TOTAL	**409.6**	**429.9**	**0.7**	**28.9**	**28.9**	**97.0**	**16,679**

a Transco would make modifications to the existing and jointly owned Transco/FGT Interconnection to permit bi-directional flow. These modifications would be constructed by Transco and would be reviewed by FERC under its blanket certificate process.

Mitigation Measures

The combustion and fugitive dust emissions that would occur during construction of the Pipeline Modifications would be primarily limited to the existing meter stations and on the Gulf LNG Pipeline side of the 36-inch-diameter battery-limits valve. The Pipeline Modifications are very minor and would be completed relatively quickly, therefore air emissions would be short-term. Gulf LNG would employ the same mitigation measures for the Pipeline Modifications as described for the Terminal Expansion construction.

Transco would also make modifications to the existing and jointly owned Transco/FGT Interconnection to permit bi-directional flow. These modifications would be constructed by Transco and would be reviewed by FERC under its blanket certificate process.

Air emissions resulting from the Pipeline Modifications would subside once construction is completed and would represent a small portion of Jackson County's yearly emissions inventories. Therefore, the construction-related impact on local air quality would be temporary and would not be significant.

4.11.1.5 Operations Air Emissions Impacts and Mitigation

Terminal Expansion

Emissions

Table 4.11.1-3 shows operational stationary equipment emissions and fugitive emissions from component leaks at the existing Terminal. Table 4.11.1-4 shows stationary equipment emissions and fugitive emission from component leaks that would occur during operation of the proposed Terminal Expansion. According to the Project schedule, the first liquefaction train would be in operation while constructing the second liquefaction train. Therefore, **we recommend that:**

- **Prior to the end of the draft EIS comment period, Gulf LNG should file with the Secretary the total estimated emissions (including emissions calculation methodology and spreadsheets) while construction of liquefaction train 2 and operations of liquefaction train 1 are occurring concurrently. Gulf LNG should include a regulatory analysis of compliance and any additional mitigation required.**

In addition to stationary equipment emissions and fugitive emissions from component leaks; Terminal operational emissions include stationary and mobile source combustion emissions from LNG carriers and support vessels. The final EIS (FERC, 2006) prepared for the existing Terminal included operational impacts of stationary source emissions from LNG carriers while unloading (and stationary), as well as mobile emissions from:

- LNG carriers – cruise;
- LNG carriers – within moored safety zone (i.e., within 500 yards in all directs from the area occupied by a typical LNG carrier at berth);
- LNG carriers – maneuvering;
- LNG carriers – hoteling;
- pilot boats;
- USCG escort boats;
- tug assists; and
- commuter traffic.

The mobile source emissions from marine vessels are authorized under Gulf LNG's existing operations and could occur independently of the proposed Terminal Expansion. However, it is expected that that the LNG carrier size would increase from 170,000 m^3 to 208,000 m^3 as part of the Terminal Expansion Project. The LNG carrier emissions for this increased size would be less than the LNG carrier emissions for the smaller vessel due to the fewer number of vessel calls that would be required for receipt of LNG at the same production rate. Although mobile source emissions are expected to be less than what is currently authorized and are not considered in the air permitting process, we are including a discussion of the emissions in this section for completeness as well as to support the discussion in the Cumulative Impacts section.

Table 4.11.1-8 shows the updated emissions from LNG carriers and support vessels while inside the moored safety zone (i.e., maneuvering and berthing, hoteling, disconnection and unberthing) and while outside the moored safety zone (i.e., channel transit within state waters).

TABLE 4.11.1-8

Summary of Gulf LNG Terminal LNG Carrier and Support Vessel Emissions

Location	Annual Pollutant Emissions (tpy)					
	NO_X	CO	SO_2	PM	VOCs	GHGs
Inside Moored Safety Zone	78.5	5.7	2.1	1.3	3.2	3,445
Outside Moored Safety Zone	13.4	0.9	0.3	0.2	0.6	525
TOTAL	**91.8**	**6.7**	**2.4**	**1.5**	**3.8**	**3,971**

Gulf LNG conducted air dispersion modeling for compliance with the NAAQS for CO, and with NAAQS and PSD increments for NO_x, PM_{10}, $PM_{2.5}$, and SO_2 for the Terminal Expansion. Modeling results are listed in table 4.11.1-9. The modeling was conducted in accordance the June 28, 2010 EPA memorandum for the new 1-hour NO_2 standard, and August 23, 2010 memorandum for the 1-hour SO_2 standard. The modeling analysis includes emissions from LNG carriers and support vessels while hoteling. Meteorological data from 2009 to 2013 was used as inputs to the model.

TABLE 4.11.1-9

Results of Project Screening Analysis and NAAQS/PSD Increment Analysis for Operation of the Terminal Expansion

Pollutant and Averaging Period	Project Modeled Concentration	Class II Significant Impact Level	Less than Significant Impact Level?
Screening Results			
PM_{10} 24-hour	3.85 μg/m^3	5 μg/m^3	Yes
$PM_{2.5}$ Annual	0.11 μg/m^3	0.3 μg/m^3	Yes
$PM_{2.5}$ 24-hour	0.66 μg/m^3	1.2 μg/m^3	Yes
SO_2 3-hour	9.04 μg/m^3	25 μg/m^3	Yes
SO_2 1-hour	9.1 μg/m^3	7.8 μg/m^3	No
CO 8-hour	53.77 μg/m^3	500 μg/m^3	Yes
CO 1-hour	636.46 μg/m^3	2,000 μg/m^3	Yes
NO_2 Annual	0.32 μg/m^3	1 μg/m^3	Yes
NO_2 1-hour	7.29 μg/m^3	7.5 μg/m^3	Yes
NAAQS Refined Modeling Analysis			
Pollutant and Averaging Period	**Total Concentration (Modeled + Background)**	**NAAQS**	**Less than NAAQS?**
SO_2 1-hour	4,050 μg/m^3	196 μg/m^3 a/	No
Culpability Analysis			
Pollutant and Averaging Period	**Project Contribution to Modeled Maximum Concentration**	**Class II Significant Impact Level**	**Less than Significant Impact Level?**
SO_2 1-hour	3.99 μg/m^3	7.8 μg/m^3	Yes

a 196 μg/m^3 is equal to 75 ppb.

Mobile source emissions and modeling results are also discussed in section 4.13.2.11.

The model used was the American Meteorological Society/EPA Regulatory Model (AERMOD) version 14134. AERMOD incorporated data from AERMAP (version 11103), the terrain preprocessor, AERMET (version 14134), the meteorological preprocessor, and AERSURFACE (version 14134), which is used to estimate surface characteristics required for input to AERMET. A screening analysis was conducted to determine if emissions from the Terminal Expansion would cause a significant impact. The screening results (see table 4.11.1-9) indicate that all pollutants and averaging periods except for 1-hour SO_2 are below their respective PSD modeling significant impact levels (SILs). Therefore, further modeling for these pollutants was not required.

The screening results for the 1-hour SO_2 indicated an exceedance of the SIL; therefore, a refined modeling was conducted for 1-hour SO_2. Gulf LNG obtained the off-site sources for the refined analysis from the MDEQ. Major sources within the area of impact were modeled for the 1-hour SO_2 NAAQS run. The results of the refined analysis for the 1-hour SO_2 NAAQS run also exceeded the standard (see table 4.11.1-9). A culpability analysis was conducted using the MAXDCONT post processor to determine if operation of the Terminal Expansion contributed significantly (7.8 μg/m^3) to any of the exceedances when combined in both time and space. The results listed in table 4.11.1-9 indicate that operation of the Terminal Expansion would not contribute significantly to exceedances of the 1-hour NAAQS for SO_2. As previously indicated, Gulf LNG is anticipating submitting a revised PSD air permit application with additional modeling. The results will be incorporated into the final EIS.

Gulf LNG also conducted a Class I impact analysis because the Terminal Expansion is 47 km from a Class I area (Breton National Wildlife Refuge). Gulf LNG plotted the modeled annual PM_{10}, 24-hour $PM_{2.5}$, annual $PM_{2.5}$, 3-hour SO_2, 24-hour SO_2, and annual SO_2 impact on maps of the area and found that the modeled impacts were below Class I SILs prior to reaching the Class I area. Therefore, no additional Class I analyses were necessary. Visibility impacts were assessed using the procedures from the U.S. Forest Service (FS), the National Park Service, and the FWS's Federal Land Manager's Air Quality Related Values Workgroup (FLAG) Phase I Report (FS et al., 2010). As discussed in the FLAG report, for areas within 50 km of a viewshed, federal land managers should look at change in color and contrast compared to natural conditions. The federal land managers would be concerned if the modeled change in color is expected to exceed 0.05 or if the change in contrast is expected to exceed 2. Gulf LNG found that the worst-case change in color is predicted to be 0.015 and worst-case change in contrast is predicted to be 1.581. The results indicate that the Project would not have a significant near-field impact on visibility at the Breton National Wildlife Refuge. For the far-field impacts (i.e., for Class I areas greater than 50 km away from the Project), Gulf LNG conducted a Q/D screening analysis as described in FS et al. (2010), using total Project emissions of NO_x, SO_2, and PM (Q) of 491 tpy and a minimum distance (D) of 50 km. Because Q/D of 9.82 was less than 10, Gulf LNG concluded that further analysis using CALPUFF was not necessary. The FWS concurred with Gulf LNG's conclusion in an email dated September 16, 2015. In July 2018, Gulf LNG provided written responses to MDEQ's questions regarding Gulf LNG's PSD application. Gulf LNG's responses indicated that a corrected Class I impact analysis would be submitted using total Project emissions of NO_x, SO_2, PM_{10}, and H_2SO_4 (Q) of 541 tpy corresponding to the potential emissions in table 4.11.1-4. As previously indicated, Gulf LNG is anticipating submitting a revised PSD air permit application with updated Class I impact analysis. The results will be incorporated into the final EIS.

Gulf LNG reviewed the Terminal Expansion's impact on the ozone NAAQS by calculating the maximum percentage increase in NO_x and VOC emissions (combined) and applying that increase to the 3-year average ozone monitored values for 2013 through 2015, as measured at the Pascagoula monitor. The highest-fourth high monitored values were 0.064, 0.075, and 0.065 ppm between 2013 and 2015 respectively for an average of 0.068 ppm. Gulf LNG calculated the percentage increase in NO_x and VOC emissions in Jackson County, George County, Harrison County, Mississippi; and Mobile County Alabama (combined) to be 0.64 percent. A 0.64 percent increase to the 3-year average ozone monitored value is 0.0684 ppm, below the NAAQS of 0.070 ppm. Therefore, we conclude impacts on ozone from the Terminal Expansion would not be significant.

We received a comment on the monitoring station locations used in modeling analysis. The background monitoring data for NO_2, $PM_{2.5,}$ and SO_2 used in the model to determine Project impacts on the NAAQS and increments was from a monitor in Pascagoula, about 4 miles from the Project. This site is very close to the Project. Therefore, we conclude it would provide representative background data. Note that, as Gulf LNG must obtain a PSD permit for this Project, the MDEQ will assess the representativeness of the monitoring data under the PSD rules as part of the air quality permitting process. In addition, the background data was only used to assess the 1-hour SO_2 impacts, as all other pollutants and averaging periods Project impacts were below the SIL.

Mitigation Measures

Gulf LNG would minimize potential impacts on air quality due to the operation of the Terminal Expansion by adhering to applicable federal and state regulations and installing Best Available Control Technology (BACT) to minimize emissions. As presented in Gulf LNG's PSD permit application, the BACT analysis includes identification of all applicable control technologies based on control effectiveness. The strictest controls are evaluated first and if those are technically or economically infeasible, or if environmental effects are significant, then the next most stringent control technology is reviewed. The process continues until the BACT level being considered cannot be eliminated based on technical or economic considerations, energy or environmental impacts. BACT is required for NO_x, CO, SO_2, PM_{10}/$PM_{2.5}$, VOC, sulfuric acid mist, and GHG emissions for the proposed equipment.

BACT for Refrigeration Turbines. For NO_x, Selective Catalytic Reduction and Dry Low NO_x burners are determined to be BACT for the turbines, in addition to the use of good combustion practices. For CO and VOCs, oxidation catalyst is determined to be BACT, in addition to the use of good combustion practices. For PM (encompassing both PM_{10} and $PM_{2.5}$), good combustion practices and the use of natural gas are determined as BACT. For SO_2, use of low sulfur natural gas is determined as BACT. For GHG, use of natural gas fuel, and good combustion practices are determined as BACT. For sulfuric acid mist, treating streams to reduce sulfur content before combustion using a H_2S removal unit is determined to be BACT.

BACT for Hot Oil Heaters. For NO_x, good combustion practices and ultra-low NO_x burners are determined as BACT. For CO and VOCs, good combustion practices are determined as BACT. For PM, good combustion practices and the use of natural gas are determined as BACT. For SO_2, the use of low sulfur natural gas is determined as BACT. For GHGs, use of natural gas fuel and good combustion practices are determined as BACT. For sulfuric acid mist, use of a H_2S removal unit is determined to be BACT.

BACT for Thermal Oxidizers. Two thermal oxidizers would be installed to control VOCs and H_2S within the acid gas vent streams generated by the amine units. Good combustion practices are determined as BACT for NO_x and VOC emissions from the thermal oxidizers. For CO, VOCs, and PM, good combustion practices and the use of natural gas are determined as BACT. For SO_2 and sulfur acid mist, the use of a H_2S removal unit is determined as BACT. For GHGs, good combustion practices are determined as BACT.

BACT for Flares. Good combustion practices and flaring minimization would minimize NO_x, CO, VOC, and GHG emissions and are determined as BACT. For PM, good combustion practices and natural gas fuel is determined as BACT. For SO_2, the use of low sulfur natural gas to limit maximum SO_2 emissions is determined as BACT. Because all gases going to the flare would already be treated by an H_2S removal unit, no additional BACT is required for sulfur acid mist.

BACT for ICE. For NO_x, CO, VOCs, PM, and GHGs, limited use, turbocharger and aftercooler, and good operating practices are determined as BACT. For SO_2, the use of ultra-low sulfur diesel, limited use, and good combustion practices are determined as BACT. For sulfur acid mist, use of ultra-low sulfur diesel is determined as BACT.

BACT from Storage Tanks. For the solvent tank and hot oil tank, VOC BACT is submerged fill and a nitrogen blanket. For the diesel tank, VOC BACT is submerged fill and appropriate breather vent settings. For the condensate tank, VOC BACT is submerged fill and vent to flare.

BACT for Truck Loading. VOC BACT is determined to be use of a flare (or equivalent device) capable of achieving 98 percent destruction and removal efficiency to control vapors collected during truck loading operations.

BACT for Fugitive Components. For VOCs and GHGs, BACT is determined to include the development of a site-specific Leak Detection and Repair (LDAR) type program consisting of semiannual Audio Visual and Olfactory (AVO) inspections.

Gulf LNG also proposes combustion turbine startup/shutdown work practices. The refrigeration turbine startup would begin when fuel is introduced into the combustion turbine and would end when the Selective Catalytic Reduction and Dry Low NO_x burners systems are operating at normal destruction efficiency. Turbine startup would not exceed 30 minutes. The refrigeration turbine shutdown would begin when the initiation of a shutdown sequence results in the combustion turbine dropping below 75 percent power and would be complete when fuel is terminated to the turbine. Turbine shutdown would not exceed 30 minutes.

As a result of the mitigation measures described above, we conclude that air quality impacts during operation of the Terminal Expansion would be minor.

Pipeline Modifications

Emissions

Operation of the existing pipeline and meter stations cause fugitive emissions of VOCs and GHGs from valves, flanges, and other equipment. The Pipeline Modifications would not increase these emissions.

Mitigation Measures

Gulf LNG would continue to comply with all applicable state and local air permitting requirements during construction and operation of the Pipeline Modifications.

Because there would be no increase in emissions, we conclude that air quality impacts due to operation of the proposed Pipeline Modifications would be negligible.

4.11.2 Noise

The existing noise environment would be affected by construction and operation of the proposed facilities. Temporary noise would be generated during Project construction, and long-term noise would be generated during operation. Construction and operational noise impacts as well as proposed mitigation measures are discussed in sections 4.11.2.4 and 4.11.2.5.

4.11.2.1 Noise Levels and Terminology

Sound is mechanical energy transmitted by pressure waves in media such as air or water (FTA, 2006). When sound becomes excessive, annoying, or unwanted, it is referred to as noise. Noise levels are quantified using units of dB. Noise may be continuous (constant noise with a steady decibel level), steady (constant noise with a fluctuating decibel level), impulsive (having a high peak of short duration), stationary (occurring from a fixed source), intermittent (at intervals of high and low sound levels), or transient (occurring at different rates).

Noise levels are quantified using dB, which is a unit of sound pressure. The A-Weighted Sound Level, expressed as dBA, can be used to quantify sound and its effect on people (EPA, 1978). On the dBA scale, normal conversation falls at about 60 to 65 dBA, and sleep disturbance occurs at about 40 to 45 dBA.

Ambient sound levels, or background sound levels, result from sound emanating from natural and artificial sources. The magnitude and frequency of background noise may vary considerably over the course of a day and throughout the year, caused in part by weather conditions, seasonal vegetative cover, and human activity. Two measures used by federal agencies to relate the time-varying quality of environmental sound levels to known effects on people are the 24-hour equivalent sound level ($L_{eq(24)}$)

and the day-night sound level (L_{dn}). The $L_{eq(24)}$ is the level of steady sound with the same total energy as the time-varying sound, averaged over a 24-hour period. The L_{dn} is the $L_{eq(24)}$ with 10 decibels on the dBA scale added to the nighttime sound levels between the hours of 10 p.m. and 7 a.m., to account for people's greater sensitivity to sound during nighttime hours.

Table 4.11.2-1 contains examples of common activities and their associated noise levels in dBA (CALTRANS, 2009).

TABLE 4.11.2-1

Common Activities and Associated Noise Levels

Activity	Noise Level (dBA)
Loud live band music	110
Truck 50 feet away	80
Gas lawnmower 100 feet away	70
Normal conversation indoors	60
Moderate rainfall on vegetation	50
Refrigerator	40
Source: CALTRANS, 2009	

The potential for noise impacts can be assessed by considering the sound level increase over existing levels at receptors, referred to as noise sensitive areas (NSAs) such as residences, schools, or hospitals. In general, an increase of 3 dBA is barely detectable by the human ear and an increase of 6 dBA is considered clearly noticeable. Increases of 10 dBA are perceived as a doubling of noise (i.e., twice as loud).

4.11.2.2 Noise Regulations

The State of Mississippi and Jackson County do not have regulations that would limit noise from construction or operation of the Project.

In 1974, the EPA published its *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. This document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has indicated that an L_{dn} of 55 dBA protects the public from indoor and outdoor activity interference (EPA, 1974). Absent an applicable state or local noise level limit, we have used this criterion to evaluate the potential noise impacts from construction and operation of the Project. The potential for noise impacts are assessed by comparing the Project's noise levels with the 55 dBA noise level criterion.

4.11.2.3 Existing Sound Levels and Noise Sensitive Areas

Terminal Expansion

Gulf LNG evaluated potential noise impacts during construction and operation of the Terminal Expansion by conducting a background noise level survey and then conducting noise impact evaluations at the nearest NSAs. The baseline noise survey was conducted on June 30, 2014 (Hoover and Keith, 2014). Ambient noise levels were recorded at two nearby residential NSAs identified by the surveyors. At NSA #1, the sources of sound during the sound measurements included insects/birds, water, and occasionally industrial activity from across Bayou Casotte. At NSA #2, the sources of sound included insects/birds, outdoor residential air conditioning units, and occasionally water. The sound measurements typically exclude "extraneous sound" or intermittent sound such as a vehicle passing the sound measurement location. During the daytime surveys the temperature ranged from 84 to 91 °F, relative humidity ranged from 70 to 75 percent, the sky was mostly clear and the wind was primarily from the west. During the nighttime survey the temperature ranged from 83 to 85 °F, relative humidity was 80 percent, the sky was mostly clear, and the wind was primarily from the south. The existing Terminal was operating in idle mode at the time of the baseline noise survey.

Table 4.11.2-2 shows the noise survey results and estimated existing ambient L_{dn} at each NSA (see also figure 4.11.2-1). The table includes corresponding distances and directions of the NSA from the proposed liquefaction facility, where most noise generating sources would be during operations.

TABLE 4.11.2-2

Summary of Existing Ambient Noise Levels at NSAs near the Proposed Terminal Expansion

NSA	Land Use	Distance and Direction from Liquefaction Facility	Average Measured Ambient Noise Level, L_d (dBA)	Average Measured Ambient Noise Level, L_n (dBA)	Average Calculated Ambient Noise Level, L_{dn} (dBA)
#1	Residential	9,400 feet NW	47.6	48.5	54.8
#2	Residential	10,500 feet NW	43.9	43.2	49.7

Source: Hoover & Keith, 2014
Abbreviations:
L_d = daytime equivalent sound level (dBA) NW = northwest
L_n = nighttime equivalent sound level (dBA)

As shown in the table, the nearest NSAs' ambient L_{dn} noise level was estimated at 54.8 dBA.

Pipeline Modifications

The land uses in the areas of the Gulfstream and Destin Meter Stations as well as the Transco/FGT Interconnection are classified as industrial. The noise levels due to the Pipeline Modifications at these locations are not expected to change compared to existing pipeline operations. However, there would be noise impacts during construction.

Note that Transco would make modifications to the existing and jointly owned Transco/FGT Interconnection to permit bi-directional flow. These modifications would be constructed by Transco and would be reviewed by FERC under its blanket certificate process.

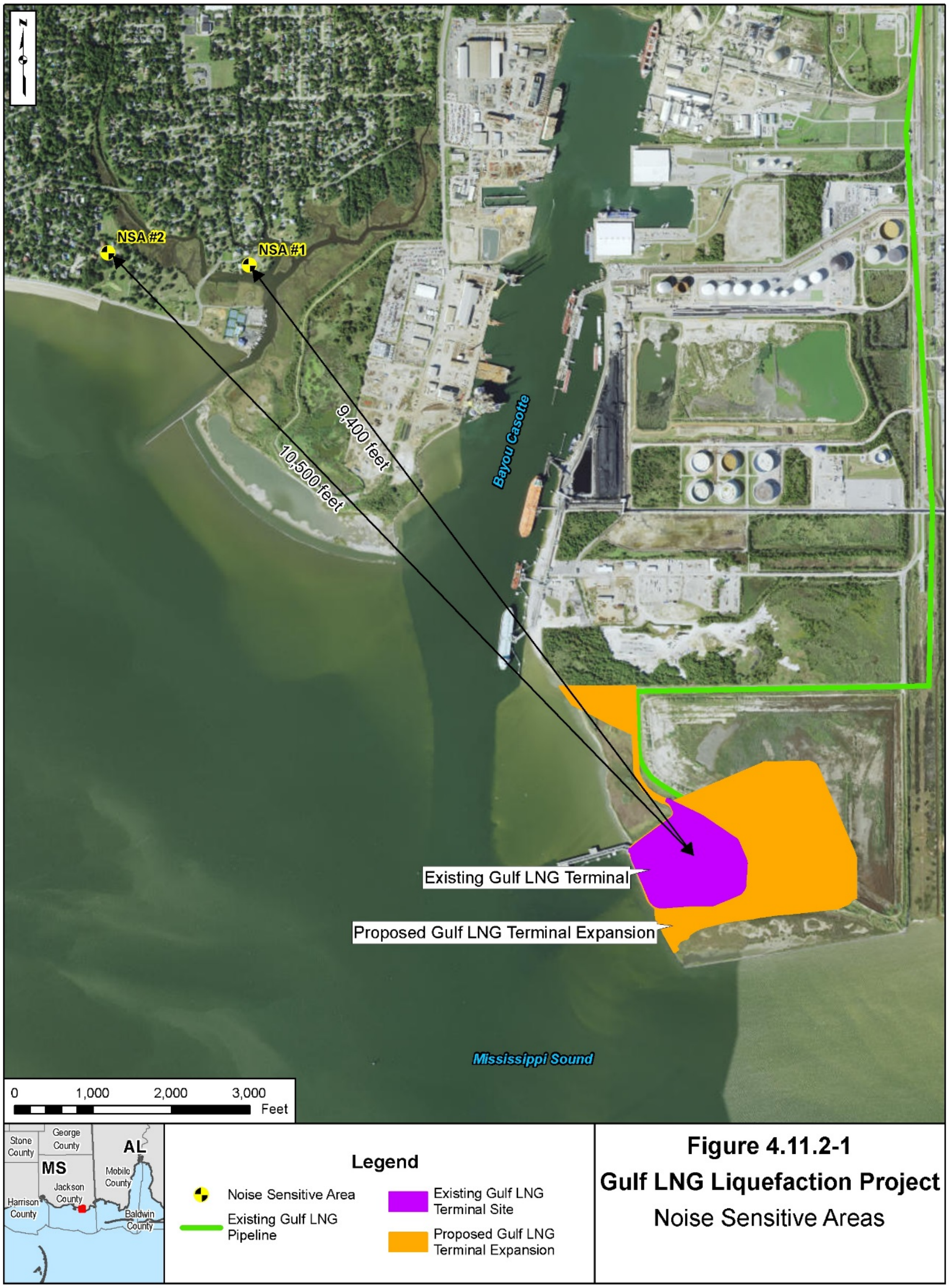


Figure 4.11.2-1
Gulf LNG Liquefaction Project
Noise Sensitive Areas

4.11.2.4 Construction Noise Impacts and Mitigation

Construction noise levels are rarely steady; instead, they fluctuate depending on the number and type of equipment in use at any given time. There would be times when no large equipment is operating and noise would be at or near existing ambient levels. In addition, construction-related sound levels experienced by a noise sensitive receptor in the vicinity of construction activity would be a function of distance, other noise sources, and the presence and extent of vegetation and intervening topography between the noise source and the sensitive receptor.

Terminal Expansion

Construction of the Terminal Expansion would take place for about 66 months from commencement through the completion of Phase II. Construction work would entail site clearing, grading, and excavation; construction of temporary facilities such as equipment and laydown areas and two supply docks; removal of one supply dock, extension of the existing storm surge protection wall; installation of permanent foundations for heavy equipment and structures; installation of underground utilities; and building erection. To help distribute impacts of vehicle trips by workers, Gulf LNG would have two daytime shift start times and one nighttime shift start time.

The most prevalent and typical sound generating equipment during site construction of the Terminal Expansion would be the ICE of construction equipment including track-excavators, backhoes, bulldozers, dump trucks and concrete trucks, which produce noise levels up to 90 dBA at 50 feet. The sound levels experienced at the NSAs would depend on the type of equipment used, the mode of operation of the equipment, the length of time the equipment is in use, the amount of equipment used simultaneously, and the distance between the sound generation source and the receptor. However, based on the distance to the NSA, construction noise from this typical construction equipment is not anticipated to exceed the noise criterion. If perceived noise levels cause a nuisance at the nearby NSAs are inconvenienced, Gulf LNG would ensure the noise standard is met by construction of sound barriers, installation of residential grade exhaust mufflers on equipment, or reducing utilization rates as necessary.

Dredging operations would also produce noise during construction and would be conducted using a hydraulic or clamshell (bucket) method (up to 93 dBA L_{max} [maximum sound level] at 50 feet) (FHWA, 2006). Gulf LNG would perform dredging activities 24 hours per day for up to 6 months total during construction of the marine off-loading facilities and for material barge access to the wetland mitigation area. The worst-case peak noise level at NSA#1 and NSA#2 is expected to be 55 to 60 dBA; this is a peak noise level and not a day/night average (L_{dn}). The resultant day/night average would depend on utilization rates, which can be controlled to keep the L_{dn} to less than 55 dBA at the nearest NSA. Based on a typical 20 percent utilization, dredging is expected to contribute sound levels of about 46.8 dBA L_{dn} which is less than our noise criterion, and would not be expected to result in significant impacts on the NSA.

Another dominant noise source during construction of the Terminal Expansion would be that of pile driving (96 to 101 dBA L_{max} at 50 feet for one vibratory pile driver and one impact pile driver, respectively) (FHWA, 2006), which could produce peak noise levels that would be perceptible above the prevalent sound levels. Gulf LNG would conduct pile driving activities 24 hours per day during both onshore construction of the Terminal Expansion (concurrent operation up to six impact pile drivers for an estimated 12 months per train) and offshore during construction of the supply docks (concurrent operation of one vibratory pile driver at the North Supply Dock for 40 to 60 days and one vibratory pile driver at the South Supply Dock for 20 to 30 days). The operation of six impact pile drivers during onshore construction would cause the maximum noise impact on the nearest NSA. Based on the distance to the nearest NSA (9,400 feet), pile driving could contribute sound levels of 49.7 dBA L_{dn} based on 20 percent utilization, which is less than our noise criterion, and would not be expected to result in significant impacts on the NSA.

Pile driving operations would also produce the most dominant vibration impact during construction. Based on the distance to the nearest NSA, operation of six impact pile drivers could contribute vibration levels up to 62.4 vibration velocity decibels (VdB). Because the threshold of perception for humans is around 65 VdB (FTA, 2006), pile driving would not be expected to result in significant impacts on the NSAs.

Pipeline Modifications

Sound level increases during Pipeline Modifications would occur only during the day. Based on the type of equipment proposed for construction (one backhoe, two cherry pickers, and two portable welding machines), Gulf LNG modeled noise levels to be 28 dBA L_{eq} at the nearest NSA, located 2,508 feet from a construction site. This would correspond to an L_{dn} of 35 dBA, which is below the FERC criterion of 55 dBA L_{dn}, and would not be expected to result in significant impacts on the NSA.

4.11.2.5 Operation Noise Impacts and Mitigation

Terminal Expansion

Operation of the expanded Terminal would generate sound levels that would occur throughout the life of the Project. Noise would generally be produced on a continuous basis at the liquefaction facility by a number of sources, which would include various types of compressors and cooling fans.

Preliminary operational noise levels for anticipated equipment were assessed based on the two liquefaction trains and associated equipment operating at full load concurrently. The preliminary maximum estimated L_{dn} of the Terminal Expansion would be 47.0 dBA L_{dn} at NSA #1, below our noise criterion of 55 dBA L_{dn} (see table 4.11.2-3). The maximum increase in noise level would be 1.5 dBA L_{dn} at NSA #2, below the "barely detectable" level of 3 dBA above current noise level. The liquefaction facility design should also result in no discernable vibration at the nearest NSAs. Generally, if there are off-site vibrations being induced from the Terminal, it would be indicative of malfunctioning equipment and would lead to equipment shutdown to enable repairs to establish normal operation.

TABLE 4.11.2-3

Estimated Noise Levels at Nearby Noise Sensitive Areas Due to Operation of Terminal Expansion

		Sound Levels (dBA)			
NSA	Distance and Direction from Liquefaction Facility	Background (L_{dn})	Noise Level Contributed by the Noise Source at NSA (L_{dn})	Noise Level During Operation (including background) (L_{dn})	Change in Background Sound Level (dBA)
#1	9,500 ft NW	54.8	47.0	55.4	0.8
#2	10,500 ft NW	49.7	46.0	51.8	1.5

Gulf LNG would use the following mitigation measures to limit noise and vibration from operation of the Project:

- design turbine drivers with exhaust silencers to meet sound power level of 105 dBA within enclosures, such that resulting noise meets sound pressure level of 85 dBA at 1 meter;

- insulate piping from compressor to suction drum and aftercoolers with Class D mineral wool that meets ISO 15665 requirements (ISO) 2003;
- install air cooler units with sound power levels less than 95 dBA each;
- install exhaust stack silencers on turbine exhaust systems, which would also control vibration; and
- install vibration monitoring equipment on all rotating machines to continuously monitor and ensure proper alignment and operations.

In addition, to ensure operations do not cause noise levels above 55 dBA, Gulf LNG would conduct and file a post-construction noise survey within 60 days after the facility is put in service as noted below.

As discussed in sections 1.0 and 2.7.1, while liquefying natural gas and exporting LNG, the Terminal Expansion would retain the capability to regasify (vaporize) imported LNG. However, the proposed design of the facility would not allow concurrent liquefaction, regasification, and transfer of LNG to and from an LNG carrier. Therefore, at any point in time the expanded Terminal would be operated exclusively as a liquefaction/export facility or exclusively as an import/regasification facility, thus there is no potential for noise levels to exceed 55 dBA under this scenario.

The results of the noise impact analysis indicate that the noise attributable to the Project would be lower than the FERC criterion of 55 dBA L_{dn} at the nearest NSA. We recognize, however, that actual results may different from those obtained from modeling. Therefore, **we recommend that:**

- **Gulf LNG should file a full power load noise survey with the Secretary for the Terminal Expansion <u>no later than 60 days</u> after each liquefaction train is placed into service. If the noise attributable to operation of the equipment at the Terminal Expansion exceeds an L_{dn} of 55 dBA at the nearest NSA, <u>within 60 days</u> Gulf LNG should modify operation of the liquefaction facilities or install additional noise controls until a noise level below an L_{dn} of 55 dBA at the NSA is achieved. Gulf LNG should confirm compliance with the above requirement by filing a second noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

In addition, **we recommend that:**

- **Gulf LNG should file a noise survey with the Secretary <u>no later than 60 days</u> after placing the entire Terminal Expansion into service. If a full load condition noise survey is not possible, Gulf LNG should provide an interim survey at the maximum possible horsepower load <u>within 60 days</u> of placing the Terminal Expansion into service and provide the full load survey <u>within 6 months</u>. If the noise attributable to operation of the equipment at the Terminal Expansion exceeds an L_{dn} of 55 dBA at the nearest NSA under interim or full horsepower load conditions, Gulf LNG should file a report on what changes are needed and should install the additional noise controls to meet the level <u>within 1 year</u> of the in-service date. Gulf LNG should confirm compliance with the above requirement by filing an additional noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

Based on the results of the noise analysis and mitigation, we conclude that operational noise from the Terminal Expansion would have no significant impact on the noise environment in the vicinity of the Terminal Expansion.

Flare Operations

Gulf LNG would install three in-service flares (warm, cold, and low pressure) for venting excess natural gas, if necessary, during maintenance, startup/shutdown, and upset activities. The facility would include one additional flare to act as backup. The four flares would be constructed on a common 430-foot-tall support structure [with an overall height of 433 feet above msl] (see figure 2.0-1). Noise impacts would occur from flare operation on an intermittent basis during startup, shutdown, or commissioning of the liquefaction facility, and infrequently in the event of a malfunction de-pressuring event.

The worst-case planned flare event would be for a total plant startup, which would happen for the initial startup of the two liquefaction trains. Once the facility is in operation, a total plant re-start from a warm condition would only occur if there is an extended outage of the entire train for maintenance or repairs or a significant commercial interruption of the facility operation. Each total plant startup would last several days. The total time in warm and cold starts is not anticipated to exceed 120 hours per year. A conservative estimate of flare noise would be 55 dBA L_{dn} plus or minus 3 dBA L_{dn} for a worst-case of 58 dBA L_{dn} at the nearest NSA based on utilization of an elevated sonic flare tip designed for smokeless operation and for a conservative liquefaction plant startup flare rate. However, it is expected that noise attributable to the planned flare events would achieve 55 dBA L_{dn} or less once detailed design is completed, the flare design/vendor is selected, and final emergency flare rates are known.

The worst-case unplanned flare event would be a total liquefaction plant Emergency Shut-Down (ESD). An event of this type would last less than one hour. Although the detailed flare design is not yet completed, the worst-case peak noise is expected to be 70 to 75 dBA at NSA #1 and NSA #2; this is a peak noise rate and not a day/night average (L_{dn}) since any such event would be for a short duration. The correlating L_{dn} is estimated to be 56 to 61 dBA at the nearest NSAs assuming the event lasts for an entire hour. Because of the infrequent occurrence and expected operation of flares during unplanned flare events, we conclude that the resulting noise would not result in a significant impact on the NSAs.

Pipeline Modifications

The Pipeline Modifications would not include any additional noise generating equipment so would not be anticipated to increase existing operational noise levels. Therefore, we conclude that operational noise from the Pipeline Modifications would have no significant impact on the noise environment in the vicinity of the Project.

4.12 RELIABILITY AND SAFETY

4.12.1 LNG Facility Reliability, Safety, and Security Regulatory Oversight

LNG facilities handle flammable and sometimes toxic materials that can pose a risk to the public if not properly managed. These risks are managed by the companies owning the facilities, through selecting the site location and plant layout as well as through suitable design, engineering, construction, and operation of the LNG facilities. Multiple federal agencies share regulatory authority over the LNG facilities and the operator's approach to risk management. The safety, security, and reliability of the Gulf LNG Liquefaction Project would be regulated by the DOT, the USCG, and the FERC.

In February 2004, the DOT, USCG, and FERC entered into an Interagency Agreement to ensure greater coordination among these three agencies in addressing the full range of safety and security issues at LNG terminals and LNG marine vessel operations, and maximizing the exchange of information related to the safety and security aspects of LNG facilities and related marine operations. Under the Interagency Agreement, FERC is the lead federal agency responsible for the preparation of the analysis required under NEPA for impacts associated with terminal construction and operation. The DOT and

USCG participate as cooperating agencies but remain responsible for enforcing their regulations covering LNG facility siting, design, construction, and operation. All three agencies have some oversight and responsibility for the inspection and compliance during the LNG Terminal's operation.

The DOT establishes and has the authority to enforce the federal safety standards for the location, design, installation, construction, inspection, testing, operation, and maintenance of on-shore LNG facilities under the Natural Gas Pipeline Safety Act (49 USC 1671 *et seq*.). The DOT's LNG safety regulations are codified in 49 CFR 193, which prescribes safety standards for LNG facilities used in the transportation of gas by pipeline that are subject to federal pipeline safety laws (49 USC 60101 *et seq*.), and 49 CFR 192. On August 31, 2018, DOT and FERC signed a MOU regarding methods to improve coordination throughout the LNG permit application process for FERC jurisdictional LNG facilities. In the MOU, the DOT agreed to issue a Letter of Determination (LOD) stating whether a proposed LNG facility would be capable of complying with location criteria and design standards contained in Subpart B of Part 193. The Commission committed to rely upon the DOT determination in conducting its review of whether the facilities would be consistent with the public interest. The issuance of the LOD does not abrogate the DOT's continuing authority and responsibility over a proposed project's compliance with Part 193 during construction and future operation of the facility. The DOT's conclusion on the siting and hazard analysis required by Part 193 would be based on preliminary design information which may be revised as the engineering design progresses to final design. DOT regulations also contain requirements for the design, construction, installation, inspection, testing, operation, maintenance, qualifications and training of personnel, fire protection, and security for LNG facilities, as defined by 49 CFR 193, which would be completed during later stages of the Gulf LNG Liquefaction Project. If the Project is approved and constructed, the liquefaction facilities would be subject to the DOT's inspection and enforcement programs to ensure compliance with the requirements of 49 CFR 193.

The USCG has authority over the safety of an LNG terminal's marine transfer area and LNG marine traffic, as well as security plans for the waterfront facilities handling LNG and LNG marine vessels. The USCG regulations for LNG facilities are codified in 33 CFR 105 and 33 CFR 127. As a cooperating agency, the USCG assists the FERC staff in evaluating whether an applicant's proposed waterway would be suitable for LNG marine vessel traffic and whether the waterfront facilities handling LNG would be operated in accordance with 33 CFR 105 and 33 CFR 127. If the facilities are constructed and become operational, the facilities would be subject to the USCG inspection program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

FERC authorizes the siting and construction of LNG terminals under the NGA and delegated authority from the DOE. FERC requires standard information to be submitted to perform safety and reliability engineering reviews. FERC's filing regulations are codified in 18 CFR 380.12 (m) and (o), and requires each applicant to identify how its proposed design would comply with the DOT's siting requirements of 49 CFR 193, Subpart B. The level of detail necessary for this submittal requires the applicant to perform substantial front-end engineering review of the complete project. The design information is required to be site-specific and developed to the extent that further detailed design would not result in significant changes to the siting considerations, basis of design, operating conditions, major equipment selections, equipment design conditions, or safety system designs. As part of the review required for a FERC Order, we use this information from the applicant to assess whether the proposed facilities would have a public safety impact and to suggest additional mitigation measures for the Commission to consider for incorporation as conditions in the Order. If the facilities are approved and the suggested mitigation measures are incorporated into the Order as conditions, FERC staff would review material filed to satisfy the conditions of the Order and conduct periodic inspections throughout construction and operation.

In addition, the Energy Policy Act of 2005 requires FERC to coordinate and consult with the DOD on the siting, construction, expansion, and operation of LNG terminals that would affect the military. On November 21, 2007, the FERC and the DOD entered into a MOU formalizing this process.[14] In accordance with the MOU, the FERC sent a letter to the DOD on June 29, 2015 requesting their comments on whether the planned Project could potentially have an impact on the test, training, or operational activities of any active military installation. On March 10, 2016 the FERC received a response letter from the DOD Siting Clearinghouse stating that the Gulf LNG Liquefaction Project would have a minimal impact on military training and operations conducted in the Jackson County, Mississippi area.

4.12.1.1 DOT Siting Requirements and Part 193 Subpart B Determination

Siting LNG facilities, as defined in 49 CFR 193, with regard to ensuring that the proposed site selection and location would not pose an unacceptable level or risk to public safety is required by DOT's regulations in 49 CFR 193, Subpart B. The Commission's regulations under 18 CFR 380.12(o)(14) require Gulf LNG to identify how the proposed design complies with the siting requirements in DOT's regulations under 49 CFR 193, Subpart B. The scope of DOT's siting authority under 49 CFR 193 applies to LNG facilities used in the transportation of gas by pipeline subject to the federal pipeline safety laws and 49 CFR 192.[15]

The requirements in 49 CFR 193 Subpart B state that an operator or government agency must exercise legal control over the activities as long the facility is in operation that can occur within an "exclusion zone," defined as the area around an LNG facility that could be exposed to specified levels of thermal radiation or flammable vapor in the event of a release of LNG or ignition of LNG vapor. Approved mathematical models must be used to calculate the dimensions of these exclusion zones. The siting requirements specified in NFPA 59A (2001), an industry consensus standard for LNG facilities, are incorporated into 49 CFR 193 Subpart B, by reference, with regulatory preemption in the event of conflict. The following sections of 49 CFR 193 Subpart B specifically address siting requirements:

- Section 193.2051, Scope, states that each LNG facility designed, replaced, relocated or significantly altered after March 31, 2000, must be provided with siting requirements in accordance with Subpart B and NFPA 59A (2001). In the event of a conflict with NFPA 59A (2001), the regulatory requirements in Part 193 prevail.
- Section 193.2057, Thermal radiation protection, requires that each LNG container and LNG transfer system have thermal exclusion zones in accordance with Section 2.2.3.2 of NFPA 59A (2001).
- Section 193.2059, Flammable vapor-gas dispersion protection, requires that each LNG container and LNG transfer system have a dispersion exclusion zone in accordance with Sections 2.2.3.3 and 2.2.3.4 of NFPA 59A (2001).
- Section 193.2067, Wind forces, requires that shop fabricated containers of LNG or other hazardous fluids less than 70,000 gallons must be designed to withstand wind forces based on the applicable wind load data in ASCE 7 (2005). All other LNG facilities must be designed for a sustained wind velocity of not less than 150 mph unless the DOT Administrator finds a lower wind speed is justified or the most critical combination of wind velocity and duration for a 10,000-year mean return interval.

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14 The MOU is available at: http://www.ferc.gov/legal/mou/mou-dod.pdf.

15 49 CFR 193.2001(b)(3), Scope of part, excludes any matter other than siting provisions pertaining to marine cargo transfer systems between the LNG marine vessel and the last manifold or valve immediately before a storage tank.

As stated in Section 193.2051, LNG facilities must meet the siting requirements of NFPA 59A (2001), Chapter 2, and include but may not be limited to:

- NFPA 59A (2001) Section 2.1.1(c) requires consideration of protection against forces of nature. Section 2.1.1(d) also requires that other factors applicable to the specific site that have a bearing on the safety of plant personnel and surrounding public be considered, including an evaluation of potential incidents and safety measures incorporated in the design or operation of the facility.
- NFPA 59A (2001) Section 2.2.3.2 requires provisions to minimize the damaging effects of fire from reaching beyond a property line, and requires provisions to prevent a radiant heat flux level of 1,600 British thermal units per square foot per hour (Btu/ft^2-hr) from reaching beyond a property line that can be built upon. The distance to this flux level is to be calculated with LNGFIRE3 or with models that have been validated by experimental test data appropriate for the hazard to be evaluated and that have been approved by DOT.
- NFPA 59A (2001) Section 2.2.3.4 requires provisions to minimize the possibility of any flammable mixture of vapors from a design spill from reaching a property line that can be built upon and that would result in a distinct hazard. Determination of the distance that the flammable vapors extend is to be determined with DEGADIS or approved alternative models that take into account physical factors influencing LNG vapor dispersion.[16]

Taken together, 49 CFR 193 Subpart B and NFPA 59A (2001) require that flammable LNG vapors either from a design spill do not extend beyond areas in which the operator or a government agency legally controls all activities. Furthermore, consideration of other hazards which may affect the public or plant personnel must be evaluated as prescribed in NFPA 59A (2001), Section 2.1.1(d).

Title 49 CFR 193 Subpart B and NFPA 59A (2001) also specify radiant heat flux levels which must be considered as long as the facility is in operation.

The requirements for design spills from process and transfer areas require the 1,600 Btu/ft^2-hr flux level to not extend beyond the plant property line onto a property that can be built upon.

In addition, Section 2.1.1 of NFPA 59A (2001) requires that factors applicable to the specific site with a bearing on the safety of plant personnel and the surrounding public must be considered, including an evaluation of potential incidents and safety measures incorporated into the design or operation of the facility. DOT has indicated that potential incidents, such as vapor cloud explosions and toxic releases should also be considered to comply with Part 193 Subpart B.[17]

In accordance with the August 31, 2018 MOU, the DOT will issue a LOD to the Commission after the DOT completes its analysis of whether the proposed liquefaction facilities would meet the DOT's siting standards. The LOD will evaluate the hazard modeling results and endpoints used to establish exclusion zones, as well as Gulf LNG's evaluation on potential incidents and safety measures incorporated in the design or operation of the facility specific to the site that have a bearing on the safety of plant personnel and surrounding public. The LOD will serve as one of the considerations for the Commission to deliberate in its decision to authorize or deny an application.

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[16] DOT has approved two additional models for the determination of vapor dispersion exclusion zones in accordance with 49 CFR 193.2059: FLACS 9.1 Release 2 (Oct. 7, 2011) and PHAST-UDM Version 6.6 and 6.7 (Oct. 7, 2011).

[17] The DOT PHMSA's "LNG Plant Requirements: Frequently Asked Questions" item H1. Available at: https://www.phmsa.dot.gov/pipeline/liquified-natural-gas/lng-plant-requirements-frequently-asked-questions, accessed Aug 2018.

The DOT's conclusion on the siting and hazard analysis required by Part 193 would be based on preliminary design information which may be revised as the engineering design progresses to final design. DOT regulations also contain requirements for the design, construction, installation, inspection, testing, operation and maintenance, and contingency plans for LNG facilities, which would be completed during later stages of the Gulf LNG Liquefaction Project. If the facilities are approved and constructed, final compliance with the requirements of 49 CFR 193 Subpart B will be subject to the DOT's inspection and enforcement programs.

4.12.1.2 USCG Safety Regulatory Requirements and Letter of Recommendation

LNG Marine Vessel Historical Record

Since 1959, marine vessels have transported LNG without a major release of cargo or a major accident involving an LNG marine vessel. There are more than 370 LNG marine vessels in operation routinely transporting LNG between more than 100 import/export terminals currently in operation worldwide. Since U.S. LNG terminals first began operating under FERC jurisdiction in the 1970s, there have been thousands of individual LNG marine vessel arrivals at terminals in the United States. For more than 40 years, LNG shipping operations have been safely conducted in U.S. ports and waterways.

A review of the history of LNG maritime transportation indicates that there has not been a serious accident at sea or in a port which resulted in a spill due to rupturing of the cargo tanks. However, insurance records, industry sources, and public websites identify a number of incidents involving LNG marine vessels, including minor collisions with other marine vessels of all sizes, groundings, minor LNG releases during cargo unloading operations, and mechanical/equipment failures typical of large marine vessels. Some of the more significant occurrences, representing the range of incidents experienced by the worldwide LNG marine vessel fleet, are described below:

- **El Paso Paul Kayser** grounded on a rock in June 1979 in the Straits of Gibraltar during a loaded voyage from Algeria to the United States. Extensive bottom damage to the ballast tanks resulted; however, no cargo was released because no damage was done to the cargo tanks. The entire cargo of LNG was subsequently transferred to another LNG marine vessel and delivered to its U.S. destination.
- **Tellier** was blown by severe winds from its docking berth at Skikda, Algeria in February 1989 causing damage to the loading arms and the LNG marine vessel and shore piping. The cargo loading had been secured just before the wind struck, but the loading arms had not been drained. Consequently, the LNG remaining in the loading arms spilled onto the deck, causing fracture of some plating.
- **Mostefa Ben Boulaid** had an electrical fire in the engine control room during unloading at Everett, Massachusetts. The LNG marine vessel crew extinguished the fire and the LNG marine vessel completed unloading.
- **Khannur** had a cargo tank overfill into the LNG marine vessel's vapor handling system on September 10, 2001, during unloading at Everett, Massachusetts. Approximately 100 gallons of LNG were vented and sprayed onto the protective decking over the cargo tank dome, resulting in several cracks. After inspection by the USCG, the Khannur was allowed to discharge its LNG cargo.
- **Mostefa Ben Boulaid** had LNG spill onto its deck during loading operations in Algeria in 2002. The spill, which is believed to have been caused by overflow rather than a mechanical failure, caused significant brittle fracturing of the steelwork. The LNG marine vessel was required to discharge its cargo, after which it proceeded to dock for repair.

- **Norman Lady** was struck by the USS Oklahoma City nuclear submarine while the submarine was rising to periscope depth near the Strait of Gibraltar in November 2002. The 87,000 m^3 LNG marine vessel, which had just unloaded its cargo at Barcelona, Spain, sustained only minor damage to the outer layer of its double hull but no damage to its cargo tanks.
- **Tenaga Lima** grounded on rocks while proceeding to open sea east of Mopko, South Korea due to strong current in November 2004. The shell plating was torn open and fractured over an approximate area of 20 by 80 feet, and internal breaches allowed water to enter the insulation space between the primary and secondary membranes. The LNG marine vessel was refloated, repaired, and returned to service.
- **Golar Freeze** moved away from its docking berth during unloading on March 14, 2006, in Savannah, Georgia. The powered emergency release couplings on the unloading arms activated as designed, and transfer operations were shut down.
- **Catalunya Spirit** lost propulsion and became adrift 35 miles east of Chatham, Massachusetts on February 11, 2008. Four tugs towed the LNG marine vessel to a safe anchorage for repairs. The Catalunya Spirit was repaired and taken to port to discharge its cargo.
- **Al Gharrafa** collided with a container ship, Hanjin Italy, in the Malacca Strait off Singapore on December 19, 2013. The bow of the Al Gharrafa and the middle of the starboard side of the Hanjin were damaged. Both ships were safely anchored after the incident. No loss of LNG was reported.
- **Al Oraiq** collided with a freight carrier, Flinterstar, near Zeebrugge, Belgium on October 6, 2015. The freight carrier sank, but the Al Oraiq was reported to have sustained only minor damage to its bow and no damage to the LNG cargo tanks. According to reports, the Al Oraiq took on a little water but was towed to the Zeebrugge LNG terminal where its cargo was unloaded using normal procedures. No loss of LNG was reported.
- **Al Khattiya** suffered damage after a collision with an oil carrier off the Port of Fujairah on February 23, 2017. Al Khattiya had discharged its cargo and was anchored at the time of the incident. A small amount of LNG was retained within the LNG marine vessel to keep the cargo tanks cool. The collision damaged the hull and two ballast tanks on the Al Khattiya, but did not cause any injury or water pollution. No loss of LNG was reported.

LNG Marine Vessel Safety Regulatory Oversight

The USCG exercises regulatory authority over LNG marine vessels under 46 CFR 154, which contains the United States safety standards for LNG marine vessels transporting LNG in bulk. The LNG marine vessels visiting the proposed facility would also be constructed and operated in accordance with the International Maritime Organization (IMO) *Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk and the International Convention for the Safety of Life at Sea*. All LNG marine vessels entering U.S. waters are required to possess a valid IMO Certificate of Fitness and either a USCG Certificate of Inspection for U.S. flag vessels or a USCG Certificate of Compliance for foreign flag vessels. These documents certify that the LNG marine vessel is designed and operating in accordance with both international standards and the U.S. regulations for bulk LNG marine vessels under Title 46 CFR 154.

The LNG marine vessels that would deliver or receive LNG to or from the proposed liquefaction facilities would also need to comply with various U.S. and international security requirements. The IMO adopted the *International Ship and Port Facility Security Code* in 2002. This code requires both marine vessels and ports to conduct vulnerability assessments and to develop security plans. The purpose of the code is to prevent and suppress terrorism against marine vessels; improve security aboard marine vessels and ashore; and reduce the risk to passengers, crew, and port personnel on board marine vessels and in port areas. All LNG marine vessels, as well as other cargo marine vessels (e.g. 500 gross tons and larger), and ports servicing those regulated marine vessels, must adhere to the IMO standards. Some of the IMO requirements for marine vessels are as follows:

- marine vessels must develop security plans and have a Vessel Security Officer;
- marine vessels must have a marine vessel security alert system to transmit ship-to-shore security alerts identifying the marine vessel, its location, and an indication of whether the security of the marine vessel is under threat or has been compromised;
- marine vessels must have a comprehensive security plan for international port facilities, focusing on areas having direct contact with marine vessels; and
- marine vessels may have equipment onboard to help maintain or enhance the physical security of the marine vessel.

In 2002, the *Maritime Transportation Security Act* (MTSA) was enacted by the U.S. Congress and aligned domestic regulations with the maritime security standards of the *International Ship and Port Facility Security Code and the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* and the *International Convention for the Safety of Life at Sea*. The USCG's regulations in 33 CFR 104 require marine vessels to conduct a vessel security assessment and develop a vessel security plan that addresses each vulnerability identified in the vessel security assessments. All LNG marine vessels servicing the facility would have to comply with the MTSA requirements and associated regulations while in U.S. waters.

The USCG also exercises regulatory authority over LNG facilities that affect the safety and security of port areas and navigable waterways under Executive Order 10173; the Magnuson Act (50 USC Section 191); the *Ports and Waterways Safety Act of 1972,* as amended (33 USC Section 1221, et seq.); and the MTSA of 2002 (46 USC Section 701). The USCG is responsible for matters related to navigation safety, LNG marine vessel engineering and safety standards, and all matters pertaining to the safety of facilities or equipment located in or adjacent to navigable waters up to the last valve immediately before the receiving tanks. The USCG also has authority for LNG FSP review, approval, and compliance verification as provided in Title 33 CFR 105.

The USCG regulations in 33 CFR 127 apply to the marine transfer area of waterfront facilities between the LNG marine vessel and the last manifold or valve immediately before the receiving tanks. Title 33 CFR 127 applies to the marine transfer area for LNG of each new waterfront facility handling LNG and to new construction in the marine transfer areas for LNG of each existing waterfront facility handling LNG. The scope of the regulations includes the design, construction, equipment, operations, inspections, maintenance, testing, personnel training, firefighting, and security of the marine transfer area of LNG waterfront facilities. The safety systems, including communications, ESD, gas detection, and fire protection, must comply with the regulations in 33 CFR 127. Under 33 CFR 127.019, Gulf LNG would be required to submit two copies of its Operations and Emergency Manuals to the USCG Captain of the Port (COTP) for examination.

Both the USCG regulations under 33 CFR 127 and FERC regulations under 18 CFR 157.21, require an applicant who intends to build an LNG terminal facility to submit a Letter of Intent (LOI) to the USCG no later than the date that the owner/operator initiates pre-filing with FERC, but, in all cases, at least 1 year prior to the start of construction. In addition, the applicant must submit a WSA to the COTP with the LOI.

The Preliminary WSA provides an initial explanation of the port community and the proposed facility and transit routes. It provides an overview of the expected impacts LNG operations may have on the port and the waterway. Generally, the Preliminary WSA does not contain detailed studies or conclusions. This document is used by the COTP to begin his or her evaluation of the suitability of the waterway for LNG marine traffic. The Preliminary WSA must provide an initial explanation of the following

- port characterization;
- characterization of the LNG facility and the LNG marine vessel route;
- risk assessment for maritime safety and security;
- risk management strategies; and
- resource needs for maritime safety, security, and response.

A Follow-On WSA must be provided no later than the date the owner/operator files an application with FERC, but in all cases at least 180 days prior to transferring LNG. The Follow-On WSA must provide a detailed and accurate characterization of the LNG facility, the LNG marine vessel route, and the port area. The Follow-On WSA provides a complete analysis of the topics outlined in the Preliminary WSA. It should identify credible security threats and navigational safety hazards for the LNG marine traffic, along with appropriate risk management measures and the resources (i.e., federal, state, local, and private sector) needed to carry out those measures. Until a facility begins operation, applicants must also annually review their WSAs and submit a report to the COTP as to whether changes are required. This document is reviewed and validated by the USCG and forms the basis for the agency's LOR to the FERC.

In order to provide the USCG COTPs/Federal Maritime Security Coordinators, members of the LNG industry, and port stakeholders with guidance on assessing the suitability of a waterway for LNG marine traffic, the USCG has published a Navigation and Vessel Inspection Circular – *Guidance on Assessing the Suitability of a Waterway for Liquefied Natural Gas (LNG) Marine Traffic* (NVIC 01-11).

NVIC 01-11 directs the use of the three concentric Zones of Concern, based on LNG marine vessels with a cargo carrying capacity up to 265,000 m^3, used to assess the maritime safety and security risks of LNG marine traffic. The Zones of Concern are:

- Zone 1 – impacts on structures and organisms are expected to be significant within 500 meters (1,640 feet). The outer perimeter of Zone 1 is approximately the distance to thermal hazards of 37.5 kW/m^2 (12,000 Btu/ft^2-hr) from a pool fire;
- Zone 2 – impacts would be significant but reduced, and damage from radiant heat levels are expected to transition from severe to minimal between 500 and 1,600 meters (1,640 and 5,250 feet). The outer perimeter of Zone 2 is approximately the distance to thermal hazards of 5 kW/m^2 (1,600 Btu/ft^2-hr) from a pool fire; and
- Zone 3 – impacts on people and property from a pool fire or an un-ignited LNG spill are expected to be minimal between 1,600 meters (5,250 feet) and a conservative maximum distance of 3,500 meters (11,500 feet or 2.2 miles). The outer perimeter of Zone 3 should be considered the vapor cloud dispersion distance to the lower flammability limit from a worst-case un-ignited release. Impacts on people and property could be significant if the vapor cloud reaches an ignition source and burns back to the source.

Once the applicant submits a complete Follow-On WSA, the USCG reviews the document to determine if it presents a realistic and credible analysis of the public safety and security implications from LNG marine traffic both in the waterway and when in port.

As required by its regulations (33 CFR 127.009), the USCG is responsible for issuing a LOR to the FERC regarding the suitability of the waterway for LNG marine traffic with respect to the following items:

- physical location and description of the facility;
- the LNG marine vessel's characteristics and the frequency of LNG shipments to or from the facility;
- waterway channels and commercial, industrial, environmentally sensitive, and residential areas in and adjacent to the waterway used by LNG marine vessels en route to the facility, within 25 kilometers (15.5 miles) of the facility;
- density and character of marine traffic in the waterway;
- locks, bridges, or other manmade obstructions in the waterway;
- depth of water;
- tidal range;
- protection from high seas;
- natural hazards, including reefs, rocks, and sandbars;
- underwater pipes and cables; and
- distance of berthed LNG marine vessels from the channel and the width of the channel.

The USCG may also prepare an LOR Analysis, which serves as a record of review of the LOR and contains detailed information along with the rationale used in assessing the suitability of the waterway for LNG marine traffic.

Gulf LNG's Waterway Suitability Assessment

As part of the existing Terminal application under FERC docket number CP06-12, Gulf LNG conducted marine safety and vessel maneuverability studies for various size and capacity LNG marine vessels. The USCG issued a LOR that was based upon the import of 170,000 m^3 capacity LNG marine vessels. The Gulf LNG Liquefaction Project proposes to load up to 208,000 m^3 capacity LNG marine vessels and maximum length of 1,000 feet. As a result, the USCG instructed Gulf LNG to amend its existing Follow-On Waterway Suitability Assessment to account for the Gulf LNG Liquefaction Project and increased capacity and size of the proposed LNG marine vessels for export. On June 19, 2015, Gulf LNG submitted a LOI and on October 23, 2015 submitted an Amendment to Follow-On WSA (June 2009 Rev. 2) to the COTP, Marine Safety Unit Mobile to notify the USCG that it proposed to add liquefaction and export capabilities to the existing Terminal. In order to assess the safety and security aspects of this Project, the COTP Marine Safety Unit Mobile consulted with various safety and security working groups, including the Area Maritime Security Committee, Harbor Safety Committee, state and local government representatives, and local emergency response groups. Gulf LNG submitted an update to the Amendment to Follow-On WSA to the USCG on July 17, 2018.

LNG Marine Vessel Routes and Hazard Analysis

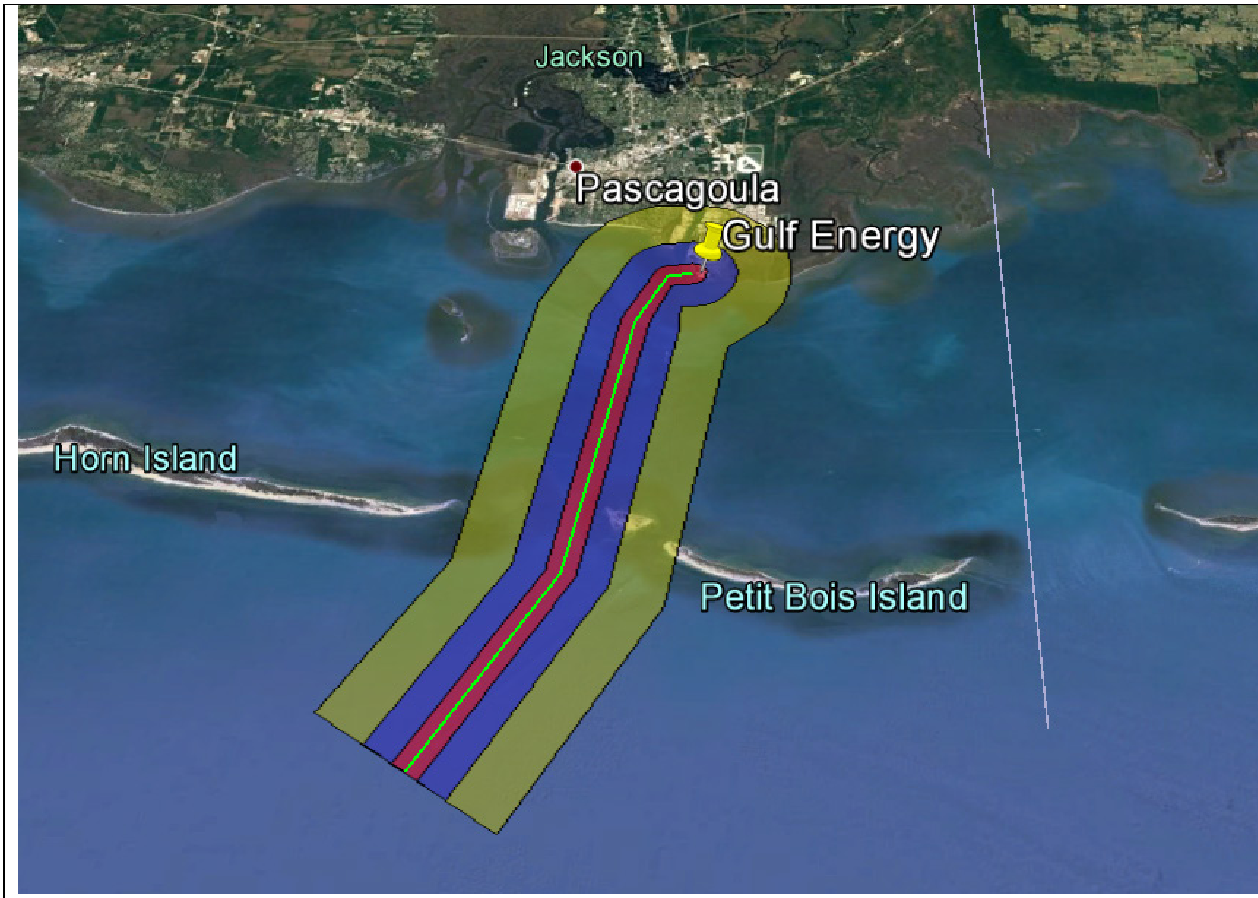
As described in Gulf LNG's WSAs, an LNG marine vessel's transit to the Terminal would begin at the Gulf of Mexico where it would enter the Pascagoula Bar Channel. Pilot control and tug assistance is required to enter the Horn Island Pass between Horn Island and Petit Bois Island, and must be maintained until reaching the Gulf LNG berth. The LNG marine vessel then would travel approximately 5 miles north along the Lower Pascagoula Channel to the "Y" that feeds into the Bayou Casotte Channel and the Pascagoula River. From here, the LNG marine vessel would follow the Bayou Casotte Channel and transit approximately 1.5 nautical miles, before turning right using the Bayou Casotte turning basin and proceeding approximately 0.5 nautical mile to approach the Gulf LNG berth. LNG marine vessels would return to sea by reversing their travel. Pilotage is compulsory for foreign marine vessels and U.S. marine vessels under registry in foreign trade when in U.S. waters. All deep draft marine vessels currently entering the shared waterway would employ a U.S. pilot. The National Vessel Movement Center in the U.S. would require a 96-hour advance notice of arrival for deep draft marine vessels calling on U.S. ports. During transit, LNG marine vessels would be required to maintain voice contact with controllers and check in on designated frequencies at established way points.

NVIC 01-11 references the "Zones of Concern" for assisting in a risk assessment of the waterway. As LNG marine vessels proceed along the intended transit route, no hospitals, cultural centers, city centers, or military installations would be located within any of the three Zones of Concern. Intentional Hazard Zone 1 only encompasses the Gulf LNG Terminal. Intentional Hazard Zone 2 encompasses the same locations as Hazard Zone 1 as well as the Chevron Pascagoula Refinery and Terminal. Intentional Hazard Zone 3 is a wider zone that encompasses the same locations as Hazard Zones 1 and 2 as well as some single residences in the Pascagoula community, Mississippi Phosphates Dry Bulk Chemical Terminal, VT Halter Marine Shipyard Facility, Singal International Shipyard Facility, and JCPA General Cargo Terminal. Accidental Hazard Zones 1 and 2 only encompass the Gulf LNG Terminal. Accidental Hazard Zone 3 encompasses Hazard Zones 1 and 2 as well as the Chevron Pascagoula Refinery and Terminal.

The areas impacted by the three different hazard zones are illustrated for accidental events in figure 4.12.1-1. The areas impacted by the three different hazard zones are illustrated for intentional events in figure 4.12.1-2.

Legend	
Marine Vessel Transit Route Accidental Sandia Hazard Zone 1 (0-250m) Accidental Sandia Hazard Zone 2 (250-750m) Accidental Sandia Hazard Zone 3 (750-1700m)	Gulf LNG Liquefaction Project

Figure 4.12.1-1 Accidental Hazard Zones along LNG Marine Vessel Route



Legend	
Marine Vessel Transit Route Intentional Sandia Hazard Zone 1 (0-500m) Intentional Sandia Hazard Zone 2 (500-1600m) Intentional Sandia Hazard Zone 3 (1600-3500m)	Gulf LNG Liquefaction Project

Figure 4.12.1-2 Intentional Hazard Zones along LNG Marine Vessel Route

Coast Guard Letter of Recommendation and Analysis

In a letter dated May 4, 2016, the USCG issued an LOR and LOR Analysis to FERC stating that the Bayou Casotte turning basin, Bayou Casotte Channel, Lower Pascagoula Channel, Horn Island Pass Channel, and Pascagoula Bar Channel would be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this Project. The LOR was based on full implementation of the strategies and risk management measures identified by the USCG to Gulf LNG in its WSA, Follow-On WSA, and Amendment to the Follow-On WSA.

Although Gulf LNG has suggested mitigation measures for responsibly managing the maritime safety and security risks associated with LNG marine vessel traffic, the necessary marine vessel traffic and/or facility control measures may change depending on changes in conditions along the waterway. The USCG regulations in 33 CFR 127 require that applicants annually review WSAs until a facility begins operation. The annual review and report to the USCG would identify any changes in conditions, such as changes to the port environment, the LNG facility, or the LNG marine vessel route, that would affect the suitability of the waterway. Gulf LNG submitted its annual WSA update on July 17, 2018 and the USCG determined that the annual review met the requirements of 33 CFR 127.

The USCG's LOR is a recommendation, regarding the current status of the waterway, to the FERC, the lead agency responsible for siting the on-shore LNG facility. Neither the USCG nor the FERC has authority to require waterway resources of anyone other than the applicant under any statutory authority or under the ERP or the Cost-Sharing Plan. As stated in the LOR, the USCG would assess each transit on a case by case basis to identify what, if any, safety and security measures would be necessary to safeguard the public health and welfare, critical infrastructure and key resources, the port, the marine environment, and the LNG marine vessel.

Under the *Ports and Waterways Safety Act*, the Magnuson Act, the MTSA, and the *Security and Accountability For Every (SAFE) Port Act*, the COTP has the authority to prohibit LNG transfer or LNG marine vessel movements within his or her area of responsibility if he or she determines that such action is necessary to protect the waterway, port, or marine environment. If this Project is approved and if appropriate resources are not in place prior to LNG marine vessel movement along the waterway, then the COTP would consider at that time what, if any, marine vessel traffic and/or facility control measures would be appropriate to adequately address navigational safety and maritime security considerations.

4.12.1.3 LNG Facility Security Regulatory Requirements

The security requirements for the proposed Gulf LNG Liquefaction Project are governed by 33 CFR 105, 33 CFR 127, and 49 CFR 193, Subpart J. Title 33 CFR 105, as authorized by the MTSA, requires all terminal owners and operators to submit a Facility Security Assessment (FSA) and a FSP to the USCG for review and approval before commencement of operations of the proposed Project facilities. The existing facility has a FSP, as required by 33 CFR 105, which has been approved by the USCG. However, Gulf LNG would be expanding beyond the footprint of the existing Terminal and would need to update the FSP to account for the Terminal Expansion. Gulf LNG would be required to control and restrict access, patrol and monitor the plant, detect unauthorized access, and respond to security threats or breaches under 33 CFR 105. In addition, some of the already existing responsibilities of the applicant that may need to be updated include, but are not limited to:

- designating a Facility Security Officer with a general knowledge of current security threats and patterns, security assessment methodology, marine vessel and facility operations, conditions, security measures, emergency preparedness, response, and contingency plans, who would be responsible for implementing the FSA and FSP and performing an annual audit for the life of the Project;

- conducting a FSA to identify site vulnerabilities, possible security threats and consequences of an attack, and facility protective measures; developing a FSP based on the FSA, with procedures for: responding to transportation security incidents; notification and coordination with federal, state, and local authorities; prevention of unauthorized access; measures to prevent or deter entrance with dangerous substances or devices; training; and evacuation;
- defining the security organizational structure with facility personnel with knowledge or training in current security threats and patterns; recognition and detection of dangerous substances and devices, recognition of characteristics and behavioral patterns of persons who are likely to threaten security; techniques to circumvent security measures; emergency procedures and contingency plans; operation, testing, calibration, and maintenance of security equipment; and inspection, control, monitoring, and screening techniques;
- implementing scalable security measures to provide increasing levels of security at increasing maritime security levels for facility access control, restricted areas, cargo handling, LNG marine vessel stores and bunkers, and monitoring; ensuring that the Transportation Worker Identification Credential (TWIC) program is properly implemented;
- ensuring coordination of shore leave for LNG marine vessel personnel or crew change out as well as access through the facility for visitors to the LNG marine vessel;
- conducting drills and exercises to test the proficiency of security and facility personnel on a quarterly and annual basis; and
- reporting all breaches of security and transportation security incidents to the National Response Center.

Title 33 CFR 127 has requirements for access controls, lighting, security systems, security personnel, protective enclosures, communications, and emergency power that would also need to be applied to the Gulf LNG Liquefaction Project. In addition, a waterfront facility handling LNG regulated under 33 CFR 105 and 33 CFR 127 would be subject to the TWIC Reader Requirements Rule issued by the USCG on August 23, 2016. This rule requires owners and operators of certain marine vessels and facilities regulated by the USCG to conduct electronic inspections of TWICs (e.g., readers with biometric fingerprint authentication) as an access control measure. The final rule would also include recordkeeping requirements and security plan amendments that would incorporate these TWIC requirements. The implementation of the rule was first proposed to be in effect August 23, 2018. In a subsequent notice issued on June 22, 2018, USCG indicated delaying the effective date for certain facilities by 3 years, until August 23, 2021. On August 2, 2018, the President of the United States signed into law the TWIC Accountability Act of 2018 (H.R. 5729). This prohibits the USCG from implementing the rule requiring electronic inspections of TWICs until after the Department of Homeland Security (DHS) has submitted a report to the Congress. Although the implementation of this rule has been postponed, the company may need to consider the rule when developing access control and security plan provisions for the facility.

Title 49 CFR 193 Subpart J also specifies security requirements for the on-shore component of LNG facilities, as defined in 49 CFR 193, including requirements for conducting security inspections and patrols, liaison with local law enforcement officials, design and construction of protective enclosures, lighting, monitoring, alternative power sources, and warning signs. The existing Terminal, as defined in 49 CFR 193, is subject to these requirements already and Gulf LNG would augment their security program to take into account the Gulf LNG Liquefaction Project facilities subject to 49 CFR 193.

If the Gulf LNG Liquefaction Project is constructed and operated, compliance with the security requirements of 33 CFR 105, 33 CFR 127, and 49 CFR 193 Subpart J would be subject to the respective USCG and DOT inspection and enforcement programs.

Gulf LNG provided preliminary information on these security features and indicated additional details would be completed in the final design. We recommend in section 4.12.1.5 that Gulf LNG: demonstrate lighting coverage adequately covers the perimeter of the facility and along paths/roads of access and egress; provide details of fencing that demonstrates it would restrict and deter access and has a 10-foot clearance from exterior power lines, trees, interior hazardous piping and equipment, and other objects; and provide vehicle barriers and design details at controlled access points. In accordance with the February 2004 Interagency Agreement among FERC, DOT, and USCG, FERC staff would collaborate with USCG and DOT on the Project's security features.

4.12.1.4 FERC Engineering and Technical Review of the Preliminary Engineering Designs

LNG Facility Historical Record

The operating history of the U.S. LNG industry has been free of safety-related incidents resulting in adverse effects on the public or the environment with the exception of the October 20, 1944, failure at an LNG plant in Cleveland, Ohio. The 1944 incident in Cleveland led to a fire that killed 128 people and injured 200 to 400 more people.[18] The failure of the LNG storage tank was due to the use of materials not suited for cryogenic temperatures. LNG migrated through streets and into underground sewers due to inadequate spill impoundments at the site. Current regulatory requirements ensure that proper materials suited for cryogenic temperatures are used in the design and that spill impoundments are designed and constructed properly to contain a spill at the site. To ensure that this potential hazard would be addressed for proposed LNG facilities, we evaluate the preliminary and final specifications for suitable materials of construction and for the design of spill containment systems that would properly contain a spill at the site.

Another operational accident occurred in 1979 at the Cove Point LNG plant in Lusby, Maryland. A pump electrical seal located on a submerged electrical motor LNG pump leaked causing flammable gas vapors to enter an electrical conduit and settle in a confined space. When a worker switched off a circuit breaker, the flammable gas ignited, causing severe damage to the building and a worker fatality. With the participation of the FERC, lessons learned from the 1979 Cove Point accident led to changes in the national fire codes to better ensure that the situation would not occur again. To ensure that this potential hazard would be addressed for proposed facilities that have electrical seal interfaces, we evaluated the preliminary designs and recommend in section 4.12.1.5 that Gulf LNG provide, for review and approval, the final design details of the electrical seal design at the interface between flammable fluids and the electrical conduit or wiring system, details of the electrical seal leak detection system, and the details of a downstream physical break (i.e., air gap) in the electrical conduit to prevent the migration of flammable vapors.

On January 19, 2004, a blast occurred at Sonatrach's Skikda, Algeria, LNG liquefaction plant that killed 27 and injured 56 workers. No members of the public were injured. The findings of the accident investigation suggested that a cold hydrocarbon leak occurred at Liquefaction Train 40 and was introduced into a high-pressure steam boiler by the combustion air fan. An explosion developed inside the boiler firebox, which subsequently triggered a larger explosion of the hydrocarbon vapors in the immediate vicinity. The resulting fire damaged the adjacent liquefaction process and liquid petroleum gas separation equipment of Train 40, and spread to Trains 20 and 30. Although Trains 10, 20, and 30 had been modernized in 1998 and 1999, Train 40 had been operating with its original equipment since start-up in 1981. To ensure that this potential hazard would be addressed for proposed facilities, we evaluated the preliminary design for mitigation of flammable vapor dispersion and ignition in buildings

18 For a description of the incident and the findings of the investigation, see "U.S. Bureau of Mines, Report on the Investigation of the Fire at the Liquefaction, Storage, and Regasification Plant of the East Ohio Gas Co., Cleveland, Ohio, October 20, 1944," dated February 1946.

and combustion equipment to ensure they would be adequately covered by hazard detection equipment that could isolate and deactivate any combustion equipment whose continued operation could add to or sustain an emergency. We also recommend in section 4.12.1.5 that Gulf LNG provide, for review and approval, the final design details of hazard detection layout and devices.

On March 31, 2014, a detonation occurred within a gas heater at Northwest Pipeline Corporation's LNG peak-shaving plant in Plymouth, Washington.[19] This internal detonation subsequently caused the failure of pressurized equipment, resulting in high velocity projectiles. The plant was immediately shut down, and emergency procedures were activated, which included notifying local authorities and evacuating all plant personnel. No members of the public were injured, but one worker was sent to the hospital for injuries. As a result of the incident, the liquefaction trains and a compressor station located on-site were rendered inoperable. Projectiles from the incident also damaged the control building that was located near pre-treatment facilities and penetrated the outer shell of one of the LNG storage tanks. All damaged facilities were ultimately taken out of service for repair. The accident investigation showed that an inadequate purge after maintenance activities resulted in a fuel-air mixture remaining in the system. The fuel-air mixture auto-ignited during start-up after it passed through the gas heater at full operating pressure and temperature. To ensure that this potential hazard would be addressed for proposed facilities, we recommend in section 4.12.1.5 that Gulf LNG provide a plan for purging, for review and approval, which addresses the requirements of the American Gas Association *Purging Principles and Practice* and to provide justification if not using an inert or non-flammable gas for purging. In evaluating such plans, we would assess whether the purging could be done safely based on review of other plans and lessons learned from this and other past incidents. If a plan proposes the use of flammable mediums for cleaning, dry-out or other activities, we would evaluate the plans against other recommended and generally accepted good engineering practices, such as NFPA 56, *Standard for Fire and Explosion Prevention during Cleaning and Purging of Flammable Gas Piping Systems*.

We also recommend in section 4.12.1.5 that Gulf LNG provide, for review and approval, operating and maintenance plans, including safety procedures, prior to commissioning. In evaluating such plans, we would assess whether the plans cover all standard operations, including purging activities associated with start-up and shutdown. Also, in order to prevent other sources of projectiles from affecting occupied buildings and storage tanks, we recommend in section 4.12.1.5 that Gulf LNG incorporate mitigation into their final design with supportive information, for review and approval, that demonstrates it would mitigate the risk of a pressure vessel burst or boiling liquid expanding vapor explosion (BLEVE) from occurring.

Engineering Review

FERC requires an applicant to provide safety, reliability, and engineering design information as part of its application, including hazard identification studies and front-end-engineering-design (FEED) information for its proposed Project. FERC staff evaluates this information with a focus on potential hazards from within and nearby the site, including external events, which may have the potential to cause damage or failure to the Project facilities, and the engineering design and safety and reliability concepts of the various protection layers to mitigate the risks of potential hazards.

The primary concerns are those events that could lead to a hazardous release of sufficient magnitude to create an off-site hazard or interruption of service. In general, FERC staff considers an acceptable design to include various layers of protection or safeguards to reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public. These layers of

19 For a description of the incident and the findings of the investigation, see Root Cause Failure Analysis, Plymouth LNG Plant Incident Investigation under CP14-515.

protection are generally independent of one another so that any one layer would perform its function regardless of the initiating event or failure of any other protection layer. Such design features and safeguards typically include:

- a facility design that prevents hazardous events, including the use of inherently safer designs; suitable materials of construction; adequate design margins from operating limits for process piping, process vessels, and storage tanks; adequate design for wind, flood, seismic, and other outside hazards;
- control systems, including monitoring systems and process alarms, remotely-operated control and isolation valves, and operating procedures to ensure that the facility stays within the established operating and design limits;
- safety-instrumented prevention systems, such as safety control valves and emergency shutdown systems, to prevent a release if operating and design limits are exceeded;
- physical protection systems, such as appropriate electrical area classification, proper equipment and building spacing, pressure relief valves, spill containment, and cryogenic, overpressure, and fire structural protection, to prevent escalation to a more severe event;
- site security measures for controlling access to the plant, including security inspections and patrols, response procedures to any breach of security, and liaison with local law enforcement officials; and
- on-site and off-site emergency response, including hazard detection and control equipment, firewater systems, and coordination with local first responders, to mitigate the consequences of a release and prevent it from escalating to an event that could impact the public.

We believe the inclusion of such protection systems or safeguards in a plant design can minimize the potential for an initiating event to develop into an incident that could impact the safety of the off-site public. The reviews of the engineering design for these layers of protection are initiated in the application process and carried through to the next phase of the proposed Project in final design if authorization is granted by the Commission.

The reliability of these layers of protection is informed by occurrence and likelihood of root causes and the potential severity of consequences based on past incidents and validated hazard modeling. As a result of the continuing engineering review, FERC staff recommend mitigation measures and continuous oversight to the Commission for consideration to include as conditions in the Order. If a facility is authorized and recommendations are adopted as conditions to the Order, FERC staff would continue its engineering review through final design, construction, commissioning, and operation.

Process Design

In order to liquefy natural gas, most liquefaction technologies require that the feed gas stream be pre-treated to remove components that could freeze out and clog the liquefaction equipment or would otherwise be incompatible with the liquefaction process or equipment, including mercury, H_2S, CO_2, water, and heavy hydrocarbons. For example, mercury is typically limited to concentrations less than 0.01 microgram per normal cubic meter because it can cause embrittlement and corrosion resulting in catastrophic failure of equipment.

The inlet gas would be conditioned by a filter/coalescer to remove solids and entrained water droplets prior to entering feed gas pre-treatment processes. Once the inlet gas is conditioned, the feed gas would enter the mercury removal system consisting of mercury adsorber(s) to reduce the mercury concentration in the feed gas. Once the mercury is removed, the feed gas would contact an amine-based solvent solution in an acid gas absorber column to remove acid gas components (i.e., CO_2 and H_2S). Once the acid gas components accumulate in the amine solution, a solvent regenerator column would release the acid gas from the amine solution. The regenerated amine solution would be recycled back to the acid gas absorber column and the removed acid gas would be sent to a thermal oxidizer, where CO_2, H_2S, and trace amounts of hydrocarbons would be incinerated. The feed gas exiting the acid gas absorber column then enters a dryer inlet separator where bulk water would be recovered and recycled back to the acid gas absorber column. After the dryer inlet separator, any remaining water in the feed gas would be removed using regenerative molecular sieve beds. Water collected during the molecular sieve regeneration process would be routed back to the acid gas removal equipment.

The dried treated feed gas is then sent through a propane pre-cooler to condense heavier hydrocarbons prior to entering a scrub column that would separate the feed gas and the heavy hydrocarbons. The heavy hydrocarbons would be stabilized after flowing through the deethanizer and debutanizer columns and would be stored in the condensate storage tank and would be removed from the site by truck. The dry treated feed gas exiting the scrub column would enter the main cryogenic heat exchanger and would be cooled by thermal exchange with a mixed refrigerant (MR) stream. The Project expects to utilize a liquefaction process designed and optimized by Air Products and Chemicals Inc. (APCI). After cooling the natural gas into its liquid form, LNG would be routed to a LNG flash vessel before being pumped to and stored in two existing full-containment LNG storage tanks.

In order to achieve the cryogenic temperatures needed to liquefy the natural gas stream in the above process, the gas would be cooled by a MR stream comprised of a mixture of nitrogen, methane, ethane, and propane. Methane would be provided from the dry treated feed gas stream exiting the scrub column and both propane and ethane would be unloaded from trucks and stored on-site for initial filling and use, as needed, for makeup. Nitrogen makeup would be provided from a nitrogen generation package that includes a nitrogen storage vessel and vaporizer. The truck loading/unloading facility would be provided to unload makeup refrigerants and to load condensate product for delivery into the marketplace.

As part of our engineering review, we evaluated the process flow diagrams (PFDs) and heat and material balances (HMBs) to determine the liquefaction capacities relative to the requested capacity in the application. While the application requests export with peak liquefaction rates of up to 11.5 million metric tonnes per annum (mtpa), the PFDs and HMBs do not cover this liquefaction range and suggest a maximum liquefaction rate of 10.85 mtpa. This is important as the PFDs and HMBs provide the flow rates, pressures, and temperatures that form the basis of design for other engineering documents, including piping and instrumentation diagrams (P&IDs), piping specifications, hazard analyses, and other pertinent engineering information. As a result, Gulf LNG indicated, in a response to our January 11, 2018 data request, that Gulf LNG is requesting authorization produce 10.85 mtpa of LNG at its proposed facility. We recommend in section 4.12.1.5 that Gulf LNG provide updated PFDs and HMBs and any other engineering documentation.

During export operations, LNG stored within the existing LNG storage tanks would be sent out through multiple new in-tank pumps (the pump discharge piping would penetrate through the roof and is an inherently safer design when compared to penetrating the side of an LNG storage tank) and would be routed through modified discharge lines (the discharge lines would have an increased diameter to accommodate higher flow). The LNG would then flow through an existing marine transfer line and multiple liquid marine transfer arms connected to LNG marine vessel. In order to keep the marine transfer line cold between LNG export cargoes, an existing LNG recirculation line would keep the marine transfer line cold and avoid cool down prior to every LNG carrier loading operation. The LNG transferred to the LNG marine vessel would displace vapors from the marine vessel, which would be sent back through a vapor marine transfer arm, a new vapor return line, and into the BOG header. Once loaded, the LNG marine vessel would be disconnected and leave for export.

Low-pressure BOG generated from stored LNG (LNG is continuously boiling) as well as vapors returned during LNG carrier filling operations would be compressed and would be split between the fuel gas system and the feed gas stream prior to the liquefaction process. The closed BOG system would prevent the release of BOG to the atmosphere and would be in accordance with NFPA 59A. This would be an inherently safer design when compared to allowing the BOG to vent to the atmosphere.

In addition, the Project would include many utilities and associated auxiliary equipment. The major auxiliary systems required for the operation of the liquefaction facility include fuel gas, hot oil, flares, instrument and utility air, water, demineralized water, nitrogen, and backup power. Hot oil would provide heat to the acid gas removal unit inlet gas heater, amine regeneration reboiler, molecular sieve regeneration gas heater, fuel gas heater, deethanizer reboiler, deethanizer overhead heater, and debutanizer reboiler. There would be three flare systems: warm (wet), cold (dry), and low-pressure flares plus a common spare flare. Each system would be routed to a separate flare stack and would be designed to handle and control the vent gases from the process areas. Electric power would be generated off-site by the MPC system. Diesel would be stored in a single above ground tank and would supply diesel to day tanks for each essential diesel generator. In addition, diesel day tanks would be provided for the diesel firewater pumps. The nitrogen generation system would supply gaseous nitrogen for various uses in the plant including pre-commissioning, start-up, and refrigerant makeup. In addition, aqueous ammonia would be used in the selective catalytic removal process to reduce the NOx emissions from gas turbine exhausts.

The failure of process equipment could pose potential harm if not properly safeguarded through the use of appropriate controls and operation. Gulf LNG would install process control valves and instrumentation to safely operate and monitor the facilities. Alarms would have visual and audible notification in the control room to warn operators that process conditions may be approaching design limits. Operators would have the capability to take action from the control room to mitigate an upset. Gulf LNG would develop facility operation procedures after completion of the final design; this timing is fully consistent with accepted industry practice. Gulf LNG would design their control systems and human machine interfaces to the International Society for Automation (ISA) Standards 5.3, 5.5, 60.1, 60.3, 60.4, and 60.6, and other standards and recommended practices. We recommend in section 4.12.1.5 that Gulf LNG provide more information, for review and approval, on the operating and maintenance procedures, including safety procedures, hot work procedures and permits, abnormal operating conditions procedures, and personnel training prior to commissioning. We would evaluate these procedures to ensure that an operator can operate and maintain all systems safely, based on benchmarking against other operating and maintenance plans and comparing against recommended and generally accepted good engineering practices, such as American Institute of Chemical Engineers, *Guidelines for Writing Effective Operating and Maintenance Procedures*. In addition, we recommend in section 4.12.1.5 that Gulf LNG tag and label instrumentation and valves, piping, and equipment and provide car-seals/locks to address human factor considerations and improve facility safety and prevent incidents. We also recommend in section 4.12.1.5 that Gulf LNG develop and implement an alarm management program, for review and approval to ensure the effectiveness of the alarms. FERC staff would evaluate the alarm management program against recommended and generally accepted good engineering practices, such as ISA Standard 18.2.

In the event of a process deviation, ESD valves and instrumentation would be installed to monitor, alarm, shutdown, and isolate equipment and piping during process upsets or emergency conditions. Currently, the Project's engineering development standard does not specify the ability to shut down the entire facility via a single plant-wide emergency shutdown command, however the cause-and-effect diagrams show a plant-wide shutdown as well as local shutdown ability to address local emergency conditions. A single plant-wide shutdown is common among jurisdictional LNG facilities at FERC. Given the uncertainty of a plant-wide shutdown button, we recommend in section 4.12.1.5 that prior to the end of the draft EIS comment period, Gulf LNG clarify whether a plant-wide ESD button would be provided. In addition, we recommend Gulf provide details of the ESD system, including whether a plant-wide ESD button with proper sequencing and reliability would be included in the design or whether another system that is demonstrated through a human reliability analysis would be provided to quickly and reliably shutdown the entire plant. The ESD system for existing equipment would remain in place. Safety-instrumented systems would comply with ISA Standard 84.00.01 and other recommended and generally accepted good engineering practices. We also recommend in section 4.12.1.5 that Gulf LNG file information, for review and approval, on the final design, installation, and commissioning of instrumentation and ESD equipment to ensure appropriate cause-and-effect alarm or shutdown logic and enhanced representation of the ESD system in the plant control room and throughout the plant.

In developing the FEED, Gulf LNG conducted a simplified process hazard review (PHR) to identify potential hazards (both safety and environmental) associated with the design of the process and the facility. The PHR applied a checklist approach to identify hazards through review of the PFDs and other documents such as the HMBs, process descriptions, and plot plans. However, Gulf LNG did not consider the process details from the P&IDs in the PHR. Therefore, we made a recommendation in section 4.12.1.5 that at the onset of detailed engineering to identify major process design issues prior to detailed design, Gulf LNG provide, for review and approval, a preliminary hazard and operability review of the completed design.

Commonly, a more detailed hazard and operability review (HAZOP) analysis would be performed during the final design to identify the major process hazards that may occur during the operation of the facilities. The HAZOP study would be intended to address hazards of the process, engineering and administrative controls and would provide a qualitative evaluation of a range of possible safety, health, and environmental consequences that may result from the process hazard, and identify whether there are adequate safeguards (e.g., engineering and administrative controls) to prevent or mitigate the risk from such events. Where insufficient engineering or administrative controls were identified, recommendations to prevent or minimize these hazards would be generated from the results of the HAZOP review. We recommend in section 4.12.1.5 that Gulf LNG file the HAZOP study on the completed final design for review and approval. We would evaluate the HAZOP to ensure all systems and process deviations are addressed appropriately based on likelihood, severity, and risk values with commensurate layers of protection in accordance with recommended and generally accepted good engineering practices, such as American Institute of Chemical Engineers, *Guidelines for Hazard Evaluation Procedures*. We also recommend in section 4.12.1.5 that Gulf LNG file the resolutions of the recommendations generated by the HAZOP review for evaluation and approval by FERC staff. Once the design has been subjected to a HAZOP review, the design development team would track, manage, and keep records of changes in the facility design, construction, operations, documentation, and personnel. Gulf LNG would evaluate these changes to ensure that the safety, health, and environmental risks arising from these changes are addressed and controlled based on its management of change procedures. If our recommendations are adopted into the Commission Order, resolutions of the recommendations generated by the HAZOP review would be monitored by FERC staff. We also recommend in section 4.12.1.5 that Gulf LNG file all changes to their FEED for review and approval by FERC staff. However, major modifications could require an amendment or new proceeding.

If the Project is authorized and constructed, Gulf LNG would install equipment in accordance with its design. We recommend in section 4.12.1.5 that Project facilities be subject to construction inspections and that Gulf LNG provide, for review and approval, commissioning plans, procedures and commissioning demonstration tests that would verify the performance of equipment. In addition, we recommend in section 4.12.1.5 that Gulf LNG provide semi-annual reports that include abnormal operating conditions and planned facility modifications. Furthermore, we recommend in section 4.12.1.5 that the Project facilities be subject to regular inspections throughout the life of the facilities to verify that equipment is being properly maintained and to verify basis of design conditions, such as feed gas and send out conditions, do not exceed the original basis of design.

Mechanical Design

Gulf LNG provided codes and standards for the design, fabrication, construction, and installation of piping and equipment and additional specifications for the facility. The design specifies materials of construction and ratings suited to the pressure and temperature conditions of the process design. Piping would be designed, fabricated, assembled, erected, inspected, examined, and tested in accordance with the American Society of Mechanical Engineers (ASME) Standards B31.3, B36.10/M, and B36.19/M. Valves and fittings would be designed to standards and recommended practices such as API Standards 6FA, 594, 598, 600, 602, 607, 608, and 609; ASME Standards B16.5, B16.9, B16.10, B16.11, B16.20, B16.21, B16.25, B16.34, B16.47, and B16.48; and ISA Standard 75.08.01, 75.08.02, 75.0805, 75.08.06, 75.19.01.

Pressure vessels must be designed, fabricated, inspected, examined, and tested in accordance with ASME Boiler and Pressure Vessel Code (BPVC) Section VIII and must be code-stamped per NFPA 59A (2001), as incorporated by reference in 49 CFR 193 Subparts C, D, and E. Portions of the facility regulated under 33 CFR 127 for the marine transfer system, including piping, should also be tested in accordance with 33 CFR 127.407. In addition, the operator should verify the set pressure of the pressure relief valves meet the requirements in 33 CFR 127.407.

Low-pressure storage tanks such as the amine and condensate storage tanks, would be designed, inspected, and maintained in accordance with the API Standards 620, 625, and 650. Heat exchangers would be designed to ASME BPVC Section VIII standards; API Standards 530, 660, 661, and 662; and the Tubular Exchanger Manufacturers Association standards. Rotating equipment would be designed to standards and recommended practices, such as API Standards 610, 613, 614, 616, 617, 619, 670, 671, 672, 675, 682, and 686; and ASME Standards B73.1 and B73.2. Fired heaters would be specified and designed to standards and recommended practices, such as API Standards 556 and 560.

Pressure and vacuum safety relief valves and flares would be installed to protect the storage containers, pressure vessels, process equipment, and piping in the event of an unexpected vapor release or uncontrolled pressure excursion. The safety relief valves would be designed to handle process upsets and thermal expansion, per NFPA 59A (2001), ASME Standard B31.3, and ASME BPVC Section VIII; and would be designed in accordance with API Standards 520, 521, 526, 527, 537, and 2000; and other recommended and generally accepted good engineering practices. In addition, we recommend in section 4.12.1.5 that Gulf LNG provide final design information on pressure and vacuum relief devices and flares, for review and approval, to ensure that the final sizing, design, and installation of these components are adequate and in accordance with the standards reference and other recommended and generally accepted good engineering practices.

If the Project is authorized and constructed, Gulf LNG would install equipment in accordance with its design and FERC staff would verify equipment nameplates to ensure equipment is being installed based on the approved design. In addition, we would conduct construction inspections including reviewing quality assurance and quality control plans to ensure construction work is being performed according to proposed Project specifications, procedures, codes, and standards. We recommend in section 4.12.1.5 that Gulf LNG provide semi-annual reports that include equipment malfunctions and abnormal maintenance activities. In addition, we recommend in section 4.12.1.5 that the Project facilities be subject to inspections throughout the life of the facility to verify that the plant equipment is being properly maintained.

Hazard Mitigation Design

If operational control of the facilities were lost and operational controls and ESD systems failed to maintain the Gulf LNG Liquefaction Project within the design limits of the piping, containers, and safety relief valves, a release could potentially occur. FERC regulations under 18 CFR 380.12(o)(1) through (4) require applicants to provide information on spill containment, spacing and plant layout, hazard detection, hazard control, and firewater systems. In addition, 18 CFR 380.12(o)(7) require applicants to provide engineering studies on the design approach and 18 CFR 380.12(o)(14) requires applicants to demonstrate how they comply with 49 CFR 193 and NFPA 59A. As required by 49 CFR Part 193 Subpart I and by incorporation Section 9.1.2 of NFPA 59A (2001), fire protection must be provided for all DOT-regulated LNG plant facilities based on an evaluation of sound fire protection engineering principles, analysis of local conditions, hazards within the facility, and exposure to or from other property. NFPA 59A (2001) also requires a fire protection evaluation to determine the type, quantity, and location of hazard detection and hazard control, passive fire protection, ESD and depressurizing systems, and emergency response equipment, training, and qualifications. All LNG facilities, as defined in 49 CFR 193, once constructed, must comply with the requirements of 49 CFR 193 Subpart I and would be subject to DOT's inspection and enforcement programs. However, NFPA 59A (2001) also indicates the wide range in size, design, and location of LNG facilities precludes the inclusion of detailed fire protection provisions that apply to all facilities comprehensively and includes subjective performance-based language on where ESD systems and hazard control are required and does not provide any additional guidance on placement or selection of hazard detection equipment and provides minimal requirements on firewater. Also, the Project marine facilities would be subject to 33 CFR 127, which incorporates sections of NFPA 59A (1994), which have similar performance-based guidance. Therefore, we evaluated the proposed spill containment and spacing, hazard detection, ESD and depressurization systems, hazard control, firewater coverage, structural protection, and on-site and off-site emergency response to determine whether they would provide adequate protection of the LNG facilities as described more fully below.

Gulf LNG performed a preliminary fire protection evaluation to ensure that adequate mitigation would be in place, including spill containment and spacing, hazard detection, ESD and depressurization systems, hazard control, firewater coverage, and structural protection. Although the preliminary fire protection evaluation did not address on-site and off-site emergency response (e.g., plans, equipment, training, or qualifications), Gulf LNG indicated they would update their existing ERP for the potential hazards introduced by the Project that did not exist previously. We recommend in section 4.12.1.5 that Gulf LNG provide a final fire protection evaluation, for review and approval, and to provide more information on the final design, installation, and commissioning of spill containment, hazard detection, hazard control, firewater systems, structural fire protection, and on-site and off-site emergency response procedures for review and approval.

Spill Containment

In the event of a release, sloped areas at the base of storage and process facilities would direct a spill away from equipment and into the impoundment system. This arrangement would minimize the dispersion of flammable vapors into confined, occupied, or public areas and minimize the potential for heat from a fire to impact adjacent equipment, occupied buildings, or public areas if ignition were to occur.

Gulf LNG proposes to install an LNG Process Area impoundment located in each of the two liquefaction units that would collect a spill from the LNG liquefaction areas. Gulf LNG also proposes to install a Refrigerant Process Area impoundment for each of the two liquefaction units to collect spills from all other process equipment in the train. Gulf LNG proposes to install an LNG Transfer Area impoundment located in the BOG Compressor Area that would collect a potential spill from the LNG pumps and rundown lines, the BOG compressor suction drum, and the end flash drums. In this area, the elevated spill trough for the LNG rundown lines from the trains is proposed to transition to two downcomers to direct a spill into the impounding area. One rundown line would also run through each downcomer. We will evaluate the downcomer sizing calculations during final design. We acknowledge that Gulf LNG must comply with 49 CFR 193, regarding spill downcomers that are not associated with a container. LNG pumped from the end flash drums to the existing storage tanks would be routed over a concrete trough which would drain to the existing impoundment basin near the LNG tanks. Any spill from the new LNG withdrawal lines from the existing LNG storage tanks would also be directed to this existing impoundment near the tanks. Tank top spill collection is proposed to be expanded to serve the larger pump platform area. Gulf LNG proposes to install a Diesel/Hot Oil Unloading impoundment located in the Utility Area that would collect potential diesel and hot oil spills from that truck unloading area as well as from a propane transfer line. Gulf LNG also proposes additional propane transfer impounding area in the Utility Area. A Diesel Storage Tank impoundment and Hot Oil Tank impoundment would be provided to contain a full failure of each of those tanks. In the Project storage area, Gulf LNG proposes a Refrigerant/Condensate Truck Unloading impoundment that would contain spills in that area. Gulf LNG also proposes a Refrigerant/Condensate transfer sump in the storage area to collect transfer piping spills. A Condensate/Off-spec Storage Tank impoundment would be provided to contain a full failure of that tank. Gulf LNG would also provide a Propane Storage Sphere Impoundment, which it proposes would be designed to contain the liquid remaining after flashing from a full failure of that tank. In addition, Gulf proposes a curbed area under the three Ethane Storage Tanks, which is indicated to be based on NFPA 55 Section 6.13. However, NFPA 55 Chapter 6 is for building related controls and NFPA 55 Section 6.13 specifically excludes compressed gases as needing any spill containment. We recommend that spill containment be provided for all hazardous fluids if the spill containment reduces the consequences based on the maximum amount of liquid that can rainout after a release. Gulf LNG would also provide a Solvent Storage Tank impoundment and an Aqueous Ammonia Storage Drum impoundment to contain a full failure of each of those vessels. FERC staff was not able to verify the provision of containment for all significant amounts of hazardous liquids, such as for the liquid nitrogen storage area, heated hot oil areas, the aqueous ammonia truck transfer, and other hazardous fluid facilities. We recommend in section 4.12.1.5 that Gulf LNG provide additional information on the final design of the impoundment systems for review and approval.

Under NFPA 59A (2001) Section 2.2.2.2, the capacity of impounding areas for vaporization, process, or LNG transfer areas must equal the greatest volume that can be discharged from any single accidental leakage source during a 10-minute period or during a shorter time period based upon demonstrable surveillance and shutdown provisions acceptable to the DOT. All DOT-regulated facilities, once constructed, must comply with the requirements of 49 CFR 193 Subpart C and would be subject to DOT's inspection and enforcement programs. The impoundment system design for the marine facilities would be subject to the USCG's 33 CFR 127, which does not specify a spill or duration for impoundment sizing. However, FERC staff evaluates whether all hazardous liquids are provided with spill containment based on the largest flow capacity from a single pipe for 10 minutes or the liquid capacity of the largest vessel (or total of impounded vessels) served, whichever is greater and whether providing spill containment reduces consequences from a release. Some details and would need to be clarified and adjustments would need to be made during the final design phase, including but not limited to, evaluation of the impounding area or prevention mechanisms needed for the sizing spill for the new in-tank LNG pumps, clarification of maximum liquid levels for vessels and tanks, calculation of usable impoundment volumes considering only the depth under any trough intersection and considering the volume used by any foundations and equipment, sizing of all hazardous liquid trenches and troughs, routing of unloading/transfer piping in storage areas and also detailed justification, including verification or validation, for liquid spill calculations for the size, fluid type, and potential orientations for the refrigerant sizing spills. FERC staff would verify adequate sizing of the final containment design during our final design review, based on our recommendation in section 4.12.1.5 that Gulf LNG provide additional information on the final design of the impoundment systems for review and approval.

FERC staff also generally evaluate the means to remove water and snow from impounding areas to ensure impoundment volumes would not be reduced through accumulation of rainwater or snow. In addition, FERC staff generally evaluate whether there are provisions to ensure that hazardous fluids are not accidentally discharged through the systems intended to remove rainwater or snow. In addition, all facilities, once constructed, must comply with the requirements of 49 CFR 193 and would be subject to DOT's inspection and enforcement programs. Gulf LNG indicated that the stormwater removal pumps in the LNG spill containment basins would be automatically and manually operated, and interlocked using low temperature detectors to prevent pumps from operating if LNG is present. Gulf LNG would need to verify that the sump pumps meet the automatic shutdown controls and water removal requirements specified in 49 CFR 193 Subpart C. Other hazardous liquid impounding areas were indicated to have a manual outlet valve and drain piping as required. Therefore, we recommend in section 4.12.1.5 that Gulf LNG provides correspondence from DOT demonstrating the sump pump design meets DOT regulations regarding automatic shutdown controls and water removal systems.

If the Project is authorized and constructed, Gulf LNG would install spill impoundments in accordance with its design and FERC staff would verify during construction inspections that the spill containment system including dimensions, and slopes of curbing and trenches, and volumetric capacity matches final design information. In addition, we recommend in section 4.12.1.5 that Project facilities be subject to regular inspections throughout the life of the facility to verify that impoundments are being properly maintained.

Spacing and Plant Layout

The spacing of vessels and equipment between each other, from ignition sources, and to the property line would need to meet the requirements of 49 CFR 193 Subparts C, D, and E, which incorporate NFPA 59A (2001). NFPA 59A (2001) includes requirements for spacing and plant layout and further references NFPA Standards 30, NFPA 58, and NFPA 59 for additional spacing and plant layout requirements. If the facilities are approved and constructed, Gulf LNG must comply with the requirements of 49 CFR 193 and would be subject to DOT's inspection and enforcement programs.

In addition, we evaluated the spacing to determine if there could be cascading damage and identify what fire protection measures may be necessary to reduce the risk of cascading damage. A pool fire in any of multiple proposed impoundments would result in high radiant heats at both adjacent elevated piperacks and troughs. In addition, we note that radiant heats greater than 4,000 BTU/ft^2-hr level from an impoundment fire could impact process equipment, refrigerant storage vessels, process vessels, truck transfer areas, and pipe racks. We also noted that thermal radiation levels from a LNG Rundown Line Impoundment Basin fire could potentially impact the adjacent buildings (i.e. maintenance building and warehouse). To mitigate against a impoundment fires and jet fires within the plant, Gulf LNG proposes thermal radiation mitigation measures to prevent cascading events in the design, including emergency block valves with fire protective blankets and fire resistant cables, ESD and emergency depressurization systems, fire and gas detectors, fire proofing of structural steel columns supporting critical equipment, high expansion foam systems, firewater monitors and hydrants, as well as consideration of deluge systems . However, details of these systems would be developed in final design. We recommend in section 4.12.1.5 that Gulf LNG provide the final design of these thermal mitigation measures, for review and approval, demonstrating cascading events would be mitigated.

To address impacts from fires or explosions, we evaluated external fire and explosion risks for all plant buildings and safety critical equipment. Results of hazard analyses indicate a number of fires and explosions could impact buildings, but do not include occupied buildings. However, there were some potential impacts from explosions to safety critical equipment, such as essential power generators and firewater tanks. Therefore, we recommend in section 4.12.1.5 that Gulf LNG conduct a facility siting study, for review and approval, to assess explosion risks to safety critical equipment or provide refined modeling that takes into account plant features that reduce the explosion risk and demonstrate explosions would not impact safety critical equipment. Furthermore, to minimize risk for flammable or toxic vapor ingress into buildings, we recommend in section 4.12.1.5 that Gulf LNG conduct a technical review of facility, for review and approval, to identify all combustion/ventilation air intake equipment and the distances to any possible flammable gas or toxic release; and verify that these areas would be adequately covered by hazard detection devices that would isolate or shut down any combustion or heating ventilation and air conditioning equipment whose continued operation could add to or sustain an emergency. We recommend in section 4.12.1.5 that Project facilities be subject to periodic inspections during construction to verify flammable/toxic gas detection equipment is installed in heating, ventilation, and air condition intakes of buildings at appropriate locations. In addition, we recommend in section 4.12.1.5 that Project facilities be subject to regular inspections throughout the life of the facilities to continue to verify that flammable/toxic gas detection equipment installed in building air intakes function as designed and are being maintained and calibrated.

If the Project is authorized, Gulf LNG would finalize the plot plan, and we recommend in section 4.12.1.5 that Gulf LNG provide any changes for review and approval to ensure capacities and setbacks are maintained. If the facilities are constructed, Gulf LNG would install equipment in accordance with the spacing indicated on the plot plans, and we recommend in section 4.12.1.5 that Project facilities be subject to periodic inspections during construction to verify equipment is installed in appropriate locations and the spacing is met in the field. In addition, we recommend in section 4.12.1.5 that Project facilities be subject to regular inspections throughout the life of the facilities to continue to verify that equipment setbacks from other equipment and ignition sources are being maintained during operations.

Ignition Controls

Gulf LNG's plant areas would be designated with an appropriate hazardous electrical classification and process seals commensurate with the risk of the hazardous fluids being handled in accordance with NFPA 59A, 70, 497, and API RP 500. All facilities subject to DOT regulations, once constructed, must comply with the requirements of 49 CFR Part 193 and would be subject to DOT's inspection and enforcement programs, which require compliance, by incorporation by reference, with NFPA 59A (2001) and NFPA 70 (1999). The marine facilities must comply with similar electrical area classification requirements of NFPA 59A (1994) and NFPA 70 (1993), which are incorporated by reference into the USCG regulations in 33 CFR 127. Depending on the risk level, these areas would either be unclassified or classified as Class 1 Division 1, or Class 1 Division 2. Electrical equipment located in these classified areas would be designed such that in the event a flammable vapor is present, the equipment would have a minimal risk of igniting the vapor. We evaluated the Gulf LNG electrical area classification drawings to determine whether the Project would generally meet these electrical area classification requirements and good engineering practices in NFPA 59A, 70, 497, and API RP 500, and found that some revisions would be needed to properly implement these classification areas. If the Project is authorized, Gulf LNG would finalize the electrical area classification drawings and would describe changes made from the FEED design. We recommend in section 4.12.1.5 that Gulf LNG file the final design of the electrical area classification drawings. If facilities are constructed, Gulf LNG would install appropriately classed electrical equipment, and we recommend that the Project facilities be subject to periodic inspections during construction for FERC staff to spot check electrical equipment and verify equipment is installed per classification and are properly bonded or grounded in accordance with NFPA 70.

In addition, submerged pumps and instrumentation that have a direct interface with a flammable fluid must be equipped with electrical process seals and leak detection in accordance with NFPA 59A and NFPA 70 at each interface between a flammable fluid system and an electrical conduit or wiring system. We generally recommend that companies provide final design drawings showing process seals installed at the interface between a flammable fluid system and an electrical conduit or wiring system that meet the requirements of NFPA 59A (2001) and NFPA 70. In its application, Gulf LNG describes an electrical process seal design that may not "continuously vent to atmosphere" as required by NFPA 59A Section 7.6.3.4. The design may also not detect a range of leak sizes through either side of the seal. We acknowledge that Gulf LNG must meet the design requirements of NFPA 59A (2001), as incorporated by 49 CFR 193.2101 and that Gulf LNG should provide a means to detect a range of leak sizes in either side of the seal. In addition, we recommend in section 4.12.1.5 that Gulf LNG provide details of an air gap or vent equipped with a leak detection device that should continuously monitor for the presence of a flammable fluid, alarm the hazardous condition, and shut down the appropriate systems.

In addition, we would recommend Project facilities be subject to regular inspections throughout the life of the facility to ensure electrical equipment is maintained (e.g., bolts on explosion proof equipment properly installed and maintained, panels provided with purge, etc.), electrical process seals for submerged pumps conform to NFPA 59A (2001) and NFPA 70, and electrical equipment are appropriately de-energized and locked out and tagged out when being serviced.

Hazard Detection, Emergency Shutdown, and Depressurization Systems

Gulf LNG would also install hazard detection systems to detect cryogenic spills, flammable and toxic vapors, and fires. The hazard detection systems would alarm and notify personnel in the area and control room to initiate an ESD, depressurization, or initiate appropriate procedures, and would meet NFPA Standard 72, ISA Standard 12.13, and other recommended and generally accepted good engineering practices. In addition, Gulf LNG would have hazard detection that alarms in the control room for the operators to initiate an ESD. However, Gulf LNG did not include a specification for hazard detection in the application. We recommend in section 4.12.1.5 that Gulf LNG provide specifications, for review and approval, for the final design of fire safety specifications, including, but not limited to, hazard detection.

We also evaluated the adequacy of the hazard detection equipment type, location, and layout to ensure adequate coverage to detect cryogenic spills, flammable and toxic vapors, and fires near potential release sources (i.e. pumps, compressors, sumps, trenches, flanges, and instrument and valve connections). However, we note that Gulf LNG did not include H_2S detection within the areas of the liquefaction train that contains acid gas, low oxygen detection within the utilities liquid nitrogen area, smoke detection in all occupied buildings, and gas detection in all buildings with an HVAC system (e.g. at the utilities substation), therefore we recommend that the final hazard detection locations be submitted for review and approval with these features. We also reviewed the fire and gas cause-and-effect matrices to evaluate that the detectors that would initiate an alarm, shutdown, depressurization, or other action based on the FEED. We recommend in section 4.12.1.5 that Gulf LNG provide additional information, for review and approval, on the final design of all hazard detection systems (e.g., manufacturer and model, elevations, etc.) and hazard detection layout drawings. If the Project is authorized and constructed, Gulf LNG would install hazard detectors according to its specifications, and we recommend in section 4.12.1.5 that Project facilities be subject to periodic inspections during construction to verify hazard detectors and ESD pushbuttons are appropriately installed per approved design and functional based on cause-and-effect matrices prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.1.5 that Project facilities be subject to regular inspections throughout the life of the facility to verify hazard detector coverage and functionality is being maintained and are not being bypassed without appropriate precautions.

Hazard Control

If ignition of flammable vapors occurred, hazard control devices would be installed to extinguish or control incipient fires and releases, and would meet NFPA 59A (2001); NFPA 10, 12, 15, 17, and 2001; API 2218, and 2510A; as well as other recommended and generally accepted good engineering practices. We evaluated the adequacy of the number and availability of hand-held, wheeled, and fixed fire extinguishing devices throughout the site based on the FEED. We also generally evaluated whether the spacing of the fire extinguishers meet NFPA 10 and agent type and capacities meet NFPA 59A (2009 and later editions). The hazard control plans appeared to meet NFPA 10 travel distances to nearly all components containing flammable or combustible fluids (Class B) for hand-held fire extinguishers (30-50 feet) and wheeled extinguishers (100 feet) and NFPA 10 travel distance to nearly all other components that could pose an ordinary combustible hazard (Class A) or associated electrical (Class C) hazard for hand-held extinguishers (75 feet). Buildings also appear to be provided with hand-held extinguishers that appear to satisfy NFPA 10 requirements, including placement at each entry/exit. The agent type (potassium bicarbonate) and agent storage capacities for hand-held (minimum 20 pounds [lb]) and wheeled (minimum 125 lb) also appear to meet NFPA 59A requirements. In addition, travel distances, installation heights, visibility, flow rate capacities, and other requirements should be confirmed in final design and in the field where design details, such as manufacturer, obstructions, and elevations, would be better known. Therefore, we recommend in section 4.12.1.5 that Gulf LNG files the final design of these systems, for review and approval, where details are yet to be determined (e.g., manufacturer and model, elevations, flowrate, capacities, etc.) and where the final design could change as a result of these details or other changes in the final design of the Liquefaction Project. In addition, we evaluated whether clean agent or equivalent systems would be installed in all instrumentation buildings systems in accordance with NFPA 2001 and CO_2 or equivalent systems in gas turbine enclosures in accordance with NFPA 12. Gulf LNG did not have clean agent systems in all instrumentation buildings. Therefore, we recommend Gulf LNG provide clean agent or equivalent systems in all instrumentation buildings. If the Project is authorized and constructed, Gulf LNG would install hazard control equipment, and we recommend in section 4.12.1.5 that Project facilities be subject to periodic inspections during construction to verify hazard control equipment is installed and functional prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.1.5 that Project facilities be subject to regular inspections throughout the life of the facility to verify hazard control coverage and ensure equipment is being properly maintained and inspected.

Passive Cryogenic and Fire Protection

If a fire could not be separated, controlled, or extinguished to limit fire exposures to insignificant levels, structural fire protection would be provided to prevent failure of structural supports of equipment and pipe racks. The structural fire protection would comply with NFPA 59A (2001) and other recommended and generally accepted good engineering practices. We recommend passive cryogenic and fire protection is applied to pressure vessels and structural supports to facilities that could be exposed to cryogenic liquids or to radiant heats of 4,000 Btu/ft^2-hr or greater from fires with durations that could result in failures[20] and that they are specified in accordance with recommended and generally accepted good engineering practices with a fire protection rating of a commensurate to the radiant heat and duration. In addition, we recommend in section 4.12.1.5 that Gulf LNG provide additional information on the final design of these systems, for review and approval, where details are yet to be determined (e.g., calculation of structural fire protection materials, thicknesses, etc.) and where the final design could

20 Pool fires from impoundments are generally mitigated through use of emergency shutdowns, depressurization systems, structural fire protection, and firewater, while jet fires are primarily mitigated through the use of emergency shutdowns, depressurization systems, and firewater without structural fire protection.

change as a result of these details or other changes in the final design of the Gulf LNG Liquefaction Project. It was unclear as to whether Gulf LNG would incorporate cryogenic protection or use materials of construction that would protect equipment and structural supports that could potentially be exposed to cryogenic releases or fires. Therefore, we recommend in section 4.12.1.5 that Gulf LNG file drawings and specifications, for review and approval, for the structural passive protection systems to protect equipment and supports from cryogenic releases and fires.

If the Project is authorized and constructed, Gulf LNG would install structural cryogenic and fire protection according to its design, and we recommend in section 4.12.1.5 that Project facilities be subject to periodic inspections during construction to verify structural cryogenic and fire protection is properly installed in the field as designed prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.1.5 that Project facilities be subject to regular inspections throughout the life of the facility to continue to verify that passive protection is being properly maintained.

Firewater Systems

Gulf LNG would also provide firewater systems, including remotely-operated firewater monitors, sprinkler systems, fixed water spray systems, and firewater hydrants and hoses for use during an emergency to cool the surface of storage vessels, piping, and equipment exposed to heat from a fire. These firewater systems would be designed, tested, and maintained to meet NFPA 59A (2001), 13, 15, 20, 22, 24, and 25 requirements. However, the firewater tank data sheet denotes the firewater tank would be designed to API 650 with only applicable appurtenances specified in accordance with NFPA 22. Therefore, we recommend Gulf LNG design the firewater tank in accordance with NFPA 22 or justify how API 650 provides an equivalent or better level of safety. We evaluated the adequacy of the general firewater or foam system coverage and verifies the appropriateness of the associated firewater demands of those systems and worst-case fire scenarios to size the firewater and foam pumps. Gulf LNG provided firewater coverage drawings for the firewater monitors, fire hydrants, and deluge and foam systems. The coverage generally appears satisfactorily, but where coverage circles intersect pipe racks, large vessels or process equipment, the firewater coverage could be blocked and the coverage circles should be modified to account for obstructions during the final design.

We also assessed whether the reliability of the firewater pumps and firewater source or on-site storage volume are appropriate. If the Project is authorized and constructed, Gulf LNG would install the firewater and foam systems as designed, and we recommend in section 4.12.1.5 that Project facilities be subject to periodic inspections during construction and that companies provide results of commissioning tests to verify the firewater and foam systems are installed and functional as designed prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.1.5 that Project facilities be subject to regular inspections throughout the life of the facility to ensure firewater and foam systems are being properly maintained and tested.

Geotechnical and Structural Design

Once the preliminary process, mechanical, and hazard mitigation features are determined, the preliminary design of the supportive foundations and structures can be determined based on the estimated loads and size of equipment and underlying geological and soil conditions. Gulf LNG provided geotechnical and structural design information for its facilities to demonstrate the site preparation and foundation designs would be appropriate for the underlying geological and soil characteristics and to ensure the structural design of the Project facilities would be in accordance with federal regulations, standards, and recommended and generally accepted good engineering practices. The application focuses on the resilience of the Project facilities against natural hazards, including extreme geological, meteorological, and hydrological events, such as earthquakes, tsunamis, seiche, hurricanes, tornadoes, floods, rain, ice, snow, regional subsidence, sea level rise, landslides, wildfires, volcanic activity, and geomagnetism.

Geotechnical Evaluation

FERC regulations under 18 CFR 380.12(h)(3) require geotechnical investigations to be provided. In addition, FERC regulations under 18 CFR §380.12(o)(14) require an applicant demonstrate compliance with regulations under 49 CFR 193 and NFPA 59A. If approved and constructed, all LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR Part 193 and would be subject to DOT's inspection and enforcement programs. DOT regulations incorporate by reference NFPA 59A (2001). NFPA 59A (2001) Section 2.1.4 requires soil and general investigations of the site to determine the design basis for the facility. However, no additional requirements are set forth in 49 CFR 193 or NFPA 59A on minimum requirements for evaluating existing soil site conditions or evaluating the adequacy of the foundations, therefore we evaluated the existing site conditions, geotechnical report, and proposed foundations to ensure they are adequate for the LNG facilities as described below.

The existing Terminal can be divided into four distinct areas: the existing LNG tanks and process area; existing marine berth; existing wetlands area; and the BCDMMS. The Terminal Expansion would cover an area of approximately 80 acres; this area primarily covers the existing wetlands area to the south and east of the existing LNG tanks and process area and the BCDMMS to the east of the existing Terminal. The mudline elevations in the area of the marine berth range from about -2 feet to -6 feet, the existing wetlands area to the northwest south and southeast of the site consists of wetlands with ground surface elevations ranging from approximately +1 feet to +4 feet, and the ground surface elevation at the pond boundary is approximately +1 feet. An uplands area, stretching over about 3.5 acres, is situated to the south of the existing wetlands area south of the existing Terminal. The elevation of the uplands area is approximately +5 feet. The uplands area forms the southern boundary of the existing Terminal. The existing COE created wetland mitigation site lies to the south of the uplands area and ranges from about 0 feet to -3 feet. During the site investigation, the existing site grades average +4 feet msl. As such, approximately 8 to 9 feet of fill would be placed to achieve the final site grades of +13 feet msl for the process area and +12 feet msl for the balance of the site. The site would be cleared, grubbed, and prepared using standard earthmoving and compaction equipment. Site preparation would result in a final grade elevation being raised to +13 feet for the process unit and +12 feet for the remainder (above mean sea level [amsl]) NAVD 88 with varying amounts of fill that would be added across the site. The facility would be surrounded by a storm surge protective berm with the elevation +27 to +39.2 feet NAVD 88 around the perimeter of Terminal.

Gulf LNG contracted MMI/Geosyntec to conduct geotechnical investigations to evaluate the existing soil site conditions and proposed foundation design for the Project. The subsurface conditions in this area were characterized using a comprehensive geotechnical investigation program that included soil borings, cone penetration tests with pore pressure measurements (CPTu) and seismic cone penetration test with pore pressure measurements (SCPTu), Standard Penetration Tests (SPTs) with split spoon sampling in granular soil layers, Shelby-tube sampling of cohesive soils, and geotechnical laboratory testing. MMI/Geosyntec conducted eight soil borings to depths ranging from 127 feet to 150 feet below existing, grade, five cone penetration tests (CPTs) to depths ranging from 110 feet to 125 feet (or to refusal) below existing grade, two seismic cone penetration tests (SCPTs) to depths ranging from 110 feet to 125 feet below existing grade. The elevation of groundwater within the existing wetlands area was observed to be 0 feet. The groundwater within the BCDMMS was estimated to be at a depth of 1 feet bgs and therefore ranges from approximated elevation of +3 feet to +4.5 feet. The groundwater elevation measured from the borings closest to where the Project facilities would be located were estimated to range from +1.2 feet to +1.4 feet. MMI/Geosyntec performed 12 different tests on 100 recovered soil samples, including soil identification and classification tests, plasticity and density tests (water/moisture content, Atterberg limits, sieve tests), strength and compressibility tests (shear tests, triaxial tests), corrosion potential tests (pH, chloride ion concentration, sulfate ion concentration), and organic content tests on recovered soil samples in general accordance with pertinent ASTM standards. We evaluated the geotechnical investigation to ensure the adequacy in the number, coverage, and types of the geotechnical borings, CPTs, SCPTs, and other tests and found the number borings, CPT/SPT's, and soil laboratory tests to be limited and insufficient to adequately cover the proposed facility. Therefore, we recommend in section 4.12.1.5 that Gulf LNG conduct a more extensive geotechnical field investigation in particular beneath equipment foundations spaced 200 to 300 feet apart, consistent with FERC's Guidance Manual published in 2017. FERC staff would continue its review of the results of the geotechnical investigation to ensure foundation designs are appropriate prior to construction of final design and throughout the life of the facilities.

Based on the test boring results, MMI/Geosyntec developed two generalized subsurface profiles to represent the soil condition in the existing wetlands area and the BCDMMS. In the existing wetlands area, the site is sand to clayey sand from +4 feet to -8 feet; very soft to soft clay, interbedded with thin sand layers from -8 feet to -18 feet, and soft to medium (firm) clay from -18 feet to -38 feet; very loose to loose sand with interbedded gravely (shelly) clay layers from -38 feet to -68 feet, and stiff to very stiff clay from -68 feet to -123 feet (wooden fragments and pieces encountered between about -103 feet, -105 feet and -115feet at some spots); very dense sand below -123 feet. In the BCDMMS, the site is very soft to soft clay (Dredged Material) from +6 feet to -1 feet, and very loose to medium dense sand from -1 feet to -11 feet; soft to medium (firm) clay from -11 feet to -30 feet, and very loose to loose sand from -30 feet to -50 feet (wooden fragments encountered at -35 feet and -47 feet at some spots); gravelly clay interbedded with sand layers from -50 feet to -60 feet, and from -60 feet to -117 feet is majority stiff to very stiff clay with thin sand layer at -110 feet and 1 feet thick wooden fragment layer, suspected peat, encountered at about -115 feet at some spots; very dense sand below -117 feet. Gulf LNG indicated that the stratigraphy at the site (comprising the existing wetlands area and BCDMMS) is very consistent below an elevation of about 0 feet (+/-) where the very soft to soft clay layer is encountered. Design analyses were therefore conducted wherein a single subsurface profile was used for the entire expansion area with differences only related to surface grades and water level assumptions.

Soil pH and chloride ion concentration, and sulfate ion concentration tests were performed to assess the corrosion potential of the on-site near-surface soils on buried steel and concrete. The potential for corrosion due to chloride ion concentration is predominantly high and the potential for corrosion due to pH is mild in the samples tested based on EPA testing guidelines. Possible measures to address corrosion include assuming sacrificial thickness based on predicted steel losses due to corrosion (i.e., use a heavier steel section) or using a protective coating. The potential for deterioration of concrete is generally mild to moderate based on sulfate ion concentrations with some samples indicating a potential for severe concrete degradation. Measures which could be used to protect buried concrete elements and concrete piles include using a high density concrete which is less permeable to sulfate ions. As a result, the geotechnical report recommends that a corrosion and concrete degradation specialist be consulted to provide appropriate protective measures. We agree with this recommendation. In addition, electrical resistivity tests are commonly done to aid in the determination of corrosion potential and potential solutions. Therefore, we also recommend in section 4.12.1.5 that additional samples and tests be done, including electrical resistivity tests prior to initial site preparation.

Based on the subsurface conditions and shallow footing analyses, shallow foundations should not be used to support settlement-sensitive structures and would only be suitable for select very lightly loaded or settlement insensitive structures. Therefore, all settlement-sensitive and heavily loaded structures should be supported on deep foundations. Gulf LNG is proposing to use Open-end Hollow Steel Pipe Piles and precast and prestressed Concrete Square Piles. For facilities including, but not limited to: loading facilities and trestles, LNG booster pumps, gas turbines, pre-treatment and liquefaction equipment, compressors, and blowers. Piles are proposed to be embedded between 80 to 138 feet below grade, depending on the equipment being supported, pile spacing, pile type, and pile diameter. Gulf LNG indicated that they would only use spread footings or mat foundations to support the settlement insensitive structures and lightly loaded structures. Shallow spread footings and mat foundations would be placed at an embedment depth of at least 4 feet below final grade. However, the insensitive and lightly loaded structures were not defined. These would be defined in our recommendation to file foundation design drawings and calculations.

Subsidence is the sudden sinking or gradual downward settling of land with little or no horizontal motion, caused by movements on surface faults or by subsurface mining or pumping of oil, natural gas, or ground water. The results of Gulf LNG's geotechnical investigation at the Project site indicate that subsurface conditions are generally suitable for the proposed facilities, if adequate site preparation, foundation design, and construction methods are implemented. Because subsidence is a recognized concern in the area of the Project, Gulf LNG proposes to install all key liquefaction facilities on piles, including but not limited to: loading facilities and trestles, LNG booster pumps, gas turbines, pre-treatment and liquefaction equipment, and all compressors and blowers. Gulf LNG would monitor foundations and other critical facilities to ensure they are maintained within acceptable limits. Site preparation activities would be monitored to ensure adherence to the geotechnical design. Surface subsidence would be controlled by potential use of lime-fly ash stabilization of the fill materials during placement and compaction with monitoring settlement and systematic reworking, as needed. The lime-fly ash stabilized soil subgrade should be thoroughly mixed and then recompacted to 95 percent of standard Proctor maximum dry density (ASTM D698). Foundations would be constructed with pile supports to protect equipment and interconnecting piping from differential movement. Earthen containment embankments would be earth-supported and constricted with wide bases (using 2 horizontal to 1 vertical or 2.75 horizontal to 1 vertical slopes, depending on height) to ensure stability. Earth-supported elements, such as the storm surge wall and plant roads, would require periodic maintenance to mitigate the long-term effects of settlements and differential movements. Because site-specific geotechnical mitigation has been incorporated into the Project (e.g., pile-supported foundations) in accordance with NFPA 59A (2001) and where applicable, NFPA 59A (2006), subsidence would not be a significant hazard to the proposed facilities.

FERC staff would continue its review of the results of the geotechnical investigation to ensure foundation designs are appropriate and make recommendations to the Commission for consideration to include in the Order and follow through during initial site preparation, construction of final design, commissioning, and throughout the life of the facilities. The preliminary results of Gulf LNG's limited geotechnical investigation at the Project site indicate that the subsurface conditions are generally suitable for the proposed facility, pending the completion of the recommended comprehensive geotechnical investigation prior to initial site preparation, as well as the proper implementation of proposed site preparation, foundation design, and construction methods.

Structural and Natural Hazard Evaluation

FERC regulations under 18 CFR 380.12 (m) requires applicants to address the potential hazard to the public from failure of facility components resulting from accidents or natural catastrophes, evaluate how these events would affect reliability, and describe the design features and procedures that would be used to reduce potential hazards. In addition, 18 CFR 380.12 (o) (14) require an applicant to demonstrate how they would comply with 49 CFR 193 and NFPA 59A. In addition, if approved and constructed, all LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to DOT's inspection and enforcement programs. DOT regulations under 49 CFR 193 have some specific requirements on designs to withstand certain loads from natural hazards and also incorporates by reference NFPA 59A (2001 and 2006) and ASCE 7-05 and ASCE 7-93 via NFPA 59A (2001). NFPA 59A (2001) Section 2.1.1(c) also requires that Gulf LNG consider the plant site location in the design of the Project, with respect to the proposed facilities being protected, within the limits of practicality, against natural hazards, such as from the effects of flooding, storm surge, and seismic activities. This will be covered in DOT Pipeline and Hazardous Materials Safety Administration's (PHMSA) LOD on 49 CFR 193 Subpart B. However, the LOD will not cover whether the facility is designed appropriately against these hazards, which would be part of 49 CFR 193 Subpart C with the exception of wind loads, which are covered in 49 CFR 193 Subpart B and will also be covered in the LOD. If authorized and constructed, all facilities would be subject to DOT's inspection and enforcement program.

In addition, the facilities would be constructed to the requirements in the 2009 International Building Code and ASCE 7-05. These standards require various structural loads to be applied to the design of the facilities, including live (i.e., dynamic) loads, dead (i.e., static) loads, and environmental loads. FERC staff also evaluated the engineering design to withstand impacts from natural hazards, such as earthquakes, tsunamis, seiche, hurricanes, tornadoes, floods, rain, ice, snow, regional subsidence, sea level rise, landslides, wildfires, volcanic activity, and geomagnetism. We recommend in section 4.12.1.5 that Gulf LNG file final design information (e.g., drawings, specifications, and calculations) and associated quality assurance and quality control procedures with the documents reviewed, approved, and stamped and sealed by a professional engineer-of-record registered in the state of Mississippi. If the Project is authorized and constructed, the company would install equipment in accordance with its final design.

Earthquakes, Tsunamis, and Seiche

Earthquakes and tsunamis have the potential to cause damage from shaking ground motion and fault ruptures. Earthquakes and tsunamis often result from sudden slips along fractures in the earth's crust (i.e., faults) and the resultant ground motions caused by those movements, but can also be a result of volcanic activity or other causes of vibration in the earth's crust. The damage that could occur as a result of ground motions is affected by the type/direction and severity of the fault activity and the distance and type of soils the seismic waves must travel from the hypocenter (or point below the epicenter where seismic activity occurs). To assess the potential impact from earthquakes and tsunamis, Gulf LNG evaluated historic earthquakes along fault locations and their resultant ground motions.

The USGS maintains a database containing information on surface and subsurface faults and folds in the United States that are believed to be sources of earthquakes of greater than 6.0 magnitude occurring during the past 1.6 million years (Quaternary Period).[21] The Project is located in the East Gulf Coast Plain Physiographic Region of the Gulf Coast Basin geologic tectonic province. The closet seismogenic faults to the area are situated with the New Madrid and Charleston seismic zones located approximately 450 miles to the northwest and 475 miles to the northeast, respectively (USGS, 2008). Within the Northern Gulf of Mexico, hundreds of non-seismogenic, extensional "growth faults" have been mapped (Wheeler, 1998). However, previous studies performed in the region suggest that the growth faults, which are common in the Louisiana and Texas coastal regions, are not present near coastal Mississippi (Champlin et al., 1994). To evaluate the potential for fault rupture hazard at the Project site a previous study (Fugro, 2005) reviewed a series of historic aerial photographs and topographic maps, reviewed subsurface structural maps, and performed a site reconnaissance to document any suspect features on the ground. None of the lines of evidence to support the presence of or potential for, active surface faulting was observed during the course of the study. Additionally, the Fugro (2005) study concluded that the risk of active surface faulting similar to that observed on growth faults in the coastal

[21] USGS, Earthquake Hazards Program, Quaternary Fault and Fold Database of the United States, https://earthquake.usgs.gov/hazards/qfaults/, accessed Aug 2018.

plains of Louisiana and Texas, is considered very low for the Project site and that no further study of faulting or surface rupture was recommended. Movement within the fault system has been classified as a general creep as opposed to the breaking of rocks, which is often associated with earthquake events (Stevenson and McCulloh, 2001). Salt domes are prevalent throughout the Gulf Coast Basin and are characterized by having a system of faults arranged in a circular pattern around them (Gagliano, 1999). However, the Project is not located near an identified salt dome, and is unlikely to be impacted by associated faults. While the presence of faults can require special consideration, the presence or lack of faults identified near the site does not define whether earthquake ground motions can impact the site because ground motions can be felt large distances away from an earthquake hypocenter depending on number of factors. To address the potential ground motions at the site, DOT regulations in 49 CFR 193.2101 under Subpart C require that field-fabricated LNG tanks must comply with Section 7.2.2 of NFPA 59A (2006) for seismic design. NFPA 59A (2006) requires LNG storage tanks to be designed to continue safely operating with earthquake ground motions at the ground surface at the site that have a 10 percent probability of being exceeded in 50 years (475 year mean return interval), termed the operating basis earthquake (OBE). In addition, DOT regulations in 49 CFR 193.2101 under Subpart C require that LNG tanks be designed to have the ability to safely shutdown when subjected to earthquake ground motions which have a 2 percent probability of being exceeded in 50 years (2,475 year mean return interval) at the ground surface at the site (termed the safe shutdown earthquake [SSE]). DOT regulations in 49 CFR 193.2101 under Subpart C also incorporate by reference of NFPA 59A (2001) Chapter 6, which require piping systems conveying flammable liquids and flammable gases with service temperatures below -20 degrees Fahrenheit, be designed as required for seismic ground motions. The facilities, once constructed, would be subject to the DOT's inspection and enforcement programs.

In addition, Gulf LNG would need to address hazardous fluid piping with service temperatures at -20 degrees Fahrenheit and higher and equipment other than piping and LNG storage containers. We also recognize the current FERC regulations under Title 18 CFR 380.12 (h) (5) continues to incorporate National Bureau of Standards and Information Report (NBSIR) 84-2833. NBSIR 84-2833 provides guidance on classifying stationary storage containers and related safety equipment as Category I and classifying the remainder of the LNG Project structures, systems, and components as either Category II or Category III, but does not provide specific guidance for the seismic design requirements for them. Absent any other regulatory requirements, this guidance recommends that other LNG Project structures classified as Seismic Category II or Category III be seismically designed to satisfy the Design Earthquake and seismic requirements of the ASCE 7-05 in order to demonstrate there is not a significant impact on the safety of the public. ASCE 7-05 is recommended as it is a complete American National Standards Institute consensus design standard, its seismic requirements are based directly on the National Earthquake Hazards Reduction Program (NEHRP) Recommended Provisions, and it is referenced directly by the International Building Code (IBC). Having a link directly to the IBC and ASCE 7 is important to accommodate seals by the engineer-of-record because the IBC is directly linked to state professional licensing laws while the NEHRP Recommended Provisions are not.

The geotechnical investigations of the existing site performed by MMI/Geosyntec indicate the site is classified as Site Class E[22] based on a site average shear wave velocity (Vs) that from the four SCPTs is 526 feet per second. While the two previous investigations performed tests in the area of the LNG tanks, the other two tests were performed in the area of the proposed Terminal Expansion. Sites with soil conditions of this type would experience significant amplifications of surface earthquake ground

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22 There are six different site classes in ASCE 7-05, A through F, that are representative of different soil conditions that impact the ground motions and potential hazard ranging from Hard Rock (Site Class A), Rock (Site Class B), Very dense soil and soft rock (Site Class C), Stiff Soil (Site Class D), Soft Clay Soil (Site Class E), to soils vulnerable to potential failure or collapse, such as liquefiable soils, quick and highly sensitive clays, and collapsible weakly cemented soils (Site Class F).

motions. However, due to the absence of a major fault in proximity to the site and lower ground motions, the seismic risk to the site is considered low.

MMI/Geosyntec performed a site-specific seismic hazard study for the site. The study concluded that the site would have an OBE peak ground acceleration (PGA) of 0.030g, a SSE PGA of 0.090g (MMI/Geosyntec, 2014) in accordance with the IBC (2006) and ASCE 7-05. FERC staff independently evaluated the OBE PGA, SSE PGA, 0.2-second design spectral acceleration, and 1.0-second design spectral accelerations for the site using the USGS Earthquake Hazards Program Seismic Design Maps[23] and Unified Hazard[24] tools for all occupancy categories (I through IV). FERC noted that the SSE PGA, OBE PGA used by Gulf LNG are lower than the values obtained from the Applied Technology Council Hazard tools, but believe the values are acceptable. These ground motions are relatively low compared to other locations in the United States. Based on the risk of the facilities impacting the public, the facilities are assigned various Seismic Categories. Seismic Category I facilities include LNG containers, systems required for isolation of LNG containers, and systems required for safe shutdown or fire protection, for which there are no facilities for this Project. Seismic Category 2 structures include facilities and systems not included in Category 1 required for safe plant operation, which include LNG liquefaction trains, inlet facilities, pre-treatment area(s), power generation area(s), fuel gas system, interconnecting piping systems, metering systems, LNG pumps, and other items. Seismic Category 3 includes all other facilities that are not included in Categories I and II, including administration buildings, dock service equipment, waste treatment plant, and incoming electrical power supply.

ASCE 7-05 also requires determination of the Seismic Design Category based on the Occupancy Category (or Risk Category in ASCE 7-10 and 7-16) and severity of the earthquake design motion. The Occupancy Category (or Risk Category) is based on the importance of the facility and the risk it poses to the public.[25] FERC staff has identified the Project as a Seismic Design Category B based on the ground motions for the site and an Occupancy Category (or Risk Category) of III, this seismic design categorization would appear to be consistent with IBC 2006 and ASCE 7-05 (and ASCE 7-10).

Seismic events can also result in soil liquefaction in which saturated, non-cohesive soils temporarily lose their strength/cohesion and liquefy (i.e., behave like viscous liquid) as a result of increased pore pressure and reduced effective stress when subjected to dynamic forces such as intense and prolonged ground shaking. Areas susceptible to liquefaction may include saturated soils that are generally sandy or silty. Typically, these soils are located along rivers, streams, lakes, and shorelines or in areas with shallow groundwater. The site-specific seismic study conducted for the Project documented soft to very dense sandy layers between -8 feet to -18 feet and -30 feet to -117 feet below grade. The site-specific geotechnical investigations indicate the presence of layers of silty sands and sandy silts that are dense to very dense. These sand layers could be liquefiable under sufficiently strong ground motions; however, the potential for a large enough seismic event near enough to cause soil liquefaction in the

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23 Available at: https://earthquake.usgs.gov/designmaps/us/application.php.

24 Available at: https://earthquake.usgs.gov/hazards/interactive/.

25 ASCE 7-05 defines Occupancy Categories I, II, III, and IV. Occupancy Category I represents facilities with a low hazard to human life in even of failure, such as agricultural facilities; Occupancy Category III represents facilities with a substantial hazard to human life in the event of failure or with a substantial economic impact or disruption of day to day civilian life in the event of failure, such as buildings where more than 300 people aggregate, daycare facilities with facilities greater than 150, schools with capacities greater than 250 for elementary and secondary and greater than 500 for colleges, health care facilities with 50 or more patients, jails and detention facilities, power generating stations, water treatment facilities, telecommunication centers, hazardous facilities that could impact public; Occupancy Category IV represents essential facilities, such as hospitals, fire, rescue, and police stations, emergency shelters, power generating stations and utilities needed in an emergency, aviation control towers, water storage and pump structures for fire suppression, national defense facilities, and hazardous facilities that could substantially impact public; and Occupancy Category II represents all other facilities. ASCE 7-10 changed the term to Risk Categories I, II, III, and IV with some modification.

Project area is low. Also LNG facilities at the site would be constructed on either a site improved with deep soil mixing and preloading with prefabricated vertical drains or in deep foundations, which would mitigate any potential impacts of soil liquefaction.

Seismic events in waterbodies can also cause tsunamis or seiches by sudden displacement of the sea floors in the ocean or standing water. Tsunamis and seiche may also be generated from volcanic eruptions or landslides. Tsunami wave action can cause extensive damage to coastal regions and facilities. The Terminal site's low lying position would make it potentially vulnerable were a tsunami to occur. There is little evidence that the Northern Gulf of Mexico is prone to tsunami events, but the occurrence of a tsunami is possible. Two did occur in the Gulf of Mexico in the early 20th century and had wave heights of 3 feet or less (USGS, 2009), which is not significantly higher than the average breaking wave height of 1.5 feet (Owen, 2008). No earthquake generating faults have been identified that are likely to produce tsunamis, despite recorded seismic activity in the area.

The potential for tsunamis associated with submarine landslides is more likely a source in the Gulf of Mexico and remains a focus of government research (USGS, 2009). Based on MMI/Geosyntec's review of the available geologic literature and a reassessment of conclusions from previous studies performed for the existing Terminal, MMI/Geosyntec indicated that the risk for potential faulting and surface rupture as well as tsunamis and seiche is considered to be negligible. From historical data, it is estimated that tsunamis generated from landslides would be significantly less than the hurricane design storm surge elevations discussed below, so any tsunami hazard has been considered in design.

Hurricanes, Tornadoes, and Other Meteorological Events

Hurricanes, tornadoes, and other meteorological events have the potential to cause damage or failure of facilities due to high winds and floods, including failures from flying or floating debris. To assess the potential impact from hurricanes, tornadoes, and other meteorological events, Gulf LNG evaluated such events historically. The severity of these events are often determined on the probability that they occur and are sometimes referred to as the average number years that the event is expected to re-occur, or in terms of its mean return/recurrence interval.

Because of its location, the Project site would likely be subject to hurricane force winds during the life of the Project. Gulf LNG stated that the Project would be designed to ASCE 7-05 using Allowable Stress Design and Strength Design. Gulf LNG indicates the design wind speed using ASCE 7-05 for all LNG facilities with a sustained wind speed of 150 mph converts to 183 mph (3-second gust) with load factor of 1.6 and importance factor of 1.15. A 183 mph 3-second gust would convert to a sustained wind speed of 150 mph, using the Durst Curve in ASCE 7-05 or using a 1.23 gust factor recommended for offshore winds at a coast line in World Meteorological Organization, *Guidelines for Converting between Various Wind Averaging Periods in Tropical Cyclone Conditions*. These wind speeds are equivalent to an approximately 6,000-9,275 year mean return interval or a 0.54 to 0.83 percent probability of exceedance in a 50-year period for the site, based on weather ASCE 7-05 and ASCE 7-10 wind speed return period conversions. The 183 mph 3-second gust equates to a strong Category 4 Hurricane using the Saffir-Simpson scale (130-156 mph sustained winds, 166-195 mph 3-second gusts). Gulf LNG also indicates the balance of the facility would be designed with 150 mph (3-second gust) wind speed in accordance with ASCE 7-05 wind load requirements with importance factor 1.0 at the facility location. Gulf LNG must meet 49 CFR 193.2067 under Subpart B for wind load requirements. In accordance with the MOU, the DOT will evaluate in its LOD whether an applicant's proposed Project meets the DOT siting requirements under Subpart B. If the Project is constructed and becomes operational, the facilities would be subject to the DOT's inspection and enforcement programs. Final determination of whether the facilities are in compliance with the requirements of 49 CFR 193 would be made by the DOT staff.

However, as noted in the limitation of ASCE 7-05, tornadoes were not considered in developing basic wind speed distributions. This leaves a potential gap in potential impacts from tornadoes. Therefore, we evaluated the potential for tornadoes. Appendix C of ASCE 7-05 makes reference to American Nuclear Society 2.3 (1983 edition), *Standard for Estimating Tornado and Extreme Wind Characteristics at Nuclear Power Sites*. This document has since been revised in 2011 and reaffirmed in 2016 and is consistent with NUREG/CR-4461, Tornado Climatology of the Contiguous U.S. Rev. 2 (NUREG2007). These documents provide maps of a 100,000 mean year return period for tornadoes using 2° latitude and longitude boxes in the region to estimate a tornado striking within 4,000-feet of an area. Figures 5-8 and 8-1 from Nuclear Regulation 4661 (NUREG/CR-4461) indicate a 100,000 year maximum tornado wind speeds would be approximately 140 mph 3-second gusts for the Project site. Later editions of ASCE 7 (ASCE 7-10 and ASCE 7-16) make reference to International Code Council 500, Standard for Design and Construction of Storm Shelters, for 10,000 year tornadoes. However, the International Code Council 500 maps were conservatively developed based on tornadoes striking regions and indicate a 200 mph 3-second gust for a 10,000 year event, which is higher than the 140 mph 3-second gust in American Nuclear Society 2.3 and NUREG/CR-4461. As a result, we conclude that the use of a 150 mph sustained wind speed, 183 mph 3-second gust, is adequate from a risk standpoint for the other LNG facilities.

ASCE 7 also recognizes the facility would be in a wind borne debris region. Wind borne debris has the potential to perforate equipment if not properly designed to withstand such impacts. The potential impact from a projectile could result in a release, but there are no LNG storage tanks proposed and process piping and equipment would have emergency shutdown equipment that would allow for shutdown and isolation within 10 minutes, and the 10 minute release would be fully contained in the spill containment. Similarly, other hazardous fluid containers would have emergency shutdown equipment that would allow for shutdown and isolation within 10 minutes, and the full contents of a container would be fully contained in the spill containment.

In addition, we evaluated historical tropical storm, hurricane, and tornado tracks in the vicinity of the Project facilities using data from the DHS Homeland Infrastructure Foundation Level Data and NOAA Historical Hurricane Tracker.[26,27] Between 1900 and 2017, 19 hurricanes and 19 tropical storms have made landfall within 65 nautical miles of the Project, the most recent hurricane being Hurricane Nate (Category 1 at landfall) in 2017. Of the 19 hurricanes and 19 tropical storms, 8 would be considered major Hurricanes (Category 3 or higher), including Unnamed Hurricane (Category 3 peak, Category 2 at landfall) in 1906, Unnamed Hurricane (Category 3 at peak and landfall) in 1916, Unnamed Hurricane (Category 4 at peak, Category 3 at landfall) in 1926, Hurricane Camille (Category 5 at peak and landfall) in 1969, Hurricane Frederic (Category 4 at peak and landfall) in 1979, Hurricane Elena (Category 3 at peak and landfall) in 1985, and Hurricane Ivan (Category 4 at peak Category 3 at landfall) in 2004, and Hurricane Katrina (Category 5 at peak, Category 3 at landfall) in 2005.

Potential flood levels may also be informed from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps, which identifies Special Flood Hazard Areas (base flood) that have a 1 percent probability of exceedance in 1 year to flood (or a 100 year mean return interval) and moderate flood hazard areas that have a 0.2 percent probability of exceedance in 1 year to flood (or a 500 year mean return interval). According to the FEMA National Flood Hazard Layer, portions of the Project would be located in the 100-year and 500-year floodplain. According to FEMA flood hazard maps (28059CV001B, 2017), the 100-year flood elevation at the Project site is +13.6 feet NAVD 88, and the 500-year flood elevation is +17.9 feet NAVD 88. We also recognize that a 500 year flood event has been

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26 DHS, Homeland Infrastructure Foundation Level Data, https://hifld-geoplatform.opendata.arcgis.com/, August 2018.

27 NOAA, Historical Hurricane Tracker, https://coast.noaa.gov/hurricanes/, August 2018.

recommended as the basis of design for critical infrastructure in publications, including ASCE 24, Flood Resistant Design and Construction. Therefore, we conclude it is good practice to design critical energy infrastructure to withstand 500 year event from a safety and reliability standpoint for the standing water elevation (SWEL) and wave crests. Gulf LNG has indicated that the facility is designed to handle a 100-year storm surge without any wave overtopping, and is designed to accommodate the wave overtopping that would occur from a 500-year storm surge.

Gulf LNG is proposed to extend the existing concrete storm surge protection system to enclose the entire Terminal, including the proposed Terminal Expansion. The existing concrete storm surge protection wall surrounding the existing Terminal that has an elevation of +27 feet NAVD 88. The eastern portion of the existing concrete storm surge protection system would be removed in order to permit access between the existing and the new facilities. Temporary measures may be required to protect the existing Terminal during this process. The new concrete wall and new earthen berm are proposed to be designed with a crest elevation of +27 feet NAVD 88 to match the height of the existing concrete wall. The earthen berm may be extended to a crest elevation at +39.2 feet NAVD 88 to accommodate some areas with additional dredged fill by the COE. A sheet pile wall would be driven at the center of the earthen berm to a depth of approximately 60 feet below ground surface (bgs) and would extend upward to just under the earthen berm control road. Gulf LNG has provided two construction options for the new storm surge protection system that would extend around the entire Terminal Expansion: (1) for the southern exposure of the Terminal Expansion the concrete storm surge protection system would be extended and the earthen berm would be constructed along the northern and eastern exposures with the BCDMMS (as discussed in section 2.2.1.7); or (2) the concrete storm surge protection system can be extended all along the southern, eastern and northern exposures of the Terminal Expansion and tied into the existing COE berm. The final plan shall be submitted for FERC staff review. The settlement analyses results conducted by MMI/Geosyntec indicated that the computed settlements from about 1.5 to 3.5 feet with some areas potentially prone to differential settlements resulting from fill thickness variability.

Gulf LNG also assessed flooding using the Sea, Lake, and Overland Surge from Hurricanes (SLOSH) Model, which is used primarily for modeling coastal flood risk from hurricane events data from the FEMA Flood Insurance Study for the City of Pascagoula, dated September 15, 1983. The SLOSH Model predicted a 100-year recurring storm surge elevation at the site of 9.7 feet and a corresponding wave crest elevation at the site of 13.8 feet. For an area 4,000 feet north of the Terminal Expansion at Chevron's Pascagoula Refinery, the SLOSH Model predicated maximum surge floods of 7.2 feet for a Category 1 storm, 11.9 feet for Category 2, 15.6 feet for Category 3, 18.8 feet for Category 4, and 22.2 feet Category 5. After comparing the actual storm surge data along the Mississippi coast (including 18 feet at Pascagoula) caused by Hurricane Katrina in August 2005 with the FEMA and SLOSH Model predictions, Gulf LNG determined that the SLOSH Model for a Category 4 hurricane, would provide the most appropriate results to use as a design basis for the Project. Further evaluation of potential waves on top of the storm surge was conducted by performing computer modeling to predict the wave height at the Project site based on an offshore Category 4 storm wave height propagating shoreward with Category 4 wind speeds. Based on the research and analysis conducted, the Category 4 storm surge elevation at the site was determined to be 19.5 feet amsl. Based on the wave modeling analysis, the Category 4 storm significant wave height at the site was determined to be 11.4 feet, with a corresponding wave crest elevation of 27.3 feet amsl.

We generally evaluate the design against a 500-year SWEL with a 500-year wave crest and projected sea level rise and subsidence. Using maximum envelope of water (MEOW) storm surge inundation maps generated from the SLOSH Model developed by NOAA National Hurricane Center, a

500-year event would equate to a Category 3 to 4 Hurricane.[28] This is lower than indicated in the 500-year FEMA maps. In addition, while NOAA seems to provide higher resolution of topographic features, it limits its SLOSH maps to storm surge levels at high tide above 9 feet. As a result, we evaluated the storm surge against other sources using SLOSH maps that indicate a similar upper range of 9 to 12 feet MEOW for Category 2 Hurricanes, and also indicated 12 to 15 feet MEOW for Category 3 Hurricanes, 13 to 17 feet MEOW for Category 4 Hurricanes, and 19 to 23 feet MEOW for Category 5 Hurricanes.[29] This data suggests that Gulf LNG design may withstand Category 5 Hurricane storm surge SWEL equivalent to more than a 10,000 year mean return intervals.

Based on monthly mean sea level data from NOAA tidal gauge at Gulf LNG between 1978 and 2017, the mean sea level trend is an increase of 4.56 millimeters per year with a 95 percent confidence interval of +/- 0.86 mm per year, which is equivalent to a change of 0.213 inch per year (NOAA, 2018). Fugro (2005) indicated that there was a possible land surface subsidence component in the Pascagoula gauge. Fugro (2005) recommended that the design of the Site consider that the possibility of relative sea level rise, as observed in the Pascagoula tide gauge, might continue or even be exceeded during the anticipated life of the facility. Fugro (2005) reviewed historical water level data between 1942 and 1994 from the USGS in 32 wells within an approximate 2-mile radius of the Project. The ground water level data, when combined with the review of relative sea level rise, concluded that some subsidence may have occurred within the immediate site area as a result of groundwater withdrawal up until the 1970s. Fugro (2005) also indicated that the risk of subsidence as a result of groundwater withdrawal is considered low, but recommended that potential future wells at the Project be designed as to not drawdown groundwater levels in the underlying Holocene age deposits. As such, Fugro does not consider long-term sea level rise as a significant geological hazard for construction or operation of the Gulf LNG Liquefaction Project. However, we believe the use of intermediate values from NOAA for sea level rise and subsidence is more appropriate for design and higher projections are more appropriate for planning in accordance with NOAA (2017),[30] which recommends defining a central estimate or mid-range scenario as baseline for shorter-term planning, such as setting initial adaptation plans for the next 2 decades and defining upper bound scenarios as a guide for long-term adaptation strategies and a general planning envelope. NOAA (2017) indicates an intermediate projected sea level rise and subsidence of 0.98 foot between 2020 and 2050.[31] Given the uncertainty in the 500-year SWEL data, 500-year wave data, SLOSH maps, sea level rise and subsidence projections, and settlement projections and uncertainties, we believe that the maintaining of wall crest elevations at +27 feet NAVD 88 post settlement levee would provide adequate protection of the Project site and should be periodically monitored and maintained. We also recommend in section 4.12.1.5 that Gulf LNG provide the monitoring and maintenance plan that has been reviewed, approved, stamped, and sealed by the professional engineer-of-record registered in the state of Mississippi.

Long-term shoreline erosion along Mississippi mainland shores is fairly low due to extensive armoring and periodic beach nourishment around the Mississippi Sound region. While the mainland shore erosion rate is relatively low, barrier island shores are eroding rapidly. The average yearly shoreline erosion rate for the state of Mississippi is approximately -2.1 meters per year, but is

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28 U.S. Department of Commerce. NOAA. National Hurricane Center. National Storm Surge Hazard Maps. Available at: https://www.nhc.noaa.gov/nationalsurge/#pop. Accessed August 2018.

29 Masters, J. Weather Underground. Storm Surge Inundation Maps for the U.S. Coast. Available at:https://www.wunderground.com/hurricane/surge_images.asp. Accessed August 2018.

30 *Global And Regional Sea Level Rise Scenarios for the United States*, U.S. Department Of Commerce, National Ocean and Atmospheric Administration, National Ocean Service Center for Operational Oceanographic Products and Services, January 2017.

31 U.S. Army Corps of Engineers, Sea-Level Change Curve Calculator (Version 2017.55), http://corpsmapu.usace.army.mil/rccinfo/slc/slcc_calc.html, accessed November 2018.

predominately experienced by the barrier islands. Shoreline erosion could occur at the Project site and along the opposite shoreline as a result of waves, currents, and vessel wakes. The Project has proposed the installation of a protective storm surge berm with riprap armoring to help mitigate the impacts of shoreline erosion. Even though shoreline erosion is a concern at the site, the proposed mitigation measures would minimize erosion and scour impacts.

Landslides and Other Natural Hazards

Due to the low relief across the Project site, there is little likelihood that landslides or slope movement at the Project site would be a realistic hazard. Landslides involve the downslope movement of earth materials under force of gravity due to natural or human causes. The Project area has low relief which reduces the possibility of landslides.

Volcanic activity is primarily a concern along plate boundaries on the West Coast and Alaska and also Hawaii. Based on our review of maps from USGS[32] and DHS[33] of the nearly 1,500 volcanoes with eruptions since the Holocene period (in the past 10,000 years) there are no known active or historic volcanic activity within proximity of the site with the closest being over 880 miles away across the Gulf of Mexico in Los Atlixcos, Mexico.

Geomagnetic disturbances (GMDs) may occur due to solar flares or other natural events with varying frequencies that can cause geomagnetically induced currents, which can disrupt the operation of transformers and other electrical equipment. USGS provides a map of GMD intensities with an estimated 100 year mean return interval.[34] The map indicates the Gulf LNG site could experience GMD intensities of 90-150 nano-Tesla (nT) with a 100 year mean return interval. However, Gulf LNG would be designed such that if a loss of power were to occur the valves would move into a fail-safe position.

External Impact Review

To assess the potential impact from external events, we conducted a series of reviews to evaluate transportation routes, land use, and activities within the facility and surrounding the Liquefaction Project site and the safeguards in place to mitigate the risk from events, where warranted. We coordinated the results of the reviews with other federal agencies to assess potential impacts from vehicles and rail; aircraft impacts to and from nearby airports and heliports; pipeline impacts from nearby pipelines; impacts to and from adjacent facilities that handle hazardous materials under EPA's Risk Management Program (RMP) regulations and power plants, including nuclear facilities under Nuclear Regulatory Commission regulations. Specific mitigation of impacts from use of external roadways, rail, airports, helipads, airstrips, or pipelines are also considered as part of the engineering review done in conjunction with the NEPA review.

FERC staff uses a risk based approach to assess the potential impact of the external events and the adequacy of the mitigation measures. The risk based approach uses data based on the frequency of events that could lead to an impact and the potential severity of consequences posed to the Project site and the resulting consequences to the public beyond the initiating events. The frequency data is based on past incidents and the consequences are based on past incidents and/or hazard modeling of potential failures.

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32 United States Geological Survey, *U.S. Volcanoes and Current Activity Alerts*, https://volcanoes.usgs.gov/index.html, accessed Aug 2018.

33 Department of Homeland Security, *Homeland Infrastructure, Foundation-Level data (HIFLD)*, Natural Hazards, https://hifld-geoplatform.opendata.arcgis.com, accessed Aug 2018

34 United States Geological Survey, *Magnetic Anomaly Maps and Data for North America*, https://mrdata.usgs.gov/magnetic/map-us.html#home, accessed Aug 2018.

Road

FERC staff generally reviews whether any truck operations would be associated with the Project and whether any existing roads would be located near the site. We use this information to evaluate whether the Project and any associated truck operations could increase the risk along the roadways and subsequently to the public and whether any pre-existing unassociated vehicular traffic could adversely increase the risk to the Project site and subsequently increase the risk to the public. In addition, all facilities, once constructed, must comply with the requirements of 49 CFR 193 and would be subject to DOT's inspection and enforcement programs. DOT regulations under 49 CFR 193.2155(a)(5)(ii) under Subpart C require that structural members of an impoundment system must be designed and constructed to prevent impairment of the system's performance reliability and structural integrity as a result of a collision by or explosion of a tank truck that could reasonably be expected to cause the most severe loading if the liquefaction facility adjoins the right-of-way of any highway. Similarly, NFPA 59A (2001), Section 8.5.4, requires transfer piping, pumps, and compressors to be located or protected by barriers so that they are safe from damage by rail or vehicle movements. However, the DOT regulations and NFPA 59A (2001) requirements do not indicate what collision(s) or explosion(s) could reasonably be expected to cause the most severe loading. We evaluated frequency and consequence data from these events to evaluate these potential impacts.

We evaluated the risk of the truck operations based on the consequences from a release, incident data from DOT Federal Highway Administration, National Highway Traffic Safety Administration, and PHMSA, and frequency of trucks and proposed mitigation to prevent or reduce the impacts of a vehicular incident from Gulf LNG.

Unmitigated consequences under worst-case weather conditions from catastrophic failures of trucks proposed at the site generally can range from 200 to 2,000 feet for flammable vapor dispersion, 850 to 1,500 feet for radiant heat of $5kW/m^2$ from fireballs, and 275 to 350 feet for radiant heat of $5kW/m^2$ from jet fires with projectiles from BLEVEs possibly extending farther. These values are also close to the distances provided by DOT Federal Highway Administration for designating hazardous material trucking routes (0.5 mile for flammable gases for potential impact distance) and DOT PHMSA for emergency response (0.5 to 1 mile for initial evacuation and 1 mile for potential BLEVEs for flammable gases).[35] Unmitigated consequences under average ambient conditions from releases of 1,000 gallons through a 1-inch hole would result in much more modest distances ranging from 25 to 200 feet for flammable vapor dispersion, and 75 to 175 feet for jet fires.

Incident data indicates hazardous material incidents are very infrequent (4E-3 incidents per lane-mile per year) and nearly 75 to 80 percent of hazardous material vehicular incidents occur during unloading and loading operations while the other 20 to 25 percent occur while in transit or in transit storage. In addition, approximately 99 percent of releases are 1,000 gallons (gal) or less and catastrophic events that would spill 10,000 gal or more make up less than 0.1 percent of releases and less than 1 percent result in injuries and less than 0.1 percent result in fatalities.

During operation of the Project, trucks or tanker trucks would transport commodities (e.g., liquid nitrogen, condensate product, etc.) to or from the facility. There are no major highways or roads within close proximity to piping or equipment containing hazardous materials to raise concerns of direct impacts from a vehicle impacting the site. The closest road to the facility is State Road 611, a road which only services Gulf LNG and the industrial services to the north of Gulf LNG, with speed limits up to 50 miles per hour. The facility is set back from the road with approximately 3,000 feet between process piping and

[35] USGS. Earthquake Hazards Program. Quaternary Fault and Fold Database of the United States. Available at: https://earthquake.usgs.gov/hazards/qfaults/ Accessed August 2018.

State Road 611. Gulf LNG also proposes to build an earthen berm bordering the Terminal Expansion. In addition, the earthen berm and separation distances would provide protection from flammable vapor dispersion and radiant heats. Therefore, hazardous material incidents would not present a significant risk or increase in risk of impacting the existing LNG facilities. Depending on the hazardous material truck routes, which are decided by the state, and frequency and consequences of potential incidents, there would also be insignificant risk or increase in risk to the public above existing levels.

While we believe the earthen berm and separation distances would provide adequate protection from most potential accidental and intentional vehicle impacts, we recommend in section 4.12.1.5 that Gulf file specifications and drawings of vehicle barriers at the access points, for review and approval, to further mitigate accidental and intentional vehicle impacts. In addition, we recommend in section 4.12.1.5 that Gulf LNG file an evaluation, for review and approval, on the need to install deceleration, acceleration, and turning lanes for all access points for safe vehicular access/departure. We recommend in section 4.12.1.5 that Gulf LNG provide final design information, for review and approval, on internal road and vehicle protections, (e.g. guard rails, barriers, and bollards) to protect transfer piping, pumps, compressors, etc. and to ensure that they are located away from roadway or protected from damage by vehicle movements.

With the implementation of our recommendations, we conclude the proposed Project would not pose a significant risk or significant increase in risk to the public due to vehicle impacts as a result of the potential consequences, incident data, and frequency of trucks.

Rail

FERC staff generally reviews whether any rail operations would be associated with the Project and whether any existing rail lines would be located near the site. We use this information to evaluate whether the Project and any associated rail operations could increase the risk along the rail line and subsequently to the public and whether any pre-existing unassociated rail operations could adversely increase the risk to the Gulf LNG site and subsequently increase the risk to the public. In addition, all facilities, once constructed, must comply with the requirements of 49 CFR 193 and would be subject to DOT's inspection and enforcement programs. DOT regulations under 49 CFR 193.2155(a)(5)(ii) under Subpart C states if the LNG facility adjoins the right-of-way of any railroad, the structural members of an impoundment system must be designed and constructed to prevent impairment of the system's performance reliability and structural integrity as a result of a collision by or explosion of a train or tank car that could reasonably be expected to cause the most severe loading. Section 8.5.4 of NFPA 59A (2001), incorporated by reference in 49 CFR 193, requires transfer piping, pumps, and compressors to be located or protected by barriers so that they are safe from damage by rail or vehicle movements. However, the DOT regulations and NFPA 59A (2001) requirements do not indicate what collision(s) or explosion(s) could reasonably be expected to cause the most severe loading. Therefore, we evaluated consequence and frequency data from these events to evaluate these potential impacts. There would be no rail transportation associated with the Gulf LNG Liquefaction Project.

We evaluated the risk of the rail operations based on the consequences from a release, incident data from DOT Federal Railroad Administration FRA, and DOT PHMSA, and frequency of rail operations nearby the Gulf LNG Liquefaction Project.

Unmitigated consequences under worst-case weather conditions from catastrophic failures of rail cars containing various flammable products generally can range from 300 to 3,000 feet for flammable vapor dispersion, 1,250 to 2,100 feet for radiant heat of $5kW/m^2$ from fireballs, and 450 to 575 feet for radiant heat of $5kW/m^2$ from jet fires with projectiles from BLEVEs possibly extending farther. These values are also close to the distances provided by DOT PHMSA for emergency response (0.5 to 1 mile for initial evacuation and 1 mile for potential BLEVEs for flammable gases).[36] Unmitigated consequences under average ambient conditions from releases of 1,000 gallons through a 1-inch hole would result in much more modest distances ranging from 25 to 200 feet for flammable vapor dispersion, and 75 to 175 feet for jet fires.

Incident data indicates hazardous material incidents are very infrequent (6E-3 incidents per rail-mile per year). In addition, approximately 95 percent of releases are 1,000 gal or less and catastrophic events that would spill 30,000 gal or more make up less than 1 percent of releases and less than 1 percent result in injuries and less than 0.1 percent result in fatalities.

There would be no rail associated with the Project. The closest rail line services the Chevron Pascagoula Refinery and Terminal and is located approximately 3,000 feet away from the Project. Given the incident rates, distance, and position of the closest rail lines serving other industrial facilities relative to the populated areas to the north of the Project, we conclude the proposed Project would not pose a significant increase in risk to the public as a result of the proximity of the Project to the rail lines.

Air

FERC staff generally reviews whether any aircraft operations would be associated with the Project and whether any existing aircraft operations would be located near the site. We use this information to evaluate whether the Project and any associated aircraft operations could increase the risk to the public and whether any pre-existing unassociated aircraft operations could adversely increase the risk to the Project site and subsequently increase the risk to the public. In addition, if authorized and constructed, all LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to DOT's inspection and enforcement programs. DOT regulations under 49 CFR 193.2155(b) under Subpart C require that the height of LNG structures in the vicinity of an airport must comply with DOT FAA requirements. In addition, we evaluated the risk of an aircraft impact from nearby airports. There would be no aircraft associated with the Gulf LNG Liquefaction Project (e.g. helipads) that would warrant a review that would increase the risk to the public from aircraft operations.

The closest airport to the Gulf LNG Liquefaction Project site is the Trent Lott International Airport located approximately 9.8 miles away. We also identified three other airports within a 20 mile radius from the Project: Ocean Springs Airport located 15.6 miles away, St. Elmo Airport located 18.4 miles away, and Roy E Ray Airport located 19.7 miles away. The nearest helipad is associated with the Pascagoula Refinery, approximately 3,500 feet away.

The DOT FAA regulations in 14 CFR 77 require Gulf LNG to provide notice to the FAA of its proposed construction. This notification should identify all equipment that are more than 200 feet above ground level or lesser heights if the facilities are within 20,000 feet of an airport (at 100:1 ratio or 50:1 ratio depending on length of runway) or within 5,000 feet of a helipad (at 100:1 ratio). In addition, mobile objects, including the LNG marine vessel that would be above the height of the highest mobile object that would normally traverse it would require notification to DOT FAA. The FAA Aeronautical Study would identify which structures and mobile objects exceed obstruction standards and would indicate if the identified structures would be a hazard to air navigation. Based on this study, FAA would issue a determination for each structure and mobile object that exceeds the obstruction standards.

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[36] DOT PHMSA. Emergency Response Guidebook. Available at: https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/ERG2016.pdf. Accessed November 2018.

The proposed Terminal Expansion would include equipment taller than 200 feet and it is unclear as to whether the larger proposed LNG marine vessels would be higher than other mobile objects in the waterway. Preliminary heights of permanent structures and temporary construction equipment were provided in the application. Given the distance to the nearest airport exceeding 20,000 feet, Gulf LNG would need to file notice to the FAA for any structures exceeding 200 feet to initiate an Aeronautical Study for determining whether they would constitute obstructions to air navigation. Gulf LNG would also need to file notice if the LNG marine vessel is higher than other objects that traverse the waterway in accordance with 14 CFR 77. In addition, given the proximity to the Chevron helipad, Gulf LNG would also need to file notice with DOT FAA. Gulf LNG has received a final determination of no hazard from the FAA dated June 26, 2018, which will expire December 26, 2019, but it only included the flare tower and not any other permanent or temporary structures. Therefore, we recommend in section 4.12.1.5 that Gulf LNG indicate whether any other permanent or temporary structures and mobile objects would exceed height requirements in 14 CFR 77 and file notice to FAA for any other permanent and temporary structures, including construction cranes and LNG marine vessels that would require an Aeronautical Study. Furthermore, we recommend in section 4.12.1.5 that Gulf LNG provide a final determination from the FAA that the proposed facilities would not pose a hazard to air navigation, if applicable.

In addition, we analyzed existing aircraft operation frequency data based on the airports identified above and their proximity to the LNG storage tanks and process areas, type and frequency of aircraft operations, take-off and landing directions, and non-airport flight paths using the DOE Standard, DOE-STD-3014-2006, Accident Analysis for Aircraft Crash into Hazardous Facilities. Based upon that review, we conclude the proposed Gulf LNG Liquefaction Project would not pose a significant risk as a result of the proximity of the Project to the airports, and we recommend in section 4.12.1.5 that Gulf LNG receive a determination of no hazard (with or without conditions) from FAA prior to initial site preparation to demonstrate there would not be an impact to the safety of aircraft.

With the implementation of our recommendations, we conclude the proposed Project would not pose a significant risk or significant increase in risk to the public due to nearby aircraft operations as a result of the potential consequences, incident data, and distance and position of the closest aircraft operations relative to the populated areas north of the Project.

Pipelines

FERC staff generally reviews whether any pipeline operations would be associated with the Project and whether any existing pipelines would be located near the site. We use this information to evaluate whether the Project and any associated pipeline operations could increase the risk to the pipeline facilities and subsequently to the public and whether any pre-existing unassociated pipeline operations could adversely increase the risk to the Project site and subsequently increase the risk to the public. In addition, pipelines associated with this Project must meet DOT regulations under 49 CFR 192 and are discussed in section 4.12.2. All facilities, once constructed, must comply with the requirements of 49 CFR 192 and 49 CFR 193 and would be subject to DOT's inspection and enforcement programs. We evaluated the risk of a pipeline incident impacting the Gulf LNG Liquefaction Project and the potential of cascading damage increasing the risk to the public based on the consequences from a release, incident data from the DOT PHMSA, and proposed mitigation to prevent or reduce the impacts of a pipeline incident from Gulf LNG.

We identified one crude oil pipeline and three natural gas pipelines located between 0.25 and 0.5 mile from the proposed Project. We evaluated the potential risk from an incident from the pipelines and their potential impacts. Based on the pipeline routes, markings, and damage prevention measures and based on an evaluation of the potential likelihood of pipeline incidents and potential consequences from a pipeline incident, we conclude the proposed Project would not pose a significant increase in risk to the public as a result of the potential consequences from the pipelines in the vicinity of the Gulf LNG

Liquefaction Project, the frequency of pipeline incidents, and the proposed mitigation to prevent and reduce the impacts of a pipeline incident from Gulf LNG.

Hazardous Material Facilities and Power Plants

We reviewed whether any EPA RMP regulated facilities handling hazardous materials and power plants were located near the site to evaluate whether the facilities could adversely increase the risk to the Project site and whether the Project site could increase the risk to the EPA RMP facilities and power plants and subsequently increase the risk to the public.

There were no adjacent facilities handling hazardous materials or power plants identified adjacent to the site. We also evaluated whether any EPA RMP regulated facilities would be located near the proposed Project and if these facilities could adversely increase the risk to the Project site and whether the Project site could increase the risk to the EPA RMP facilities and power plants and subsequently increase the risk to the public. The closest facility handling hazardous materials is the Chevron Pascagoula Refinery and Terminal located approximately 0.8 mile north of the new liquefaction trains. In addition, the Mississippi Phosphates Corporation is located approximately 1.7 miles, the VT Halter Marine Pascagoula Operations located approximately 1.75 miles, the Gulf Coast Cold Storage located approximately 2 miles, the First Chemical Corporation located approximately 2.1 miles, the Pascagoula Water Treatment Plant Bayou Casotte located approximately 3 miles, the Pascagoula Water Treatment Plant Community Avenue located approximately 4.1 miles, the BP Pascagoula Gas Processing Plant located approximately 4.1 miles, and the Pascagoula/Moss Point Waste Water Treatment Plant located approximately 4.7 miles from the Gulf LNG site. The closest power plant identified is a coal power plant approximately 15 miles north of the facility and the closest nuclear power plant is over 100 miles away.

Given the distances and locations of the facilities relative to the populated areas of the Pascagoula community, we conclude the proposed Project would not pose a significant increase in risk to the public or that the hazardous material facilities and power plants would pose a significant risk to the Project and subsequently to the public.

<u>On-site and Off-site Emergency Response Plans</u>

As part of its application, Gulf LNG indicated that the Project would expand the current ERP developed for the existing Terminal operations to include additional facility infrastructure and operations introduced by the Gulf LNG Liquefaction Project, such as the increase in staffing levels, changes to roads within the existing Terminal, and the addition of products that have not been previously handled at the existing Terminal. The emergency procedures would continue to provide for the protection of personnel and the public as well as the prevention of property damage that may occur as a result of incidents at the Project facilities. The facilities would also provide appropriate personnel protective equipment to enable operations personnel and first responder access to the area.

In addition, we recommend in section 4.12.1.5 that Gulf LNG provide, for review and approval, an updated emergency response plan prior to construction of final design. We also recommend in section 4.12.1.5 that Gulf LNG file three-dimensional drawings, prior to construction of final design, for review and approval that demonstrate there is a sufficient number of access and egress locations. In addition, we recommend in section 4.12.1.5 that Project facilities be subject to regular inspections throughout the life of the facility and would continue to require companies to file updates to the ERP.

4.12.1.5 Recommendations from FERC Preliminary Engineering and Technical Review

Based on our preliminary engineering and technical review of the reliability and safety of the Gulf LNG Liquefaction Project, we recommend the following mitigation measures to the Commission for consideration to incorporate as possible conditions to an Order. These recommendations would be implemented prior to initial site preparation, prior to construction of final design, prior to commissioning, prior to introduction of hazardous fluids, prior to commencement of service, and throughout the life of the facility to enhance the reliability and safety of the facility and to mitigate the risk of impact on the public.

- **<u>Prior to the end of the draft EIS comment period</u>, Gulf LNG should file with the Secretary documentation clarifying whether or not a plant-wide ESD would be included in the design.**
- **<u>Prior to the end of the draft EIS comment period</u>, Gulf LNG should file with the Secretary documentation demonstrating it has filed for an Aeronautical Study under 14 CFR 77 for all permanent and temporary construction equipment and mobile objects that exceed the height requirements in 14 CFR 77.9.**
- **<u>Prior to the end of the draft EIS comment period</u>, Gulf LNG should file with the Secretary a plan to conduct a comprehensive supplemental geotechnical field investigation and geotechnical report at the proposed locations of the new LNG facilities and a date by which the investigation and report are expected to be complete.**
- **<u>Prior to initial site preparation</u>, Gulf LNG should file with the Secretary documentation demonstrating it has received a determination of no hazard (with or without conditions) by DOT FAA for all temporary construction equipment and mobile objects that exceed the height requirements in 14 CFR 77.9.**
- **<u>Prior to construction of the final design</u>, Gulf LNG should file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in Mississippi:**

  d. site preparation drawings and specifications;

  e. LNG Terminal structures and foundation design drawings and calculations (including prefabricated and field constructed structures);

  f. seismic specifications for procured equipment; and

  g. quality control procedures to be used for civil/structural design and construction.

  In addition, Gulf LNG should file, in its Implementation Plan, the schedule for producing this information.
- **<u>Prior to commencement of service</u>, Gulf LNG should file with the Secretary a monitoring and maintenance plan, stamped and sealed by the professional engineer-of-record registered in Mississippi, for the perimeter levee which ensures the crest elevation relative to mean sea level will be maintained for the life of the facility considering berm settlement, subsidence, and sea level rise.**

Information pertaining to the following specific recommendations should be filed with the Secretary for review and written approval by the Director of OEP, or the Director's designee, within the timeframe indicated by each recommendation. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 833 (Docket No. RM16-15-000), including security information, should be submitted as critical energy infrastructure information pursuant to 18 CFR 388.113. See *Critical Electric Infrastructure Security and Amending Critical Energy Infrastructure Information*, Order No. 833, 81 Fed. Reg. 93,732 (December 21, 2016), FERC Stats. & Regs. 31,389 (2016). Information pertaining to items such as off-site emergency response, procedures for public notification and evacuation, and construction and operating reporting requirements would be subject to public disclosure. All information should be filed a minimum of 30 days before approval to proceed is requested.

- **<u>Prior to initial site preparation</u>, Gulf LNG should file an overall Project schedule, which includes the proposed stages of the commissioning plan.**
- **<u>Prior to initial site preparation</u>, Gulf LNG should file quality assurance and quality control procedures for construction activities.**
- **<u>Prior to initial site preparation</u>, Gulf LNG should file procedures for controlling access during construction.**
- **<u>Prior to initial site preparation</u>, Gulf LNG should file an updated ERP to include the Project facilities.**
- **<u>Prior to initial site preparation</u>, Gulf LNG should file an updated Cost-Sharing Plan identifying the mechanisms for funding all Project-specific security/emergency management costs that would be imposed on state and local agencies. This comprehensive plan should include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file change logs that list and explain any changes made from the FEED provided in Gulf LNG's application and filings. A list of all changes with an explanation for the design alteration should be provided and all changes should be clearly indicated on all diagrams and drawings.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file information/revisions pertaining to Gulf LNG' response numbers 15, 16, 17, 19, 43 from its March 1, 2016 filing, response numbers 20, 23, 41 from its April 5, 2016 filing, response 61 from is May 10, 2016 filing, response numbers 18, 24, 26, 35, 36, 37, 42, 48, 52, 56, 66, 67, 70, 71, 72, 74, 80, 91 from its October 7, 2016 filing which indicated features to be included or considered in the final design.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file three-dimensional plant drawings to confirm plant layout for maintenance, access, egress, and congestion.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file an up-to-date equipment list, process and mechanical data sheets, and specifications. The specifications should include:**
  - **a. building specifications (e.g., control buildings, electrical buildings, compressor buildings, storage buildings, pressurized buildings, ventilated buildings, blast resistant buildings);**
  - **b. mechanical specifications (e.g., piping, valve, insulation, rotating equipment, heat exchanger, storage tank and vessel, other specialized equipment);**
  - **c. electrical and instrumentation specifications (e.g., power system specifications, control system specifications, safety instrument system [SIS] specifications, cable specifications, other electrical and instrumentation specifications); and**
  - **d. security and fire safety specifications (e.g., security, passive protection, hazard detection, hazard control, firewater).**
- **<u>Prior to construction of final design</u>, Gulf LNG should file up-to-date PFDs and P&IDs. The PFDs should include HMBs. The P&IDs should include the following information:**
  - **a. equipment tag number, name, size, duty, capacity, and design conditions;**

b. equipment insulation type and thickness;

c. storage tank pipe penetration size and nozzle schedule;

d. valve high pressure side and internal and external vent locations;

e. piping with line number, piping class specification, size, and insulation type and thickness;

f. piping specification breaks and insulation limits;

g. all control and manual valves numbered;

h. relief valves with size and set points; and

i. drawing revision number and date.

- **<u>Prior to construction of final design</u>, Gulf LNG should file a car seal philosophy document and a list of all car-sealed and locked valves consistent with the P&IDs.**
- **<u>Prior to construction of final design</u>, the engineering, procurement, and construction contractor should verify that the recommendations from the FEED Hazard Identification are complete and consistent with the requirements of the final design as determined by the engineering, procurement, and construction contractor.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file a HAZOP review prior to issuing the P&IDs for construction. A copy of the review, a list of the recommendations, and actions taken on the recommendations should be filed.**
- **<u>Prior to construction of final design</u>, Gulf LNG should provide P&IDs, specifications, and procedures that clearly show and specify the tie-in details required to safely connect the Terminal Expansion to the existing facility.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file process design information for the thermal oxidizer system to include drawings, process simulation results, and calculations to ensure the thermal oxidizer is sized to remove up to 2 percent CO_2 from the feed gas streams.**
- **<u>Prior to construction of final design</u>, Gulf LNG should include a low temperature alarm and shutdown system on the piping connecting the overhead and bottoms of the deethanizer to isolate and protect the piping from potential cryogenic conditions.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file equipment datasheets and vendor drawings for the MR/PR compressor gas turbine emission control system.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (i.e., temperature, pressures, flows, and compositions).**
- **<u>Prior to construction of final design</u>, Gulf LNG should file cause-and-effect matrices for the process instrumentation, fire and gas detection system, and ESD system for review and approval. The cause-and-effect matrices should include alarms and shutdown functions, details of the voting and shutdown logic, and set points.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file an evaluation of ESD valve closure times. The evaluation should account for the time to detect an upset or hazardous condition, notify plant personnel, and close the ESD valve.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file an evaluation of dynamic pressure surge effects from valve opening and closure times and pump operations.**

- **<u>Prior to construction of final design</u>, Gulf LNG should demonstrate that, for hazardous fluids, piping and piping nipples 2 inches or less in diameter are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and operator live loads in areas accessible by operators.**
- **<u>Prior to construction of final design</u>, Gulf LNG should specify that all drains from high pressure hazardous fluid systems are to be equipped with double isolation and bleed valves.**
- **<u>Prior to construction of final design</u>, Gulf LNG should provide electrical area classification drawings. The drawings should demonstrate compliance with NFPA 59A, NFPA 70, NFPA 497, API 500, or equivalent, including but not limited to, illustrating or denoting Class 1 Division 1 and Division 2, as applicable, at the refrigerant truck transfer connection, diesel truck transfer connection, vents and reliefs. In addition, LNG and other fluids that would behave as dense gases should be designated as heavier than air and LNG and other fluids that have a vapor pressure exceeding 40 psia at 100°F should be designated as highly volatile liquids.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file drawings and details of how process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system meet the requirements of NFPA 59A (2001).**
- **<u>Prior to construction of final design</u>, Gulf LNG should file details of an air gap or vent installed downstream of process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap should vent to a safe location and be equipped with a leak detection device that should continuously monitor for the presence of a flammable fluid, alarm the hazardous condition, and shut down the appropriate systems.**
- **<u>Prior to construction of final design</u>, Gulf LNG should include layout and design specifications of the pig trap, inlet separation and liquid disposal, inlet/send out meter station, and pressure control.**
- **<u>Prior to construction of final design</u>, Gulf LNG should specify that piping and equipment that may be cooled with liquid nitrogen is to be designed for liquid nitrogen temperatures, with regard to allowable movement and stresses.**
- **<u>Prior to construction of final design</u>, Gulf LNG should provide a stress and structural analysis of the existing LNG storage tank piping and supports/platform to ensure they are adequately designed for the higher rated in-tank pump discharge flow rates and modifications.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file procedures for replacing, inspecting and testing the proposed in-tank pump column flanges and discharge piping.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file detailed drawing(s) and sizing calculations to verify the existing steel collection pan under the in-tank pump platform would be adequately sized to contain the maximum LNG flowrate from the higher rated in-tank pumps.**
- **<u>Prior to construction of the final design</u>, Gulf LNG should file a process narrative with accompanying detailed drawings for direct loading of LNG to a marine vessel from the rundown pumps.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file a process narrative with accompanying detailed drawings for the BOG system, including valving and piping to allow the BOG compressors to be pre-cooled during a standby condition.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file results of BOG compressor dynamic simulation to ensure the anti-surge valve speed and capacity is designed to prevent surge or reverse flow through the compressor during start-up and shutdown conditions.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file the sizing basis and capacity for the final design of the flares and/or vent stacks as well as the pressure and vacuum relief valves for major process equipment, vessels, and storage tanks.**

- **<u>Prior to construction of final design</u>, Gulf LNG should provide sizing calculations for pressure relief valve (16-PRV-1274) based on a full flow valve failure to provide adequate protection for the propane transfer drum in the event of back pressure in the purge gas line.**

- **<u>Prior to construction of final design</u>, Gulf LNG should include a relief valve study to evaluate the existing LNG storage tank vacuum relief valves to ensure they provide adequate protection based on the higher capacity in-tank pumps operating at full capacity.**

- **<u>Prior to construction of final design</u>, Gulf LNG should specify fixed toxic gas detection to detect H_2S releases from loss of containment from the acid gas piping system and potential release points (i.e., vents, relief valves, vent stacks, and thermal oxidizer stack).**

- **<u>Prior to construction of final design</u>, Gulf LNG should file three-dimensional model and hazard modeling results of acid gas vents and thermal oxidizer to demonstrate they are located safely away from work areas.**

- **<u>Prior to construction of final design</u>, Gulf LNG should provide the procedures for pressure/leak tests which address the requirements of ASME VIII and ASME B31.3.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file a plan for clean-out, dry-out, purging, and tightness testing. This plan should address the requirements of the American Gas Association's Purging Principles and Practice, and should provide justification if not using an inert or non-flammable gas for clean-out, dry-out, purging, and tightness testing.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file design and specifications for the hot oil distribution and discharge piping that safeguard them from temperature above their maximum design temperature.**

- **<u>Prior to construction of final design</u>, Gulf LNG should evaluate the high pressure alarm set point of (18-PAH 1001A) for the hot oil system and verify that it annunciates when the output from the pressure controller (18-PIC 1001A) signals valve (18-PV 1001A) to open.**

- **<u>Prior to construction of final design</u>, Gulf LNG should specify that all ESD valves are to be equipped with open and closed position switches connected to the Distributed Control System (DCS)/SIS.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file a drawing showing the location of the ESD buttons. ESD buttons should be easily accessible, conspicuously labeled, and located in an area which would be accessible during an emergency.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file fencing drawings. The fencing drawings should provide details of fencing that demonstrates it would restrict and deter access around the entire facility and has a 10-foot clearance from exterior features (e.g., power lines, trees, etc.) and from interior features (e.g., piping, equipment, buildings, etc.) with details of vehicle barriers at controlled access points.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file drawings and specifications for protecting transfer piping, firewater equipment (e.g. hydrants, monitors, manifolds, etc.)**

pumps, and compressors, etc. to ensure that they are located away from roadway or protected from inadvertent damage from vehicles.

- **<u>Prior to construction of final design</u>, Gulf LNG should file drawings and specifications for vehicle barriers at each facility entrance for access control.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file security camera and intrusion detection drawings. The security camera drawings should show the location, areas covered, and features of the camera (fixed, tilt/pan/zoom, motion detection alerts, low light, mounting height, etc.) to verify camera coverage of the entire perimeter with redundancies and cameras interior to the facility that would enable rapid monitoring of the Terminal Expansion. The drawings should show or note the location of the intrusion detection to verify it covers the entire perimeter of the Terminal Expansion.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file lighting drawings. The lighting drawings should show the location, elevation, type of light fixture, and lux levels of the lighting system and should illustrate adequate coverage of the perimeter of the facility and along paths/roads of access and egress.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file an updated fire protection evaluation of the proposed facilities. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations should be filed.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file spill containment system drawings with dimensions and slopes of curbing, trenches, impoundments, and capacity calculations considering any foundations and equipment within impoundments. The spill containment drawings should show containment for all hazardous fluids based on the largest flow from a single line for 10 minutes or from the largest vessel, or otherwise demonstrate that providing spill containment would not significantly reduce the flammable vapor dispersion or radiant heat consequences of a spill.**

- **<u>Prior to construction of final design</u>, Gulf LNG should specify the material of construction for the curbed areas, trenches, and impoundments as insulated concrete or otherwise demonstrate insulated concrete would not significantly reduce the flammable vapor dispersion or radiant heat consequences of a spill.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file the details of the wastewater removal systems for all hazardous liquid impoundments.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file detailed calculations to confirm that the final fire water volumes would be accounted for when evaluating the capacity of the impoundment system during a spill and fire scenario.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file complete drawings and a list of the hazard detection equipment. The drawings should clearly show the location and elevation of all detection equipment and demonstrate potential releases resulting in an off-site impact could be detected by at least two detectors to allow for shutdown in less than 10 minutes. The list should include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file an analysis of the localized hazards to operators from a potential liquid nitrogen release and should also provide low oxygen detectors or other mitigation that may be prudent.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file the details of the ESD system, including whether a plant-wide ESD button with proper sequencing and reliability would**

be installed or whether another system would be installed that is demonstrated through a human reliability analysis to provide a means to quickly and reliably shutdown the entire plant.

- **<u>Prior to construction of final design</u>, Gulf LNG should file a technical review of facility design that:**

  a. **identifies all combustion/ventilation air intake equipment and the distances to any possible flammable gas or toxic release; and**

  b. **demonstrates that these areas are adequately covered by hazard detection devices and indicates how these devices would isolate or shut down any combustion or heating ventilation and air conditioning equipment whose continued operation could add to or sustain an emergency.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of the hazard detectors when determining the lower flammable limit set points for methane, propane, butane, ethane, and condensate.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of hazard detectors when determining the set points for toxic components such as aqueous ammonia, natural gas liquids and H_2S.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file an evaluation of the voting logic and voting degradation for hazard detectors.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file a drawing that includes smoke detection in occupied buildings.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file a drawing that includes hazard detection equipment suitable to detect high temperatures and smoldering combustion products in electrical buildings and control room buildings.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file facility plan drawings and a list of the fixed and wheeled dry-chemical, hand-held fire extinguishers, and other hazard control equipment. Plan drawings should clearly show the location by tag number and elevation of all fixed dry-chemical system in accordance with NFPA 17, and wheeled and hand-held extinguishers demonstrate travel distances are along normal paths of access and egress and in compliance with NFPA 10. The list should include the equipment tag number, type, capacity, equipment covered, discharge rate, and automatic and manual remote signals initiating discharge of the units.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file a drawing that includes clean agent systems in the instrumentation buildings.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file drawings and specifications for the structural passive protection systems to protect equipment and supports from cryogenic releases.**

- **<u>Prior to construction of final design</u>, Gulf LNG should file a detailed quantitative analysis to demonstrate that adequate thermal mitigation would be provided for each significant component within the 4,000 BTU/ft^2-hr zone from an impoundment, or provide an analysis that evaluates the consequences of pressure vessel bursts and boiling liquid expanding vapor explosions. Trucks at the truck transfer station should be included in the analysis. A**

combination of passive and active protection should be provided and demonstrate the effectiveness and reliability. Effectiveness of passive mitigation should be supported by calculations for the thickness limiting temperature rise and effectiveness of active mitigation should be justified with calculations demonstrating flow rates and durations of any cooling water to mitigate the heat absorbed by the vessel.

- **<u>Prior to construction of final design</u>, Gulf LNG should file facility plan drawings showing the proposed location of the firewater and any foam systems. Plan drawings should clearly show the location of firewater and foam piping, post indicator valves, and the location and area covered by, each monitor, hydrant, hose, water curtain, deluge system, foam system, water-mist system, and sprinkler. The drawings should demonstrate that each process area, fire zone, or other sections of piping with several users can be isolated with post indicator valves and that firewater flow to cool exposed surfaces subjected to a fire. Drawings should also include P&IDs of the firewater and foam systems.**
- **<u>Prior to construction of final design</u>, Gulf LNG should include or demonstrate the firewater storage volume for its facilities has minimum reserved capacity for its most demanding firewater scenario plus 1,000 gpm for no less than 2 hours. The firewater storage should also demonstrate compliance with NFPA 22 or demonstrate how API 650 provides an equivalent or better level of safety.**
- **<u>Prior to construction of final design</u>, Gulf LNG should file firewater hydraulic calculations to demonstrate that the firewater system is capable of delivering 100 percent of the design rate for at least 2 hours.**
- **<u>Prior to construction of final design</u>, Gulf LNG should specify that the firewater flow test meter is equipped with a transmitter and that a pressure transmitter is installed upstream of the flow transmitter. The flow transmitter and pressure transmitter should be connected to the DCS and recorded.**
- **<u>Prior to commissioning</u>, Gulf LNG should file a detailed schedule for commissioning through equipment start-up. The schedule should include milestones for all procedures and tests to be completed: prior to introduction of hazardous fluids and during commissioning and start-up. Gulf LNG should file documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and start-up will be issued.**
- **<u>Prior to commissioning</u>, Gulf LNG should file detailed plans and procedures for: testing the integrity of on-site mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service.**
- **<u>Prior to commissioning</u>, Gulf LNG should file a plan for clean-out, dry-out, purging, and tightness testing. This plan should address the requirements of the American Gas Association's Purging Principles and Practice, and should provide justification if not using an inert or non-flammable gas for clean-out, dry-out, purging, and tightness testing.**
- **<u>Prior to commissioning</u>, Gulf LNG should file the procedures for pressure/leak tests which address the requirements of ASME BPVC Section VIII and ASME B31.3. The procedures should include a line list of pneumatic and hydrostatic test pressures.**
- **<u>Prior to commissioning</u>, Gulf LNG should file updated operation and maintenance procedures and manuals, as well as safety procedures, hot work procedures and permits, abnormal operating conditions reporting procedures, simultaneous operations procedures, and management of change procedures and forms.**

- **Prior to commissioning, Gulf LNG should tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.**

- **Prior to commissioning, Gulf LNG should file and maintain a detailed training log to demonstrate that operating, maintenance, and emergency response staff has completed the required training.**

- **Prior to introduction of hazardous fluids, Gulf LNG should complete and document all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the DCS and SIS that demonstrates full functionality and operability of the system.**

- **Prior to introduction of hazardous fluids, Gulf LNG should file an updated alarm management program to ensure effectiveness of operator response to alarms.**

- **Prior to introduction of hazardous fluids, Gulf LNG should complete and document a firewater pump acceptance test and firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant should be shown on facility plot plan(s).**

- **Prior to introduction of hazardous fluids, Gulf LNG should complete and document a pre-start-up safety review to ensure that installed equipment meets the design and operating intent of the facility. The pre-start-up safety review should include any changes since the last hazard review, operating procedures, and operator training. A copy of the review with a list of recommendations, and actions taken on each recommendation, should be filed.**

- **Gulf LNG should file a request for written authorization from the Director of OEP prior to unloading or loading the first LNG commissioning cargo. After production of the first LNG, Gulf LNG should file weekly reports on the commissioning of the proposed systems that detail the progress toward demonstrating the facilities can safely and reliably operate at or near the design production rate. The reports should include a summary of activities, problems encountered, and remedial actions taken. The weekly reports should also include the latest commissioning schedule, including projected and actual LNG production by each liquefaction train, LNG storage inventories in each storage tank, and the number of anticipated and actual LNG commissioning cargoes, along with the associated volumes loaded or unloaded. Further, the weekly reports should include a status and list of all planned and completed safety and reliability tests, work authorizations, and punch list items. Problems of significant magnitude should be reported to the FERC within 24 hours.**

- **Prior to commencement of service, Gulf LNG should label piping with fluid service and direction of flow in the field, in addition to the pipe labeling requirements of NFPA 59A (2001).**

- **Prior to commencement of service, Gulf LNG should file plans for any preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring.**

- **Prior to commencement of service, Gulf LNG should file updated procedures for off-site contractors' responsibilities, restrictions, and limitations and for supervision of these contractors by Gulf LNG staff.**

- **Prior to commencement of service, Gulf LNG should notify the FERC staff of any proposed revisions to the security plan and physical security of the plant.**

- **Prior to commencement of service, Gulf LNG should file a request for written authorization from the Director of OEP. Such authorization would only be granted following a**

determination by the USCG, under its authorities under the *Ports and Waterways Safety Act*, *the Magnuson Act*, *the MTSA of 2002*, and the *Safety and Accountability For Every Port Act*, that appropriate measures to ensure the safety and security of the facility and the waterway have been put into place by Gulf LNG or other appropriate parties.

In addition, the following recommendations should apply throughout the life of the facility:

- **The facilities should be subject to regular FERC staff technical reviews and site inspections on at least an <u>annual basis</u> or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, Gulf LNG should respond to a specific data request including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed P&IDs reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, should be submitted.**

- **<u>Semi-annual</u> operational reports should be filed with the Secretary to identify changes in design and operating conditions; abnormal operating experiences; activities (e.g., marine vessel arrivals, quantity and composition of imported and exported LNG, liquefied and vaporized quantities, boil off/flash gas); and plant modifications, including future plans and progress thereof. Abnormalities should include, but not be limited to, unloading/loading/shipping problems, potential hazardous conditions from off-site vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, hazardous fluids releases, fires involving hazardous fluids and/or from other sources, negative pressure (vacuum) within a storage tank, and higher than predicted boil off rates. Adverse weather conditions and the effect on the facility also should be reported. Reports should be submitted <u>within 45 days after each period ending June 30 and December 31</u>. In addition to the above items, a section entitled "Significant Plant Modifications Proposed for the Next 12 Months (dates)" should be included in the semi-annual operational reports. Such information would provide the FERC staff with early notice of anticipated future construction/maintenance at the facilities.**

- **In the event the temperature of any region of any secondary containment, including imbedded pipe supports, becomes less than the minimum specified operating temperature for the material, the Commission should be notified <u>within 24 hours</u> and procedures for corrective action should be specified.**

- **Significant non-scheduled events, including safety-related incidents (e.g., LNG, heavier hydrocarbons, refrigerant, or natural gas releases; fires; explosions; mechanical failures; unusual over pressurization; and major injuries) and security-related incidents (e.g., attempts to enter site, suspicious activities) should be reported to the FERC staff. In the event that an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification should be made immediately, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification should be made to the FERC staff <u>within 24 hours</u>. This notification practice should be incorporated into the emergency response plan. Examples of reportable hazardous fluids-related incidents include:**

  a. fire;

b. explosion;

c. estimated property damage of $50,000 or more;

d. death or personal injury necessitating in-patient hospitalization;

e. release of hazardous fluids for 5 minutes or more;

f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of facilities that contains, controls, or processes hazardous fluids;

g. any crack or other material defect that impairs the structural integrity or reliability of facilities that contain, control, or process hazardous fluids;

h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes hazardous fluids to rise above its maximum allowable operating pressure (or working pressure for facilities) plus the build-up allowed for operation of pressure-limiting or control devices;

i. a leak in a facility that contains or processes hazardous fluids that constitutes an emergency;

j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;

k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or a facility that contains or processes hazardous fluids;

l. safety-related incidents from hazardous fluids transportation occurring at or en route to and from the facilities; or

m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an incident management plan.

In the event of an incident, the Director of OEP has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property, or the environment, including authority to direct the facilities to cease operations. Following the initial company notification, the FERC staff would determine the need for a separate follow-up report or follow-up in the upcoming semi-annual operational report. All company follow-up reports should include investigation results and recommendations to minimize a reoccurrence of the incident.

4.12.1.6 Conclusions on LNG Facility and LNG Marine Vessel Reliability and Safety

As part of the NEPA review and NGA determinations, we assess the potential impact to the human environment in terms of safety and assess whether the proposed facilities would be able to operate safely, reliably, and securely.

As a cooperating agency, the DOT assists the FERC staff by determining whether Gulf LNG's proposed design would meet the DOT's 49 CFR 193 Subpart B siting requirements. The DOT will provide a LOD on the Project's compliance with 49 CFR 193 Subpart B. This would be provided to the Commission for further consideration during its decision and final action on the Project application. If the facility is authorized and constructed, the facility would be subject to the DOT's inspection and enforcement program and final determination of whether a facility is in compliance with the requirements of 49 CFR 193 would be made by the DOT staff.

As a cooperating agency, the USCG also assisted the Commission by reviewing the proposed LNG Terminal and the associated LNG marine vessel traffic. The USCG reviewed a WSA submitted by Gulf LNG that focused on the navigation safety and maritime security aspects of LNG marine vessel transits along the affected waterway. On May 4, 2016, the USCG issued a LOR staff indicating the Bayou Casotte turning basin, Bayou Casotte Channel, Lower Pascagoula Channel, Horn Island Pass Channel, and Pascagoula Bar Channel would be considered suitable for accommodating the type and frequency of LNG marine traffic associated with the Liquefaction Project, based on the WSA and in accordance with the guidance in the USCG's NVIC 01-11. If the Liquefaction Project is authorized and constructed, the facilities would be subject to the USCG's inspection and enforcement program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

FERC staff conducted a preliminary engineering and technical review of the Gulf LNG design, including potential external impacts based on the site location. Based on our review, we recommend a number of mitigation measures and continuous oversight prior to initial site preparation, prior to construction of final design, prior to commissioning, prior to introduction of hazardous fluids, prior to commencement of service, and throughout the life of the facility to enhance the reliability and safety of the facility and to mitigate the risk of impact on the public. With the incorporation of these mitigation measures and oversight, we conclude that the Gulf LNG Terminal design would include acceptable layers of protection or safeguards that would reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public.

4.12.2 Pipeline Modifications

4.12.2.1 Pipeline Safety Standards

The transportation of natural gas by pipeline involves some risk to the public in the event of an accident and subsequent release of gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death.

Methane has an ignition temperature of 1,000 °F and is flammable at concentrations between 5 and 15 percent in air. Unconfined mixtures of methane in air are not explosive. However, a flammable concentration within an enclosed space in the presence of an ignition source can explode. It is buoyant at atmospheric temperatures and disperses rapidly in air.

The DOT is mandated to provide pipeline safety under 49 USC 601. The PHMSA Office of Pipeline Safety administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards, which set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety. The PHMSA ensures that people and the environment are protected from the risk of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local level. Section 5(a) of the Natural Gas Pipeline Safety Act provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards, while Section 5(b) permits a state agency that does not qualify under Section 5(a) to perform certain inspection and monitoring functions. The state of Mississippi has a Section 5(a) certification.

The DOT pipeline standards are published in 49 CFR 190 to 199. Part 192 address natural gas pipeline safety issues. Under an MOU on Natural Gas Transportation Facilities (Memorandum) dated January 15, 1993 between the DOT and the FERC, the DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of the FERC's regulations require an applicant certify that the applicant will design, install, inspect, test, construct, operate, replace, and maintain the facility for which a certificate is requested in accordance with federal safety standards and plans for maintenance and inspection, or to certify that the applicant has been granted a waiver of the requirements of the safety standards by the DOT in accordance with Section 3(e) of the Natural Gas Pipeline Safety Act. Gulf LNG has stated that it would design, construct, operate, and maintain its pipeline and aboveground facilities associated with the Pipeline Modifications in accordance with the DOT's Minimum Federal Safety Standards in 49 CFR 192.

The FERC accepts this certification and does not impose additional safety standards other than the DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert the DOT. The Memorandum also provides for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipelines under the Commission's jurisdiction. The FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee, which determines whether proposed safety regulations are reasonable, feasible, and practicable.

4.12.2.2 Pipeline Modifications

Gulf LNG would modify the Destin and Gulfstream Meter Stations and the existing Gulf LNG Pipeline at the existing LNG Import Terminal in accordance with 49 CFR 192. The proposed Pipeline Modifications would include bypass lines, switching valves, and new filter/separators. No special provisions for reverse flow would be required, and there would be no changes to the existing instrumentation and control equipment. No measures would be required to comply with the PHMSA Advisory Bulletin ADB-2014-04 regarding flow reversals.

Transco would also make modifications to the existing and jointly owned Transco/FGT Interconnection to permit bi-directional flow. These modifications would be constructed by Transco and would be reviewed by the FERC under its blanket certificate process.

The only modification to the Gulf LNG Pipeline would be at the southern end of the existing pipeline where Gulf LNG would construct a new connection to the liquefaction pre-treatment facilities within the Terminal Expansion site. Internal pipe inspection would not be affected and would continue as currently scheduled.

As required by 49 CFR 192, Gulf LNG has a written operation plan for the existing pipeline. That plan would be modified to accommodate the Pipeline Modifications and the reversal of pipeline flow. There would be no change to the current pipeline monitoring program; the pipeline would continue to be monitored in accordance with DOT requirements or better. Gulf LNG also has an emergency plan as required by 49 CFR 192.615. That plan, which includes procedures to minimize the hazards in a natural gas pipeline emergency, would be modified, if appropriate, to incorporate the Pipeline Modifications.

4.12.2.3 Summary

As described above, the Pipeline Modifications would be constructed and operated at existing pipeline facilities in accordance with DOT requirements. Therefore, we believe that operation of the Pipeline Modifications would be safe and would represent a negligible increase in risk to the public.

4.13 CUMULATIVE IMPACTS

Cumulative impacts may result when the environmental effects associated with a proposed project are added to impacts associated with past, present, and reasonably foreseeable future projects. Although the individual impact of each separate project might not be significant, the additive or synergistic effects of multiple projects could be significant.

This cumulative impacts analysis uses an approach consistent with the methodology set forth in relevant guidance (CEQ, 1997; CEQ, 2005; EPA, 1999b), and focuses on potential impacts from the proposed Project on resource areas or issues where their incremental contribution would be potentially significant when added to the potential impacts of other actions. To avoid unnecessary discussions of insignificant impacts and projects and to adequately address and accomplish the purposes of this analysis, an action must first meet the following three criteria to be included in the cumulative analysis:

- impact a resource potentially affected by the proposed Project;
- impact that resource within all, or part of, the geographic scope of the Project. The geographical area considered varies depending on the resource being discussed, which is the general area in which the Project could contribute to cumulative impacts on that particular resource; and
- impact that resource within all, or part of, the time span for the potential impact from the proposed Project.

Table 4.13.1-1 lists present and reasonably foreseeable future actions that may, when added to the effects of past actions and the effects of construction and operation of the Project, result in a cumulative effect on environmental resources (see also figure 4.13-1). These actions were identified based on information provided by Gulf LNG; internet research; stakeholder comments; and communications with federal, state, and local agencies.

The criteria listed below define the Project's geographic scope, which is used in this cumulative impacts analysis to describe the general area for which the Project could contribute to cumulative impacts. Specifically, for the various resources our conservative approach considered that the:

- geographic scope of potential impact on geologic resources and hazards was the area affected by and immediately adjacent to proposed construction areas for the Project;
- geographic scope of potential impact on soils was the area affected by and immediately adjacent to the construction areas for the Project;
- geographic scope of potential impact established on groundwater, surface water, vegetation, aquatic, threatened and endangered species, and wildlife resources includes the hydrologic unit code (HUC)-12 watersheds Bayou Casotte-Point Aux Chenes Bay (031700090301) and Point Aux Chenes Bay-Mississippi Sound (031700090303) underlying the Project;
- geographic scope of potential impact on land use and recreational resources was a 1-mile-radius around the Project;

- geographic scope of potential impact on visual resources was considered to be a 12-mile radius around the Project;[37]
- geographic scope of potential impact on socioeconomics was Jackson County, Mississippi, where Gulf LNG would construct the Project, and where most workers would reside during construction and operation of the Project;
- geographic scope for potential impacts on environmental justice was census tracts 420, 421, 426, and 427, that encompass the Project and the tract immediately across Bayou Casotte;
- geographic scope for potential impacts on marine transportation was the Bayou Casotte Navigation Channel and the Mississippi Sound within the vicinity of the Terminal Expansion;
- geographic scope for potential impacts on land transportation include Jackson County, Mississippi;
- geographic scope of potential impact for cultural resources was the overlapping impacts within the APE of the proposed Project;
- geographic scope for air quality during operation of the Project was defined by the Terminal's PSD Radius of Impact (the maximum distance from the Project at which the impact exceeds the SIL). Other projects, within 50 km (about 31.1 miles), which could contribute to cumulative impacts on air quality were also identified. The methodology and cumulative impacts analysis is described in section 4.11;
- geographic scope for noise was a 2-mile radius around the Project;
- geographic scope of potential impact on safety was the Mississippi Sound and the Bayou Casotte Navigation Channel for the Terminal Expansion and the area adjacent to and in the vicinity of Pipeline Modifications. The cumulative area for emergency services includes the area in the general vicinity of the Project and other projects listed in table 4.13.1-1.

For the purposes of this analysis, the temporal extent of cumulative actions would start in the recent past and extend out for the expected physical operational service life of the Project (50 years). "Reasonably foreseeable actions" are proposed actions or developments that have applied for a permit from federal, state, or local authorities or that are publicly known.

[37] According to Gulf LNG 12 miles is the line of sight across a flat ocean to a point half way up the existing Terminal tanks.

TABLE 4.13.1-1

Past, Present, and Reasonably Foreseeable Actions Considered in the Cumulative Impacts Analysis a/

Project Type	Project ID b/	Project Description	Temporal Status	Area Affected	Resources Affected within the Geographic Scope	In HUC-12 Watershed	Overlap with Gulf LNG
FERC Non-jurisdictional Facilities Considered for the Cumulative Impacts Analysis							
Mississippi Power Company (MPC) Upgrade to Gulf LNG Terminal	16	The Gulf LNG Terminal Expansion would add about 100 megawatts of load to the local utility, MPC's system. The LNG Import Terminal is served by an existing 23 kV distribution line. MPC indicates that service to the Project site would be upgraded by adding a new 115kV substation (1.4 acres), located immediately adjacent and contiguous to Gulf LNG's new electric service facilities, that this is included in our Project impacts, and by adding two new 115 kV transmission lines on concrete poles. Concrete poles would be about 30- to 36-inch diameter at the physical ground surface and would be about 300 feet to 500 feet apart within rights-of-way of about 100 feet in width and about 1.5 miles in length.	Anticipated 2020	18 acres	Geology; soils; surface water; wetlands; vegetation; wildlife; visual	Yes (Bayou Casotte-Point Aux Chenes Bay)	Yes
JCPA Maintenance Dredging of the North Supply Dock	20	After construction of the Project is completed, ownership of the North Supply Dock would be transferred to the JCPA. In addition to use of the North Supply Dock by barges and support vessels associated with operation of the Project, the dock may also be used by the JCPA as a berthing facility for barges waiting for a berth at one of the private or public terminals in the Bayou Casotte Harbor or for temporary berthing of other vessels not associated with the Project. Dredging of about 10,000 cy per year is expected.	Anticipated 2025	10,000 cy per year	Surface water; fisheries; marine organisms	Yes (Bayou Casotte-Point Aux Chenes Bay)	Yes

TABLE 4.13.1-1

Past, Present, and Reasonably Foreseeable Actions Considered in the Cumulative Impacts Analysis a/

Project Type	Project ID b/	Project Description	Temporal Status	Area Affected	Resources Affected within the Geographic Scope	In HUC-12 Watershed	Overlap with Gulf LNG
COE Earthen Berm Maintenance and Extension	21	Following initial construction of the berm by Gulf LNG, the COE, in order to expand capacity of the BCDMMS, would extend the berm to a height of 39.2 feet NAVD. The COE would be responsible for maintaining the berm during operations of the Project	Anticipated 2025	Unknown	Geology	Yes (Bayou Casotte-Point Aux Chenes Bay)	Yes
Truck Transport of NGLs	22	The Project would require trucking of NGLs or condensate generated as part of the liquefaction process, and makeup refrigerants including ethane, propane, and nitrogen used in the liquefaction process and amine solution used in the acid gas removal system. During normal plant operation with average feed gas, 5 trucks per month of condensate would be removed from the Terminal Expansion. Ethane would be trucked into the facility up to two times each month. Propane would be trucked into the facility up to four times each month. Additionally, amine associated with the acid gas removal system would be trucked in one time per year for makeup and re-inventory of the amine systems after removal of the spent amine during major scheduled maintenance activities. Liquid nitrogen would be delivered by truck twice per year for makeup refrigerant.	Anticipated 2025	N/A	Socioeconomic	Yes (Bayou Casotte-Point Aux Chenes Bay)	Yes
Other Projects Considered for the Cumulative Impacts Analysis							
State Highway 611 Widening Project	1	Widening Highway 611 to five lanes from Old Mobile Highway to the end of the route near the Chevron Refinery, railroad crossing replacements, as well as relocation and reconstruction of several intersections.	Completed 2017	40 acres	Surface water and wetlands; vegetation; wildlife; land use; socioeconomic	Yes (Bayou Casotte-Point Aux Chenes Bay)	Yes

TABLE 4.13.1-1

Past, Present, and Reasonably Foreseeable Actions Considered in the Cumulative Impacts Analysis a/

Project Type	Project ID b/	Project Description	Temporal Status	Area Affected	Resources Affected within the Geographic Scope	In HUC-12 Watershed	Overlap with Gulf LNG
Bayou Casotte Harbor Channel Improvement Project	2	The Bayou Casotte Harbor Channel Improvement Project involves dredging and widening the Pascagoula channel from the Horn Island Pass to the entrance of the Bayou Casotte Harbor. The preferred plan consists of widening the navigation channel 100 feet to the west about 38,549 feet (~7.3 miles) in length along with bend easing north of Horn Island Pass. The northern portion of the Horn Island Pass Channel would be widened as necessary to facilitate (ease) the transition between the two channel segments.	Planning phase. The DEIS was completed in May 2014. Preparation of the Final Environmental Impact Statement (FEIS) is ongoing. The COE anticipates the FEIS for the project to be released in 2019.	3,400,000 cy	Surface water; fisheries; marine organisms; recreation	Yes (Point Aux Chenes Bay – Mississippi Sound)	Unknown (timing and specific location of dredge spoil placement are still to be determined by the COE)
Chevron Base Oil Plant Project	3	The Pascagoula Base Oil Plant is adjacent to Gulf LNG and involved the filling of 72 acres of wetland and the dredging of 12 acres of water bottoms and the removal of 400,000 cy of dredge material.	Completed in June 2014	90 acres; 400,000 cy	Surface water; wetlands; vegetation; wildlife; visual; socioeconomic	Yes (Bayou Casotte-Point Aux Chenes Bay)	No (1.7 miles northeast of the Project)
Hague Property Housing Development	4	Construction of a single-family housing development with possible mixed use components at 5102 Old Mobile Highway, also known as the Hague Property in Pascagoula, MS.	Planning phase. The Pascagoula Strategic Housing Subcommittee is currently soliciting qualifications for a developer to work with the subcommittee.	77 acres	Surface water; wetlands; vegetation; wildlife; visual; socioeconomic	Yes (Bayou Casotte-Point Aux Chenes Bay)	No (3.7 miles north of the Project)
Holland Street Housing Development	5	Construction of a single-family housing development with possible mixed use components along Holland Street.	Planning phase. The Pascagoula Strategic Housing Subcommittee is currently soliciting qualifications for a developer to work with the subcommittee.	16 acres	Surface water; wetlands; vegetation; wildlife; visual; socioeconomic	Yes (Bayou Casotte-Point Aux Chenes Bay)	No (1.9 miles northwest of the Project)

TABLE 4.13.1-1

Past, Present, and Reasonably Foreseeable Actions Considered in the Cumulative Impacts Analysis a/

Project Type	Project ID b/	Project Description	Temporal Status	Area Affected	Resources Affected within the Geographic Scope	In HUC-12 Watershed	Overlap with Gulf LNG
Hospital Road Improvement Project	6	The City of Pascagoula is expanding Hospital Road from two lanes to five lanes and adding sidewalks and bicycle lanes. A center median filled with native plants and shrubs will also be constructed.	Ongoing construction date unknown. Completion	5 acres	Vegetation; wildlife; socioeconomic	Yes (Bayou Casotte-Point Aux Chenes Bay)	No (3.8 miles northwest of the Project)
Greenwood Island (BU Site)	7	Greenwood Island is a BU site for the disposal of dredged sediment. In addition to dredge material placement, marsh creation, small bird islands, and mosquito ditch filling have also been identified as possible beneficial uses at various sites.	Planning phase. 2014 Draft EIS and Feasibility Study. Final EIS anticipated in 2019	Unknown	Surface water; fisheries; marine organisms	Yes (Bayou-Casotte-Point Aux Chenes Bay and Point Aux Chenes Bay-Mississippi Sound)	Unknown (timing and specific location of dredge spoil placement are still to be determined by the COE)
Littoral Zone (BU Site)	8	This site has been identified as a disposal site for dredged material.	Planning phase. 2014 Draft EIS and Feasibility Study. Final EIS anticipated in 2019.	Unknown	Surface water; fisheries; marine organisms	Yes (Point Aux Chenes Bay – Mississippi Sound)	Generally located about 8 miles south of the Project site (timing and specific location of dredge spoil placement are still to be determined by the COE)
Mississippi Phosphate Company	9	Mississippi Phosphate Corporation filed for bankruptcy in 2014 and left more than 700 million gallons of stored contaminated waste water. The EPA obtained control of the facility in February 2017 and has been treating about 2 million gallons of wastewater per day. In January 2018, the EPA added the site to the Superfund National Priorities List. On April 18, 2018, an Action Memorandum for $107.6 million was executed by the EPA to accelerate clean-up of the site from 2018 to 2020.	The site has been listed as a superfund site. Clean-up is ongoing and is expected to continue through 2020.	N/A	Surface water; socioeconomic	Yes (Bayou Casotte-Point Aux Chenes Bay)	No (1.9 miles north of the Project)

TABLE 4.13.1-1

Past, Present, and Reasonably Foreseeable Actions Considered in the Cumulative Impacts Analysis a/

Project Type	Project ID b/	Project Description	Temporal Status	Area Affected	Resources Affected within the Geographic Scope	In HUC-12 Watershed	Overlap with Gulf LNG
Mobile Bay Gas Processing Facility	10	Williams Mobile Bay Producer Services is proposing to construct additional facilities to increase the capacity of their Coden Gas Plant and enable that facility to process additional natural gas streams from new offshore drilling development.	Permitting phase. Construction is anticipated to begin in 2019.	37 acres	Air Quality (operation)	No	No (20 miles east/northeast of the Project)
Pascagoula Harbor Dredging Activities and Pascagoula Harbor Federal Navigation Project	11 and 12	The COE, Mobile District, proposes to conduct previously-authorized, new work, and maintenance dredging associated with the federally-authorized Pascagoula Harbor Federal Navigation Project in Jackson County, Mississippi. The project proposes to dredge the Upper Pascagoula Channel and Pascagoula River Channel segments of the Pascagoula Harbor Federal Navigation Project from the existing depth of -38 feet mean lower low water (MLLW) to the federally-authorized channel depth of -42 feet MLLW and to maintain the channel at the specified depths in the future.	Ongoing construction	2,000,000 cy; approximately 150 acres of marsh creation	Surface water; wetlands; fisheries; marine organisms; land use; recreation	Yes (Bayou Casotte Bay-Point Aux Chenes Bay and Point Aux Chenes Bay-Mississippi Sound)	No (0.8 mile northwest of the Project)
Port of Pascagoula Wood Pellet Terminal	13	The Port of Pascagoula plans to build a specialized wood pellet exporting facility on Bayou Casotte. Green Circle Bio Energy Inc. will use the site to export up to 500,000 tons of pellets per year to European utility companies. The warehouse facility adjacent to Terminals E and F within the Bayou Casotte Harbor is expected to be demolished for construction of the Wood Pellet Facility at the current warehouse's location. A DOT grant would relocate about 2.5 miles of railroad, close 16 rail crossings, build a new 5,400-foot interchange yard, and install 6,200 feet of new railroad track.	Wood Pellet Terminal - Anticipated to begin construction in 2019. Railroad Interchange construction ongoing – expected to be complete in 2019.	95 acres	Soils and geology; surface water; visual; socioeconomic; noise (construction)	Yes (Bayou Casotte-Point Aux Chenes Bay)	No. Gulf LNG has agreed to not utilize CSA-6 if the projects overlapped in time.(1.7 miles northwest of the Terminal Expansion)

TABLE 4.13.1-1

Past, Present, and Reasonably Foreseeable Actions Considered in the Cumulative Impacts Analysis a/

Project Type	Project ID b/	Project Description	Temporal Status	Area Affected	Resources Affected within the Geographic Scope	In HUC-12 Watershed	Overlap with Gulf LNG
Round Island (BU Site)	14	Round Island is a BU site for the disposal of dredged sediment.	Planning phase. 2014 Draft EIS and Feasibility Study. Final EIS anticipated in 2019.	Unknown	Surface water; fisheries; marine organisms	Yes (Point Aux Chenes Bay-Mississippi Sound and Biloxi Bay-Mississippi Sound)	About 6 miles northeast of Project site (timing and specific location of dredge spoil placement are still to be determined by the COE)
Signal International LLC, East Bank Yard	15	Signal International LLC operates their East Bank Yard in Bayou Casotte. The facility is 94 acres in total area and includes a 30,000 ton dry dock. Maintenance dredging is performed every 4 to 5 years with 10,000 to 20,000 cy of sediment dredged each time. On June 10, 2013, MDEQ issued a renewal of Signal International, LLC's Title V Permit.	Ongoing maintenance dredging	10,000 to 20,000 cy	Surface water; air quality (operation)	Yes (Bayou-Casotte-Point Aux Chenes Bay)	No (1.5 miles northwest of the Project)
Singing River Island (BU Site)	17	Singing River Island has been identified as a potential BU site for the disposal of dredged sediment. In addition to dredge material placement, marsh creation, small bird islands, and mosquito ditch filling have also been identified as possible beneficial uses at various sites.	Planning phase. 2014 Draft EIS and Feasibility Study. Final EIS anticipated in 2019.	Unknown	Surface water; fisheries; marine organisms	Yes (Point Aux Chenes Bay-Mississippi Sound)	Unknown (timing and specific location of dredge spoil placement are still to be determined by the COE)

TABLE 4.13.1-1

Past, Present, and Reasonably Foreseeable Actions Considered in the Cumulative Impacts Analysis a/

Project Type	Project ID b/	Project Description	Temporal Status	Area Affected	Resources Affected within the Geographic Scope	In HUC-12 Watershed	Overlap with Gulf LNG
Terminal E/F and G/H Maintenance Dredging (Bayou Casotte Ship Basin)	18	Maintenance dredging of the Bayou Casotte Ship Basin between Terminals E&F and G&H. The basin would be dredged to 38 feet plus an additional 2 feet for advanced maintenance. The area adjacent to the G Extension docks would be dredged to 25 feet plus an additional 2 feet for advanced maintenance. About 150,000 cy of material would be removed for the initial maintenance. An additional 45,000 cy would be dredged every 3 to 4 years to account for an annual shoaling rate of 12,000 cy to 15,000 cy. The dredged material is proposed to be removed by hydraulic dredging and would be discharged into the BCDMMS. The material may also be mechanically dredged and placed into the Port's dredge material placement site (former International Paper Wastewater Pond Site) or other approved BU sites if the BCDMMS is unavailable or not the preferred option at the time of dredging and disposal activities. The appropriate sampling for BU disposal will be conducted if these sites become necessary.	Complete. COE Joint Public Notice Mobile District/State of Mississippi dated November 22, 2013 (SAM-2013-01299-PAH and DMR-040396).	150,000 cy	Surface water; fisheries and marine organisms; recreation	Yes (Bayou Casotte-Point Aux Chenes Bay)	No (1.6 miles north of the Project)

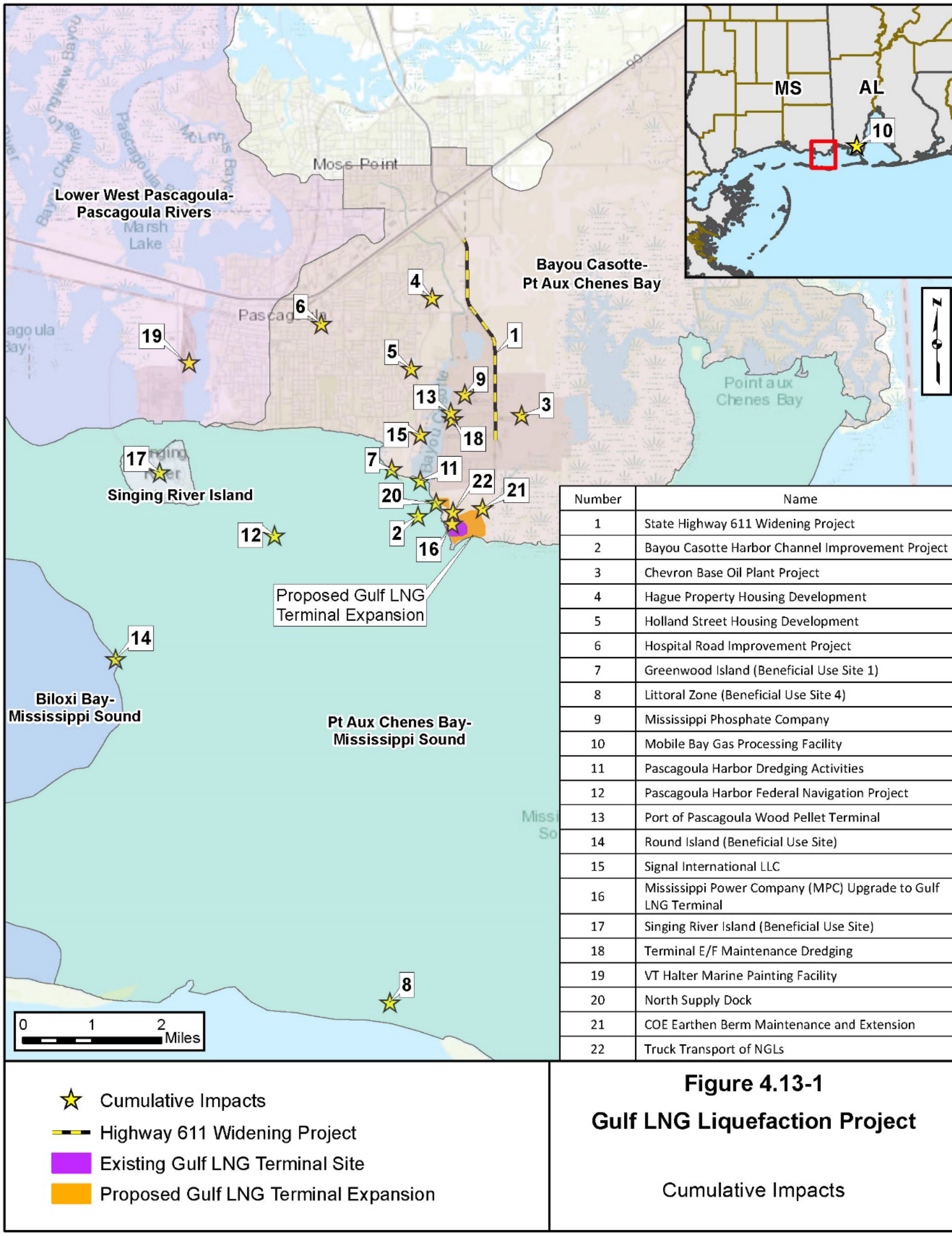
TABLE 4.13.1-1

Past, Present, and Reasonably Foreseeable Actions Considered in the Cumulative Impacts Analysis a/

Project Type	Project ID b/	Project Description	Temporal Status	Area Affected	Resources Affected within the Geographic Scope	In HUC-12 Watershed	Overlap with Gulf LNG
Mississippi Coastal Improvements Program (MsCIP) Comprehensive Barrier Island Restoration	Not depicted on figure 4.13-1	The project area includes the mainland coast of Mississippi, the Mississippi Sound, the Mississippi-Alabama barrier islands, and the northern Gulf of Mexico to about 8 miles seaward of the barrier islands. The MsCIP, as designed including the restoration of existing and placement of new barrier islands, will protect and maintain the estuarine ecosystem of the Mississippi Sound and reduce storm damage; preserve and protect the Mississippi barrier islands; reduce erosion and land loss of the barrier islands; and enhance the long-term sand supply to the littoral drift system.	Permitting	22,000,000 cy 1,280 sq. miles	Surface water; fisheries and marine organisms; recreation	Yes (Point Aux Chenes Bay-Mississippi Sound)	About 8 miles south of the Project site (timing and specific location of dredge spoil placement are still to be determined by the COE)
VT Halter Marine Blast and Paint Facility	19	In April 2018, VT Halter Marine completed construction of a large blasting and painting facility.	Construction completed April 2018.	17 acres	Water resources; vegetation; wildlife; visual; socioeconomic	Yes	No (5 miles southeast of the Project site; construction was completed in April 2018)

a This table is not intended to provide an all-inclusive listing of projects, however, it does list those projects with the most potential to contribute to cumulative impacts in the vicinity of the Project.

b Project ID refers to the identification # assigned to the project on figure 4.13-1.



Number	Name
1	State Highway 611 Widening Project
2	Bayou Casotte Harbor Channel Improvement Project
3	Chevron Base Oil Plant Project
4	Hague Property Housing Development
5	Holland Street Housing Development
6	Hospital Road Improvement Project
7	Greenwood Island (Beneficial Use Site 1)
8	Littoral Zone (Beneficial Use Site 4)
9	Mississippi Phosphate Company
10	Mobile Bay Gas Processing Facility
11	Pascagoula Harbor Dredging Activities
12	Pascagoula Harbor Federal Navigation Project
13	Port of Pascagoula Wood Pellet Terminal
14	Round Island (Beneficial Use Site)
15	Signal International LLC
16	Mississippi Power Company (MPC) Upgrade to Gulf LNG Terminal
17	Singing River Island (Beneficial Use Site)
18	Terminal E/F Maintenance Dredging
19	VT Halter Marine Painting Facility
20	North Supply Dock
21	COE Earthen Berm Maintenance and Extension
22	Truck Transport of NGLs

Figure 4.13-1
Gulf LNG Liquefaction Project

Cumulative Impacts

4.13.1 Projects and Activities Considered

There are many existing, under construction, planned, and reasonably foreseeable projects in the vicinity of Gulf LNG's Project. Table 4.13.1-1 lists the substantial projects and activities that were considered in this cumulative impact analysis (see also figure 4.13-1).

CEQ regulations require agencies to consider environmental effects of proposed actions, including direct and indirect effects, if these effects are reasonably foreseeable.

Several liquefaction and export projects that are proposed, planned, or under construction in the vicinity of the proposed Project were identified and discussed in section 3.0. None of these projects would be within the geographic scope of the proposed Project. Therefore, these facilities would not have the potential to contribute to cumulative impacts when combined with the proposed Project.

4.13.1.1 State Highway 611 Widening Project

The project was completed in 2017 and extended from Old Mobile Highway to near the Chevron Refinery. Highway 611 is now a five-lane highway. The project required railroad crossing replacements and the reconstruction and relocation of several intersections (Sun Herald, 2017) and affected about 40 acres. The location of this project is depicted as project #1 on figure 4.13-1.

4.13.1.2 Bayou Casotte Harbor Channel Improvement Project

The Bayou Casotte Harbor Channel Improvement Project (BCHCIP) would involve the dredging and widening the Pascagoula channel from the Horn Island Pass to the entrance of the Bayou Casotte Harbor. The location of this project is depicted as project #2 on figure 4.13-1.

The draft EIS was completed in May 2014 and established that the proposed plans for the BCHCIP were viable and technically feasible. There is a "locally preferred plan" which consists of widening the navigation channel 100 feet to the west for about 38,549 feet (7.3 miles) north of Horn Island Pass. This northern portion of the Horn Island Pass Channel would be widened as necessary to simplify the transition between the two channel segments. Potential impacts associated with improving Port of Pascagoula's Lower Pascagoula and Bayou Casotte Channels would be addressed by the BCHCIP. These improvements are associated with the federal navigation channel project and its associated future operation and maintenance in Jackson County, Mississippi. About 3.4 million cy of dredged material would be removed from the navigation channel. About 125,000 cy of dredged material would be placed within the littoral zone placement site and/or Disposal Area #10, located east and south of Horn Island while about 3.3 million cy of dredged material would be placed within the Pascagoula Ocean Dredged Material Disposal Sites (ODMDS) south of Horn Island.

The COE is conducting a Feasibility Study. Should the study conclude favorably, future operation and maintenance would be undertaken by the COE as part of its routine maintenance efforts. Preparation of the final EIS is ongoing and is anticipated to be released in 2019.

4.13.1.3 Chevron Base Oil Plant Project

In June 2014 Chevron, Inc. completed its Pascagoula Base Oil Plant at the Chevron Pascagoula Refinery adjacent to Gulf LNG. The project affected about 90 acres and resulted in 400,000 cy of dredge material. The new plant can produce about 25,000 barrels per day of premium base oil. Construction included adding two new berths to the Chevron wharf, 16 new product tanks, and new railcar capabilities, which resulted in the filling of 72.29 acres of wetlands. Mitigation credits were to be obtained from the

Rhodes Lake Mitigation Area (Chevron, 2017). The location of this project is depicted as project #3 on figure 4.13-1.

4.13.1.4 Hague Property Housing Development

The project is located 3.7 miles north of Gulf LNG. The Pascagoula Strategic Housing Subcommittee is in the process of seeking a developer to work with them to construct a 77-acre single-family housing development with possible mixed use components at 5102 Old Mobile Highway (the Hague Property), in Pascagoula, Mississippi (City of Pascagoula, 2017a). The project is depicted as project #4 on figure 4.13-1.

4.13.1.5 Holland Street Housing Development

The project is located 1.9 miles northwest of Gulf LNG. The Pascagoula Strategic Housing Subcommittee is in the process of seeking a developer to work with them to construct a 16-acre single-family housing development with possible mixed use components along Holland Street. (City of Pascagoula, 2017b). The project is depicted as project #5 on figure 4.13-1.

4.13.1.6 Hospital Road Improvement Project

The City of Pascagoula is currently expanding Hospital Road from two lanes to five lanes. Sidewalks and bicycle lanes are being included as well as a center median filled with native plants and shrubs. The project will improve safety and increase economic growth in the area. The project is estimated to cost about $3.3 million and is being funded mostly with federal highway dollars. According to the city, construction is anticipated to last about 2 years (City of Pascagoula, 2017c). The location of this project is depicted as project #6 on figure 4.13-1.

4.13.1.7 Beneficial Use Sites

Dredged material has typically been disposed of by placement in sites along the margins of the channels or in un-confined, open water disposal sites such as offshore of Horn Island. These types of disposal areas are becoming limited in space and availability, therefore there is a need for new locations for the BU of dredged sediment. Areas that are currently being considered as new or expanded BU sites include Greenwood Island, Singing River Island, and Round Island.

An example of these new BU sites is the littoral zone disposal site, which is located just west of Horn Island Pass and south of Horn Island between the -14 and -22-foot depth mean lower low water (MLLW) contours. This site is designated to accept BU material dredged from the channel near Horn Island Pass. Dredged material is pumped to an area west of the federal channel where it is reintroduced into the east-to-west sediment transportation system. This BU disposal site was positioned specifically to maximize sand migration to supplement the barrier island system. Suitable, sandy material dredged during new work or channel maintenance efforts are placed within the littoral disposal site. There are also three additional types of BU that are possible along the Mississippi Gulf Coast. These include marsh creation, the filling of mosquito ditches, and small bird islands. In marsh creation, dredged material is used to raise the intertidal elevation of the substrate. Small bird island creation occurs when dredged material is placed in contained areas to form new habitat for migratory and resident bird populations (COE, 2014). Examples of these projects are depicted as projects # 7, 8, 14, and 17 on figure 4.13-1.

4.13.1.8 Mississippi Phosphate Company

Mississippi Phosphate Corporation facilities are located about 1.9 miles north of the Project, at the northern tip of the Bayou Casotte Channel. Production facilities consist of two sulfuric acid facilities, a phosphoric acid facility, and a diammonium phosphate (DAP) granulation facility. Mississippi Phosphate Corporation filed for bankruptcy in 2014 and left more than 700 million gallons of stored contaminated waste water at this location. The EPA obtained control of the facility in February 2017 and has been treating about 2 million gallons of wastewater per day. In January 2018, the EPA added the site to the Superfund National Priorities List. On April 18, 2018, an Action Memorandum for $107.6 million was executed by the EPA to accelerate clean-up of the site from 2018 to 2020. This project is depicted as project #9 on figure 4.13-1.

4.13.1.9 Mobile Gas Processing Facility

Williams Mobile Bay Producer Services proposes the construction of additional facilities located 20 miles east/northeast of Gulf LNG. The expansion would affect about 37 acres of land and will result in increased capacity of their Coden Gas Plant. It will enable that facility to process additional natural gas streams from new offshore drilling development. The project is anticipated to begin in 2019 (EPA, 2017c) and is depicted as project #10 on figure 4.13-1.

4.13.1.10 Pascagoula Harbor Dredging Activities and Pascagoula Harbor Federal Navigation Project

The Pascagoula Harbor Federal Navigation Project is located about 0.8 mile northwest of the Project in Jackson County, Mississippi. The COE plans to conduct previously-authorized work, new work, and maintenance dredging associated with this federally-authorized project. Two BU placement areas are being proposed for this project. The project proposes to dredge the Upper Pascagoula Channel and Pascagoula River Channel segments of the Pascagoula Harbor Federal Navigation Project from the existing depth of -38 feet MLLW to the federally-authorized channel depth of -42 feet MLLW and to maintain the channel at the specified depths in the future. This would include an additional -2 feet of advance maintenance dredging and -2 feet of allowable over depth for a total of maximum depth of -46 feet MLLW. An additional 3 feet of sediment below the 2-foot paid allowable dredging cut may be disturbed in the dredging process with minor amounts of the material being removed. Dredged material would be placed within BU areas. These areas are the Singing River Island Semi-Confined Site, Round Island, and the previously approved/utilized ODMDS adjacent to the channel. Areas of the channel affected by shoaling are targeted for dredging and not all portions of the channel are dredged in each cycle (COE, 2016a). Maintenance dredging cycles occur irregularly every 18 to 36 months. These projects would result in over 200,000 cy in Pascagoula Harbor and about 150 acres of marsh creation. These projects are depicted as projects # 11 and 12 on figure 4.13-1.

4.13.1.11 Port of Pascagoula Wood Pellet Terminal

Port of Pascagoula proposes the construction of a specialized wood pellet exporting facility on Bayou Casotte, about 1.7 miles northwest of Gulf LNG. The proposed facility will be operated by Green Circle Bio Energy Inc. and will result in the export up to 500,000 tons of pellets per year to European utility companies. The project would affect about 95 acres which is currently occupied by a warehouse facility, located adjacent to Terminals E and F within the Bayou Casotte Harbor. The existing warehouse facility is expected to be demolished for construction of the Wood Pellet Facility. An additional $14 million from the DOT's *Transportation Investment Generating Economic Recovery* (TIGER) discretionary grant Program will also be used for intermodal improvements (Port of Pascagoula, 2017). The TIGER grant would be used to:

- relocate about 2.5 miles of track through the City of Moss Point;
- close 16 rail crossings through Moss Point and Pascagoula;
- construct a new 5,400 foot interchange yard and

- construct about 6,200 feet of additional track within Bayou Casotte Harbor.

Construction of the Wood Pellet Facility is expected to begin in 2019 and the railroad interchange construction is expected to be completed in 2019. The project is depicted as project #13 on figure 4.13-1.

4.13.1.12 Signal International LLC

The Signal International LLC East Bank Yard is located 1.5 miles northwest of Gulf LNG and is 94 acres in total area. The facility specializes in marine drilling rig fabrication and upgrades, conversion, and repair and includes a 30,000 ton dry dock. Maintenance dredging of 10,000 to 20,000 cy of sediment each time is conducted every 4 to 5 years. In 2010, the company increased the dredging depth of a 3.5-acre area to 60 feet to accommodate deep draft vessels such as semi-submersible rigs. The dredged material was utilized for BU at the former International Paper Mill site in Moss Point. On June 10, 2013, the MDEQ issued a renewal of Signal International, LLC's Title V Permit. In addition, the facility's air quality permit allows emissions of 249 tpy VOCs. This project is depicted as project #15 on figure 4.13-1.

4.13.1.13 Mississippi Power Company Upgrade to Gulf LNG Terminal

The proposed Gulf LNG Terminal Expansion would add about 100 MW of load to the MPC system. The existing Terminal is currently served by an existing 23 kV distribution line. According to MPC, upgraded service to the Project site would be accomplished through the addition of a new 1.4-acre, 115kV substation. This would be located immediately adjacent to and contiguous with Gulf LNG's new electric service facilities. This substation is included in our Project impacts as two new 115 kV transmission lines on concrete poles. The concrete poles would be about 30- to 36-inch diameter and would be located about 300 to 500 feet apart. Construction of this project is expected to begin in 2020 and would affect about 18 acres of land. The project is depicted as project #16 on figure 4.13-1.

4.13.1.14 Terminal Maintenance Dredging (E, F, G, and H)

The maintenance dredging of the Bayou Casotte Ship Basin is proposed, about 1.6 miles north of the Project, between Terminals E&F and G&H. The basin would be dredged to 38 feet plus an additional 2 feet for advanced maintenance. The area adjacent to the G Extension docks would be dredged to 25 feet plus an additional 2 feet for advanced maintenance. Initial maintenance would remove about 150,000 cy of material, and an additional 45,000 cy would be dredged every 3 to 4 years to account for an annual shoaling rate of 12,000 cy to 15,000 cy. The dredged material would be removed by hydraulic dredging and would be discharged into the BCDMMS. If the BCDMMS is unavailable or not the preferred option at the time of dredging and disposal activities, the material may also be mechanically dredged and placed into the Port's dredge material placement site (former International Paper Wastewater Pond Site) or other approved BU sites. The appropriate sampling for BU disposal will be conducted if these sites become necessary (COE, 2013). This project is depicted as project #18 on figure 4.13-1.

4.13.1.15 Mississippi Coastal Improvements Program - Comprehensive Barrier Island Restoration

The Mississippi Coastal Improvements Program (MsCIP) was created to support the long-term recovery of Hancock, Harrison, and Jackson Counties from devastation caused by Hurricane Katrina and other hurricanes in the Gulf of Mexico in 2005 and from past navigational dredging and disposal activities. These activities (man-made and natural) have altered sediment availability and transport along the islands.

The Program's project area includes the mainland coast of Mississippi, the Mississippi Sound, the Mississippi-Alabama barrier islands, and the northern Gulf of Mexico to about 8 miles seaward of the barrier islands. Improvements included in the Program intend to protect and maintain the estuarine ecosystem of the Mississippi Sound and reduce storm damage through the restoration of existing barrier islands and placement of new barrier islands. The plan includes 1,280 square miles of aquatic restoration in the Mississippi Sound, 22 million cy increased sediment budget, and 30,000 acres of coastal habitat restoration (COE, 2016b). Preservation and protection of the Mississippi barrier islands result in reduced land loss and erosion of the barrier islands and enhance the long-term sand supply to the littoral drift system. This project is not shown on figure 4.13-1 because the specific location of the proposed projects in the various counties is still to be determined by the COE.

4.13.1.16 VT Halter Marine Facility

In April 2018, VT Halter Marine announced the completion of a new blast and paint facility located in Pascagoula, Mississippi. The 17-acre facility will allow surface preparation and final painting of ship sections within an indoor and environmentally controlled structure. The facility can accommodate ship sections as large as 105 feet wide, 80 feet long, 40 feet high with weights of up to 500 tons. The location of this project is depicted as project #19 on figure 4.13-1.

4.13.1.17 Jackson County Port Authority Maintenance Dredging of the North Supply Dock

After construction of the Project is completed, ownership of the North Supply Dock would be transferred to the JCPA. A letter from the JCPA-Port of Pascagoula confirming that they would accept dock ownership was provided to Gulf LNG on May 28, 2015. In addition to use of the North Supply Dock by barges and support vessels associated with operation of the Project, the dock may also be used by the JCPA as a berthing facility for barges waiting for a berth at one of the private or public terminals in the Bayou Casotte Harbor or for temporary berthing of other vessels not associated with the Project. Based on the observed annual increase in sediment material at the existing marine berth, depth comparisons, and other variables, about 10,000 cy of material would be deposited within the North Supply Dock berthing area per year.[38] However, dredging would not be required annually. As owner of the North Supply Dock, the JCPA would be responsible for obtaining permits and clearances for dredging operations and for issuing notifications to agencies and Port of Pascagoula users regarding dredging activities. The location of this project is depicted as project #20 on figure 4.13-1.

4.13.1.18 COE Earthen Berm Maintenance and Extension

Gulf LNG would extend the existing storm protection system surrounding the existing Terminal to encompass the Terminal Expansion facilities. The new storm surge protection system would consist of (1) a new concrete wall with a top elevation of 27 feet NAVD and (2) a new earthen berm (an extension of the existing COE berm) with a top elevation of 27 feet NAVD. Following initial construction of the berm by Gulf LNG, the COE, in order to expand capacity of the BCDMMS, would extend the berm to a height of 39.2 feet NAVD. The COE would be responsible for maintaining the berm during operations of the Project, and would be responsible for all permits and approvals associated with maintenance and extension of the height of the earthen berm. The location of this project is depicted as project #21 on figure 4.13-1.

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[38] Dredging volumes were estimated from shoaling rates observed at the existing LNG carrier berth. The existing LNG carrier berth is about 1,500,000 ft^2. About 30,000 cy every 6 years (50,000 cy per year) are removed from the existing LNG carrier berth. The North Supply Dock berthing area would be about 300,000 ft^2 therefore the annual deposition of material should be 300,000 ft^2/1,500,000 ft^2 x 50,000 cy = 10,000 cy per year.

4.13.1.19 Truck Transport of Natural Gas Liquids

The Project would require trucking of NGLs or condensate generated as part of the liquefaction process, and makeup refrigerants including ethane, propane, and nitrogen used in the liquefaction process and amine solution used in the acid gas removal system. Ethane and propane would be delivered by truck and unloaded into storage facilities. In the worst case of very rich feed gas (expected less than 10 days per year), the amount of condensate removed from the plant would be 16.5 trucks per day. For the rich case, an average of 3.2 trucks per day would be removed from the plant. During normal operation with average feed gas, approximately five trucks per month of condensate would be removed from the plant. Ethane would be trucked into the facility up to two times each month. Propane would be trucked into the facility up to four times each month. Additionally, amine associated with the acid gas removal system would be trucked in one time per year for makeup and re-inventory of the amine systems after removal of the spent amine during major scheduled maintenance activities. Liquid nitrogen would be delivered by truck twice per year for makeup refrigerant.

After leaving the Terminal Expansion site, NGL trucking is regulated by DOT's Federal Motor Carrier Safety Administration. Gulf LNG anticipates negotiating agreements for the purchase of NGLs by processing facilities near the Terminal Expansion. After leaving the Terminal Expansion site, the trucks would use Industrial Road and SH-611 to transport the NGLs to nearby processing plants, or if Gulf LNG has more distant customers for the NGLs, they would transit Industrial Road, SH-611, and SH-63 to reach Interstate 90 (I-90) and I-10, the area's main highways. According to Gulf LNG, the Hazardous Waste Branch of the MDEQ does not have a requirement for a hazardous materials route analysis. Based on an average composition of feed gas, we conclude that the estimated truck traffic of eleven trucks per month would not have any significant impacts on roadway traffic.

4.13.2 Potential Cumulative Impacts by Resource

The following sections address the potential cumulative impacts from Gulf LNG's Project and the other projects identified within the geographic scope defined for specific environmental resources. The other projects considered in each section are those for which impacts on the resource(s) discussed would be within the same geographic scope as those that would result from the proposed projects and would occur within the same timeframe.

The Pipeline Modifications would include minor modifications to existing industrial facilities. Therefore, no cumulative impacts on geologic, soils, water, wetland, vegetation, wildlife, aquatic, threatened and endangered species, land use, visual, recreation, socioeconomic, cultural, air quality, and noise resources are anticipated for the Pipeline Modifications.

4.13.2.1 Geologic Resources

The geographic scope for geologic resources was considered to be the area adjacent to proposed construction areas for the Terminal Expansion.

Except for oil and gas, there are no currently known exploitable mineral resources in the general vicinity of the Terminal Expansion. The closest oil and gas exploration and production have occurred about 8 miles to the north of the existing Terminal. However, all of these wells are plugged and abandoned. Therefore, cumulative impacts on mineral resources due to the construction and operation of the proposed Terminal Expansion is not anticipated.

At the proposed Terminal Expansion site, Gulf LNG would modify the existing topographic contours to accommodate its equipment and facilities and maintain adequate drainage from the site. This would result in contours similar to those of the adjacent existing Terminal and would not differ substantially from the existing topography. The small change in topography at the proposed Terminal site would not result in significant cumulative impacts on geologic conditions.

Construction of the Wood Pellet Export Terminal project has the potential to overlap with parts of the Project, while the MPC Upgrade to Gulf LNG Project would overlap with the Project construction footprint, modifications to the existing topographic contours are not expected. If there would be concurrent construction of the Wood Pellet Export Terminal, Gulf LNG would not utilize CSA-6 and would pursue the use of another previously disturbed (in-kind) use site, resulting in no cumulative impacts and no overlap.

Maintenance and extension of the earthen berm by the COE would overlap with the Project construction footprint but would not be concurrent with construction of the Terminal Expansion. Impacts would be limited to the routinely disturbed BCDMMS which is used by the COE for placement of dredged materials from maintenance dredging of the Bayou Casotte Navigation Channel.

No other projects were identified that involve excavation or significant grading in an area that overlaps or directly abuts the proposed active construction footprint of the Project during the same timeframe. Therefore, we have determined that the Terminal Expansion, along with other projects, would not contribute to cumulative impacts on geologic resources.

4.13.2.2 Soils

The geographic scope for soils was considered to be the area adjacent to construction areas for the Terminal Expansion. The existing Terminal and surrounding areas consist mainly of land used for placement of dredge material that has occurred since the 1950s. Past impacts on soils resources in the vicinity of the proposed Project have resulted from dredge placement, construction, and maintenance of existing roads, natural gas and oil facilities and pipelines, and utility lines. Clearing and grading associated with construction of the Terminal Expansion could result in soil loss due to erosion. However, Gulf LNG would implement measures required by the FERC's Plan and Procedures and contained in the *Gulf LNG Plan* and the *Gulf LNG Procedures* to minimize erosion. In addition, the Terminal Expansion would be adjacent to and integrated with the existing Terminal and with existing third-party natural gas infrastructure, thereby minimizing impacts on previously undisturbed areas to the extent practicable.

Construction of the Wood Pellet Export Terminal would overlap the active construction footprint of the Project's CSA-6, which is an existing previously disturbed fenced graveled yard. According to the Port of Pascagoula, the Wood Pellet Export Terminal is still in the design stages but is currently scheduled for construction in 2019 and the facility would be constructed on the CSA-6 site. Based on this information, Gulf LNG's use of CSA-6 may coincide with construction of the Wood Pellet Facility in the same location. If this occurs, Gulf LNG has agreed to not utilize CSA-6 and would pursue the use of another previously disturbed (in-kind) use site, resulting in no overlap and no cumulative impacts.

Construction of the MPC Upgrade would involve the installation of a new substation and transmission line immediately adjacent and within Project footprint (about 1.4 acres of overlap with the Project footprint). It is assumed that this project would require a construction stormwater permit and impacts would be mitigated through the implementation of best management practices. Construction would also involve the restoration of disturbed areas following construction thereby minimizing impacts on soils. Therefore, impacts from the MPC Upgrade are expected to be minor.

No other projects were identified that involve excavation or significant grading in an area that overlaps or directly abuts the active construction footprint of the Project during the same timeframe. As a result, we do not anticipate a significant cumulative impact on soils or sediments from construction and operation of the Project combined with other projects.

4.13.2.3 Water Resources

The geographic scope established for water resources was considered to be the HUC-12 watersheds shared by the Terminal Expansion site. Any projects listed in table 4.13.1-1 involving ground disturbance within these HUC-12 watersheds could result in cumulative impacts on water resources.

Gulf LNG would not directly withdraw groundwater during construction or operation of the Project. Gulf LNG would obtain water for construction and operation of the Terminal Expansion from the existing Terminal's connection to the Port of Pascagoula's Industrial Water Supply. Construction needs would include water required for hydrostatic testing of the facility piping to verify the integrity of the facilities prior to placing them into service. According to the Port of Pascagoula, the JCPA has the supply and permit authority to meet the Project's industrial water requirements. Thus, adequate water is available for the planned uses at the Terminal Expansion, and we conclude that the cumulative impact on water supplies during construction and operation would not be significant.

As described in section 4.3, groundwater impacts resulting from construction or operation of the Project are not anticipated and, should they occur, would be localized and would not affect other groundwater users. Therefore, the Project would not contribute to signification cumulative impacts on groundwater with other projects in the geographic scope.

Projects that involve dredging, modification of surface water resources, or operational vessel traffic, could result in impacts on surface water resources and have the greatest potential to contribute to cumulative impacts with the Project.

Construction of the two supply docks would include dredging about 200,000 cy of material for the initial construction, 40,000 cy annually during construction, and 20,000 cy annually during operation. Maintenance dredging for the North Supply Dock would also be required (see section 2.2.1.5). An additional 200,000 cy would be dredged for the temporary barge access channel for the wetland mitigation site. Impacts associated with dredging would be minor and temporary due to the methods used to minimize sediment suspension in the water column, the high ambient levels of turbidity in the channel, and the relatively rapid deposit of the suspended sediments.

Dredging projects and projects listed in table 4.13.1-1 that potentially require dredging include the JCPA Maintenance Dredging of the North Supply Dock, BCHCIP, Signal International LLC East Bank Yard, Pascagoula Harbor Navigation Channel Dredging, and the maintenance dredging of the Bayou Casotte Ship Basin Terminals E&F and G&H.

The amount of material that would be dredged for these projects would range from about 20,000 cy for the Signal International LLC East Bank every 3 to 4 years to 3.4 million cy for the BCHCIP. The BCHCIP would be the largest dredging project within the geographic scope. The improvement project would require dredging of about 3.4 million cy of material from Horn Island Pass to the entrance of the Bayou Casotte Harbor. The considered projects would dredge an estimate 5.58 million cy from Bayou Casotte. Dredging is a routine and ongoing practice along the Bayou Casotte Navigation Channel. Given the relative size of the dredging activities proposed, the amount of increased sediment removal resulting from Project-related dredging would be minor relative to what is common in the Bayou Casotte Navigation Channel. Consequently, any potential cumulative effects to the Bayou Casotte Navigation Channel sediments are anticipated to be minor. Most of the planned dredging activities are currently in the planning stages, therefore dredging activities would not likely occur at the same time, and would be widely dispersed in the Project area.

However, prior to commencing dredging activities, Gulf LNG and the proponents of the other projects would be required to obtain authorization under Section 10/404 of the CWA from the COE and corresponding Section 401 Water Quality Certification from the state. These authorizations would be contingent on the companies' use of best management practices to minimize effects on water quality and to ensure that state water quality standards are not violated. Additionally, the permits would require that the dredge material be tested before being disposed of in an approved offshore or onshore location. These measures would ensure that there are no long-term cumulative impacts on water quality as a result of foreseeable dredging and pile-driving activities in Bayou Casotte. Because water quality would return to pre-dredging conditions shortly after dredging is completed, we conclude the resulting cumulative impact would not be significant.

Gulf LNG does not plan to increase LNG carrier traffic during operation beyond that previously evaluated and approved for the existing Terminal (FERC, 2006); therefore, the Project would not contribute to cumulative impacts related to vessel traffic beyond those previously assessed. The only increase in marine traffic associated with the Project would be temporary barge and support vessel traffic during construction; however, these vessels are generally slow moving and do not create substantial wakes and are therefore not expected to substantially increase shoreline erosion, benthic sediment disturbance, or propeller scouring in the immediate area. Therefore, we conclude that vessel traffic would not contribute to a significant cumulative impact on shorelines.

Few, if any, of the barges used for construction of the Project would have ballast systems. Nonetheless, ballast water management (discharge and uptake) may increase in the Bayou Casotte Navigation Channel with the increase in vessel traffic. However, the captains of LNG carriers and other vessels transiting the Bayou Casotte Navigation Channel would be required to comply with ballast water management the procedures presented in 33 CFR 151 (Vessels Carrying Oil, Noxious Liquid Substances, Garbage, Municipal or Commercial Waste and Ballast Water) and 46 CFR 162.060 (Ballast Water Management Systems) as last revised in 2012, and the USCG's Navigation and Vessel Inspection Circular 07-04, Change 1, dated October 29, 2004. These regulations set forth a limited number of acceptable ballast water management methods. As a result, we conclude that the contribution of ballast water discharge from the Project would not result in a significant cumulative impact on water quality.

Spills also could represent a potential for surface water contamination, but a Project-specific *SPCC Plan* designed to prevent and handle any spills with a reasonable chance to occur on the Project would be kept on-site during construction. In addition, a separate site-specific *SPCC Plan*, specifically designed to prevent and handle spills with a reasonable chance to occur during operations, would be kept at the Terminal Expansion during operation. Also, the Terminal Expansion would be designed to contain any spills. Spills from the Project are not considered to represent a significant risk to groundwater or surface water. The projects identified in table 4.13.1-1 would also be required by federal, state, or local agencies to obtain permits for and provide plans to protect and minimize impacts on groundwater and surface water quality.

On February 11, 2017, the EPA Region 4 Emergency Response and Removal Program took over temporary control and funding of wastewater treatment operations at the Mississippi Phosphate Corporation's former DAP fertilizer plant located 1.9 miles north of the Project. Wastewater treatment is occurring at a rate of approximately 2,000,000 gallons per day. Presently, the EPA is maintaining environmental stability at the facility and is evaluating potential long-term treatment and closure options for the site in the event that the facility is not returned to beneficial use. The site is currently operating under an emergency bypass of partially treated water as per the Site Contingency Plan. The EPA continues to treat acidic wastewater at a rate of about 1 to 3 million gallons per day at a cost of about $1 million per month (EPA, 2017d). Under EPA and MDEQ guidance and administration, it is not anticipated that this project will contribute to additional groundwater or surface water impacts.

We are not aware of any other substantial construction projects within the geographic scope that would contribute to surface water runoff. As a result, we conclude there would not be a significant cumulative impact on surface water due to construction and operation of the Terminal Expansion.

4.13.2.4 Wetlands

The geographic scope for wetlands was considered to be the area within the HUC-12 watersheds of the proposed Project construction areas. The Bayou Casotte-Point Aux Chenes Bay watershed encompasses the non-marine portions of the Project including the facility expansion and associated temporary workspace areas while the Point Aux Chenes Bay-Mississippi Sound watershed encompasses marine portions of the Project, including the Marine Offloading Facilities and potential dredge material disposal locations.

Projects within the wetlands geographic scope include the Pascagoula Harbor Federal Navigation Project, Chevron Base Oil Plant, the Highway 611 Project, Hospital Road Improvements, Hague Property Housing Development, Holland Street Housing Development, and the MPC Upgrade. The Chevron Base Oil Plant was estimated to have impacted about 72.3 acres of wetlands, while the non-jurisdictional transmission lines and new substation would impact less than 0.1 acre of wetlands. Chevron has initiated compensatory mitigation, while all other projects would have to obtain a permit from the COE, the MDMR, and the MDEQ (Office of Pollution Control) covering Sections 404, 10, and 401 of the CWA and the Coastal Zone Management Act, which would require restoration of wetlands or compensatory mitigation if there is a loss of wetlands. The Pascagoula Harbor Federal Navigation Project will create about 150 acres of marsh habitat.

Construction of the Terminal Expansion would result in the loss of wetlands on the proposed Terminal site. However, compensatory mitigation for wetland loss would be required by the COE and the MDMR that would result in no net loss of wetland function and could improve regional coastal marsh resources. As discussed in section 4.4, Gulf LNG has proposed in-kind compensatory mitigation for impacts on about 31 acres of wetlands on the Terminal Expansion site in the form of a 50-acre tidal marsh wetland at a site directly offshore of the southern border of the Terminal Expansion site. The success of the created tidal marsh could result in a net gain of about 19 acres of tidal marsh wetland.

Chevron, Gulf LNG, and the other projects would permanently impact more than 200 acres of wetlands; however, these projects would require mitigation for wetland loss or conversion; therefore, no net loss of wetland function or value would occur. The Chevron and Gulf LNG projects would result in a net gain of wetland habitat. While impacts on wetlands within the geographic scope would total more than 200 acres; when added to compensatory mitigation requirements for all projects, we conclude the cumulative impact on wetlands would not be significant.

4.13.2.5 Vegetation

The HUC-12 watersheds was also used as the geographic scope for vegetation. During the biological surveys conducted by Gulf LNG, several species of exotic and/or invasive vegetative species were observed in marsh habitat within the boundaries of the Terminal Expansion site. Section 4.4 provides a more detailed discussion of affected wetlands, and section 4.5.3 addresses exotic and/or invasive plant species. The existing Terminal is adjacent to the proposed Terminal Expansion site. Construction of the Terminal Expansion would remove 34.3 acres of vegetation from the Terminal Expansion site east of the existing Terminal. Gulf LNG would mitigate for the loss of wetland habitat through creation of marsh habitat at a location near the Project. Due to the minor amount of habitat that would be removed from the site, the planned mitigation efforts, as well as the presence of several protected areas nearby, we do not anticipate a significant impact on vegetation due to the Terminal Expansion.

The non-jurisdictional MPC Upgrade would affect vegetation within its 100-foot wide right-of-way in Jackson County (estimated to be about 18 acres). Vegetation clearing for construction along the 100-foot-wide right-of-way would result in a minor and short-term impact. Pole placement could result in a minor, permanent impact. Additionally, the MPC substation would be constructed within the Terminal Expansion site thereby minimizing impacts.

It is anticipated that the MPC Upgrade Project would implement best management practices during construction to minimize impacts on habitat and wildlife. Due to these best management practices and Gulf LNG's proposed wetland mitigation, we conclude there would not be a significant cumulative impact on vegetation.

Other projects within the vegetation geographic scope include the Chevron Base Oil Plant, the Highway 611 Project, Hospital Road Improvements, Hague Property Housing Development, the Holland Street Housing Development, and the VT Halter Facility. Based on publicly available information we estimate that these projects combined would disturb about 245 acres of vegetation within the HUC-12 watersheds underlying the Project. This accounts for about 0.3 percent of the total watershed area (25,644 acres in Bayou Casotte-Point Aux Chenes Bay watershed and 58,581 acres in Point Aux Chenes Bay-Mississippi Sound watershed).

While sufficient information is unavailable to accurately quantify the extent that all projects considered for cumulative impacts on vegetation would impact rare plant communities, it can be reasonably assumed that at least some of the projects would impact these resources. Impacts would be permanent within the operational workspaces of aboveground facilities.

All projects potentially contributing to cumulative impacts on vegetation would be required to adhere to applicable federal, state, and local regulations regarding water quality, erosion control, construction within floodplains, and restoration of disturbed vegetation. However, several of the projects considered for cumulative impacts on vegetation consist of large industrial developments that would result in the permanent loss of vegetation.

Due to the relatively large proportion of the HUC-12 watersheds that would be affected by the projects considered in the HUC-12 watersheds, we have determined that the Terminal Expansion would not contribute to cumulative impacts on vegetation with other projects in the geographic scope.

4.13.2.6 Wildlife

Wildlife habitats at the Terminal Expansion site consist of EEM wetlands, PEM wetlands, the BCDMMS, open upland, and open water. Some wildlife habitat (primarily EEM wetlands) would be lost permanently on the Terminal Expansion site, but surveys show that there is no evidence this habitat is being used by the wildlife that prefer it.

As stated in section 4.13.2.6, other projects within the wildlife geographic scope include the MPC Upgrade Project, Chevron Base Oil Plant, the Highway 611 Project, Hospital Road Improvements, Hague Property Housing Development, the Holland Street Housing Development, and the VT Halter Facility. Based on publicly available information we estimate that these projects combined would disturb about 263 acres of terrestrial habitat.

Habitat (vegetation) loss and conversion associated with the projects identified above account for much of the direct impact on wildlife species. Increased development and loss of habitat within the HUC-12 watersheds would cause wildlife to either adapt to new conditions (in the case of some generalist species) or relocate to undisturbed suitable habitat. Displacement of wildlife could result in additional stress and increased competition in available habitats.

Cumulative impacts on wildlife as a result of increased noise, lighting, road traffic, and human activity, would be greatest during the concurrent construction of the Terminal Expansion and other projects considered; however, due to operation noise and permanent facility lighting associated with the Terminal Expansion and several of the other projects that have permanent aboveground facilities, permanent cumulative impacts would also occur. However, most of the projects considered are located within already developed areas and characterized by industrial activities which are anticipated to have less of an impact on wildlife than projects in areas where there is less development.

Cumulative impacts on wildlife resulting from noise would be greatest during the concurrent construction of the projects considered, but would also occur during operation. Quantitative cumulative noise impacts are further discussed in section 4.13.2.13. While noise contributions from the proposed Project would not directly impact wildlife beyond the geographic scope for cumulative noise impacts, an overall increase in noise associated with projects located throughout the HUC-12 watersheds could limit the available habitat not affected by noise to which disturbed wildlife can relocate. Wildlife that cannot relocate away from noise emitting sources could be adversely affected by increasing stress levels and masking auditory cues necessary to avoid predation, hunt prey, and find mates.

Construction lighting requirements likely vary among the projects considered; however, it can reasonably be assumed that several of the larger industrial projects, housing development projects, and transportation projects could require nighttime construction lighting. The MPC Upgrade, Chevron Base Oil Plant Project, and VT Halter Facility are not anticipated to require operational facility lighting. However, the housing development projects and the transportation projects would require operation lighting. Increased lighting can cause more mobile wildlife to become disoriented, such as migrating birds, and can increase predation on prey species by making them more visible to predators. Artificial lighting can also adversely affect wildlife behavior by causing individuals to avoid the area or alter sleep/activity patterns. The Terminal Expansion would minimize impacts on wildlife as a result of lighting by only using lights that meet the minimum requirements for obstruction avoidance and pilot warning, and omitting the use of guy wires (see section 4.6.1.1). It is anticipated that other facilities would utilize similar methods to minimize the impacts of lighting on wildlife.

Elevated structures such as storage tanks, flares, and transmission lines would also contribute to cumulative impacts on migratory birds. Gulf LNG would use measures from the *2013 U.S. Fish and Wildlife Revised Voluntary Guidelines for Communication Tower Design, Siting, Construction, Operation, Retrofitting, and Decommissioning* (FWS Communication Tower Guidelines; FWS, 2013) to develop a flare tower design that would reduce the likelihood for avian collisions while minimizing potential impacts associated with light pollution. It is anticipated that other projects with elevated structures would implement similar measures to minimize impacts on migratory birds; however, bird strikes with elevated structures could still occur.

Overall, cumulative impacts on wildlife would be greatest during the concurrent construction of the projects considered, and would continue, to a lesser extent during operation. Cumulative impacts on wildlife could occur as a result of habitat disturbance and loss and increased noise and light. Most projects considered are anticipated to implement BMPs to ensure restoration of temporarily impacted wildlife habitat and minimize noise and lighting, therefore we have determined that the Project would not contribute significantly to cumulative impacts on wildlife, including protected species, relative to the other past, present, or foreseeable projects in the area.

4.13.2.7 Aquatic Resources

As with water, vegetation, and wetland resources, we considered the geographic scope for aquatic resources to be the HUC-12 watersheds. Other projects within the aquatic resources geographic scope include the JCPA Maintenance Dredging of the North Supply Dock, BCHCIP, the Signal International

LLC East Bank, Greenwood Island BU site, Littoral Zoe BU site, Pascagoula Harbor Navigation Channel Dredging, the Round Island BU site, the Singing River Island BU site, the Bayou Casotte Ship Basin Terminals E&F and G&H, and the MsCIP (see table 4.13.1-1).

The primary cumulative impact would be related to the dredging and coastal improvement projects. Altogether, the Project dredged volumes would be less than one percent of the amount projected to be dredged for the BCHCIP and the proposed MsCIP Comprehensive Barrier Island Restoration Project which includes dredging but also placement of new barrier islands.

Dredging resulting from the Project would impact bottom dwelling marine organisms and the bottom habitat, including EFH, within the dredged area; however, the subtidal habitat affected by the dredging would remain estuarine open water habitat and continue to serve as habitat for EFH species. Dredging would be required for the construction and maintenance of the North and South Supply Docks. Construction of the two supply docks would include dredging about 200,000 cy of material for the initial construction, 40,000 cy annually during construction, and 20,000 cy annually during operation. Maintenance dredging for the North Supply Dock would also be required (see section 2.2.1.5). An additional 200,000 cy would be dredged for the temporary barge access channel for the wetland mitigation site.

Dredging projects and projects listed in table 4.13.1-1 that potentially require dredging include the JCPA Maintenance Dredging of the North Supply Dock, BCHCIP, Signal International LLC, East Bank Yard, Pascagoula Harbor Navigation Channel Dredging, and the maintenance dredging of the Bayou Casotte Ship Basin Terminals E&F and G&H. These projects would dredge an estimate 5.58 million cy from Bayou Casotte. Dredging is a routine and ongoing practice in the Project area and aquatic species are likely acclimated to periodically turbid conditions.

The impact of increases in turbidity due to dredging for the supply docks, JCPA Maintenance Dredging of the North Supply Dock, BCHCIP, the MsCIP, maintenance dredging of the Bayou Casotte Ship Basin, and Signal International LLC sites would be temporary and localized to the dredged area and areas directly adjacent and a relatively short distance downstream. As a result, marine species would experience localized effects.

If dredging for the Project takes place at the same time as any of the other proposed dredging projects the geographic extent of the temporary impacts would increase beyond the area affected by dredging for the supply docks. The impact area would be smaller if the dredging projects were not concurrent, but the total duration of impacts within the geographic scope would increase.

Prior to commencing dredging activities, Gulf LNG and the proponents of the other projects would be required to obtain authorization under Section 10/404 of the CWA from the COE and corresponding Section 401 Water Quality Certification from the state. These authorizations would be contingent on the companies' use of best management practices to minimize effects on water quality and to ensure that state water quality standards are not violated. Additionally, the permits would require that the dredge material be tested before being disposed of in an approved offshore or onshore location. These measures would help to minimize any potential cumulative impacts on water quality as a result of foreseeable dredging activities in Bayou Casotte. Because water quality would return to pre-dredging conditions after dredging is completed, we conclude the resulting cumulative impact on EFH would not be substantial.

The impacts on EFH species of increases in turbidity due to dredging for the Terminal Expansion and the above projects would be temporary and localized to the dredged area and areas directly adjacent and a relatively short distance downstream. As a result, EFH species would experience localized effects. If dredging for the Project takes place at the same time as the Bayou Casotte Improvement Project, maintenance dredging of the Bayou Casotte Ship Basin, or the dredging activities at Signal International, LLC, the geographic extent of the temporary impacts would increase beyond the area affected by dredging for the supply docks. The impact area would be smaller if the dredging projects were not concurrent, but the total duration of impacts within the cumulative impact area would increase. In either case, we conclude that impacts in the cumulative impact area would not be substantial because these impacts would be temporary and localized and turbidity would return to pre-dredging levels after dredging is completed. As a result, we conclude the Project would have a minor cumulative impact on aquatic species.

The Greenwood Island BU site, the Littoral Zoe BU site, the Round Island BU site, and the Singing River Island BU site are all dredge disposal sites within the Project area. Use of these sites could impact aquatic resources. However, prior to using these sites for dredge disposal, Gulf LNG and the proponents of the other projects would be required to obtain authorization under from the COE.

Light emissions from the proposed facilities and flare may result in the temporary disruption of the movements and habits of some fish. These impacts are anticipated to be localized and insignificant as the flare lighting is expected to be intermittent with long intervals between flarings and is expected to be temporary.

While the Project has the potential to impact fisheries and other marine organisms, particularly benthos as a result of dredging activities, the incremental addition of the Project activities to the cumulative impacts relative to other projects within the HUC-12 watersheds would be negligible.

4.13.2.8 Threatened and Endangered Species

As with water, vegetation, wetland, and aquatic resources, we considered the geographic scope for threatened and endangered species to be the HUC-12 watersheds. The geographic scope of potential impact for the protected marine mammals and marine sea turtles are those areas away from the Project along the construction vessel transit corridors.

There are 19 species listed as federally threatened or endangered and 2 species that are under federal review that could occur within the Project area. In addition to the federally listed species, three animal, one plant, and one special status species of state concern occur within 2 miles of the Project facility sites and could be affected by the Project.

Based on the limited amount of available habitat in the area for federal, state-listed, or other special status species, the temporary or short-term nature of the construction impacts for the Project, and the mitigation measures proposed, we believe that the Project is not likely to adversely impact the listed species and would not contribute to a trend toward federal listing for species that are under federal review. If Project-related impacts do occur, we conclude that they would not be significant.

Of the state-listed species identified within the Project area, we determined that only one would potentially be impacted by the Terminal Expansion Project. A small area of Carolina grasswort was observed along the northern edge of the north marsh mitigation site within the Project area. This site is proposed to be impacted by construction and operation as it would be permanently converted to parking and administrative buildings. We are recommending Gulf LNG transplant the Carolina grasswort population to a similar habitat using protocols determined in consultation with the MMNS. We conclude with implementation of our recommendation, there would not be a significant impact on Carolina grasswort.

Each of the projects listed in table 4.13.1-1 would be required to comply with Section 7 of the ESA (described in detail in section 4.7). As a result of the Section 7 consultation process, the FWS and the NMFS would review each project's potential impacts on federally listed species and either provide concurrence that the project would not adversely affect listed species or issue a Biological Opinion as to whether the project would likely jeopardize the continued existence of listed species. Therefore, we conclude that cumulative impacts on threatened and endangered species would be less than significant.

4.13.2.9 Land Use, Visual Resources, and Recreation

Land Use

The geographic scope for assessing potential cumulative impact on land use was 1 mile around the proposed Project facilities.

The proposed Terminal Expansion along with the existing Terminal, the MPC Upgrade, the Highway 611 expansion, and the Pascagoula Harbor Dredging Project could contribute to the conversion of a variety of land uses to industrial and transportation use within the geographic scope, resulting in cumulative impacts on land use.

The existing Terminal site is dedicated to industrial use. Construction of the Terminal Expansion would impact 230.8 acres of existing industrial, wetland, upland open land, and open water land uses and convert them to industrial use and therefore consistent with the intended use of the land.

The MPC Upgrade and the Highway 611 expansion would disturb 58 acres of various land use types within 1 mile of the Terminal Expansion. The Pascagoula Harbor Dredging Project would result in dredging over 200,000 cy in Pascagoula Harbor and the creation of 150 acres of marsh. Combined the Terminal Expansion and considered projects would impact about 288.8 acres of various land use types. However, compensatory mitigation for wetland loss at the Terminal Expansion, and likely other considered projects, would be required by the COE and the MDMR that would result in no net loss of wetland function and could improve regional coastal marsh resources. Therefore, we conclude that successful completion of the compensatory mitigation plan would have a minor contribution to overall cumulative impacts to land use.

Visual Resources

The geographic scope used for visual resources was 12 miles of the proposed Project facilities. Because of the height of the structures at the Terminal Expansion, the viewshed of the Terminal would extend for several miles in all directions. Other projects within the visual resources geographic scope include the MPC Upgrade, Chevron Base Oil Plant Project, the Hague Property Housing Development, the Holland Street Housing Development, the Port of Pascagoula Wood Pellet Terminal, and the VT Halter Facility (see table 4.13.1-1).

The line of sight across a flat ocean to the top of the proposed flare (about 433 feet) is 24 miles. The line of sight across a flat ocean to the top of the proposed facilities and structures, (which are located below the 170-foot height of the existing storage tanks), is 12 miles. The line of sight to the Project's NSAs and other residential neighborhoods are screened by existing structures, trees, and other vegetation. The only direct line of the sight for the Bayou Casotte Industrial Park, including the Terminal, is from the crest of the Pascagoula Bridge on Highway 90, about 5 miles away.

Gulf LNG noted that there were no past, present, or reasonably foreseeable projects beyond 12 miles into the Mississippi Sound other than portions of the dredging and coastal improvement projects identified in table 4.13.1-1. The non-jurisdictional MPC Upgrade would be within Jackson County in the vicinity of the Terminal Expansion (see figure 1.4-1). The transmission line and associated right-of-way would be along existing access roads and Highway 611 from the Terminal Expansion site and the

Chevron Base Oil Plant Project is directly adjacent to the Project. The Hague Property Housing Development, the Holland Street Housing Development, the Port of Pascagoula Wood Pellet Terminal, and the VT Halter Facility are aboveground facilities located within 5 miles of the Terminal Expansion. These projects may have a view of the Terminal Expansion. However, the visual quality would be consistent with the existing industrial character of the area in the vicinity of the existing Terminal and consistent with electrical transmission lines that parallel many roadways and the adjacent Chevron Pascagoula Refinery towers, which stand about 100 to 250 feet high.

The Project would use the minimum lighting necessary to allow personnel to safely work and inspect the equipment at the Terminal. The lighting at the Project would be consistent with lighting at other industrial facilities within the industrial park and would not significantly increase light pollution in the area. The existing environment surrounding the Terminal Expansion is already affected by industrial lighting and while the proposed Project, along with the considered projects, would add to the industrial lighting, this incremental addition of lighting impacts by the Project to cumulative lighting impacts in the area would be insignificant.

The addition of new industrial development at the proposed Terminal site would be consistent with existing land uses in the area, thereby changing the viewshed by only a small increment. In addition, cumulative impacts from lighting and nighttime flaring on the environment would not be significant. The Terminal Expansion would be consistent with the visual character of the existing Terminal, the ongoing industrial facilities and activities along the Bayou Casotte Channel, and the many small oil and gas facilities near the Terminal Expansion site. We conclude there would not be a significant cumulative visual impact.

Recreation

The geographic scope for recreational facilities for the Terminal Expansion was considered to be 1 mile around the proposed Project facilities. For the proposed Terminal Expansion, the geographic scope for recreational-use vessels was considered to be the Bayou Casotte Harbor and Ship Channel and the Mississippi Sound. Other projects within the recreational geographic scope include the BCHCIP, the Pascagoula Harbor Dredging Project, the Bayou Casotte Ship Basin, and the MsCIP (see table 4.13.1-1).

The Terminal Expansion would not directly affect any designated recreational or special interest areas during construction or operation. There are several recreational and special use areas in the vicinity of the Terminal Expansion site. These include the Grand Bay Savanna Preserve, the Grand Bay NERR, Grand Bay NWR, Pascagoula River Coastal Preserve, Gulf Islands National Seashore, Gulf Islands Wilderness, Shepard State Park, Pascagoula Beach Park, and Singing River Yacht Club.

During construction of the Terminal Expansion, barge traffic within Mississippi Sound would increase. All barges would use the North and South Supply Docks. Gulf LNG estimates that between 25 and 60 barge arrivals per month would be needed, depending on the stage of construction. Although recreational and commercial boat traffic is present within Mississippi Sound. To help minimize impacts on other users of the sound, Gulf LNG would communicate barge traffic plans with various industry groups such as the Port of Pascagoula Advisory Group and the Propeller Club of Pascagoula and the barge deliveries would be coordinated using the Port of Pascagoula's daily ship schedule. Overall, construction of the Terminal Expansion would result in minor, temporary impacts on recreational boating and fishing in the channel and the waterway. Dredging from the BCHCIP, the Pascagoula Harbor Dredging Project, the Bayou Casotte Ship Basin, and the MsCIP would result in barge traffic within Bayou Casotte and Mississippi Sound. Publicly available information does not provide estimated boat traffic for these projects. However, as stated earlier, dredging is a routine and ongoing practice in the Project area. Therefore, we conclude that during construction the Gulf LNG Project would have a minor contribution to overall cumulative impacts on boat traffic.

Barge traffic during operation of the Project would be minimal and would not contribute to impacts on the waterway. Gulf LNG has not proposed to change its authorized LNG carrier traffic. Therefore, we conclude operation of the Project would not contribute to cumulative impacts on recreational vessel traffic in the Mississippi or nearby waterways.

The construction period for the Project could be concurrent with those of several of the dredging projects within the vicinity of the Terminal Expansion. The impact area would be smaller if the dredging projects were not concurrent, but the total duration of impacts within the cumulative impact area would increase. In either case, we conclude that impacts in the cumulative impact area would not be substantial because these impacts would be temporary and localized and turbidity would return to pre-dredging levels after dredging is completed

We do not anticipate that concurrent construction of these projects would result in a significant increase in non-local workers to the area. It is likely that many of those workers, and possibly their families, would use the recreational facilities and other recreational opportunities available in Jackson County. In addition, future population increases in the area resulting from housing projects, such as the Hague Property Housing Development and the Holland Street Housing Development, should not be significant; nor concurrent with the non-local work force increase. We do not expect the overall impact to be significant due to the large geographic area in which the workers would be housed and the number of recreational opportunities within that area.

4.13.2.10 Socioeconomics

Housing and Jobs

We considered the geographic scope for socioeconomics to include Jackson County, where Gulf LNG would construct its facilities and workers would reside during construction and operation of its Project. As proposed, the Project would have no significant impacts during construction or operation on population, employment, regional, or local services, or minority or low-income communities. The Project would have insignificant social impacts overall; however, it would contribute positively to social conditions in the surrounding areas. The primary impacts of the Project pertinent to cumulative impacts would be on housing and local road traffic.

Construction of the Project would generate a substantial number of jobs for a period of about 66 months starting in 2020. Construction of some of the other projects listed in table 4.13.1-1 could also occur during portions of that time period. The cumulative effect would be a minor reduction in unemployment in the area.

The influx of non-local workers would impact transient housing in Jackson County. As described in section 4.9.4, there is an adequate amount of vacant transient housing in Jackson County to house workers on the Project. The only other project with the potential to compete with the Project for housing availability or combine with the Project to affect local traffic would be the construction of the Port of Pascagoula Wood Pellet Export Terminal. Construction at the Pascagoula Wood Pellet Export Terminal is expected to begin in 2019, however, the duration of construction is unavailable. The Hospital Road Improvement project, Mississippi Phosphate Company, and VT Halter Marine Blast and Paint Facility do not represent a significant demand on housing, infrastructure, or community services. In addition, housing projects such as the Hague Property Housing Development and the Holland Street Housing Development would contribute to additional available long-term and transient housing in the area.

Given that the other projects in the area would likely not require large workforces similar to the proposed Project; we anticipate that there is adequate housing in the Project area to accommodate all of the proposed projects and do not anticipate a significant cumulative impact on the availability of housing in the county. Further, these impacts would largely be temporary and we conclude that there would not be any cumulative impacts on housing from operation of the projects.

Construction of the Project would generate a substantial number of jobs for a period of about 5 years. Construction of some of the other projects listed in table 4.13.1-1 could also occur during portions of that time period. The cumulative effect would be a minor reduction in unemployment in the area.

Public Services

The combined construction workforces of projects would not increase the need for public services. While construction of the Terminal Expansion would increase the number of workers within Jackson County, the other projects listed in table 4.13.1-1 are not expected to require large workforces. Therefore, we conclude the cumulative impact of the Project on public services would not be significant.

A large workforce for the Terminal Expansion as well as the workforces for the projects in the geographic scope would have a beneficial impact on revenues for the state and for Jackson County due to expenditures for services and materials for the projects, increased expenditures by local workers, and expenditures by the non-local workforce and any family members accompanying the non-local workers. Jackson County would also receive an increase in property taxes from some of the projects.

During operation, Gulf LNG would employ an additional 113 workers. The impact on housing, public services, or local facilities and other users of those facilities would be minor and the cumulative impact on these resources would not be significant. The total number of permanent employees for the new projects listed in table 4.13.1-1 would likely be substantially lower than the number of construction workers required for the Project. As with the construction workers, the permanent employees would be housed throughout Jackson County Therefore, we conclude the combined permanent workforce of the projects in table 4.13.1-1 that are under construction, planned, or reasonably foreseeable is not expected to have a significant impact on housing or public services in the area.

Marine Transportation

The geographic scope for marine transportation associated with the proposed Terminal Expansion was considered to be the Bayou Casotte Navigation Channel and the Mississippi Sound within the vicinity of the Terminal Expansion.

As previously described, construction of the projects within the Bayou Casotte would increase barge and support vessel traffic in the channel. Concurrent construction of those projects and the Terminal Expansion would likely result in a cumulative impact on vessel traffic in the waterway, primarily by increasing vessel travel times due to congestion. However, the major vessel traffic increase from the Project would be during the first 7 months and is not expected to result in a significant cumulative impact on vessel traffic in the waterway. No change is proposed in the number of LNG vessels that would call on the Terminal. Therefore, no cumulative impacts on marine traffic would occur during operation.

Land Transportation

We considered the geographic scope for land transportation to include Jackson County, which would house the Project facilities and the construction workers for the proposed Project. During construction, the addition of truck and commuter trips from the Project are estimated to result in a traffic increase of 53.6 percent to 68.2 percent on the north end of Highway 611 and 150 percent on the south end.

Construction of the Project would result in temporary impacts on road traffic.

During construction of the Project and the projects within the vicinity of Bayou Casotte, roadways within Pascagoula as well as Moss Point and Gautier may experience a moderate increase in daily vehicle trips as most workers are expected to be housed in Pascagoula and the surrounding towns of Moss Point and Gautier. During commuting times, impacts would be greatest along Highway 611, which is the only road that allows access to the Terminal Expansion site, as well as the proposed Wood Pellet Export facility, the existing Chevron Refinery, and the existing Mississippi Phosphates Corporation. As the construction workers of the Project and the other projects listed above would commute during the same times as workers at the existing facilities along SH-611, there may be a cumulative impact on traffic along the road. The recent widening of Highway 611 that created additional lanes as well as turning lines, would aid in reducing the overall cumulative impacts on road traffic.

Additionally, Gulf LNG has proposed several CSAs that would serve as parking areas for construction crews, limiting the traffic impacts on Highway 611. The majority of the workers would park at CSA-6 along Bayou Casotte Parkway at the Borsage Boats Facility and be transported to the construction site by bus. Based on the updated analysis of traffic impacts during construction, there could be moderate to significant delays along the roads in the area of CSA-6. The expansion of Hospital Road would alleviate additional congestion in the vicinity of the Project.

Truck transportation of NGLs would result in 11 truck trips per month. As discussed in section 4.9.6, according to Gulf LNG's Traffic Impact Analysis, 2013 daily traffic volumes were estimate to be 11,000 trips on the north end of SH-611 and 5,000 trips on the south end. The addition of 11 trucks were month would not be significant.

The Port of Pascagoula Wood Pellet Export Terminal project would be constructed at Terminals E and F on the east side of Bayou Casotte, where access would be required from Industrial Road for construction of this project. Where the construction schedule for this project overlaps with the Project construction schedule, the increase in traffic on Industrial Road would possibly increase access problems for both projects. The minimal addition of traffic to Industrial Road from the Wood Pellet Export Terminal project would not likely be significant. Construction of the Wood Pellet Export Terminal would overlap the active construction footprint of the Project's CSA-6, which is an existing previously disturbed fenced graveled yard. According to the Port of Pascagoula, the Wood Pellet Export Terminal is still in the design stages but is currently scheduled for construction in 2019 and the facility would be constructed on the CSA-6 site. Based on this information, Gulf LNG's use of CSA-6 may coincide with construction of the Wood Pellet Facility in the same location. If this occurs, Gulf LNG has agreed to not utilize CSA-6 and would pursue the use of another previously disturbed (in-kind) use site, resulting in no overlap and no cumulative impacts. Therefore, the cumulative effect of this increase in combination with the Wood Pellet Export Terminal project in the immediate Project area would be insignificant and would be temporary to short-term.

As previously stated, the Highway 611 Widening Project listed in table 4.13.1-1 has been completed and resulted in the widening of the roadway to five lanes for a section south of Old Mobile Avenue to Chevron, and then transitioning to a 4-lane undivided roadway south to Hardee Road at the end of state maintenance and the south end of the Chevron Refinery.

Although other projects listed in the table, including the Chevron Base Oil Plant Project, could increase road traffic in the Project area throughout the Project construction period, any potential increase would be offset by the reduction of 175 Mississippi Phosphates employees associated without their operations shut down and the reduction of 1,000 VT Halter Marine employees associated with their reduction in operations.

Gulf LNG is proposing to mitigate traffic impacts at the Bayou Casotte Parkway and Orchard Road Intersection by adding signage to clearly identify lane movements, adding raised pavement markers within the intersection, and restriping the intersection. These measures would help improve the functionality of the intersection and improve safety for drivers that are unfamiliar with driving in the area. To improve traffic flow into and out of the parking area at CSA-6, Gulf LNG would prohibit parking along Bayou Casotte Parkway adjacent to the parking area and would stripe the three driveways that access the parking area to ensure the entry lane would be a minimum of 14 feet wide. Even with the distribution of workers over several shifts the traffic study predicted poor levels of service at traffic intersections near CSA-6. In order to address these issues, we requested that Gulf LNG develop a *Traffic Mitigation Plan* in consultation with the City of Pascagoula and the MDOT. Gulf LNG is proposing to mitigate traffic impacts at the Bayou Casotte Parkway and Orchard Road Intersection by adding signage to clearly identify lane movements, adding raised pavement markers within the intersection, and restriping the intersection. These measures would help improve the functionality of the intersection and improve safety for drivers that are unfamiliar with driving in the area. Gulf LNG would implement these measures prior to starting construction.

We conclude that with implementation of Gulf LNG's proposed mitigation measures and our recommendation land transportation is not expected to result in a significant cumulative impact.

4.13.2.11 Environmental Justice

The geographic scope established for assessing cumulative impacts for environmental justice includes census tracts 420, 421, 426, and 427, that encompass the Project and the tract immediately across Bayou Casotte.

The distance of the Project from populated areas and the location of the existing Terminal effectively preclude disproportionate impacts by the Project on minority or low-income populations. As discussed below in section 4.13.2.13, no significant cumulative impacts are anticipated to surrounding communities, including EJ communities, based on the increase in both air and noise impacts from the Project.

As discussed in section 4.13.2.9, the line of sight to the Project's NSAs and other residential neighborhoods are screened by existing structures, trees, and other vegetation. The only direct line of the sight for the Bayou Casotte Industrial Park, including the Terminal, is from the crest of the Pascagoula Bridge on Highway 90, about 5 miles away. Therefore, none of the EJ communities would be within the viewshed for the Project nor would they experience any significant changes to their current viewshed.

There are potential traffic impacts associated with the Project traffic associated with CSA-6, which is located within a census block with a minority population of 68.3 percent and a poverty level of 31.8 percent. However, none of the other projects would contribute to the traffic along Highway 611 except the Wood Pellet Export Terminal. According to the Port of Pascagoula, the Wood Pellet Export Terminal is scheduled for construction in 2019 and the facility would be constructed on the CSA-6 site. Based on this information, Gulf LNG's use of CSA-6 may coincide with construction of the Wood Pellet Facility in the same location. If this occurs, Gulf LNG has agreed to not utilize CSA-6 and would pursue the use of another previously disturbed (in-kind) use site, resulting in no overlap and no cumulative impacts to the community or its residents.

Overall, no cumulative impacts on environmental justice would be associated with the Project relative to past, present, and reasonably foreseeable future projects in the area.

4.13.2.12 Cultural Resources

The geographic scope for cultural resources was considered to be the area adjacent to and overlapping the APE of the Project. No cultural resources were identified as a result of surveys completed for the Project. Therefore, the Project and other projects in the area would not add to cumulative impacts on cultural resources.

4.13.2.13 Air Quality and Noise

Air Quality

Air quality would be affected by construction and operation of the proposed facilities. Temporary air emissions would be generated during project construction, and long-term air emissions would be generated during operation.

Construction of the Terminal Expansion would temporarily impact air quality due to emissions from the combustion engines used to power construction equipment and from fugitive dust resulting from equipment movement on dirt roads and earth-disturbing activities. The future projects in the vicinity of the Terminal Expansion that would be constructed in a similar timeframe as the proposed Terminal Expansion are the non-jurisdictional MPC electrical line and the various small projects within Bayou Casotte, such as the residential developments and road improvement projects. The construction-related impacts of those projects would be temporary and the project proponents for those projects would minimize fugitive dust to the extent practicable. Because construction of the MPC Upgrade would be linear and move quickly, air emissions associated with this project would be intermittent. The construction of the projects along Bayou Casotte would be minor and are not expected to contribute to a significant cumulative impact on air quality.

Although the region in the vicinity of the Project is currently in attainment with air quality standards, increases in industrial point sources could affect local and regional air quality. Under MDEQ regulations, the Terminal Expansion would be considered a PSD major emissions source and would contribute to cumulative impacts on air quality within the geographic scope.

Ambient impacts were below SILs for all pollutants except SO_2. The cumulative modeling analysis for SO_2 (described in section 4.11.1) was performed to quantitatively demonstrate that the Terminal Expansion operational impacts, in addition to existing major sources of SO_2 within 50 km of the Terminal Expansion, would not have a significant impact on air quality. While the Terminal Expansion would contribute to a cumulative impact on air quality, as shown in the modeling analysis, this impact would not exceed the NAAQSs, which were established to protect public health (including sensitive populations) and public welfare. Projects that would potentially be constructed in the future, and are considered to be major sources of air emissions, would be required to conduct a similar analysis. Should operation of a new project result in a significant impact on air quality, the MDEQ would enforce operational limitations or require emissions controls that ensure the facility's compliance with the SIP and attainment with the NAAQS. In addition, Gulf LNG would be required to comply with permit conditions during operation of the facility and incorporate the required controls to limit the emission of certain criteria pollutants, HAPs, and/or GHGs.

Gulf LNG would minimize potential impacts on air quality due to the operation of the Terminal Expansion by adhering to applicable federal and state regulations and installing BACT to minimize emissions. As presented in Gulf LNG's PSD Permit application, the BACT analyses include identification of all applicable control technologies based on control effectiveness. The strictest controls are evaluated first and if those are technically or economically infeasible, or if environmental effects are significant, then the next most stringent control technology is reviewed. The process continues until the BACT level being considered cannot be eliminated based on technical or economic considerations, energy or environmental impacts.

Based on the current modeling analyses and the required emission controls, we conclude that there would be no significant cumulative impact on air quality as a result of the Terminal Expansion. As discussed in section 4.11.1.3, in July 2018 Gulf LNG indicated additional modeling is necessary and a revised PSD application is expected to be submitted by the end of 2018. The final EIS will include the additional modeling and expected emissions and the cumulative impacts assessment will be revised.

In addition to operation of the Terminal Expansion and the off-site sources of SO_2 described above, air emissions from LNG marine traffic and other Project-related vessels (considered mobile sources of air emissions), would occur along the entire waterway from the boundary of territorial waters to the vessel berths. Due to the transitory nature of these mobile sources and the large area covered, we conclude the associated emissions would not have a significant cumulative impact on air quality along the waterway. Gulf LNG has not requested an increase in the currently authorized number of LNG carriers; therefore, operation of the carriers and any associated mobile sources would not contribute to a cumulative impact on the air quality of the area beyond that previously assessed. While there would not be an increase in the currently authorized number of LNG carriers or the previously assessed vessel emissions, we evaluated emissions for total vessel operations as part of the cumulative impact analysis for the proposed Terminal Expansion. Mobile source emissions were calculated for LNG carriers and support vessels maneuvering, berthing, and loading at the Terminal Expansion, and while moored without loading (a condition termed “hoteling”), disconnection and deberthing); and outside the moored safety zone (i.e., channel transit) (see table 4.13.2-1). These mobile source emissions are not considered for permitting purposes by either the EPA or the MDEQ.

TABLE 4.13.2-1

Summary of Gulf LNG Terminal LNG Carrier and Support Vessel Emissions

Location	Annual Pollutant Emissions (tpy)					
	NO_X	**CO**	**SO_2**	**PM**	**VOCs**	**GHGs**
Inside Moored Safety Zone	78.5	5.7	2.1	1.3	3.2	3,445
Outside Moored Safety Zone	13.4	0.9	0.3	0.2	0.6	525
TOTAL	**91.8**	**6.7**	**2.4**	**1.5**	**3.8**	**3,971**

Screening air quality dispersion modeling for the Terminal Expansion and mobile sources within the moored safety zone was conducted for comparison with SILs for PM_{10}, $PM_{2.5}$, SO_2, CO, and NO_2. Table 4.13.2-2 lists the screening modeling results. Meteorological data from 2009 to 2013 was used as input to the models.

The screening levels for all pollutants except for 1-hour SO_2 were below the SILs; therefore, further refined modeling for PM_{10}, $PM_{2.5}$, CO, and NO_2 was not required. The 1-hour SO_2 screening resulted in levels greater than the SIL; therefore, refined modeling was conducted for SO_2 (see table 4.13.2-2). Potentially significant sources within 50 km of the Terminal Expansion were modeled for the 1-hour SO_2 NAAQS run.

A culpability analysis was conducted using the MAXDCONT post processor to determine if operation of the Terminal Expansion contributed significantly (7.8 $\mu g/m^3$) to any of the exceedances when combined in both time and space. The results listed in table 4.13.2-2 indicate that operation of the Terminal Expansion would not contribute significantly to exceedances of the 1-hour NAAQS for SO_2. Based on the modeling analysis, we conclude that the cumulative impact of the Terminal Expansion with the existing mobile sources at the existing Terminal would not have a significant impact on air quality in the geographic scope.

TABLE 4.13.2-2 **Results of Project Screening Analysis and NAAQS/PSD Increment Analysis for Operation of the Terminal Expansion**			
Screening Results			
Pollutant and Averaging Period	**Project Modeled Concentration**	**Class II Significant Impact Level**	**Less than Significant Impact Level?**
PM_{10} 24-hour	3.85 μg/m^3	5 μg/m^3	Yes
$PM_{2.5}$ Annual	0.11 μg/m^3	0.3 μg/m^3	Yes
$PM_{2.5}$ 24-hour	0.66 μg/m^3	1.2 μg/m^3	Yes
SO_2 3-hour	9.04 μg/m^3	25 μg/m^3	Yes
SO_2 1-hour	9.1 μg/m^3	7.8 μg/m^3	No
CO 8-hour	53.77 μg/m^3	500 μg/m^3	Yes
CO 1-hour	636.46 μg/m^3	2,000 μg/m^3	Yes
NO_2 Annual	0.32 μg/m^3	1 μg/m^3	Yes
NO_2 1-hour	7.29 μg/m^3	7.5 μg/m^3	Yes
NAAQS Refined Modeling Analysis			
Pollutant and Averaging Period	**Total Concentration (Modeled + Background)**	**NAAQS**	**Less than NAAQS?**
SO_2 1-hour	4,050 μg/m^3	196 μg/m^3 a/	No
Culpability Analysis			
Pollutant and Averaging Period	**Project Contribution to Modeled Maximum Concentration**	**Class II Significant Impact Level**	**Less than Significant Impact Level?**
SO_2 1-hour	3.99 μg/m^3	7.8 μg/m^3	Yes
a 196 μg/m^3 is equal to 75 ppb.			

Climate Change

The cumulative impact analysis described below does not focus on a specific geographic scope because climate change is a global phenomenon. Climate change is the change in climate over time, whether due to natural variability or as a result of human activity, and cannot be represented by single annual events or individual anomalies. As an example, a single large flood event or particularly hot summer may not be an indication of climate change, but a series of floods or high temperatures that statistically change the average precipitation or temperature over years or decades may indicate climate change.

The Intergovernmental Panel on Climate Change (IPCC) is the leading international, multi-governmental scientific body for the assessment of climate change. The United States is a member of the IPCC and participates in the IPCC working groups to develop reports. The leading United States scientific body on climate change is the U.S. Global Change Research Program (USGCRP).

Thirteen federal departments and agencies participate in the USGCRP, which began as a presidential initiative in 1989 and was mandated by Congress in the Global Change Research Act of 1990. The IPCC and USGCRP have recognized the following:

- globally, GHGs have been accumulating in the atmosphere since the beginning of the industrial era (circa 1750);
- combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture and clearing of forests is primarily responsible for the accumulation of GHG;
- anthropogenic GHG emissions are the primary contributing factor to climate change; and
- impacts extend beyond atmospheric climate change alone, and include changes to water resources, transportation, agriculture, ecosystems, and human health.
- average temperatures have risen about 2°F since 1970 and are projected to increase another 4.5 to 9°F during this century;
- increases in illness and death due to greater summer heat stress;
- the destructive potential of Atlantic hurricanes increased since 1970 and the intensity (with higher peak wind speeds, rainfall intensity, and storm surge height and strength) is likely to increase during this century;
- within the past century in the United States, relative sea level changes ranged from falling several inches to rising about 2 feet and are projected to increase another 3 to 4 feet this century;
- sea level rise and human alterations have caused coastal wetland loss during the past century, reducing the capacity of those wetlands to protect against storm surge, and projected sea level rise is anticipated to result in the loss of a large portion of the nation's remaining coastal wetlands;
- declines in dissolved oxygen in streams and lakes have caused fish kills and loss of aquatic species diversity;
- moderate to severe spring and summer drought areas have increased 12 to 14 percent (with frequency, duration and intensity also increasing and projected to increase);
- longer periods of time between rainfall events may lead to declines in recharge of groundwater and decreased water availability;
- responses to decreased water availability, such as increased groundwater pumping, may lead to stress or depletion of aquifers and a strain on surface water sources;
- increases in evaporation and plant water loss rates may alter the balance of runoff and groundwater recharge, which would likely to lead to saltwater intrusion into shallow aquifers;
- coastal waters temperature rose about 2°F in several regions and are likely to continue to warm as much as 4 to 8°F this century; and
- coastal water warming may lead to the transport of invasive species through ballast water exchange during ship transit.

GHGs produced by fossil fuel combustion are CO_2, CH_4, and N_2O. GHGs status as a pollutant is not related to toxicity. GHGs are non-toxic and non-hazardous at normal ambient concentrations, and there are no applicable ambient standards of emission limits for GHGs under the Clean Air Act. GHG emissions due to human activity are the primary cause of increased levels of all GHG since the industrial age. These elevated levels of GHGs are the primary cause of warming of the climate system since the 1950s. These existing and future emissions of GHGs, unless significantly curtailed, will cause further warming and changes to the local, regional, and global climate systems. During construction and operation of the Project these GHGs would be emitted from construction and operating equipment. Emissions of the GHGs are typically expressed in terms of CO_{2e}.

The GHG emissions associated with construction and operation of the Project are identified in section 4.11. Those emissions would not have any direct impacts on the environment in the general area of the Project, but may contribute incrementally to impacts in other areas. Gulf LNG would incorporate GHG BACT analyses as part of the air permits issued by the MDEQ. Potential controls for these emissions include reducing GHG emissions, through implementation of the following BACT: (1) use of low carbon fuels; (2) design and operational energy efficiency measures; (3) good combustion/operating practices; and (4) implementation of the 28VHP Leak Detection and Repair Program.

Gulf LNG also proposes combustion turbine startup/shutdown work practices. The refrigeration turbine startup would begin when fuel is introduced into the combustion turbine and would end when the Selective Catalytic Reduction and Dry Low NOx burners systems are operating at normal destruction efficiency. Turbine startup would not exceed 30 minutes. The refrigeration turbine shutdown would begin when the initiation of a shutdown sequence results in the combustion turbine dropping below 75 percent power and would be complete when fuel is terminated to the turbine. Turbine shutdown would not exceed 30 minutes.

On December 24, 2014, the CEQ published a revised draft GHG emissions guidance memo on how NEPA analysis and documentation should address GHG emissions and the impacts of climate change (CEQ, 2014). As recommended in this new guidance, to the extent practicable, the FERC staff has presented the GHG emissions associated with the Project and the potential impacts of GHG emissions in relation to climate change. The GHG emissions associated with construction and operation of the Project are discussed in sections 4.11.1.4 and 4.11.1.5, respectively. Currently, there is no standard methodology to determine how the Project's incremental contribution to GHGs would translate into physical effects on the global environment. However, the emissions would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources, and contribute incrementally to climate change that produces the impacts previously described. Because we cannot determine the Project's incremental physical impacts due to climate change on the environment, we cannot determine whether or not the Project's contribution to cumulative impacts on climate change would be significant.

Noise

Noise levels typically attenuate quickly as the distance from the noise source increases. Therefore, the geographic scope of potential impact considered for noise is within about 2 miles of the Terminal Expansion. There are two NSAs in the vicinity of the Terminal Expansion site. The closest NSAs are residences along Southshore Avenue about 1.8 miles northwest of the Project. The second NSAs are residences about 2.0 miles northwest of the facility along Beach Boulevard. Based on the distance to the NSA, sound levels from construction equipment would be significantly lower than 55 dBA and would not be expected to result in adverse impacts on the NSA. Sheet and pile driving could contribute sound levels of 52 dBA, which is also less than the noise criteria, and would also not be expected to result in significant impacts on the NSA. Furthermore, construction of the MPC Upgrade is not expected to result in significant impacts on the NSA closest to the Terminal. Noise impacts during construction of these projects and the Project would be localized and would attenuate as the distance from the noise source increases. In addition, increases in sound levels during construction activities would be intermittent and would generally occur during daylight hours. However, certain activities may need to be conducted during non-daylight hours to avoid construction schedule delays, including the unloading/staging of materials, barge unloading, dredging, pile-driving, and welding activities. Construction noise levels for these activities are not anticipated to exceed the noise criterion. However, if perceived noise levels cause a nuisance at the nearby NSAs and residents are inconvenienced, Gulf LNG would ensure the Commission's noise criterion of 55 dBA is met by construction of sound barriers, installation of residential grade exhaust mufflers on equipment, or reducing utilization rates as necessary. As a result, we conclude construction of the Terminal Expansion along with the non-jurisdictional project would not result in a significant noise impact on the nearest NSA.

The estimated operational noise level of the Terminal Expansion at the nearest NSA (about 1.8 miles to the northwest) is 47.0 dBA L_{dn} and is 0.8 dBA greater than the estimated ambient noise levels when considering operational and ambient noise. The threshold of perception of change in sound levels for human hearing is about 3 dBA; therefore, the increase would be unnoticeable or barely noticeable at the nearest NSA. Noise impacts would also occur from flare operation on an intermittent basis during startup, shutdown, or commissioning of the liquefaction facility, and infrequently in the event of a malfunction de-pressuring event. It is expected that noise attributable to the flare events would achieve 55 dBA L_{dn} or less once detailed design is completed, the flare design/vendor is selected, and final emergency flare rates are known.

The combined operation of the identified projects, should they all be authorized, could result in the raising of the average ambient noise level at the nearest NSAs but not by a significant measure. Cumulative operational noise would be audible at the Terminal site, but should not be significantly greater than current measured ambient noise due to noise attenuation. In addition, the liquefaction facility design should also result in no discernable vibration at the nearest NSAs. Generally, if there are off-site vibrations being induced from the Terminal, it would be indicative of malfunctioning equipment and would lead to equipment shutdown to enable repairs to establish normal operation.

Therefore, operational noise from the Terminal Expansion would result in minor impacts on the NSA.

4.13.2.14 Safety

For the proposed Terminal Expansion, we considered the geographic scope for marine vessel traffic to include the Mississippi Sound and the Bayou Casotte Navigation Channel. The geographic scope for the Terminal Expansion itself is the area adjacent to and in the vicinity of the Terminal site. The geographic scope for emergency services includes the area in the general vicinity of the proposed Terminal Expansion (which includes the non-jurisdictional projects and the existing industrial facilities along Highway 611).

Gulf LNG would mitigate impacts on public safety through the implementation of applicable federal, state, and local rules and regulations for the proposed Project as described in section 4.12. Those rules and regulations would ensure that the applicable design and engineering standards are implemented to protect the public and avoid or minimize the potential for accidents and failures.

Because Gulf LNG has not requested an increase in the number of LNG carriers calling on the Terminal, the Terminal Expansion would not add to the current risk assessment of public safety within the Mississippi Sound or Bayou Casotte Navigation Channel or of an intentional attack on an LNG carrier at berth or in transit in the sound.

As noted in section 4.12.2, the risk associated with the Pipeline Modifications would be small. In addition, the proposed Pipeline Modifications would be within an existing interconnection or meter station. As a result, we conclude that the cumulative impact on risk for the Pipeline Modifications would not be significant.

Emergency response time is a key aspect of public health and safety. Key emergency services are provided by the Gulf LNG Terminal, the Chevron Refinery, the Mississippi Phosphate Corporation, and

Jackson County and those services would expand to include the associated proposed liquefaction projects. In accordance with our regulations, Gulf LNG would prepare a comprehensive plan that identifies the cost sharing mechanisms for funding these emergency response costs. Therefore, we believe that the cumulative impact of each project's comprehensive plans would not result in a significant impact on public safety.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF THE ENVIRONMENTAL ANALYSIS

The conclusions and recommendations presented in this section are those of the FERC environmental staff. Our conclusions and recommendations are based on input from the COE, the EPA, the USCG, the DOE/FE, the DOT/PHMSA, the FWS, NMFS, and the Mississippi Secretary of State as cooperating agencies in the preparation of this EIS. The federal cooperating agencies may adopt this EIS per 40 CFR 1501.3 if, after an independent review of the document, they conclude that their requirements and/or regulatory responsibilities have been satisfied. However, these agencies would present their own conclusions and recommendations in their respective and applicable records of decision or determinations. Otherwise, they may elect to conduct their own supplemental environmental analyses.

We conclude that construction and operation of the Gulf LNG Liquefaction Project would result in limited adverse environmental impacts. Most adverse environmental impacts would be temporary or short-term during construction and operation, but long-term and permanent environmental impacts on wetlands, vegetation, land use, and EFH. This determination is based on a review of the information provided by Gulf LNG and further developed from data requests; field investigations; scoping; literature research; alternatives analysis; and contacts with federal, state, and local agencies as well as individual members of the public. As part of our analysis, we developed specific mitigation measures that we determined would appropriately and reasonably reduce the environmental impacts resulting from construction and operation of the Project. We are, therefore, recommending that these mitigation measures be attached as conditions to any authorization issued by the Commission. If the Project is constructed and operated in accordance with applicable laws and regulations, the mitigating measures discussed in this EIS, and our recommendations, adverse environmental impacts would be reduced to less than significant levels. A summary of the Project impacts and our conclusions regarding impacts are provided below by resource area.

5.1.1 Geologic Resources

Given the scope of the Project, we examined impacts on geologic resources within a 1-mile radius for the Terminal Expansion and in close proximity for the Pipeline Modifications. No known mining operations exist within a 1-mile radius of the Terminal Expansion site. Oil and gas exploration and production have occurred about 8 miles to the north of the existing Terminal. Therefore, we conclude that the Terminal Expansion would not affect mining or oil and gas exploration activities. No mineral resources or mineral extraction activities are known to be within close proximity of the Pipeline Modifications. Therefore, we conclude that the Pipeline Modifications would not affect mining or oil and gas activities.

5.1.2 Soils

Construction of the Project facilities would temporarily disturb soils, resulting in increased potential for erosion, compaction, and poor revegetation following construction. Erosion potential in the Project area is reduced by the generally level topography of the area and the highly cohesive nature of most of the soils. The potential for soil erosion would be further minimized through the use of erosion control and revegetation measures as described in the *Gulf LNG Plan*. The majority of soils in the Project area are considered hydric and have a high potential for compaction. If soil de-compaction is required, Gulf LNG would use a method such as deep tilling to loosen the soil after construction is completed. The CSAs contain 34.5 acres of soils that have a low revegetation potential. CSA-2, CSA-3, and CSA-6 are currently surfaced with gravel and CSA-1, CSA-4, and CSA-5 are currently or have recently been used for industrial purposes. The CSAs would be restored to their previous condition at the completion of construction except for CSA-3, which would continue to be used by Gulf LNG throughout operation of the Project.

Based on Gulf LNG's proposed permanent filling of the wetlands at CSA-5 and our experience with natural gas facility construction, we have determined that Gulf LNG has not adequately justified permanently filling the wetlands at CSA-5. Therefore, we are recommending that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the *FERC Procedures*.

There are no prime farmland soils on the sites of the Terminal Expansion or Pipeline Modifications, but these soils are present at CSA-3 and CSA-6. CSA-3 is currently used by Gulf LNG for warehousing and equipment storage while CSA-6 is currently being used as a parking lot with a layer of crushed gravel covering the area. Neither CSA contains any active agricultural operations and both are already being used for industrial use; therefore, no new impacts on prime farmland soils is expected.

Gulf LNG did not encounter contaminated soil during construction of the existing Terminal or the associated pipeline facilities. Gulf LNG conducted soil sampling of previously dredged materials that would be removed as part of Project construction to determine their eligibility for beneficial use. According to Gulf LNG, about 10.4 acres of sediments around station 10 may have elevated contaminant levels of arsenic and cadmium. Because these sediments would meet the permissible concentration requirements for ocean disposal, Gulf LNG proposes to blend these sediments with other sediments removed from the BCDMMS. Gulf LNG would consult with the MDEQ and the COE prior to construction to determine if the blended sediments would be appropriate for use at the Terminal Expansion site. Any sediment not used would be transported to an approved site for upland disposal. In addition, if any previously unidentified contaminated soil were discovered during construction, Gulf LNG would implement its *Plan for Unanticipated Discovery of Hazardous Materials* (see appendix H).

Gulf LNG has amended its *SPCC Plan* to include the Terminal Expansion. This plan identifies cleanup procedures to be implemented in the event of soil contamination from spills or leaks of fuel, lubricants, coolants, or solvents.

Creation of the North and South Supply Docks would require dredging of approximately 100,000 cy of sediment for each dock to a depth of 12 feet below msl. Gulf LNG would work with federal and state agencies to identify a suitable BU site for dredge material disposal. Gulf LNG would utilize an offshore dredged material disposal site if a suitable BU site is not available in accordance with its dredge disposal permit that would be issued by the COE.

During construction, a temporary barge access channel would be dredged from the South Supply Dock along the outer perimeter of the proposed wetland mitigation site (dredging of about 200,000 cy of material). Barges would use the temporary channel to install the perimeter riprap. The sediment removed for the channel would be temporarily placed within the proposed wetland mitigation site and then replaced in the temporary channel after the riprap is installed. All of the dredge material would be replaced in the temporary channel or contained within the marsh creation area, so off-site disposal would not be necessary.

With implementation of the *Gulf LNG Plan*, *Gulf LNG Procedures*, SPCC Plan, and Gulf LNG abiding by any permit conditions associated with its CWA permit, we conclude that impacts on soils would mostly be temporary and would not be significant.

5.1.3 Water Resources

The Project is underlain by the upper portion of the Coastal Lowlands Aquifer System (known as the Chicot Aquifer); however, we do not anticipate any long-term or significant impacts on the aquifer due to construction or operation of the Project. Standard construction procedures could affect groundwater resources by altering overland water flow and infiltration rates. Because the recharge areas are much larger than the footprint of the Project, changes in groundwater recharge as a result of Project construction are not expected to be significant. There are no active public water supply wells, wellhead protection areas, or springs within 150 feet of Terminal Expansion. There are eight private water supply wells within 500 feet of the CSAs and one private well at CSA-1. The location of the private water supply well at CSA-1 would be clearly marked and refueling and the storage of hazardous materials would be restricted within a 200-foot buffer of its location. Gulf LNG would also conduct pre- and post-construction monitoring of water quality and yield for the private well with the owner's permission.

Gulf LNG would withdraw water for hydrostatic testing the Terminal Expansion, the Destin Meter Station, and the Gulfstream Meter Station from the Port of Pascagoula's Industrial Water Supply. Gulf LNG estimates that the Project would require a total of 111,723,725 gallons of water during construction (including 3,410,000 gallons for hydrostatic testing). Correspondence from the JCPA states it has the supply and permit authority to meet the Project's industrial water requirements. Hydrostatic test water from the Terminal Expansion would be discharged into the Mississippi Sound in accordance with MDEQ NPDES discharge permit MSG13. Groundwater would not be used for hydrostatic testing; therefore, no impacts on groundwater as a result of hydrostatic testing are expected.

Gulf LNG would dredge about 200,000 cy for construction of the North and South Supply Docks; during operation of the Project, the North Supply Dock would undergo maintenance dredging. Dredging would be conducted in accordance with the MDMR and the COE permits. The South Supply Dock would be removed following construction. Following construction, ownership of the North Supply Dock would be transferred to the JCPA. Dredging impacts would be minimized through adherence to the mitigation measures provided in Gulf LNG's *Dredging and Disposal Plan* which include the use of turbidity curtains around the area being excavated to limit the transport of turbid water beyond the vicinity of the dredging operations. Additionally, Gulf LNG is currently engaging in consultations with the COE and the MDEQ as part of the CWA Section 401 application process. As part of this process, Gulf LNG would discuss with the COE and the MDEQ the practicality and effectiveness of methods for reducing turbidity in the vicinity of dredging operations.

We conclude that the potential impacts on groundwater and surface water quality during construction and operation of the Terminal Expansion would be minimized through implementation of the measures contained in the *Gulf LNG Plan* and *Gulf LNG Procedures*, which incorporate measures required by the *FERC's Plan* and *Procedures*. In addition, Gulf LNG would implement its SPCC Plan to minimize any potential impacts from a spill of hazardous fluids. Therefore, we conclude no significant impacts on water resources would occur due to construction and operation of the Project. In addition, Gulf LNG must comply with the COE Section 404 and Section 10 permits.

5.1.4 Wetlands

Construction and operation of the Terminal Expansion would permanently affect a total of 38.7 acres of wetlands (all of which are jurisdictional). Impacts would be offset by Gulf LNG's compensatory mitigation measures, which are detailed in its compensatory wetland mitigation plan. Gulf LNG's currently proposed wetland mitigation would include creation of a 50-acre EEM wetland south of the existing Terminal on Mississippi Sound and purchase of freshwater wetland mitigation credits. The mitigation plan is under agency review; Gulf LNG would finalize the design details and construction plan and file the finalized plan during final design. To further minimize impacts on wetlands, Gulf LNG would comply with all conditions of the Section 404 and Section 10 permits.

Based on Gulf LNG's proposed permanent filling of the wetlands at CSA-5 and our experience with natural gas facility construction, we have determined that Gulf LNG has not adequately justified permanently filling the wetlands at CSA-5. Therefore, we are recommending that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the *FERC Procedures*.

No wetlands would be impacted by construction of the Pipeline Modifications.

Based on implementation of the mitigation measures outlined by Gulf LNG, collocation of the Project with the existing Terminal, and implementation of agency-approved compensatory mitigation, we conclude that impacts on wetlands during construction and operation of the Project would not be significant.

5.1.5 Vegetation

The Terminal Expansion site is generally disturbed due to industrial activities that have occurred over the last 50 years, including the construction and operation of the existing Terminal and its use as a dredge material disposal site. As a result, much of the property is comprised of vegetation indicative of disturbed sites. Operation of the Terminal Expansion would permanently impact about 81 acres of vegetation. We conclude that the loss of vegetation from the Terminal Expansion would be minor but permanent. Gulf LNG would implement compensatory mitigation for wetland vegetation impacts as mentioned above.

The proposed CSA sites are sited either partially or entirely on previously developed, industrial/commercial land. Two of the sites (i.e., CSA-3 and CSA-5) contain areas of both upland forest and wetland vegetation. Gulf LNG would avoid impacts on vegetation at CSA-3 during construction and operation of the Project. However, Gulf LNG would remove all vegetation at CSA-5 to permanently convert it to upland, industrial/commercial land. Gulf LNG would purchase credits from a wetland mitigation bank to offset impacts on wetlands at CSA-5.

As discussed above, based on Gulf LNG's proposed permanent filling of the wetlands at CSA-5 and our experience with natural gas facility construction, we have determined that Gulf LNG has not adequately justified permanently filling the wetlands at CSA-5. Therefore, we are recommending that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the *FERC Procedures*.

Construction of the Pipeline Modifications would take place mainly on industrial/commercial land. Construction of the Gulfstream Meter Station would require 0.1 acre of open upland (existing pipeline right-of-way); however, this land would revert back to pre-construction conditions once construction is completed. Therefore, impacts on vegetation would be negligible.

Twenty exotic, invasive, and/or noxious plant species were identified in the Project area (see table 4.5.3-1). Of these plants, two are noxious species of concern: Chinese tallow and cogongrass. Gulf LNG would control growth of these species through best-management vegetation practices. If these methods prove to be inadequate, Gulf LNG has committed to work with local vegetation experts to develop improved measures.

We anticipate that impacts on vegetation generally would be permanent but not significant due to the industrialized nature of the area and Gulf LNG's compensatory wetland mitigation measures. Further, we anticipate that impacts on upland forested vegetation would result in permanent impacts.

5.1.6 Wildlife and Aquatic Resources

Construction and operation of the Terminal Expansion would result in the removal of all habitats at the site and conversion of the site to industrial land. This would have a permanent effect on wildlife and wildlife habitats of the site; however, much of the Terminal Expansion site was previously disturbed, as described above, resulting in degraded wildlife habitat and a reduction in habitat diversity and the number of species on the site. Gulf LNG would mitigate wetland habitat impacts at the Terminal Expansion site through the creation of tidal marsh, which would provide additional habitat.

As stated above, all CSA sites are either fully or partially on previously developed, industrial/commercial land with little to no wildlife habitat. Impacts on vegetation at CSA-3 would be avoided during construction and operation, therefore, impacts on wildlife habitat at that site would be temporary and minor. Removal of vegetation at CSA-5 and conversion of the site to upland industrial/commercial land would result in the permanent loss of wildlife habitat at this site. However, due to the measures Gulf LNG would employ to avoid impacts on nesting birds (see below), impacts would not be significant. In addition, Gulf LNG would mitigate for impacts on wetland vegetation and associated wildlife habitat at CSA-5 by purchasing credits at a wetland mitigation bank. However, based on Gulf LNG's proposed permanent filling of the wetlands at CSA-5 and our experience with natural gas facility construction, we have determined that Gulf LNG has not adequately justified permanently filling the wetlands at CSA-5. Therefore, we are recommending that Gulf LNG commit to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with the *FERC Procedures*.

The Pipeline Modifications would be located almost entirely on industrial/commercial land. Therefore, construction and operation at these sites would not result in impacts on wildlife habitat.

Gulf LNG filed its *Migratory Bird Plan* with the FWS, which identifies migratory birds likely to be found in the Project area, discusses potential impacts on these species, and provides impact mitigation strategies (see appendix J). Gulf LNG is continuing to consult with the FWS on the development of this plan. Therefore, we are recommending that Gulf LNG file its finalized *Migratory Bird Plan* with the FERC prior to construction (see section 4.6.1.4). Gulf LNG would avoid impacts on nesting birds at CSA-5 by either restricting vegetation clearing to times outside of the nesting season or conducting pre-construction surveys for active nests prior to clearing. If an active nest is identified during surveys, Gulf LNG would postpone vegetation clearing until the nesting season is complete. Based on Gulf LNG's commitment to continue consultations with the FWS and implement mitigation measures to avoid impacts on migratory birds, we conclude adverse impacts on migratory birds would not be significant.

Impacts on aquatic resources during construction and operation of the Terminal Expansion would range from temporary and minor to permanent. Construction, including dredging, of the North and South Supply Docks and operation, including periodic dredging, at the North Supply Dock would result in minor and temporary impacts on shallow estuarine habitat. Construction of the Terminal Expansion, including the North Supply Dock, and the compensatory wetland mitigation site would result in permanent impacts on coastal marsh and shallow estuarine habitat, respectively. NMFS and the GMFMC have identified the Mississippi Sound near Bayou Casotte as EFH for multiple recreational and commercial marine species. The EFH that would be effected by the Terminal Expansion includes shallow estuarine habitat (i.e., estuarine water column and estuarine benthic habitat [soft bottom sediment]), and intertidal vegetation (i.e., coastal marsh). To minimize impacts from dredging and construction on EFH and EFH species, Gulf LNG would install and maintain turbidity curtains around the area being excavated to limit the transport of turbid water beyond the vicinity of the dredging operations, and adhere to measures contained in its *Gulf LNG Plan* and *Gulf LNG Procedures*, the *SPPC Plan*, and existing and future federal and state permit requirements.

Pile driving near and within the Bayou Casotte waters could cause rapid concussive noise and generate underwater sound pressure waves that could adversely affect nearby marine organisms, including fish, sea turtles, and marine mammals. Therefore, we are recommending that Gulf LNG file a *Pile Driving Mitigation Plan* that outlines specific mitigation measures, including acoustical in-water monitoring, that would be implemented to limit underwater noise impacts to no more than 183 dB re: 1 µPa. Aquatic resources within the Project area are likely accustomed to regular fluctuations in noise from nearby industrial activity and maintenance dredging. Therefore, we conclude that adverse impacts on EFH species due to noise would be temporary, localized, and minor. Based on a review of the EFH species' habitats and life histories and implementation of Gulf LNG's conservation measures, we conclude that no substantial adverse impacts on EFH or EFH species would occur during construction or operation of the Terminal Expansion, as impacts would primarily be localized, temporary, and minor. Where impacts on coastal marsh and shallow estuarine EFH would be permanent, Gulf LNG would provide adequate compensation, as required by the COE for wetland impacts, through the successful completion of the wetland compensatory mitigation site.

Gulf LNG would not impact waterbodies by constructing and operating the Pipeline Modifications.

Based on Gulf LNG's proposal, including implementation of its Plan and Procedures, we conclude impacts on wildlife and aquatic resources would be adequately minimized and not significant.

5.1.7 Threatened, Endangered, and Other Special Status Species

Based on consultations with the FWS, NMFS, and Gulf LNG's species-specific surveys, 19 federally listed species, and 2 species under review for federal listing potentially occur in the general Project area. We anticipate that construction and operation of the proposed Project *is not likely to adversely affect* the Alabama red-bellied turtle, rufa red knot, piping plover, wood stork, least tern, interior least tern, West Indian manatee, blue whale, sperm whale, fin whale, humpback whale, sei whale, gulf sturgeon, smalltooth sawfish, Kemp's ridley sea turtle, green sea turtle, loggerhead sea turtle, leatherback sea turtle, and hawksbill sea turtle. We expect that Project-related construction and operation would not contribute to a trend toward federal listing for the Bryde's whale and saltmarsh topminnow. As part of the ESA Section 7 consultation process, we have prepared a BA, which is summarized in section 4.7.1 and provided in appendix B.

Based on the analysis of information and potential affects regarding federally listed species and their critical habitats, we have determined that adherence with the FWS' and NMFS' avoidance and minimization recommendations, Gulf LNG's proposed construction procedures and mitigation measures described in its application, and compliance with federal and state permit conditions, the Project is not likely to adversely affect federally listed species. With the draft EIS, we are requesting that the FWS and NMFS concur with our determination of effects on these protected species and complete Section 7 consultation. Because consultation with the FWS and NMFS is ongoing, we are recommending that the FERC staff completes any necessary ESA consultation with these agencies prior to construction.

Based on consultations with the MDWFP and Gulf LNG's species-specific surveys, three birds, one plant species of state concern, and one special status species occur within 2 miles of the Project facility sites and could be affected by the Project. We anticipate that impacts from the Project would not be significant for the snowy plover, peregrine falcon, brown pelican, and bald eagle. A small population of Carolina grasswort is at the proposed Terminal Expansion. Therefore, we are recommending that Gulf LNG transplant the Carolina grasswort population to a similar habitat using protocols determined in consultation with the MMNS. With implementation of our recommendation, we expect that Project-related impacts on the population of Carolina grasswort would not be significant.

In summary, we conclude that implementation of Gulf LNG's mitigation measures, our recommendations, and implementation of the measures contained in the *Gulf LNG Plan* and *Gulf LNG Procedures,* during construction and operation of the Project would adequately minimize impacts on federally and state-listed species along with other species of concern.

5.1.8 Land Use, Recreation, and Visual Resources

Construction of the Terminal Expansion would be within and adjacent to the existing Terminal and would result in 230.8 acres of construction impacts and 172.1 acres of operation impacts of open land, industrial/commercial land, wetlands, and open water. All of the affected area within the operational footprint would be permanently converted to industrial land. The Terminal Expansion site is within the designated coastal zone, which is managed by the MDMR. A determination from the MDMR that the Project is consistent with the Mississippi CZMP has not yet been obtained by Gulf LNG. Therefore, we are recommending that Gulf LNG file documentation of concurrence from the MDMR that the Project is consistent with the Mississippi CZMP prior to construction.

Gulf LNG has not requested any changes in the number or route of LNG carriers currently authorized to call on the Terminal. Although barge traffic in the Bayou Casotte Navigation Channel would increase during construction, we anticipate that the overall impact on recreational boating and fishing would be minor.

Views of the Terminal Expansion would generally be similar to those of the adjacent existing Terminal and the surrounding industrial areas. The tallest structure to be constructed would be the 430-foot-tall flare tower at the southwest corner of the site. The flares would be operated only during start-up and when incidents require releases. Overall, we believe the Terminal Expansion would result in minor impacts on the viewshed during construction and operation.

Construction and operation of the Pipeline Modifications would result in 3.5 acres of construction impacts on industrial land and 0.1 acre of impacts on open land. All of which would be within the currently fenced areas of the meter stations and interconnection sites or the associated pipeline right-of-way. There are few viewers of these existing facilities and Gulf LNG and Transco would not make major above-ground changes to the facilities. As a result, we conclude that there would not be more than minor visual impacts due to construction and operation of the modifications.

5.1.9 Socioeconomics

Construction of the Project would increase the population within Jackson County for the 66-month construction period. Although the peak construction workforce for the Project would be about 4,300 workers, it is estimated that 40 percent of the workers would come from the local area. The large tourism destination areas of Biloxi/Gulfport, Mississippi, and Mobile, Alabama are within a 40-mile commuting distance. In addition to the local housing supply, these areas are estimated to be able to accommodate the excess demand and we conclude the impact on housing would not be significant. We anticipate that the impact of the Project workforce on public services would also be minor.

Construction and operation of the Project would increase local and state tax revenues from sales taxes, payroll taxes, and property taxes, and would likely increase local employment. However, these impacts would not be significant.

The Terminal Expansion and the Pipeline Modifications would all occur in an industrial area. The Project would not significantly impact urban or residential areas, and no disproportionately high and adverse human health or environmental effects on minority, low-income communities, or Native American tribes have been identified.

Gulf LNG would minimize traffic into and out of the Terminal Expansion site by including off-site parking into its Project design. Gulf LNG's traffic study predicted poor levels of service at traffic intersections near CSA-6 and high volumes of traffic near residential areas. To mitigate traffic impacts at the Bayou Casotte Parkway and Orchard Road intersection Gulf LNG is proposing to add signage to clearly identify lane movements, add raised pavement markers within the intersection, and restripe the intersection. These measures would help improve the functionality of the intersection and improve safety for drivers that are unfamiliar with driving in the area. Gulf LNG would implement these measures prior to starting construction. To further improve traffic flow into and out of the parking area at CSA-6, Gulf LNG would prohibit parking along Bayou Casotte Parkway adjacent to the parking area and they would stripe the three driveways that access the parking area to ensure the entry lane would be a minimum of 14 feet wide. Additionally, a large business along Bayou Casotte Parkway has reduced its number of employees by around 1,000, which would further reduce traffic during construction. However, the Project's traffic impact study was conducted prior to this reduction of employees. Therefore, we are recommending that prior to the end of the DEIS comment period, Gulf LNG file an updated traffic analysis based on the current traffic conditions and construction schedule. While residents from the area to the west of CSA-6 could access their residences and schools along Bayou Casotte Parkway, it is more likely that they would use other, more direct routes such as Martin Street. With the mitigation measures outlined by Gulf LNG, our recommendation for an updated analysis, and the availability of other routes for local residents, construction of the Project would have a temporary and minor impact on traffic in the area of the Project.

Barges would deliver equipment and materials to the two supply docks off the Bayou Casotte Navigation Channel. The impact of barge traffic on the waterway would be moderate during the 2-month period when the supply docks would be constructed and would decline to a minor impact for the rest of the construction period.

Gulf LNG has not requested to increase the number of LNG carriers calling on the Terminal above the number currently authorized; however, they did request an increase in the size of LNG carriers that could access the marine berths. The larger sized carriers would be consistent with the traffic analyzed under the existing Terminal.

5.1.10 Cultural Resources

Gulf LNG completed cultural resource surveys for the Project, and no cultural resources were identified within the Project footprint. The MDAH (SHPO) reviewed the Phase I survey reports and concurred that the Project would not affect historic properties, and we agree. The review process under Section 106 of the NHPA is complete for the Project.

5.1.11 Air Quality and Noise

Construction of the Project would result in temporary impacts on air quality due to emissions from fossil-fueled construction equipment and fugitive dust. Gulf LNG would incorporate dust control measures during construction to minimize fugitive dust, and we conclude the impact of construction on air quality would be minor. Gulf LNG has not provided total estimated emissions for operation of train 1 while train 2 is under construction. Therefore, we are recommending that Gulf LNG file updated air quality estimates prior to the end of the draft EIS comment period.

Long-term impacts on air quality would be caused during operation of the Terminal Expansion. However, Gulf LNG would minimize potential impacts on air quality associated with operation of the Terminal Expansion by adhering to applicable federal and state regulations and installing BACT to minimize emissions. Gulf LNG submitted a PSD air quality permit application for the Terminal Expansion in May 2015, with revisions in June 2015, December 2016, and another revision pending submittal. The revised application will include additional modeling, updated emissions, and revised Class I impact analysis, which will be incorporated the final EIS. As a result, at the time of this writing, the permit has not yet been issued. It is expected that compliance with the applicable state and federal air quality standards and regulations would be addressed accordingly in the issued permit.

Construction activities and the associated noise would vary depending on the phase of construction in progress at any one time. The most prevalent sound generating equipment during site construction of the Terminal Expansion would be internal combustion engines of construction equipment. The sound levels experienced at the nearby noise sensitive areas (NSAs) would depend on the type of equipment used, the mode of operation of the equipment, the length of time the equipment is in use, the amount of equipment used simultaneously, and the distance between the sound generation source and the receptor. However, based on the distance to the NSA, construction noise from this typical construction equipment is not anticipated to exceed the Commission's noise criterion. If perceived noise levels cause a nuisance at the nearby NSAs, Gulf LNG proposes to ensure the noise criterion of 55 dBA is met by construction of sound barriers or installation of residential grade exhaust mufflers on equipment as necessary. We conclude that Gulf LNG's commitments would lessen impacts on residents to the extent practicable.

Dredging of the marine off-loading facilities and for material barge access to the wetland mitigation area, as well as, pile driving during onshore construction of the Terminal Expansion and during offshore construction of the supply, would produce peak sound levels that would be perceptible above the prevalent sound levels during construction. However, the resulting noise is less than the Commission's noise criterion, and would not be expected to result in significant impacts on the NSA.

Operation of the Terminal Expansion would generate sound levels that would occur throughout the life of the Project. Based on preliminary operational noise levels for anticipated equipment, the increase in noise levels would be below the "barely detectable" noise level increase of 3 dBA and would result in minor impacts on the nearest NSA. In addition, the noise level would be below the FERC limit of an L_{dn} of 55 dBA. We are recommending, however, that Gulf LNG file a full load noise survey no later than 60 days after each liquefaction train is put in service for the first and second liquefaction trains. If noise levels attributable to operation of the Terminal Expansion exceed the FERC limit of an L_{dn} of 55 dBA, Gulf LNG would be required to install additional mitigation to reduce the Terminal's noise contribution to ensure that the noise level that is no higher than the FERC requirement. We are also recommending that Gulf LNG file a full load noise survey no later than 60 days after placing all the Terminal Expansion facilities in service.

Noise impacts would also occur from flare operation on an intermittent basis during start-up, shutdown, or commissioning of the liquefaction facility, and infrequently in the event of a malfunction de-pressuring event. We anticipate that noise attributable to planned flare events would achieve 55 dBA L_{dn} or less once detailed design is completed, the flare design/vendor is selected, and final emergency flare rates are known. Unplanned flare events would produce more noise, with an estimated L_{dn} of 56 to 61 dBA at the nearest NSAs; however, because of the infrequent occurrence and expected operation of flares during these events, we conclude that the resulting noise would not result in a significant impact on the NSAs.

5.1.12 Safety

An evaluation and review of the safety of the proposed Terminal Expansion by the FERC staff, including a review of the cryogenic design of the facilities proposed for liquefaction, related facilities, and safety systems, concluded that the Terminal Expansion would not pose a risk to public safety with the incorporation of our recommendations.

The DOT will provide a LOD on the Project's compliance with 49 CFR 193 Subpart B. This determination would be provided to the Commission for consideration during its decision and final action on the Project application.

The USCG reviewed Gulf LNG's request to increase the size of the authorized LNG carriers from a maximum of 170,000 m^3 to 208,000 m^3. The USCG determined that the navigation portion of the original WSA did not account for larger LNG carriers. Therefore, the USCG prepared an updated draft LOR and Letter of Recommendation-Analysis (LOR-A) which was provided to the FERC in January 2016. The USCG prepared the final LOR and LOR-A dated May 16, 2016 which was provided to the FERC on August 9, 2017.

Gulf LNG would design, construct, operate, and maintain its Pipeline Modifications to meet or exceed the DOT Minimum Federal Safety Standards in 49 CFR 192 and other applicable federal and state regulations.

By designing and operating the proposed Project in accordance with the applicable standards, the Project would represent only a slight increase in risk to the nearby public.

5.1.13 Cumulative Impacts

We considered the contributions of the proposed Project in specific cumulative impact areas for the resources affected by the Project. As a part of that assessment, we identified existing projects, projects under construction, projects that are proposed or planned, and reasonably foreseeable projects, including the existing Terminal, non-jurisdictional facilities, currently operating and future oil and gas projects, land transportation projects, and commercial developments and dredging projects. Our assessment considered the impacts of the proposed Project combined with the impacts of the other projects on resources within all or part of the same area and time.

We conclude that, contingent upon Gulf LNG successfully completing their proposed mitigation measures for impacts on wetlands and land transportation, and Gulf LNG following our recommendations to moderate impacts from pile driving on aquatic species and land transportation, the Project's contribution to cumulative impacts on the affected resources would not be significant.

5.1.14 Alternatives

As alternatives to the proposed action, we evaluated the No-Action Alternative, system alternatives, alternative Terminal Expansion sites, alternative plot plans for the Terminal Expansion, supply dock alternatives, alternative CSA sites, alternative Pipeline Modification sites, an alternative power source for the refrigeration compressors, and an alternative power source for the Terminal Expansion. Alternatives were evaluated and compared to the Project to determine if these alternatives were environmentally preferable to the Project. While the No-Action Alternative would avoid the environmental impacts identified in this EIS, adoption of this alternative would preclude meeting the Project objectives. If the Project is not approved and built, the need could potentially be met by other LNG export projects developed elsewhere in the Gulf Coast region or in other areas of the United States. Implementation of other LNG export projects likely would result in impacts similar to or greater than those of the proposed Project.

We evaluated 20 system alternatives for the Terminal Expansion, including 5 operating LNG import terminals in the Gulf of Mexico area, and 15 proposed or planned liquefaction and export projects along the Gulf Coast. All of the systems were eliminated from further consideration, primarily due to the need for substantial construction beyond that currently proposed or planned to meet the need of the Project, and the resultant potential environmental impacts that were considered comparable to or greater than those of the Project. As a result, none of the projects assessed as a potential system alternative offered a significant environmental advantage over the Project.

We considered potential alternative Terminal Expansion sites in proximity to the existing Terminal in an attempt to avoid or minimize wetland impacts while using the infrastructure of the existing Terminal, such as the LNG storage tanks and the marine berth. However, the area in the vicinity of the existing Terminal has extensive wetlands, including the Grand Bay Savanna Preserve, or is heavily developed. As a result, we conclude that development of the expanded Terminal on alternative sites or with alternate configurations would not be environmentally preferable.

In our alternatives analysis, we also considered the use of only one supply dock and alternative sites for the two proposed supply docks. We agreed with Gulf LNG that two supply docks were needed to facilitate construction, and that use of the existing marine berthing facility for delivery of construction equipment and materials was not a reasonable alternative. Essentially all of the area adjacent to Mississippi Sound and the Bayou Casotte Navigation Channel in the vicinity of the Terminal Expansion site is either wetlands or is heavily developed and we did not identify any reasonable alternative sites for either supply dock. As a result of these considerations, we conclude that the construction of two supply docks at the proposed sites for use during construction is the preferred alternative.

Gulf LNG selected CSAs that were previously used for similar activities. We do not consider the direct impacts on the proposed CSA sites or the impacts due to use of the sites (such as transportation, air quality, and noise impacts) to be significant and therefore did not assess alternative CSA sites.

All of the Pipeline Modifications outside of the Terminal Expansion site would be constructed within existing fenced and graveled facilities that are within natural gas pipeline rights-of-way. We did not identify any environmental concerns with those sites that require the need to identify and evaluate alternative sites.

Each liquefaction train would have two gas-fired turbines to provide the power required to operate the refrigeration compressors. FERC staff assessed whether using purchased electrical power would be a suitable alternative. Based on the available data and using EPA's emission factors for grid-supplied power for the region, we conclude that the alternative of using purchased power does not offer a significant environmental advantage over the proposed use of gas-fired turbines with emission control equipment, and that the proposed power source of gas-fired turbines for the refrigerant compressors is the preferred alternative.

Except for the refrigeration units, Gulf LNG proposes to use purchased power to operate the Terminal Expansion. We considered the alternative of installing and operating gas-fired turbines to provide the required power. Based on the available data and using EPA's emission factors for grid-supplied power for the region, we conclude that using purchased power would be the preferred alternative.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission authorizes the Gulf LNG Liquefaction Project, we are recommending that the following measures be included as specific conditions in the Commission's Order. We believe that these measures would further mitigate the environmental impacts associated with construction and operation of the Project. These measures may apply to Gulf LLC, GLE, GLP or to all applicants collectively, referred to as "Gulf LNG."

1. Gulf LNG shall follow the construction procedures and mitigation measures described in its application, supplemental filings (including responses to staff data requests), and as identified in the EIS, unless modified by the Order. Gulf LNG must:

    a. request any modification to these procedures, measures, or conditions in a filing with the Secretary;
    b. justify each modification relative to site-specific conditions;
    c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and
    d. receive approval in writing from the Director of OEP **before using that modification**.

2. For LNG facilities, the Director of OEP has delegated authority to address any requests for approvals or authorizations necessary to carry out the conditions of the Order, and take whatever steps are necessary to ensure the protection of life, health, property, and the environment during construction and operation of the Project. This authority shall include:

    a. the modification of conditions of the Order,
    b. stop-work authority and authority to cease operation; and
    c. the imposition of any additional measures deemed necessary to assure continued compliance with the intent of the conditions of the Order as well as the avoidance or mitigation of unforeseen adverse environmental impacts resulting from Project construction and operation.

3. For pipeline facilities, the Director of OEP, or the Director's designee, has delegated authority to address any requests for approvals or authorizations necessary to carry out the conditions of the Order, and take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the Project. This authority shall allow:

    a. the modification of conditions of the Order,
    b. stop-work authority, and
    c. the imposition of any additional measures deemed necessary to ensure continued compliance with the intent of the conditions of the Order as well as the avoidance or mitigation of unforeseen adverse environmental impacts resulting from Project construction and operation.

4. **Prior to any construction,** Gulf LNG shall file affirmative statements with the Secretary, certified by a senior company official, that all company personnel, EIs, and contractor personnel will be informed of the EIs' authority and have been or will be trained on the implementation of the environmental mitigation measures appropriate to their jobs **before** becoming involved with construction and restoration activities.

5. The authorized facility locations shall be as shown in the EIS, as supplemented by filed alignment sheets. **As soon as they are available, and before the start of construction**, Gulf LNG shall file with the Secretary any revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by the Order. All requests for modifications of environmental conditions of the Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

6. Gulf LNG shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all facility relocations, and staging areas, construction support areas, new access roads, and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species would be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. All areas must be approved in writing by the Director of OEP **before construction in or near that area**.

   This requirement does not apply to extra workspace allowed by the Commission's *Upland Erosion Control, Revegetation, & Maintenance Plan* and/or minor field realignments per landowner needs and requirements that do not affect other landowners or sensitive environmental areas such as wetlands.

   Examples of alterations requiring approval include all facility location changes resulting from:

   a. implementation of cultural resources mitigation measures;
   b. implementation of endangered, threatened, or special concern species mitigation measures;
   c. recommendations by state regulatory authorities; and
   d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

7. **Within 60 days of the acceptance of the Order and before construction begins**, Gulf LNG shall file its Implementation Plan with the Secretary, for review and written approval by the Director of OEP. Gulf LNG must file revisions to its plans as schedules change. The plans shall identify:

   a. how Gulf LNG will implement the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests), identified in the EIS, and required by the Order;
   b. how Gulf LNG will incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to on-site construction and inspection personnel;
   c. the number of EIs assigned per spread and/or facility, and how Gulf LNG will ensure that sufficient personnel are available to implement the environmental mitigation;
   d. company personnel, including EIs and contractors, who will receive copies of the appropriate materials;
   e. the location and dates of the environmental compliance training and instructions Gulf LNG will give to all personnel involved with construction and restoration (initial and refresher training as the Project progresses and personnel change), with the opportunity for OEP staff to participate in the training session(s);
   f. the company personnel (if known) and specific portion of Gulf LNG's organization having responsibility for compliance;

g. the procedures (including use of contract penalties) Gulf LNG will follow if noncompliance occurs; and

h. for each discrete facility, a Gantt or PERT chart (or similar Project scheduling diagram), and dates for:

1) the completion of all required surveys and reports;

2) the environmental compliance training of on-site personnel;

3) the start of construction; and

4) the start and completion of restoration.

8. Gulf LNG shall employ at least one EI for the Terminal Expansion. The EI shall be:

a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or authorizing documents;

b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 7 above) and any other authorizing document;

c. empowered to order correction of acts that violate the environmental conditions of the Order, and any other authorizing document;

d. a full-time position separate from all other activity inspectors;

e. responsible for documenting compliance with the environmental conditions of the Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and

f. responsible for maintaining status reports.

9. Beginning with the filing of its Implementation Plan, Gulf LNG shall file updated status reports with the Secretary on a **monthly** basis for the Terminal Expansion and the Pipeline Modifications until all construction and restoration activities are complete. Problems of a significant magnitude shall be reported to the FERC **within 24 hours**. On request, these status reports will also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include the following:

a. an update on Gulf LNG's efforts to obtain the necessary federal authorizations;

b. Project schedule including the current construction status at the Terminal Expansion site and at the Pipeline Modification sites, work planned for the following reporting period, and any schedule changes for work in other environmentally sensitive areas;

c. a listing of all problems encountered, contractor nonconformance/deficiency logs, and each instance of noncompliance observed by the EI during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);

d. a description of the corrective actions implemented in response to all instances of noncompliance, nonconformance, or deficiency;

e. the effectiveness of all corrective and remedial actions implemented;

f. a description of any landowner/resident complaints which may relate to compliance with the requirements of the Order, and the measures taken to satisfy their concerns; and

g. copies of any correspondence received by Gulf LNG from other federal, state, or local permitting agencies concerning instances of noncompliance, and Gulf LNG's response.

10. Gulf LNG must receive written authorization from the Director of OEP **before commencing construction of any Project facilities**. To obtain such authorization, Gulf LNG must file with the Secretary documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof).

11. Gulf LNG must receive written authorization from the Director of OEP **prior to introducing hazardous fluids into the Terminal Expansion facilities**. Instrumentation and controls, hazard detection, hazard control, and security components/systems necessary for the safe introduction of such fluids shall be installed and functional.

12. Gulf LNG must receive written authorization from the Director of OEP **before placing the Pipeline Modifications into service**. Such authorization will only be granted following a determination that rehabilitation and restoration of the areas affected by the Pipeline Modifications are proceeding satisfactorily.

13. Gulf LNG must receive written authorization from the Director of OEP **before placing the Terminal Expansion into service**. Such authorization will only be granted following a determination that the facilities have been constructed in accordance with FERC approval, can be expected to operate safely as designed, and the rehabilitation and restoration of the areas affected by the Terminal Expansion are proceeding satisfactorily.

14. **Within 30 days of placing the authorized facilities in service**, Gulf LNG shall file an affirmative statement with the Secretary, certified by a senior company official:

    a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities will be consistent with all applicable conditions; or

    b. identifying which of the conditions of the Order Gulf LNG has complied with or will comply with. This statement shall also identify any areas affected by the Project where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

15. **Prior to the end of the draft EIS comment period**, Gulf LNG shall file with the Secretary a commitment to restore the wetlands at CSA-5 to pre-construction conditions following construction in accordance with Sections VI.C.2 and VI.C.5 of the Commission's *Wetland and Waterbody Construction and Mitigation Procedures*. *(section 4.4.2.2*)

16. **Prior to construction**, Gulf LNG shall file with the Secretary its final *Migratory Bird Impact Assessment and Conservation Plan* developed in consultation with the FWS. *(section 4.6.1.4)*

17. **Prior to the end of the draft EIS comment period**, Gulf LNG shall file with the Secretary a *Pile Driving Mitigation Plan* that outlines specific mitigation measures, including acoustical in-water monitoring, that would be implemented to limit underwater noise impacts to no more than 183 dB re: 1 µPa. *(section 4.6.2.1)*

18. Gulf LNG shall **not begin construction activities until**:

    a. FERC staff receives comments from the FWS and NMFS regarding the proposed action;

b. FERC staff completes ESA Section 7 consultation with the FWS and NMFS; and

c. Gulf LNG has received written notification from the Director of OEP that construction or use of mitigation may begin. *(section 4.7.1)*

19. **Prior to construction**, Gulf LNG shall transplant the Carolina grasswort population along the northern edge of the existing North Marsh Mitigation Area to a similar habitat using protocols determined in consultation with the MMNS. *(section 4.7.2.5)*

20. **Prior to construction**, Gulf LNG shall file documentation of concurrence from the MDMR that the Project is consistent with the Mississippi CZMP. *(section 4.8.7)*

21. **Prior to the end of the draft EIS comment period**, Gulf LNG shall file with the Secretary an updated Traffic Impact Analysis which includes an updated analysis based on current traffic conditions and the currently anticipated construction schedule. (*section 4.9.6*)

22. **Prior to the end of the draft EIS comment period**, Gulf LNG shall file with the Secretary the total estimated emissions (including emissions calculation methodology and spreadsheets) while construction of liquefaction train 2 and operations of liquefaction train 1 are occurring concurrently. Gulf LNG shall include a regulatory analysis of compliance and any additional mitigation required. *(section 4.11.1.5)*

23. Gulf LNG shall file a full power load noise survey with the Secretary for the Terminal Expansion **no later than 60 days** after each liquefaction train is placed into service. If the noise attributable to operation of the equipment at the Terminal Expansion exceeds an L_{dn} of 55 dBA at the nearest NSA, **within 60 days** Gulf LNG shall modify operation of the liquefaction facilities or install additional noise controls until a noise level below an L_{dn} of 55 dBA at the NSA is achieved. Gulf LNG shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. *(section 4.11.2.5)*

24. Gulf LNG shall file a noise survey with the Secretary **no later than 60 days** after placing the entire Terminal Expansion into service. If a full load condition noise survey is not possible, Gulf LNG shall provide an interim survey at the maximum possible horsepower load **within 60 days** of placing the Terminal Expansion into service and provide the full load survey **within 6 months**. If the noise attributable to operation of the equipment at the Terminal Expansion exceeds an L_{dn} of 55 dBA at the nearest NSA under interim or full horsepower load conditions, Gulf LNG shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. Gulf LNG shall confirm compliance with the above requirement by filing an additional noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. *(section 4.11.2.5)*

25. **Prior to the end of the draft EIS comment period**, Gulf LNG shall file with the Secretary documentation clarifying whether or not a plant-wide ESD would be included in the design. *(section 4.12.1.5)*

26. **Prior to the end of the draft EIS comment period**, Gulf LNG shall file with the Secretary documentation demonstrating it has filed for an Aeronautical Study under 14 CFR 77 for all permanent and temporary construction equipment and mobile objects that exceed the height requirements in 14 CFR 77.9. *(section 4.12.1.5)*

27. **Prior to the end of the draft EIS comment period**, Gulf LNG shall file with the Secretary a plan to conduct a comprehensive supplemental geotechnical field investigation and geotechnical report at the proposed locations of the new LNG facilities and a date by which the investigation and report are expected to be complete. *(section 4.12.1.5)*

28. **Prior to initial site preparation**, Gulf LNG shall file with the Secretary documentation demonstrating it has received a determination of no hazard (with or without conditions) by DOT FAA for all temporary construction equipment and mobile objects that exceed the height requirements in 14 CFR 77.9. *(section 4.12.1.5)*

29. **Prior to construction of the final design**, Gulf LNG shall file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in Mississippi:

    a. site preparation drawings and specifications;

    b. LNG Terminal structures and foundation design drawings and calculations (including prefabricated and field constructed structures);

    c. seismic specifications for procured equipment; and

    d. quality control procedures to be used for civil/structural design and construction.

    In addition, Gulf LNG shall file, in its Implementation Plan, the schedule for producing this information. *(section 4.12.1.5)*

30. **Prior to commencement of service,** Gulf LNG shall file with the Secretary a monitoring and maintenance plan, stamped and sealed by the professional engineer-of-record registered in Mississippi, for the perimeter levee which ensures the crest elevation relative to mean sea level will be maintained for the life of the facility considering berm settlement, subsidence, and sea level rise. *(section 4.12.1.5)*

Conditions 31 through 120 shall apply to the liquefaction facilities at the Gulf LNG Terminal. Information pertaining to the following specific recommendations shall be filed with the Secretary for review and written approval by the Director of OEP, or the Director's designee, within the timeframe indicated by each recommendation. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 833 (Docket No. RM16-15-000), including security information, shall be submitted as critical energy infrastructure information pursuant to 18 CFR 388.113. See *Critical Electric Infrastructure Security and Amending Critical Energy Infrastructure Information*, Order No. 833, 81 Fed. Reg. 93,732 (December 21, 2016), FERC Stats. & Regs. 31,389 (2016). Information pertaining to items such as off-site emergency response, procedures for public notification and evacuation, and construction and operating reporting requirements would be subject to public disclosure. All information shall be filed **a minimum of 30 days** before approval to proceed is requested.

31. **Prior to initial site preparation**, Gulf LNG shall file an overall Project schedule, which includes the proposed stages of the commissioning plan. *(section 4.12.1.5)*

32. **Prior to initial site preparation**, Gulf LNG shall file quality assurance and quality control procedures for construction activities. *(section 4.12.1.5)*

33. **Prior to initial site preparation**, Gulf LNG shall file procedures for controlling access during construction. *(section 4.12.1.5)*

34. **Prior to initial site preparation**, Gulf LNG shall file an updated ERP to include the Project facilities. *(section 4.12.1.5)*

35. **Prior to initial site preparation**, Gulf LNG shall file an updated Cost-Sharing Plan identifying the mechanisms for funding all Project-specific security/emergency management costs that would be imposed on state and local agencies. This comprehensive plan shall include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. *(section 4.12.1.5)*

36. **Prior to construction of final design**, Gulf LNG shall file change logs that list and explain any changes made from the FEED provided in Gulf LNG's application and filings. A list of all changes with an explanation for the design alteration shall be provided and all changes shall be clearly indicated on all diagrams and drawings. *(section 4.12.1.5)*

37. **Prior to construction of final design**, Gulf LNG shall file information/revisions pertaining to Gulf LNG' response numbers 15, 16, 17, 19, 43 from its March 1, 2016 filing, response numbers 20, 23, 41 from its April 5, 2016 filing, response 61 from is May 10, 2016 filing, response numbers 18, 24, 26, 35, 36, 37, 42, 48, 52, 56, 66, 67, 70, 71, 72, 74, 80, 91 from its October 7, 2016 filing which indicated features to be included or considered in the final design. *(section 4.12.1.5)*

38. **Prior to construction of final design**, Gulf LNG shall file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems. *(section 4.12.1.5)*

39. **Prior to construction of final design**, Gulf LNG shall file three-dimensional plant drawings to confirm plant layout for maintenance, access, egress, and congestion. *(section 4.12.1.5)*

40. **Prior to construction of final design**, Gulf LNG shall file an up-to-date equipment list, process and mechanical data sheets, and specifications. The specifications shall include:

    a. building specifications (e.g., control buildings, electrical buildings, compressor buildings, storage buildings, pressurized buildings, ventilated buildings, blast resistant buildings);

    b. mechanical specifications (e.g., piping, valve, insulation, rotating equipment, heat exchanger, storage tank and vessel, other specialized equipment);

    c. electrical and instrumentation specifications (e.g., power system specifications, control system specifications, safety instrument system [SIS] specifications, cable specifications, other electrical and instrumentation specifications); and

    d. security and fire safety specifications (e.g., security, passive protection, hazard detection, hazard control, firewater). *(section 4.12.1.5)*

41. **Prior to construction of final design**, Gulf LNG shall file up-to-date PFDs and P&IDs. The PFDs shall include HMBs. The P&IDs shall include the following information:

    a. equipment tag number, name, size, duty, capacity, and design conditions;

    b. equipment insulation type and thickness;

    c. storage tank pipe penetration size and nozzle schedule;

    d. valve high pressure side and internal and external vent locations;

e. piping with line number, piping class specification, size, and insulation type and thickness;

f. piping specification breaks and insulation limits;

g. all control and manual valves numbered;

h. relief valves with size and set points; and

i. drawing revision number and date. *(section 4.12.1.5)*

42. **Prior to construction of final design**, Gulf LNG shall file a car seal philosophy document and a list of all car-sealed and locked valves consistent with the P&IDs. *(section 4.12.1.5)*

43. **Prior to construction of final design**, the engineering, procurement, and construction contractor shall verify that the recommendations from the FEED Hazard Identification are complete and consistent with the requirements of the final design as determined by the engineering, procurement, and construction contractor. *(section 4.12.1.5)*

44. **Prior to construction of final design**, Gulf LNG shall file a HAZOP review prior to issuing the P&IDs for construction. A copy of the review, a list of the recommendations, and actions taken on the recommendations shall be filed. *(section 4.12.1.5)*

45. **Prior to construction of final design**, Gulf LNG shall provide P&IDs, specifications, and procedures that clearly show and specify the tie-in details required to safely connect the Terminal Expansion to the existing facility. *(section 4.12.1.5)*

46. **Prior to construction of final design**, Gulf LNG shall file process design information for the thermal oxidizer system to include drawings, process simulation results, and calculations to ensure the thermal oxidizer is sized to remove up to 2 percent CO_2 from the feed gas streams. *(section 4.12.1.5)*

47. **Prior to construction of final design**, Gulf LNG shall include a low temperature alarm and shutdown system on the piping connecting the overhead and bottoms of the deethanizer to isolate and protect the piping from potential cryogenic conditions. *(section 4.12.1.5)*

48. **Prior to construction of final design**, Gulf LNG shall file equipment datasheets and vendor drawings for the MR/PR compressor gas turbine emission control system. *(section 4.12.1.5)*

49. **Prior to construction of final design**, Gulf LNG shall file the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (i.e., temperature, pressures, flows, and compositions). *(section 4.12.1.5)*

50. **Prior to construction of final design**, Gulf LNG shall file cause-and-effect matrices for the process instrumentation, fire and gas detection system, and ESD system for review and approval. The cause-and-effect matrices shall include alarms and shutdown functions, details of the voting and shutdown logic, and set points. *(section 4.12.1.5)*

51. **Prior to construction of final design**, Gulf LNG shall file an evaluation of ESD valve closure times. The evaluation shall account for the time to detect an upset or hazardous condition, notify plant personnel, and close the ESD valve. *(section 4.12.1.5)*

52. **Prior to construction of final design**, Gulf LNG shall file an evaluation of dynamic pressure surge effects from valve opening and closure times and pump operations. *(section 4.12.1.5)*

53. **Prior to construction of final design**, Gulf LNG shall demonstrate that, for hazardous fluids, piping and piping nipples 2 inches or less in diameter are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and operator live loads in areas accessible by operators. *(section 4.12.1.5)*

54. **Prior to construction of final design**, Gulf LNG shall specify that all drains from high pressure hazardous fluid systems are to be equipped with double isolation and bleed valves. *(section 4.12.1.5)*

55. **Prior to construction of final design**, Gulf LNG shall provide electrical area classification drawings. The drawings shall demonstrate compliance with NFPA 59A, NFPA 70, NFPA 497, API 500, or equivalent, including but not limited to, illustrating or denoting Class 1 Division 1 and Division 2, as applicable, at the refrigerant truck transfer connection, diesel truck transfer connection, vents and reliefs. In addition, LNG and other fluids that would behave as dense gases shall be designated as heavier than air and LNG and other fluids that have a vapor pressure exceeding 40 psia at 100 °F shall be designated as highly volatile liquids. *(section 4.12.1.5)*

56. **Prior to construction of final design**, Gulf LNG shall file drawings and details of how process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system meet the requirements of NFPA 59A (2001). *(section 4.12.1.5)*

57. **Prior to construction of final design**, Gulf LNG shall file details of an air gap or vent installed downstream of process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap shall vent to a safe location and be equipped with a leak detection device that shall continuously monitor for the presence of a flammable fluid, alarm the hazardous condition, and shut down the appropriate systems. *(section 4.12.1.5)*

58. **Prior to construction of final design**, Gulf LNG shall include layout and design specifications of the pig trap, inlet separation and liquid disposal, inlet/send-out meter station, and pressure control. *(section 4.12.1.5)*

59. **Prior to construction of final design**, Gulf LNG shall specify that piping and equipment that may be cooled with liquid nitrogen is to be designed for liquid nitrogen temperatures, with regard to allowable movement and stresses. *(section 4.12.1.5)*

60. **Prior to construction of final design**, Gulf LNG shall provide a stress and structural analysis of the existing LNG storage tank piping and supports/platform to ensure they are adequately designed for the higher rated in-tank pump discharge flow rates and modifications. *(section 4.12.1.5)*

61. **Prior to construction of final design**, Gulf LNG shall file procedures for replacing, inspecting and testing the proposed in-tank pump column flanges and discharge piping. *(section 4.12.1.5)*

62. **Prior to construction of final design**, Gulf LNG shall file detailed drawing(s) and sizing calculations to verify the existing steel collection pan under the in-tank pump platform would be adequately sized to contain the maximum LNG flowrate from the higher rated in-tank pumps. *(section 4.12.1.5)*

63. **Prior to construction of the final design**, Gulf LNG shall file a process narrative with accompanying detailed drawings for direct loading of LNG to a marine vessel from the rundown pumps. *(section 4.12.1.5)*

64. **Prior to construction of final design**, Gulf LNG shall file a process narrative with accompanying detailed drawings for the BOG system, including valving and piping to allow the BOG compressors to be pre-cooled during a standby condition. *(section 4.12.1.5)*

65. **Prior to construction of final design**, Gulf LNG shall file results of BOG compressor dynamic simulation to ensure the anti-surge valve speed and capacity is designed to prevent surge or reverse flow through the compressor during start-up and shutdown conditions. *(section 4.12.1.5)*

66. **Prior to construction of final design**, Gulf LNG shall file the sizing basis and capacity for the final design of the flares and/or vent stacks as well as the pressure and vacuum relief valves for major process equipment, vessels, and storage tanks. *(section 4.12.1.5)*

67. **Prior to construction of final design**, Gulf LNG shall provide sizing calculations for pressure relief valve (16-PRV-1274) based on a full flow valve failure to provide adequate protection for the propane transfer drum in the event of back pressure in the purge gas line. *(section 4.12.1.5)*

68. **Prior to construction of final design**, Gulf LNG shall include a relief valve study to evaluate the existing LNG storage tank vacuum relief valves to ensure they provide adequate protection based on the higher capacity in-tank pumps operating at full capacity. *(section 4.12.1.5)*

69. **Prior to construction of final design**, Gulf LNG shall specify fixed toxic gas detection to detect H_2S releases from loss of containment from the acid gas piping system and potential release points (i.e., vents, relief valves, vent stacks, and thermal oxidizer stack). *(section 4.12.1.5)*

70. **Prior to construction of final design**, Gulf LNG shall file three-dimensional model and hazard modeling results of acid gas vents and thermal oxidizer to demonstrate they are located safely away from work areas. *(section 4.12.1.5)*

71. **Prior to construction of final design**, Gulf LNG shall provide the procedures for pressure/leak tests which address the requirements of ASME VIII and ASME B31.3. *(section 4.12.1.5)*

72. **Prior to construction of final design**, Gulf LNG shall file a plan for clean-out, dry-out, purging, and tightness testing. This plan shall address the requirements of the American Gas Association's Purging Principles and Practice, and shall provide justification if not using an inert or non-flammable gas for clean-out, dry-out, purging, and tightness testing. *(section 4.12.1.5)*

73. **Prior to construction of final design**, Gulf LNG shall file design and specifications for the hot oil distribution and discharge piping that safeguard them from temperature above their maximum design temperature. *(section 4.12.1.5)*

74. **Prior to construction of final design**, Gulf LNG shall evaluate the high pressure alarm set point of (18-PAH 1001A) for the hot oil system and verify that it annunciates when the output from the pressure controller (18-PIC 1001A) signals valve (18-PV 1001A) to open. *(section 4.12.1.5)*

75. **Prior to construction of final design**, Gulf LNG shall specify that all ESD valves are to be equipped with open and closed position switches connected to the Distributed Control System (DCS)/ SIS. *(section 4.12.1.5)*

76. **Prior to construction of final design**, Gulf LNG shall file a drawing showing the location of the ESD buttons. ESD buttons shall be easily accessible, conspicuously labeled, and located in an area which would be accessible during an emergency. *(section 4.12.1.5)*

77. **Prior to construction of final design**, Gulf LNG shall file fencing drawings. The fencing drawings shall provide details of fencing that demonstrates it would restrict and deter access around the entire facility and has a 10-foot clearance from exterior features (e.g., power lines, trees, etc.) and from interior features (e.g., piping, equipment, buildings, etc.) with details of vehicle barriers at controlled access points. *(section 4.12.1.5)*

78. **Prior to construction of final design**, Gulf LNG shall file drawings and specifications for protecting transfer piping, firewater equipment (e.g. hydrants, monitors, manifolds, etc.) pumps, and compressors, etc. to ensure that they are located away from roadway or protected from inadvertent damage from vehicles. *(section 4.12.1.5)*

79. **Prior to construction of final design**, Gulf LNG shall file drawings and specifications for vehicle barriers at each facility entrance for access control. *(section 4.12.1.5)*

80. **Prior to construction of final design**, Gulf LNG shall file security camera and intrusion detection drawings. The security camera drawings shall show the location, areas covered, and features of the camera (fixed, tilt/pan/zoom, motion detection alerts, low light, mounting height, etc.) to verify camera coverage of the entire perimeter with redundancies and cameras interior to the facility that would enable rapid monitoring of the Terminal Expansion. The drawings shall show or note the location of the intrusion detection to verify it covers the entire perimeter of the Terminal Expansion. *(section 4.12.1.5)*

81. **Prior to construction of final design**, Gulf LNG shall file lighting drawings. The lighting drawings shall show the location, elevation, type of light fixture, and lux levels of the lighting system and shall illustrate adequate coverage of the perimeter of the facility and along paths/roads of access and egress. *(section 4.12.1.5)*

82. **Prior to construction of final design**, Gulf LNG shall file an updated fire protection evaluation of the proposed facilities. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations shall be filed. *(section 4.12.1.5)*

83. **Prior to construction of final design**, Gulf LNG shall file spill containment system drawings with dimensions and slopes of curbing, trenches, impoundments, and capacity calculations considering any foundations and equipment within impoundments. The spill containment drawings shall show containment for all hazardous fluids based on the largest flow from a single line for 10 minutes or from the largest vessel, or otherwise demonstrate that providing spill containment would not significantly reduce the flammable vapor dispersion or radiant heat consequences of a spill. *(section 4.12.1.5)*

84. **Prior to construction of final design**, Gulf LNG shall specify the material of construction for the curbed areas, trenches, and impoundments as insulated concrete or otherwise demonstrate insulated concrete would not significantly reduce the flammable vapor dispersion or radiant heat consequences of a spill. *(section 4.12.1.5)*

85. **Prior to construction of final design**, Gulf LNG shall file the details of the wastewater removal systems for all hazardous liquid impoundments. *(section 4.12.1.5)*

86. **Prior to construction of final design**, Gulf LNG shall file detailed calculations to confirm that the final fire water volumes would be accounted for when evaluating the capacity of the impoundment system during a spill and fire scenario. *(section 4.12.1.5)*

87. **Prior to construction of final design**, Gulf LNG shall file complete drawings and a list of the hazard detection equipment. The drawings shall clearly show the location and elevation of all detection equipment and demonstrate potential releases resulting in an off-site impact could be detected by at least two detectors to allow for shutdown in less than 10 minutes. The list shall include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment. *(section 4.12.1.5)*

88. **Prior to construction of final design**, Gulf LNG shall file an analysis of the localized hazards to operators from a potential liquid nitrogen release and shall also provide low oxygen detectors or other mitigation that may be prudent. *(section 4.12.1.5)*

89. **Prior to construction of final design**, Gulf LNG shall file the details of the ESD system, including whether a plant-wide ESD button with proper sequencing and reliability would be installed or whether another system would be installed that is demonstrated through a human reliability analysis to provide a means to quickly and reliably shutdown the entire plant. *(section 4.12.1.5)*

90. **Prior to construction of final design**, Gulf LNG shall file a technical review of facility design that:

    a. identifies all combustion/ventilation air intake equipment and the distances to any possible flammable gas or toxic release; and

    b. demonstrates that these areas are adequately covered by hazard detection devices and indicates how these devices would isolate or shut down any combustion or heating ventilation and air conditioning equipment whose continued operation could add to or sustain an emergency. *(section 4.12.1.5)*

91. **Prior to construction of final design**, Gulf LNG shall file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of the hazard detectors when determining the lower flammable limit set points for methane, propane, butane, ethane, and condensate. *(section 4.12.1.5)*

92. **Prior to construction of final design**, Gulf LNG shall file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of hazard detectors when determining the set points for toxic components such as aqueous ammonia, natural gas liquids and H_2S. *(section 4.12.1.5)*

93. **Prior to construction of final design**, Gulf LNG shall file an evaluation of the voting logic and voting degradation for hazard detectors. *(section 4.12.1.5)*

94. **Prior to construction of final design**, Gulf LNG shall file a drawing that includes smoke detection in occupied buildings. *(section 4.12.1.5)*

95. **Prior to construction of final design**, Gulf LNG shall file a drawing that includes hazard detection equipment suitable to detect high temperatures and smoldering combustion products in electrical buildings and control room buildings. *(section 4.12.1.5)*

96. **Prior to construction of final design**, Gulf LNG shall file facility plan drawings and a list of the fixed and wheeled dry-chemical, hand-held fire extinguishers, and other hazard control equipment. Plan drawings shall clearly show the location by tag number and elevation of all fixed dry-chemical system in accordance with NFPA 17, and wheeled and hand-held extinguishers demonstrate travel distances are along normal paths of access and egress and in compliance with NFPA 10. The list shall include the equipment tag number, type, capacity, equipment covered, discharge rate, and automatic and manual remote signals initiating discharge of the units. *(section 4.12.1.5)*

97. **Prior to construction of final design**, Gulf LNG shall file a drawing that includes clean agent systems in the instrumentation buildings. *(section 4.12.1.5)*

98. **Prior to construction of final design**, Gulf LNG shall file drawings and specifications for the structural passive protection systems to protect equipment and supports from cryogenic releases. *(section 4.12.1.5)*

99. **Prior to construction of final design**, Gulf LNG shall file a detailed quantitative analysis to demonstrate that adequate thermal mitigation would be provided for each significant component within the 4,000 BTU/ft2-hr zone from an impoundment, or provide an analysis that evaluates the consequences of pressure vessel bursts and boiling liquid expanding vapor explosions. Trucks at the truck transfer station shall be included in the analysis. A combination of passive and active protection shall be provided and demonstrate the effectiveness and reliability. Effectiveness of passive mitigation shall be supported by calculations for the thickness limiting temperature rise and effectiveness of active mitigation shall be justified with calculations demonstrating flow rates and durations of any cooling water to mitigate the heat absorbed by the vessel. *(section 4.12.1.5)*

100. **Prior to construction of final design**, Gulf LNG shall file facility plan drawings showing the proposed location of the firewater and any foam systems. Plan drawings shall clearly show the location of firewater and foam piping, post indicator valves, and the location and area covered by, each monitor, hydrant, hose, water curtain, deluge system, foam system, water-mist system, and sprinkler. The drawings shall demonstrate that each process area, fire zone, or other sections of piping with several users can be isolated with post indicator valves and that firewater flow to cool exposed surfaces subjected to a fire. Drawings shall also include P&IDs of the firewater and foam systems. *(section 4.12.1.5)*

101. **Prior to construction of final design**, Gulf LNG shall include or demonstrate the firewater storage volume for its facilities has minimum reserved capacity for its most demanding firewater scenario plus 1,000 gpm for no less than 2 hours. The firewater storage shall also demonstrate compliance with NFPA 22 or demonstrate how API 650 provides an equivalent or better level of safety. *(section 4.12.1.5)*

102. **Prior to construction of final design**, Gulf LNG shall file firewater hydraulic calculations to demonstrate that the firewater system is capable of delivering 100 percent of the design rate for at least 2 hours. *(section 4.12.1.5)*

103. **Prior to construction of final design**, Gulf LNG shall specify that the firewater flow test meter is equipped with a transmitter and that a pressure transmitter is installed upstream of the flow transmitter. The flow transmitter and pressure transmitter shall be connected to the DCS and recorded. *(section 4.12.1.5)*

104. **Prior to commissioning**, Gulf LNG shall file a detailed schedule for commissioning through equipment start-up. The schedule shall include milestones for all procedures and tests to be completed: prior to introduction of hazardous fluids and during commissioning and start-up. Gulf LNG shall file documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and start-up will be issued. *(section 4.12.1.5)*

105. **Prior to commissioning**, Gulf LNG shall file detailed plans and procedures for: testing the integrity of on-site mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service. *(section 4.12.1.5)*

106. **Prior to commissioning**, Gulf LNG shall file a plan for clean-out, dry-out, purging, and tightness testing. This plan shall address the requirements of the American Gas Association's Purging Principles and Practice, and shall provide justification if not using an inert or non-flammable gas for clean-out, dry-out, purging, and tightness testing. *(section 4.12.1.5)*

107. **Prior to commissioning**, Gulf LNG shall file the procedures for pressure/leak tests which address the requirements of ASME BPVC Section VIII and ASME B31.3. The procedures shall include a line list of pneumatic and hydrostatic test pressures. *(section 4.12.1.5)*

108. **Prior to commissioning**, Gulf LNG shall file updated operation and maintenance procedures and manuals, as well as safety procedures, hot work procedures and permits, abnormal operating conditions reporting procedures, simultaneous operations procedures, and management of change procedures and forms. *(section 4.12.1.5)*

109. **Prior to commissioning**, Gulf LNG shall tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves. *(section 4.12.1.5)*

110. **Prior to commissioning**, Gulf LNG shall maintain a detailed training log to demonstrate that operating, maintenance, and emergency response staff has completed the required training. *(section 4.12.1.5)*

111. **Prior to introduction of hazardous fluids**, Gulf LNG shall complete and document all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the DCS and SIS that demonstrates full functionality and operability of the system. *(section 4.12.1.5)*

112. **Prior to introduction of hazardous fluids**, Gulf LNG shall file an updated alarm management program to ensure effectiveness of operator response to alarms. *(section 4.12.1.5)*

113. **Prior to introduction of hazardous fluids**, Gulf LNG shall complete and document a firewater pump acceptance test and firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant shall be shown on facility plot plan(s). *(section 4.12.1.5)*

114. **Prior to introduction of hazardous fluids**, Gulf LNG shall complete and document a pre-start-up safety review to ensure that installed equipment meets the design and operating intent of the facility. The pre-start-up safety review shall include any changes since the last hazard review, operating procedures, and operator training. A copy of the review with a list of recommendations, and actions taken on each recommendation, shall be filed. *(section 4.12.1.5)*

115. Gulf LNG shall file a request for written authorization from the Director of OEP **prior to unloading or loading the first LNG commissioning cargo**. After production of the first LNG, Gulf LNG shall file weekly reports on the commissioning of the proposed systems that detail the progress toward demonstrating the facilities can safely and reliably operate at or near the design production rate. The reports shall include a summary of activities, problems encountered, and remedial actions taken. The weekly reports shall also include the latest commissioning schedule, including projected and actual LNG production by each liquefaction train, LNG storage inventories in each storage tank, and the number of anticipated and actual LNG commissioning cargoes, along with the associated volumes loaded or unloaded. Further, the weekly reports shall include a status and list of all planned and completed safety and reliability tests, work authorizations, and punch list items. Problems of significant magnitude shall be reported to the FERC **within 24 hours**. *(section 4.12.1.5)*

116. **Prior to commencement of service**, Gulf LNG shall label piping with fluid service and direction of flow in the field, in addition to the pipe labeling requirements of NFPA 59A (2001). *(section 4.12.1.5)*

117. **Prior to commencement of service**, Gulf LNG shall file plans for any preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring. *(section 4.12.1.5)*

118. **Prior to commencement of service**, Gulf LNG shall file updated procedures for off-site contractors' responsibilities, restrictions, and limitations and for supervision of these contractors by Gulf LNG staff. *(section 4.12.1.5)*

119. **Prior to commencement of service**, Gulf LNG shall notify the FERC staff of any proposed revisions to the security plan and physical security of the plant. *(section 4.12.1.5)*

120. **Prior to commencement of service**, Gulf LNG shall file a request for written authorization from the Director of OEP. Such authorization would only be granted following a determination by the USCG, under its authorities under the *Ports and Waterways Safety Act*, the *Magnuson Act*, the *MTSA of 2002*, and the *Safety and Accountability For Every Port Act*, that appropriate measures to ensure the safety and security of the facility and the waterway have been put into place by Gulf LNG or other appropriate parties. *(section 4.12.1.5)*

In addition, conditions 121 through 124 shall apply throughout the life of the facility.

121. The facilities shall be subject to regular FERC staff technical reviews and site inspections on at least an **annual basis** or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, Gulf LNG shall respond to a specific data request including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed P&IDs reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, shall be submitted. *(section 4.12.1.5)*

122. **Semi-annual** operational reports shall be filed with the Secretary to identify changes in design and operating conditions; abnormal operating experiences; activities (e.g., marine vessel arrivals, quantity and composition of imported and exported LNG, liquefied and vaporized quantities, boil off/flash gas); and plant modifications, including future plans and progress thereof. Abnormalities shall include, but not be limited to, unloading/loading/shipping problems, potential

hazardous conditions from off-site vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, hazardous fluids releases, fires involving hazardous fluids and/or from other sources, negative pressure (vacuum) within a storage tank, and higher than predicted boil off rates. Adverse weather conditions and the effect on the facility also shall be reported. Reports shall be submitted **within 45 days after each period ending June 30 and December 31**. In addition to the above items, a section entitled "Significant Plant Modifications Proposed for the Next 12 Months (dates)" shall be included in the semi-annual operational reports. Such information would provide the FERC staff with early notice of anticipated future construction/maintenance at the facilities. *(section 4.12.1.5)*

123. In the event the temperature of any region of any secondary containment, including imbedded pipe supports, becomes less than the minimum specified operating temperature for the material, the Commission shall be notified **within 24 hours** and procedures for corrective action shall be specified. *(section 4.12.1.5)*

124. Significant non-scheduled events, including safety-related incidents (e.g., LNG, heavier hydrocarbons, refrigerant, or natural gas releases; fires; explosions; mechanical failures; unusual over pressurization; and major injuries) and security-related incidents (e.g., attempts to enter site, suspicious activities) shall be reported to the FERC staff. In the event that an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification shall be made **immediately**, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification shall be made to the FERC staff **within 24 hours**. This notification practice shall be incorporated into the emergency response plan. Examples of reportable hazardous fluids-related incidents include:

a. fire;

b. explosion;

c. estimated property damage of $50,000 or more;

d. death or personal injury necessitating in-patient hospitalization;

e. release of hazardous fluids for 5 minutes or more;

f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of facilities that contains, controls, or processes hazardous fluids;

g. any crack or other material defect that impairs the structural integrity or reliability of facilities that contain, control, or process hazardous fluids;

h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes hazardous fluids to rise above its maximum allowable operating pressure (or working pressure for facilities) plus the build-up allowed for operation of pressure-limiting or control devices;

i. a leak in a facility that contains or processes hazardous fluids that constitutes an emergency;

j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;

k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or a facility that contains or processes hazardous fluids;

l. safety-related incidents from hazardous fluids transportation occurring at or en route to and from the facilities; or

m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an incident management plan.

In the event of an incident, the Director of OEP has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property, or the environment, including authority to direct the facilities to cease operations. Following the initial company notification, the FERC staff would determine the need for a separate follow-up report or follow-up in the upcoming semi-annual operational report. All company follow-up reports shall include investigation results and recommendations to minimize a reoccurrence of the incident. *(section 4.12.1.5)*

APPENDIX A

Distribution List for the Notice of Availability

Federal Agencies

Advisory Council on Historic Preservation
Office of Federal Programs
Charlene D Vaughn, Assistant Director for Federal Program Development, DC
Council on Environmental Quality
Edward Boling, Associate Director for NEPA Oversight, DC
U.S. Department of Agriculture
Farm Service Agency
Conservation and Environmental Program Division
Nell Fuller, National Environmental Compliance Manager, DC
Forest Service-Ecosystem Management Coordination
Joe Carbone, Assistant Director, NEPA, DC
Natural Resources Conservation Service
Andree DuVarney, National Environmental Coordinator, DC
U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Brandon Howard, Fishery Biologist, LA
Kyle Baker, FL
NOAA NEPA Coordinator, MD
Habitat Conservation Division, Galveston Branch Office
Heather Young, TX
Southeast Regional District
Eric Hawk, FL
U.S. Department of Defense
Army Corps of Engineers, Mobile District
Allison Monroe, AL
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Planning and Policy Division, DC
Office of the Assistant Secretary of the Army for Civil Works
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Tribal & Regulatory Affairs, DC
Office of the Assistant Secretary of the Navy
Energy, Installations and Environment, DC
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Installations
Liaison, DoD Siting Clearinghouse, SAF/IEI, DC
Office of the Deputy Assistant Secretary of the Army
Energy & Sustainability
Liaison, DoD Siting Clearinghouse, DC

Office of the Deputy Under Secretary of Defense
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Chief, Mission Evaluation Branch, DOD Siting Clearinghouse, DC
Siting Clearinghouse
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U.S. Department of Energy
Larine A. Moore, DC
Office of Environmental Management
Mark Whitney, Principal Deputy Assistant Secretary, DC
Office of the National Environmental Policy Act, Policy and Compliance
Brian Costner, Acting Director, OGC, DC
Office of Natural Gas Regulatory Activities
John Anderson, Director, DC
Office of Fossil Energy
Lisa C. Tracy, DC
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Everett Bole, CHMM, Chief Environmental Officer, DC
Centers for Disease Control, National Center for Environmental Health
Division of Emergency and Environmental Health Services
Sharunda Buchanan, Director, GA
U.S. Department of Homeland Security
Customs and Border Protection
Christopher Oh, Branch Chief, DC
Federal Emergency Management Agency, Region IV
Susan Wilson, GA
U.S. Coast Guard
Commandant (CG-OES-4) Chief (Acting)
Deepwater Ports Standards Division
Curtis E. Borland, Attorney/Advisor, DC
Mobile Sector
Facility Inspection Branch
Bill Easterling, AL
Waterways Management Division
Christopher C. Morgan, AL
Duke Walker, Captain of the Port, AL
James Kirby, AL
Scott Muller, Commander, AL
U.S. Department of Housing and Urban Development
Office of Environment and Energy
Danielle Schopp, Community Planner, DC

U.S. Department of Justice
Environment and Natural Resources Division
NEPA Coordinator, DC
U.S. Department of State
Bureau of Oceans & International Environmental & Scientific Affairs
Alexander Yuan, Foreign Affairs Officer, DC
U.S. Department of the Interior
Bureau of Indian Affairs
BJ Howerton, VA
Terry L McClung, NEPA Coordinator, DC
Bureau of Land Management
FERC Contact, DC
Bureau of Ocean Energy Management
Division of Environmental Assessment
Dr. Jill Lewandowski, Chief, VA
Bureau of Safety and Environmental Enforcement
Environmental Compliance Division
David Fish, Chief, VA
Fish and Wildlife Service
Mississippi Field Office Ecological Services
Paul Necaise, MS
National Park Service
Environmental Planning and Compliance Branch
Patrick Walsh, Chief, CO
U.S. Department of Transportation
Melanie Barber, Emergency Support and Response Officer, DC
Office of Assistant Secretary for Transportation Policy
Camille Mittelholtz, Environmental Policy Team Coordinator, DC
Helen Serassio, Senior Environmental Attorney Advisor, DC
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William Schoonover, Associate Administrator for Hazardous Materials Safety, DC
Office of Pipeline Safety
Ahuva Battams, Attorney Advisor, DC
Karen Lynch, Community Liaison Services Program Manager, DC
Melanie Stevens, Attorney Advisor, DC
Engineering and Research Division
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Sentho K. White, DC
M. "Buddy" Secor, Jr. PE, General Engineer, DC
Surface Transportation Board
Section of Environmental Analysis
Victoria Rutson, Chief, DC

U.S. Environmental Protection Agency
Natural Gas STAR
Jerome Blackman, DC
Office of Enforcement and Compliance Assurance
Lawrence Starfield, Assistant Administrator, DC
Office of Federal Activites
Susan E Bromm, Director, DC
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Larry O. Gissentanna , GA
NEPA Program Office
Heinz Mueller, Chief, GA
U.S. Geological Survey
Environmental Management Branch
Mark Leeper, Chief, VA

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Casey Street, Chief of Staff, DC
Office of U.S. Senator Roger Wicker
Bevin Wilkinson, Legislative Coorespondent, DC
Office of U.S. Senator Thad Cochran
Bruce Evans, Chief of Staff, DC
U.S. Senate Energy and Natural Resources Committee
Lisa Murkowski, Chairman, DC

State Senators and Representatives

Mississippi House of Representatives
Charles Busby, Representative, MS
Manly Barton, Representative, MS
Mississippi State Senate
Brice Wiggins, Senator, MS
Michael Watson, Senator, MS

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Kyle Williams, Chairman, TX
Caddo Nation
Brenda Shemayme Edwards, Chairperson, OK
Chitimacha Tribe of Louisiana
John Paul Darden, Chairman, LA

Choctaw Nation of Oklahoma
Gary Batton, Chief, OK
Coushatta Tribe of Louisiana
Kevin Sickey, Chairman, LA
Eastern Band of Cherokee Indians
Michell Hicks, Principal Chief, NC
Jena Band of Choctaw Indians
B. Cheryl Smith, Tribal Chief, LA
Mississippi Band of Choctaw Indians
Kenneth H. Carleton, Tribal Historic Preservation Officer/Archaeologist, MS
Mississippi Band of Choctaw Indians
Phyliss J. Anderson, Chief, MS
Tunica-Biloxi Indians of Louisiana
Earl J. Barbry, Chairman, LA

State Agencies

Mississippi Assistant Secretary of State for the Gulf Coast
Raymond D. Carter , MS
Mississippi Department of Archives and History, State Historic Preservation Office
Greg Williamson, Division Director, MS
Mississippi Department of Environmental Quality
Florance Bass, MS
Energy and Transportation
Bryan Collins, Branch Chief, MS
Mississippi Department of Marine Resources
Coastal Zone Management Office
Bureau of Wetland Permitting
Willa Brantley, Wetland Permitting Program Coordinator, MS
Mississippi Department of Transportation, MS
Mississippi Development Authority
Brent Christensen, Executive Director, MS
Mississippi Governor's Office
Chris Champion, Policy Directo, MS r
Mississippi Wildlife, Fisheries and Parks
Museum of Natural Science
Jennifer Frey, Natural Heritage Program Database Manager, MS
Andy Sanderson, Natural Heritage Program Coordinator, MS

Local Agencies

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    Gordon Gollott, Mayor, MS
City of Gulfport
    Billy Hewes, Mayor, MS
City of Moss Point
    Shirley Chambers, Alderman, MS
    Chuck Redmond, Alderman, MS
    Gary Wayne Lennep, Alderman, MS
    Houston Cunningham, Alderman, MS
    James Smith, Alderman, MS
    Linwood Grierson, Alderman, MS
    Robert Byrd, Alderman, MS
City of Ocean Springs
    Connie Moran, Mayor, MS
City of Pascagoula,
    Brenda Simkins, Councilor, MS
    Burton Hill, Councilor, MS
    David Tadlock, Councilor, MS
    Freddy Jackson, Councilor, MS
    Jim Blevins, Mayor, MS
    Larry Taylor, Councilor, MS
    Scott Tipton, Councilor, MS
Jackson County Board of Supervisors
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    Melton Harris, Jr, Supervisor, MS
    Mike Magnum, Supervisor, MS
    Troy Ross, Supervisor, MS
    Barry Cumbest, Supervisor, MS
Jackson County Port Authority
    Mark McAndrews, Port Director, MS
  Board of Commissioners
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    Wallace Easley, Commissioner, MS
    Ronald Robinson, Vice-President, MS
    Marshall Smith, Commissioner, MS
    John Arledge, Commissioner, MS
    Greg Williams, Commissioner, MS
    Carolyn Moore, Commissioner, MS
    Benny Lassitter, Commissioner, MS
    James Colmer, Jr, Secretary, MS
  Government Affairs and Public Relations
    Betty Ann White, Manager, MS

Pascagoula Municipal Separate School District, MS

Library

Jackson-George Regional Library, MS

Media

The Mississippi Press, AL

Intervenors

Florida Gas Transmission Company, LLC

Organizations and Companies

Allegheny Defense Project
Ryan Talbott, PA
Amoco Production, TX
Audubon Mississippi
James Woods Jr., Executive Director, MS
Bosarge Boats Inc., MS
Bosarge Diving Inc., MS
BP America Production Company, TX
CAMCO 3 LLC, MS
Cherokee Concerned Citizens,Barbara Weckesser, President, MS
Chevron U.S.A., Inc., MS
Chevron U.S.A., Inc., TX
Coastal Conservation Association (CCA) Mississippi, MS
CSX Transportation, Inc., FL
Ducks Unlimited, MS
Enterprise Gas Processing, LLC, TX
First Chemical Corporation, MS
GCMS Properties LLC, AL
Gulf LNG Energy, LLC., TX
Gulf LNG Pipeline, LLC., AL
Gulfstream Natural Gas System, LLC, FL
Gulfstream Natural Gas System, LLC, TX
Knight Holdings, LLC, MS
Land Trust for the Mississippi Coastal Plain
Judy Steckler, Executive Director, MS
Martin Operating Partnership c/o LB Walker & Associates, TX
Midstream Fuel Service c/o LB Walker & Associates, TX
Mississippi Association of Supervisors
Derrick Surrette, Executive Director, MS
Mississippi Chapter of Sierra Club - Gulf Coast Group, MS
Mississippi Phosphates Corporation, MS
Mississippi Wildlife Federation
Brad Young, Executive Director, MS
Misty Meadow Farms, Inc., AL
Pascagoula River Basin Alliance, Pascagoula River Audubon Center, MS
QCI Acquisition LLC (Knight #2), LA
RTW Properties, LLC, MS
Singing River Yacht Club, MS
Southeast Aquatic Resources Partnership (SARP), GA
Steps Coalition, Howard Page, MS
T. C. Broome Construction Co., LLC, MS
The Nature Conservatory in Mississippi, Chapter Office, MS
The Nature Conservatory in Mississippi, South Mississippi Field Office, MS
Wells Fargo Bank National Association, UT
Wildlife Mississippi, MS

Individuals

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Billy Ray Krebs, MS
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Carolyn F. Mills, MS
Darshana S and Anjana and Pushpaben Patel, MS
Dawn M. Gadel and Elmer L. Headrick Jr., MS
Dean Moody, MS
Deborah A. Hardison, MS
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Devon C. Dicks, AL
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Douglas M. Hopkins, MS
Dwyer Tran, MS
Edith M. Phillips, MS
Edmund W. and Tonya S. Trussell, MS
Elroy J. and Cecile Toups, MS
Elroy J. and Nancy Marie Toups, MS
Gerald and Carolyn Nichols, MS
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Harold E. Tillman, Sr (Estate),Sheila D. Alexander, MS
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James W. and Edna M. McDaniel, MS
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Sandy Kaye Cox Living Trust, MS
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Sue Wright, MS
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Theodore Phillip and Cheryl Ann Gilbert, MS
Todd R. Peacock, MS
Vivian W. Lambert, MS
Walter C. Randle, Sr., MS
Wendall R. Wells and Erica Wells E and Gloria J. Wells, MS
Willie Nettles, MS

APPENDIX B

BIOLOGICAL ASSESSMENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

API	American Petroleum Institute
BA	Biological Assessment
BCDMMS	Bayou Casotte Dredge Material Management Site
bcfd	billion cubic feet per day
BOG	boil-off gas
BU	Beneficial Use
CFR	Code of Federal Regulations
COE	U.S. Army Corps of Engineers
Commission	Federal Energy Regulatory Commission
CSA	construction support area
cy	cubic yards
dB	decibels
EEM	estuarine emergent
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	*Endangered Species Act of 1973*
FERC	Federal Energy Regulatory Commission
FGT	Florida Gas Transmission Company, LLC
ft^3	cubic feet
FWS	U.S. Fish and Wildlife Service
GLE	Gulf LNG Energy, LLC
GLP	Gulf LNG Pipeline
Grand Bay NERR	Grand Bay National Estuarine Research Reserve
Grand Bay NWR	Grand Bay National Wildlife Refuge
Gulf LLC	Gulf LNG Liquefaction, LLC
JCPA	Jackson County Port Authority
kV	kilovolt
LNG	liquefied natural gas
LOR	Letter of Recommendation
LOR-A	Letter of Recommendation-Analysis
m	meter
m^3	cubic meters
MDEQ	Mississippi Department of Environmental Quality
MDWFP	Mississippi Department of Wildlife, Fish, and Parks
Migratory Bird Plan	*Migratory Bird Impact Assessment and Conservation Plan*
MPC	Mississippi Power Company
msl	mean sea level
MW	megawatt
NAVD	North America Vertical Datum of 1988
NFPA	National Fire Protection Association
NGL	natural gas liquids

NMFS	National Marine Fisheries Service
NOAA	National Oceanic Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
PCE	primary constituent elements
Project	Gulf LNG Liquefaction Project
re	referenced to
SH	State Highway
SPCC Plan	*Spill Prevention, Control, and Countermeasure Plan*
Strike Avoidance Procedures	*Vessel Strike Avoidance Measures and Reporting for Mariners*
SWPPP	*Stormwater Pollution Prevention Plan*
Transco	Transcontinental Gas Pipe Line Company, LLC
U.S.C.	United States Code
USCG	U.S. Coast Guard
μPa	micropascal

1.0 INTRODUCTION

1.1 GENERAL PROJECT INFORMATION

The environmental staff of the Federal Energy Regulatory Commission (FERC or Commission) prepared this biological assessment (BA) to assess effects on federally listed threatened and endangered species and/or their designated critical habitat resulting from construction and operation of the liquefied natural gas (LNG) facility referred to in this document as the Gulf LNG Liquefaction Project (Project). The Project is a joint collaboration between three companies: Gulf LNG Liquefaction, LLC (Gulf LLC); Gulf LNG Energy, LLC (GLE); and Gulf LNG Pipeline (GLP) (collectively referred to as Gulf LNG or the applicant).

On June 19, 2015 Gulf LNG filed an application with the FERC requesting authorization to construct and operate liquefaction and export facilities adjacent to and integrated with the existing GLE LNG Import Terminal (existing Terminal) in Jackson County, Mississippi. All federal agencies, in consultation with the U.S. Fish and Wildlife Service (FWS) and/or the National Marine Fisheries Service (NMFS), are mandated by Section 7(a)(2) of the *Endangered Species Act of 1973*, as amended (ESA) to ensure that any action that is authorized, funded, or carried out by the federal government would not jeopardize the continued existence of a federally listed threatened or endangered species, or result in the destruction or adverse modification of designated critical habitat (16 United States Code [U.S.C.]§ 1531, et seq.). As the lead federal agency, the FERC is responsible for consulting with the FWS and/or NMFS to determine whether any federally listed endangered or threatened species or designated critical habitat is near the proposed action, and to determine the proposed action's potential effects on those species or critical habitats. The FWS has jurisdiction over terrestrial animals, freshwater fish, beach-nesting sea turtles, pinnipeds, and manatees. NMFS has jurisdiction over marine and estuarine species, including diadromous and catadromous fish species, pelagic sea turtles, and cetaceans. The Project would be located in areas with species under both the FWS's and NMFS's jurisdictions; therefore, consultation with both agencies is required.

Although the species and critical habitat areas that are currently proposed, petitioned, or are a candidate for federal listing do not receive formal ESA protection, we considered the potential effects on these species and habitats so that Section 7 ESA consultation could be facilitated if these species or habitats became listed before or during Project construction. Should a federally listed, proposed, petitioned, or candidate species or critical habitat be identified during construction that was not been previously identified during field surveys or was not assessed through Section 7 ESA consultation, the applicant would be required to suspend any construction activity that could potentially affect that species and notify the Commission, the FWS and/or NMFS about the newly identified species. The construction activity would not be permitted to resume until the Commission completed its additional required FWS and NMFS Section 7 ESA consultations.

The Project area includes habitat that supports threatened and endangered species, including marine mammals. Federally threatened and endangered marine mammal species are protected by the ESA; additionally, all marine mammals (both ESA-listed and unlisted species) are protected under the *Marine Mammal Protection Act of 1972*, as amended (16 U.S.C. § 1361 et seq.). Many of these species that may occur in the Project action area are either transient in nature (i.e., migratory or highly mobile over large territories); would be unlikely to respond adversely to temporary and permanent impacts associated with the proposed Project and facilities; or lack suitable foraging or nesting habitat within the Project area.

As discussed below, based on the limited amount of available habitat in the area, the temporary or short-term nature of the construction impacts for the Project, and the mitigation measures proposed, we believe that the Project is *not likely to adversely affect* 19 federally listed species and would *not contribute to a trend toward federal listing* for 2 species under federal review.

1.2 CONSULTATION HISTORY

Gulf LNG initiated informal Section 7 ESA consultation with both the FWS Mississippi Ecological Services Field Office and the NMFS Panama City, Florida Habitat Conservation Division Office[1] in an April 18, 2014 letter. Gulf LNG conducted terrestrial wildlife and habitat surveys in June 2014 and August 2014 in addition to completing a scientific literature review. Although Gulf LNG did not identify any federally listed species during field surveys, the U.S. Army Corps of Engineers (COE) made two incidental observations of piping plovers during December 2014 visits to the proposed Project area. Gulf LNG submitted the results of its field surveys to the FWS and NMFS.

The FERC staff held conference calls with the FWS and NMFS on December 10, 2014; June 29, 2015; and September 23, 2015 to discuss impacts on federally threatened and endangered species, species of special concern, and critical habitat. The agencies also discussed if there was any need for additional consultations with federal and state agencies to ensure that Gulf LNG would use consistent surveying, monitoring, and reporting protocols during protection and mitigation activities. FWS and NMFS staff agreed to be cooperating agencies for the Project and that the BA and Essential Fish Habitat (EFH) assessments would be separate appendices to the EIS. In addition, it was agreed that further discussions about the mitigation plans were needed. Gulf LNG met with the COE on September 15, 2015 to discuss the proposed wetland mitigation site location. On September 16, 2015, Gulf LNG requested for NMFS to review and comment on the analysis of protected species included within the June 19, 2015 Gulf LNG FERC application resource reports. On October 30, 2015, NMFS provided comments to the FERC about Gulf sturgeon habitat at the proposed wetland mitigation site. Consultations between the applicant, the FERC staff, the FWS, and NMFS about federally protected species are ongoing.

Using agency correspondence, literature review, and field survey data. Gulf LNG has compiled a list of 21 species potentially affected by the Project; 2 of these species are under review for ESA listing (see table 1.2-1).

[1] NMFS consultations were initiated with the Panama City, Florida office in 2014. However, due to staffing changes the Southeast Regional Office located in St. Petersburg, Florida is reviewing the Project.

TABLE 1.2-1

Gulf LNG Liquefaction Project
Federally Listed Endangered and Threatened Species Occurring in the Project Area

Common Name	Scientific Name	Federal Status a/	Presence in Project Area/Comments	Effect Determination
U.S. Fish and Wildlife Service Jurisdiction				
Terrestrial Reptiles				
Alabama Red-bellied Turtle	*Pseudemys alabamensis*	E	Suitable habitat is present within the Project area. No individuals were observed during surveys.	*Not Likely to Adversely Affect.*
Birds				
Interior Least Tern **b/**	*Sternula antillarum athalassos*	E	Suitable foraging habitat may be present within the Project area. No individuals were observed during surveys.	*Not Likely to Adversely Affect.* .
Least Tern	*Sternula antillarum*	E	Suitable foraging habitat may be present within the Project area. No individuals were observed during surveys.	*Not Likely to Adversely Affect.*
Piping Plover	*Charadrius melodus*	E	Suitable foraging habitat is present within the Project area, and two foraging individuals were observed at the Terminal Expansion site in December 2014.	*Not Likely to Adversely Affect.*
Rufa Red Knot	*Calidris canutus rufa*	T	Suitable foraging habitat is present within the Project area. No individuals were observed during surveys.	*Not Likely to Adversely Affect.* .
Wood Stork	*Mycteria americana*	T	Suitable foraging habitat may be present within the Project area. No individuals were observed during surveys.	*Not Likely to Adversely Affect.*
Marine Mammals				
West Indian Manatee	*Trichechus manatus*	T	Suitable habitat is not present within the Project area, but this species could occur as a transient.	*Not Likely to Adversely Affect.*
Fish				
Saltmarsh Topminnow	*Fundulus jenkinsi*	UR	Suitable habitat is present at the Terminal Expansion site.	*Project would not contribute to a trend toward federal listing.*

TABLE 1.2-1

Gulf LNG Liquefaction Project
Federally Listed Endangered and Threatened Species Occurring in the Project Area

Common Name	Scientific Name	Federal Status a/	Presence in Project Area/Comments	Effect Determination
National Marine Fisheries Service Jurisdiction				
Marine Mammals				
Blue Whale	*Balaenoptera musculus*	E	Suitable habitat may be present within the Project area, but this species is unlikely to occur in the Gulf of Mexico.	*Not Likely to Adversely Affect.*
Fin Whale	*Balaenoptera physalus*	E	Suitable habitat may be present within the Project area, but this species is unlikely to occur in the Gulf of Mexico.	*Not Likely to Adversely Affect.*
Humpback Whale	*Megaptera novaeangliae*	E	Suitable habitat may be present within the Project area, but this species is unlikely to occur in the Gulf of Mexico.	*Not Likely to Adversely Affect.*
Sei Whale	*Balaenoptera borealis*	E	Suitable habitat may be present within the Project area, but this species is unlikely to occur in the Gulf of Mexico.	*Not Likely to Adversely Affect.*
Sperm Whale	*Physeter macrocephalus*	E	Suitable habitat is present within the Project area.	*Not Likely to Adversely Affect.*
Bryde's Whale	*Balaenoptera edeni*	UR	Suitable habitat is present within the Project area.	*Project would not contribute to a trend toward federal listing.*
U.S. Fish and Wildlife Service and National Marine Fisheries Service Jurisdiction				
Fish				
Gulf Sturgeon	*Acipenser oxyrinchus desotoi*	T	Critical habitat located in Mississippi Sound and would be affected by wetland mitigation.	*Not Likely to Adversely Affect.*
Smalltooth sawfish	*Pristis pectinatat*	E	Suitable habitat is not present within the Project area, but juveniles of this species could occur as transients.	*Not likely to Adversely Affect.*
Sea Turtles				
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E	Suitable habitat is present within the Project area. There is no known nesting habitat in Mississippi.	*Not Likely to Adversely Affect.*

TABLE 1.2-1

Gulf LNG Liquefaction Project
Federally Listed Endangered and Threatened Species Occurring in the Project Area

Common Name	Scientific Name	Federal Status a/	Presence in Project Area/Comments	Effect Determination
Leatherback Sea Turtle	*Dermochelys coriacea*	E	Suitable habitat is present within the Project area. There is no known nesting habitat in Mississippi.	*Not Likely to Adversely Affect.*
Green Sea Turtle	*Chelonia mydas*	T c/	Suitable habitat is present within the Project area. There is no known nesting habitat in Mississippi.	*Not Likely to Adversely Affect.*
Loggerhead Sea Turtle	*Caretta*	T	Suitable habitat is present within the Project area.	*Not Likely to Adversely Affect.*
Hawksbill Sea Turtle	*Eretmochelys imbricata*	E	Suitable habitat is not present within the vicinity of the Terminal Expansion site, but the species could occur along LNG vessel transit routes.	*Not Likely to Adversely Affect.*

Sources: FWS, 2018, MNHP, 2015, MDWFP, 2018

a T= threatened, E = endangered, UR = under review

b The state and federal listing information for the interior least tern applies to interior populations nesting along the Mississippi River only.

c The green sea turtle is federally threatened, with the exception of breeding colony populations in Florida and the Pacific coast of Mexico, which are federally endangered.

2.0 PROJECT DESCRIPTION

The Gulf LNG Liquefaction Project consists of two main components: (a) expansion of the existing Terminal in Jackson County, Mississippi (Terminal Expansion), and (b) piping modifications to add bi-directional flow capability (Pipeline Modifications) to the existing pipeline facilities. Figure 2.0-1 depicts the general location of the Project, figure 2.2-1 depicts the locations of the key components of the proposed Terminal Expansion, and figure 2.2-2 depicts the locations of the Pipeline Modifications.

2.1 EXISTING FACILITIES

2.1.1 Gulf LNG Import Terminal

The existing Terminal encompasses 33 acres and is near the City of Pascagoula at the south end of State Highway (SH) 611. Gulf LNG constructed the existing Terminal to regasify and transport natural gas imported to the United States from foreign markets. The environmental review for the existing Terminal was provided in the FERC final EIS issued in November 2006 (FERC, 2006). In 2007, the Terminal was authorized by the Commission to send out 1.5 billion cubic feet per day (bcfd) of natural gas through the Terminal facilities for delivery to interconnections with the interstate pipeline systems of Destin and Gulfstream, and the non-affiliated third-party processing plant owned by BP American Production Company (FERC, 2007).

Construction of the Gulf LNG Import Terminal was authorized by the FERC on February 16, 2007, and the facility was placed into service on October 1, 2011. A maximum of 200 LNG carriers per year are currently authorized to import foreign LNG at the marine berth of the Terminal. Unloading of LNG can occur at a rate of up to 12,000 cubic meters (m^3) per hour, with unloading typically requiring about 24 hours. The frequency and total number of LNG carriers calling on the existing Terminal each year could vary depending on the size of carriers, with authorized vessel sizes ranging from 88,000 to 170,000 m3. The berthing facility was designed and constructed to accommodate LNG carriers up to 250,000 m3 in size. The average frequency of LNG carriers that could call on the existing Terminal is about one carrier every 2.4 days.

The existing Terminal includes the following major facilities:

- one berthing facility on the Bayou Casotte Navigation Channel;
- two LNG storage tanks, each with a capacity of 160,000 m3;
- hazard detection, control, and prevention systems, cryogenic piping and insulation, and electrical and instrumentation systems;
- a firewater system;
- a concrete storm surge protection wall surrounding the Terminal with a top elevation of 27 feet North America Vertical Datum of 1988 (NAVD);
- 23,000 volt electrical services provided by Mississippi Power Company (MPC), and a transformer to step down the voltage to 4,160 volts for service to the Terminal;
- two essential power backup gas turbine generators each with a capacity of 12 megawatts (MW); and
- ancillary utilities, buildings, and service facilities.

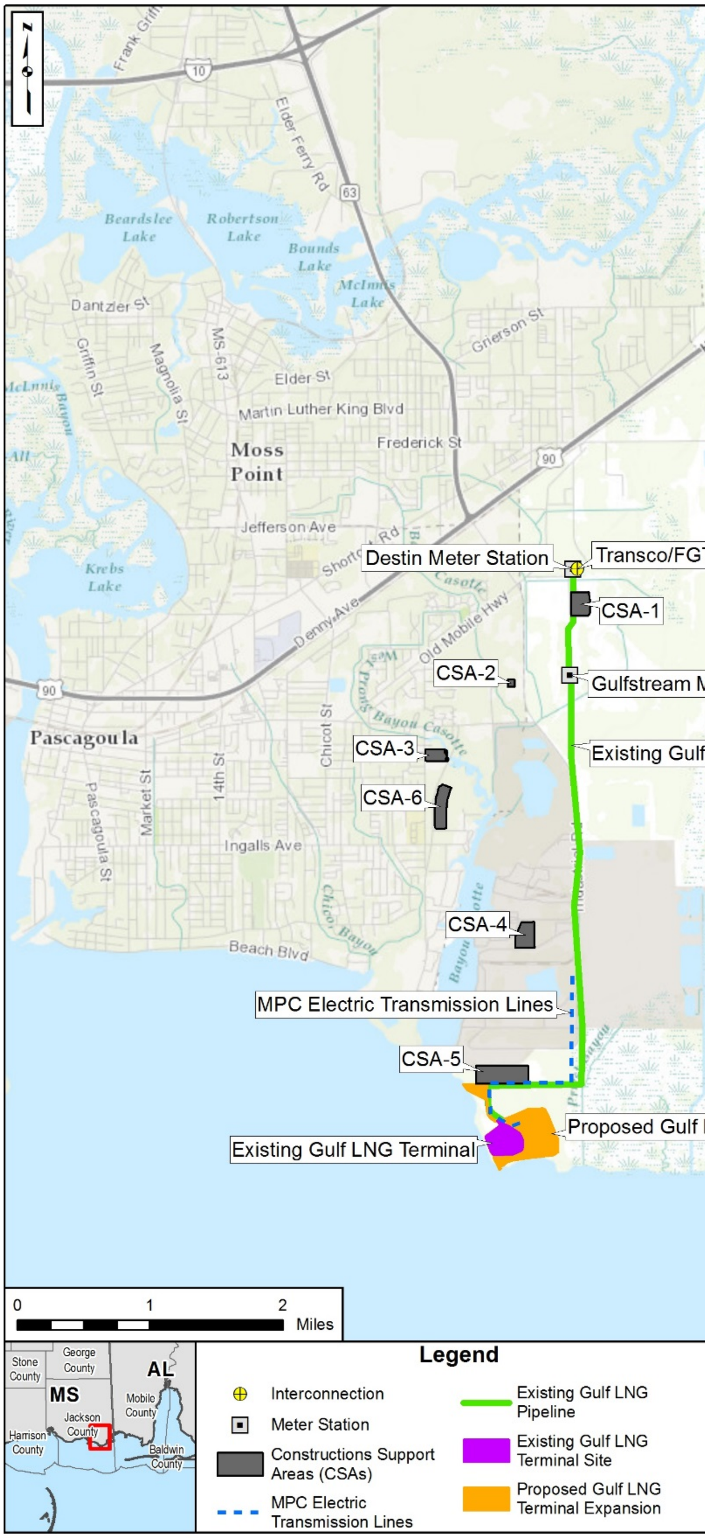

Figure 2.0-1
Gulf LNG Liquefaction Project
General Project Location

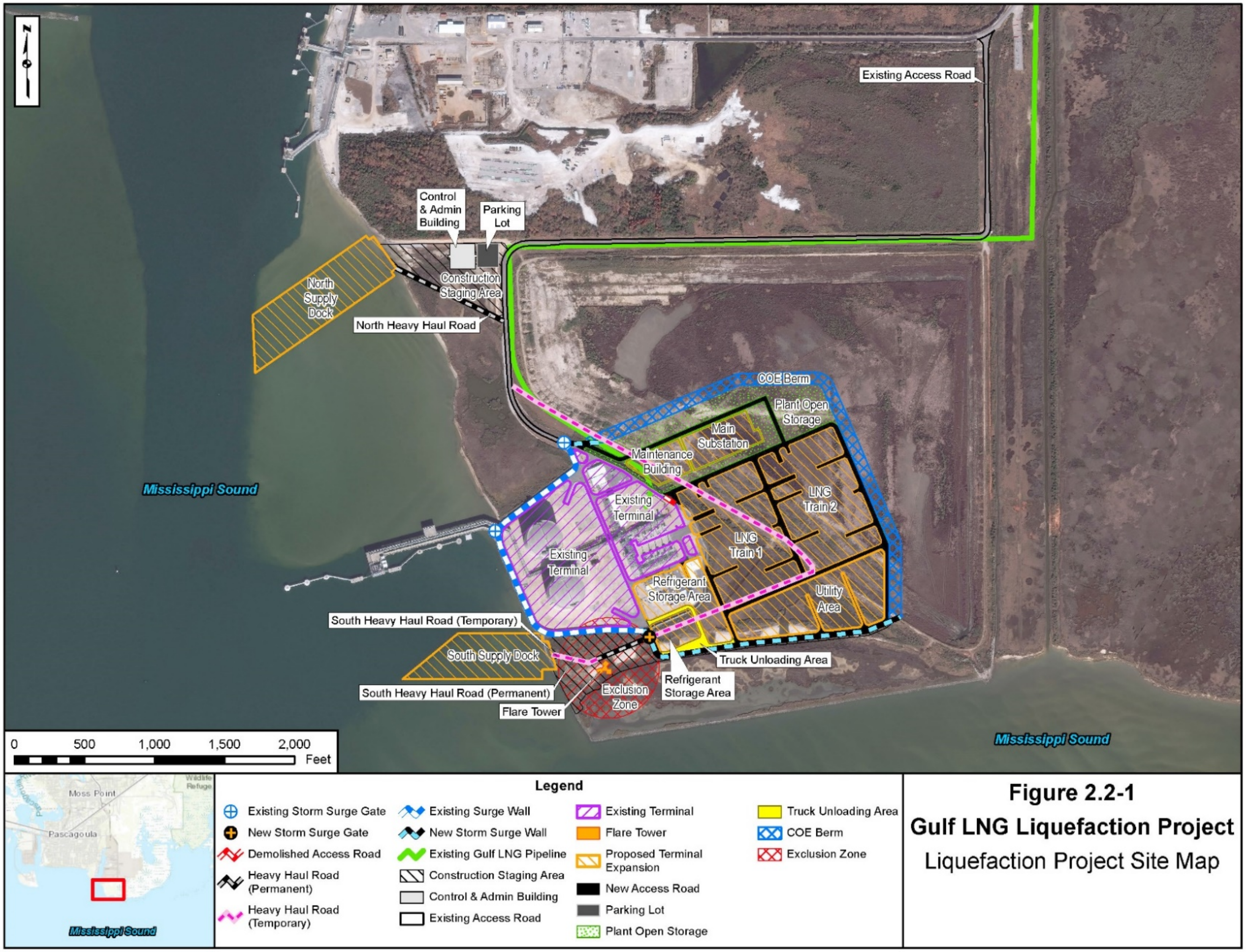

Figure 2.2-1
Gulf LNG Liquefaction Project
Liquefaction Project Site Map

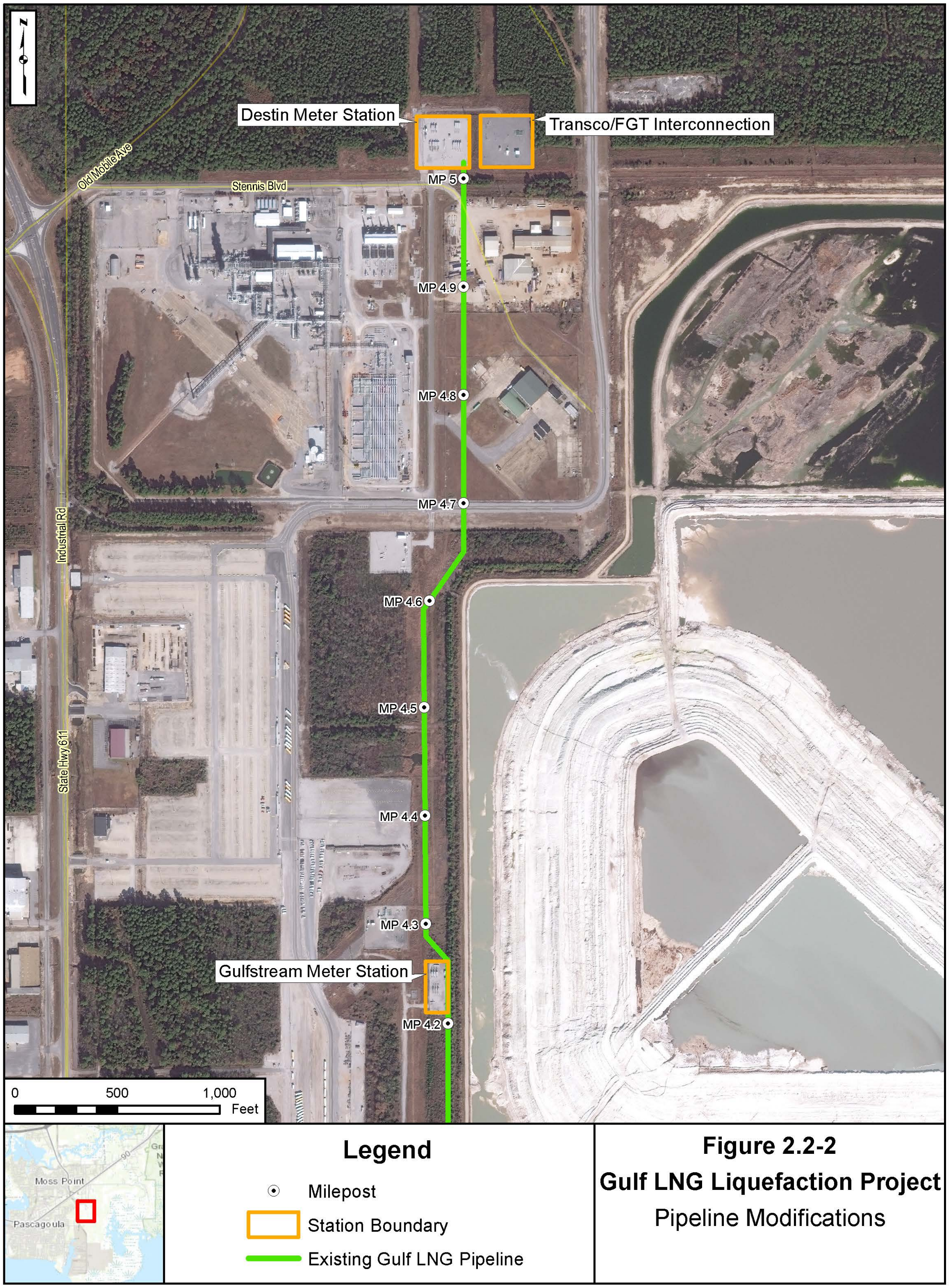

Figure 2.2-2
Gulf LNG Liquefaction Project
Pipeline Modifications

2.1.2 Gulf LNG Existing Pipeline System

Gulf LNG owns and operates the 5-mile-long, 36-inch-diameter natural gas send out pipeline and associated facilities that were constructed in conjunction with the existing Terminal (FERC, 2007). The existing Gulf LNG Pipeline extends north from the existing Terminal along SH-611 and connects to the Gulfstream, Destin, and Transcontinental Gas Pipe Line Company (Transco)/Florida Gas Transmission Company (FGT) pipeline systems and the Pascagoula Gas Processing Plant operated by BP American Production Company.

2.2 PROPOSED FACILITIES

2.2.1 Terminal Expansion

The Terminal Expansion facilities would be constructed adjacent to the existing Terminal boundaries on land currently owned by the COE and the Port of Pascagoula and part of the Bayou Casotte Dredge Material Management Site (BCDMMS) (see figure 2.0-1). The BCDMMS is used by the COE for placement of dredged materials from maintenance dredging of the Bayou Casotte Navigation Channel. Gulf LNG has not requested a change to the currently authorized number of or the transit route for the LNG carriers; however, Gulf LNG has requested authorization to increase the size of LNG carriers permitted at the facility from 170,000 m3 to 208,000 m3. The U.S. Coast Guard (USCG) determined that the navigation portion of the original Water Sustainability Assessment did not account for larger LNG carriers. The USCG prepared an updated draft Letter of Recommendation (LOR) and Letter of Recommendation-Analysis (LOR-A), which was provided to the FERC in January 2016. The USCG prepared the final LOR and LOR-A dated May 16, 2016 which was provided to the FERC on August 9, 2017. The USCG concluded that the Bayou Casotte Channel was suitable for LNG marine traffic.

2.2.1.1 Liquefaction Facilities

Liquefaction Trains, Utilities, and Systems

The existing Gulf LNG Pipeline and the Pipeline Modifications would transport natural gas (feed gas) to the liquefaction facilities at the existing Terminal. The liquefaction facilities would consist of two liquefaction trains, gas pretreatment units, utilities, and associated facilities (see figure 2.2-1). Prior to entering a liquefaction train, the feed gas would pass through a pretreatment unit to remove mercury, hydrogen sulfide, carbon dioxide, water, and heavy hydrocarbons. The heavy hydrocarbon removal unit would remove heavier hydrocarbons present in the feed gas (i.e. pentane, hexane, and benzene) which would be temporarily stored on-site, then trucked from the Project site to third-party customers.

After the feed gas is treated to remove the contaminants and heavy hydrocarbon components, the liquefaction unit would precool the feed gas using a closed loop propane system followed by condensing and subcooling the feed gas with a mixed refrigerant loop. The resultant liquid stream would enter an energy extraction LNG hydraulic turbine which would further lower the temperature of the LNG. Gulf LNG would then transport the LNG in cryogenic pipelines to the existing LNG storage tanks where it would be stored at -256 degrees Fahrenheit at atmospheric pressure.

Liquefaction utility components would include a boil-off gas (BOG) system, fuel gas system, hot oil system, flares, instrument and utility air systems, nitrogen generation system, source water system, tempered water system, firewater system, refrigerant storage system, natural gas liquids (NGL) storage, and hydrogen sulfide storage. BOG would be generated from the transfer of heat in the liquefaction process and diverted to three new BOG compressors and two new BOG recycle compressors. Much of the compressed BOG would be transported by pipeline to the fuel gas system, with excess BOG recycled through the liquefaction process.

Gulf LNG would install three in-service flares and a common spare flare on the southwestern portion of the Terminal Expansion site for venting excess natural gas, if necessary, during maintenance, startup/shutdown, and upset activities. The four flares would be constructed on a common 430-foot-tall support structure (see figure 2.2-1), with an overall height of 433 feet above mean sea level (msl).

2.2.1.2 LNG Storage

Gulf LNG would use the two existing 160,000 m^3 full-containment LNG storage tanks constructed of nickel steel and concrete (FERC, 2006). The only storage tank changes required for the Project would be the new LNG loading pumps installed in the existing storage tanks to transfer LNG-to-LNG carriers through the existing transfer lines.

2.2.1.3 Refrigerant and NGL Storage and NGL Trucking

Gulf LNG would construct and operate a truck loading/unloading facility to unload makeup refrigerant (propane and ethane) transported to the Terminal Expansion site for storage and use during the liquefaction process. Gulf LNG would store ethane in three pressurized storage tanks, each with a working capacity of 8,954 cubic feet (ft^3) and would store liquid propane in a tank with a capacity of 114,485 ft^3. Each refrigerant storage tank would be installed within a secondary containment system located, sized, and designed in accordance with American Petroleum Institute (API) Standard 2510 (Design and Construction of LPG Installations) and National Fire Protection Association (NFPA) Code 30 (Flammable and Combustible Liquids). Gulf LNG anticipates a delivery frequency of three to four trucks per month to the facility for propane and one to two trucks per month for ethane.

The heavy hydrocarbon removal unit within each of the liquefaction trains would continuously produce NGLs during the liquefaction process. Gulf LNG would construct a 2,800-ft^3 capacity, low-pressure storage tank and a truck loading facility for NGLs. The NGLs would be stored in the tanks prior to pick-up and delivery to third-party customers by truck. Gulf LNG anticipates five truck trips per month would be required to transport NGLs from the Terminal Expansion. Gulf LNG estimates ethane would be trucked into the facility up to two times each month and propane would be trucked into the facility up to four times each month. NGL trucking would be a non-jurisdictional activity once the trucks leave the Terminal Expansion site. After leaving the Terminal Expansion site, NGL trucking is regulated by U.S. Department of Transportation’s Federal Motor Carrier Safety Administration.

2.2.1.4 Power Generation

To provide electrical power to the Terminal Expansion, MPC would build two 1.5-mile-long, 115-kilovolt (kV) electric transmission lines from adjacent to the existing Chevron Cogeneration Facility to the Terminal Expansion. MPC would also construct a new 115-kV substation within the Terminal Expansion area. The electric transmission line would be considered non-jurisdictional, which includes additional details on the electric transmission line.

Four 2.5-MW, diesel-fueled, stand-by generators would be installed in the utility area to provide a source of backup power generation for critical equipment and plant shutdown if the electrical power system were to fail. Diesel for the generators would be stored on-site in a new, 106,971-gallon (14,300 ft^3) diesel storage tank with secondary containment. The tank would store enough fuel for three generators for 7 days of backup power generation. The fourth generator would be on-site as a spare.

2.2.1.5 Supply Docks

Gulf LNG would construct two supply docks as part of the Project, a North Supply Dock and a South Supply Dock. The North Supply Dock would be a permanent facility on the northwestern part of the existing Terminal property at the mouth of Bayou Casotte in Mississippi Sound (see figure 2.2-1). The facility would extend 280 feet along the shoreline, with a 110-foot-wide docking area extending 310 feet into Bayou Casotte. Barges would moor on both sides of the 110-foot-wide extension, perpendicular to the ship channel. Gulf LNG would construct a heavy haul road from the North Supply Dock to the main gate of the existing Terminal.

During construction, Gulf LNG would use the North Supply Dock would be used for barge delivery of large equipment, piles, construction materials, and other construction loads. Following construction, ownership of the North Supply Dock would be transferred to the Jackson County Port Authority (JCPA). In addition to use of the North Supply Dock by barges and support vessels associated with operation of the Project, the dock may also be used by the JCPA as a berthing facility for barges waiting for a berth at one of the private or public terminals in the Bayou Casotte Harbor or for temporary berthing of other vessels not associated with the Project. Security of the North Supply Dock during operations of the Project would be addressed in Gulf LNG's *Facility Security Assessment and Facility Security Plan* (pursuant to 33 Code of Federal Regulations [CFR] 105) which would be reviewed and approved by the USCG.

The South Supply Dock would be a temporary facility just south of the existing berthing facility (see figure 2.2-1). It would extend about 200 feet along the shoreline and up to 100 feet from the shoreline and would accommodate one barge at a time. Gulf LNG would construct a heavy haul road from the South Supply Dock to a new gate installed in the storm surge protection wall (see figure 2.2-1). During construction, Gulf LNG would use the South Supply Dock for delivery of fill materials, aggregate, and the flare tower. Upon completion of construction of the Terminal Expansion, Gulf LNG would completely remove the South Supply Dock and restore the adjacent shoreline to pre-construction conditions. A portion of the South Heavy Haul Road (390 feet) would be retained by Gulf LNG during operations for access to the flare tower. Gulf LNG would transfer ownership of the North Supply Dock to the Port of Pascagoula; the dock would remain part of the Project and used occasionally for delivery of materials, supplies, and equipment during operation.

For both supply docks, dredging would be required between the shoreline and the existing channel to safely accommodate barge traffic Hydrographic surveys conducted by Gulf LNG determined that the current depth of the sea bed at both planned supply docks is relatively flat with water depths ranging from 1 to 4 feet below msl. Gulf LNG would dredge the supply docks to a depth of 12 feet below msl. Gulf LNG estimates, based on similar sediment deposition rates for the existing LNG carrier berth, that about 10,000 cubic yards of sediment would accumulate in each basin annually. Gulf LNG would conduct maintenance dredging of the supply docks on an as-needed basis, which is anticipated to be about every 3 years. Upon completion of construction, Gulf LNG would discontinue maintenance dredging at the South Supply Dock and allow the area to return to its natural bathymetric state. The Port of Pascagoula, which conducts maintenance dredging at the existing marine berth, would assume responsibility for maintenance dredging of the North Supply Dock.[2]

All of the 3.5 acres created at the South Marsh Mitigation Area as mitigation due to construction of the existing Terminal, would be impacted by the construction of the liquefaction facility, South Supply Dock, and the flare tower.

[2] See Attachment No. 8 of accession number 20170929-5228.

There are several transit routes that the barges could use before entering the Bayou Casotte Navigation Channel, dependent on the origin of the trip.

During construction, a temporary barge access channel would be dredged from the South Supply Dock along the outer perimeter of the proposed wetland mitigation site (dredging of about 200,000 cubic yards [cy] of material). Barges would use the temporary channel to install the perimeter riprap. The sediment removed for the channel would be temporarily placed within the proposed wetland mitigation site and then replaced in the temporary channel after the riprap is installed. All of the dredge material would be replaced in the temporary channel or contained within the marsh creation area, so off-site disposal would not be necessary.

2.2.1.6 Modifications to Existing Terminal Facilities

Several minor modifications to facilities at the existing Terminal are proposed as part of the Terminal Expansion. These modifications consist of the following:

- installation of three BOG compressors within the existing Terminal;
- installation of a new 115-kV substation;
- installation of an inlet gas filter;
- installation of ammonia and solvent storage tanks;
- installation of new loading pumps in the existing LNG storage tanks; and
- minor changes to the piping connected to the marine loading arms to permit bi-directional flow.

In addition, Gulf LNG would make minor modifications to the existing water intake structure. The Terminal Expansion would use the same water source as the existing Terminal, the Port of Pascagoula's Industrial Water Supply, for construction and operation of the expanded facility, including firewater. The Port of Pascagoula's Industrial Water Supply is obtained from the freshwater portion of the Pascagoula River about 14 miles north of the City of Pascagoula.

2.2.1.7 Associated Infrastructure

Infrastructure associated with the Terminal Expansion would include establishment of access roads within the Terminal Expansion site, partial removal of an existing access road, expansion of the existing shoreline protection wall, extension of the COE's existing berm, construction of a new utility/firewater tank, and spill containment, as described further below.

Access Roads

Gulf LNG would use existing public roads to access the Terminal Expansion site. In addition, the Project would include removal of a segment of an existing road and construction of new access roads within the Terminal Expansion site boundaries (see figure 2.2-1). Gulf LNG would continue to use the existing access road off SH-611 to access the existing Terminal. A portion of this existing access road along the northeastern corner of the storm protection wall would be demolished. New access roads would be constructed throughout the Terminal Expansion site. New access roads would be graveled or paved with asphalt. A temporary heavy haul access road within the Terminal Expansion site would follow the existing access road located along the earthen berm dike around the perimeter of the BCDMMS.

Gulf LNG would also construct two heavy haul roads to connect the North and South Supply Docks with the existing Terminal and the Terminal Expansion (see figure 2.2-1).

Storm Protection System

Gulf LNG would extend the existing storm protection system surrounding the existing Terminal to encompass the Terminal Expansion facilities. The new storm surge protection system would consist of a new concrete wall with a top elevation of 27 feet NAVD and a new earthen berm (an extension of the existing COE berm) with a top elevation of 27 feet NAVD. The berm would be constructed to provide both storm surge protection for the Terminal as well as providing the new dredge spoils perimeter for that corresponding portion of the BCDMMS. Following initial construction of the berm by Gulf LNG, the COE, in order to expand capacity of the BCDMMS, would extend the berm to a height of 39.2 feet NAVD. The COE would be responsible for maintaining the berm during operation of the Project.

The new storm protection concrete wall would connect to the existing wall near the southeast corner of the existing facilities and extend along the southern perimeter of the Terminal Expansion site until tying into the new earthen berm that would extend along the east and northeast sides of the Terminal Expansion site (see figure 2.2-1). The concrete wall would be sloped into the earthen berm and the berm designed to withstand wave force due to storm surge and would be protected from wave-induced scour with protective armor stone and from seepage by providing sheet pile cut-off along its length. In addition, the berm would be designed to withstand anticipated future COE dredge spoil site loads. The portion of the existing storm protection system between the existing Terminal and the new storm protection concrete wall and new berm would be removed. Gulf LNG has not determined a final plan to extend the storm protection system. Once a final plan has been determined, Gulf LNG would submit the final plan for FERC staff to review.

There are two gates in the existing storm protection wall: one at the main entrance and one near the berthing facility. The existing steel-roller flood gates, about 30 feet wide at the main gate and 17 feet wide at the berthing facility, would remain in place and continue to be used during construction and operation of the Terminal Expansion. The gates seal at the base and on both sides when closed for storm events. As part of the Project, a third flood gate would be installed to allow transport of construction materials and equipment from the South Supply Dock to the new facilities via the South Heavy Haul Road. Gulf LNG would install this flood gate would be installed in the new storm protection concrete wall in the southwest portion of the Terminal Expansion, and east of the South Supply Dock (see figure 2.2-1). It would also be a steel-roller gate that would seal along the sill and on both sides when closed for storm events.

Firewater Facilities

As noted above, the Terminal Expansion would use the same water source for firewater as the existing Terminal. The firewater delivery system would be expanded to meet the firefighting needs of the expanded Terminal. The expanded firewater system would be designed in accordance with the requirements of the NFPA 59A.

Spill Containment System

Gulf LNG would construct separate containment systems for refrigerant and LNG to contain the materials in the event of an accidental release.

2.2.1.8 Administration and Maintenance Buildings

Gulf LNG would relocate the Terminal's existing administrative building to a site east of and near the North Supply Dock. The administrative building and parking lot would impact about 1.3 acres of the North Marsh Mitigation Area created as mitigation due to construction of the existing Terminal. The

Terminal's existing warehouse/maintenance building would be relocated within the Terminal Expansion site. The proposed locations of the administrative building and the warehouse/maintenance building are depicted on figure 2.2-1.

2.2.1.9 Construction Staging Areas and Construction Support Areas

Gulf LNG would use 11.7 acres of land within the proposed Terminal Expansion area for on-site construction staging areas (see figure 2.2-1). Gulf LNG would impact about 4.2 acres of the North Marsh Mitigation Area for a construction staging area. In addition, Gulf LNG would use six off-site construction support areas (CSA) for staging, laydown, contractor yards, fabrication, and parking (see figure 2.0-1). Details regarding each construction staging area are provided below.

- CSA-1 (Knight Yard #1): A 16-acre property about 5 miles north of the existing Terminal on Colmer Drive. The property currently includes existing parking, warehousing, office space, and undeveloped areas. Following construction of the Project, Gulf LNG would restore CSA-1 to landowner specifications.
- CSA-2 (Knight Yard #2): A 1.8-acre property behind an existing warehouse on SH-611 about 4 miles north of the existing Terminal. The current owner has filled the property with rock. Gulf LNG would use CSA-2 for storage and parking during construction of the Terminal Expansion. Following construction of the Project, Gulf LNG would restore CSA-2 to landowner specifications.
- CSA-3 (Louise Street): A 7.8-acre property about 2.8 miles northwest of the existing Terminal on Louise Street. CSA-3 (Louise Street), which is owned by Gulf LNG, is currently used for warehousing and equipment storage. Gulf LNG would continue the present use of this site during and after Project construction.
- CSA-4 (Port Property): A 16.2-acre property about 2.5 miles north of the existing Terminal within the Port of Pascagoula's property off SH-611. The property is an existing industrial site and was previously used as a construction support area for the existing Terminal. Following construction of the Project, Gulf LNG would restore CSA-4 to landowner specifications.
- CSA-5 (Chevron Property): A 34.5-acre property adjacent to the existing Terminal to the north. Portions of the property are existing industrial and portions are wetlands. Following construction of the Project, CSA-5 would be restored according to landowner specifications.
- CSA-6 (Bosarge Property): An 18.1-acre property on Bayou Casotte Parkway about 2.5 miles north-northwest of the existing Terminal. The property is an existing industrial site currently developed as a parking lot. Gulf LNG would use CSA-6 for additional parking during construction. Following construction of the Project, CSA-6 would be restored according to landowner specifications.

2.2.2 Pipeline Modifications

Gulf LNG would modify two existing pipeline metering stations and the existing Gulf LNG Pipeline at the existing Terminal to enable bi-directional (north/south) flow capability.

At the Destin and Gulfstream interconnections, Gulf LNG would install two pipeline segments at each interconnect and the necessary switching valves to allow the existing metering stations to meter natural gas flow to the Terminal Expansion while retaining the ability to meter natural gas flow from the existing Terminal to the distribution pipelines. Gulf LNG would install a 30-inch-diameter 200-foot-long pipeline segment and a 30-inch-diameter 40-foot pipeline segment at the Gulfstream Meter Station. Additionally, Gulf LNG would install a 36-inch-diameter 240-foot-long pipeline segment and a 36-inch-diameter 210-foot pipeline segment at the Destin Meter Station. All existing instrumentation at the meter stations would remain unchanged. In addition, Gulf LNG would install filters at both interconnections to remove trace quantities of solids, which could affect the liquefaction equipment. Gulf LNG would construct the modifications within the existing fenced and graveled areas, with the exception of 0.1 acre of temporary workspace outside the fence line of the existing Gulfstream Meter Station but within the existing pipeline right-of-way. No other equipment within the existing facilities would be affected.

Transco would also make modifications to the existing and jointly owned Transco/FGT Interconnection to permit bi-directional flow. These modifications would be constructed by Transco and would be reviewed by the FERC under its blanket Certificate process. According to Gulf LNG, modifications at the Transco/FGT Interconnection would be completed between April 2022 and September 2022.

The Gulf LNG Pipeline connection to the existing Terminal, which is within the existing Terminal boundaries, would also be modified to allow bi-directional flow and to provide a connection to the inlet of the pretreatment facilities of the liquefaction process. The flow capacity of the existing Gulf LNG Pipeline would not change.

The Destin and Gulfstream Meter Stations and the Transco/FGT Interconnection already have existing permanent access roads to each facility.

2.3 IMPACTS AND MITIGATION

2.3.1 Loss of Terrestrial Wildlife Habitat

Construction and operation of the Terminal Expansion would temporarily and permanently affect about 50.7 acres of terrestrial wildlife habitat, including wetlands (38.7 acres), upland forest (8.5 acres), and open land habitat (3.5 acres). The permanent conversion of wildlife habitat within the Project area to industrial-use land would reduce available acreage for foraging, hunting, nesting, and resting/migratory stopover habitat. However, there is a large amount of suitable habitat in nearby areas, including federal and state reserves and preserves like the Grand Bay Savanna Coastal Reserve, Grand Bay National Estuarine Research Reserve (Grand Bay NERR), Grand Bay National Wildlife Refuge (Grand Bay NWR), and the Gulf Islands National Seashore. The western boundary of the Grand Bay Savanna Coastal Preserve abuts the eastern edge of the BCDMMS; the Project footprint is about 700 feet west of the boundary. The Grand Bay NERR and Grand Bay NWR are about 1.5 and 9.0 miles east of the Terminal Expansion site, respectively. The Gulf Islands National Seashore is a chain of islands about 6.5 miles south of the Terminal Expansion site. These special status areas provide habitat for wildlife that is similar to that of the Terminal Expansion site (FERC, 2006).

Gulf LNG is working with the FWS to develop impact mitigation and minimization measures for migratory birds. Based on these consultations, Gulf LNG developed its *Migratory Bird Impact Assessment and Conservation Plan* (*Migratory Bird Plan*) and submitted it to the FWS in August 2018. Consultations with the FWS are ongoing, and we have recommended in our draft environmental impact statement (EIS) that Gulf LNG submit its final *Migratory Bird Plan* to the Commission prior to construction.

2.3.2 Lighting Impacts

Construction lighting could adversely affect protected species by exposing them to predators and by reducing the length of night that many species use for foraging, sheltering, and mating (Florida Atlantic University, no date). Aquatic species in the area are likely acclimated to the current ambient noise and light, due to the industrial nature of Bayou Casotte (FERC, 2006). To minimize impacts on protected species, nighttime construction lighting would be temporarily located at specific locations where construction would be ongoing and would be removed upon completion. Generally, construction and operational lighting of the supply docks and adjacent areas would be installed as close as possible to the locations needing illumination; these lights would also be shielded to direct light downward to minimize light impacts on adjacent areas. Industry within the Project area already contributes to nighttime artificial light levels. We have determined that Gulf LNG's proposed light placement and shielding methods to minimize lighting impacts would reduce artificial lighting impacts on protected species to greatest extent practicable.

Navigation lighting at the proposed flare tower has the potential to affect federally protected birds by causing them to collide with structures or to become disoriented during migration. Most bird collisions occur at night, when navigation lighting is most visible. Navigation safety lights can attract birds during periods of low visibility and cause disorientation (Avery et al., 1976; Caldwell and Wallace, 1966; Gauthreaux and Besler, 2006; Longcore et al., 2013). To the extent practicable, Gulf LNG would incorporate appropriate measures from the *2013 U.S. Fish and Wildlife Revised Voluntary Guidelines for Communication Tower Design, Siting, Construction, Operation, Retrofitting, and Decommissioning* into the Project's lighting design to reduce light pollution and minimize lighting-related impacts on birds (FWS, 2013). Gulf LNG's design would include minimization measures such as the installation of lights that only meet the minimum requirements for obstruction avoidance and pilot warning, and omitting the use of guy wires in tower design to reduced Project lighting impacts on federally listed species.

2.3.3 Turbidity and Sedimentation

Offshore Project-related activities, such as dredging, filling, and ballast water discharge would increase sedimentation and turbidity at the sites, potentially resulting in minor, temporary, and direct impacts on protected species. Increases in turbidity may cause protected species to avoid the immediate area of construction or cause their prey to be displaced. As suspended sediments are redeposited on the seafloor down-current, there may be additional mortality or dispersal of prey species. Dredging would be the largest source of increased turbidity and sedimentation levels for the Project. However, we expect these impacts to be short-term and minor given the proportion of available habitat within Mississippi Sound that would be affected. Although protected species may temporarily be displaced during construction, they would be expected to return to these areas after the pipeline has been installed and sediments are redeposited (FERC, 2006).

Impacts on the seafloor would occur as a result of Project activities, which include activities such as mechanical dredging, filling, and pile driving. All of these activities may have the potential to remove bottom habitat and either smother and/or crush benthic organisms and aquatic vegetation that could serve as a food source for protected species. In addition, dredging would increase water depths. All seafloor impacts would be localized to the immediate area in which the construction activity is occurring. Because of the acreage that would be affected, dredging and filling activities at the supply docks and wetland mitigation site would be the largest source of seafloor impacts. Initial dredging for the supply docks would affect 15.3 acres of seafloor habitat; maintenance dredging would impact varying and lesser acreages thereafter. As mentioned previously, wetland mitigation site creation would require about 50 acres of fill over open water, permanently converting all seafloor habitat to estuarine emergent (EEM) wetlands at the mitigation site. No oyster or submerged aquatic vegetation resources are located in the Project footprint (State of Mississippi and the National Oceanic and Atmospheric Administration [NOAA], 1995), and as a result, the construction of the proposed Project would not impact these resources.

The total impact on the seafloor from Project activities would be minimal when compared to the total amount of suitable seafloor habitat (including Gulf sturgeon critical habitat) available within the Mississippi Sound. The Project is located within Unit 2 and 8 of the designated critical habitat for the Gulf sturgeon and includes the Pascagoula River (Unit 2) and 62 square miles of the Mississippi Sound nearshore area (Unit 8) (COE, 2014), while Project impacts on open water habitat. Impacts on the seafloor from these activities would occur in localized areas, and, with the exception of the wetland mitigation site, it is expected that protected species would leave the area of construction and return upon completion of disturbance. Further, the applicant would be required to adhere with its COE permit as well as the conditions outlined in the draft EIS to minimize impacts on the seafloor as a result of construction activities. In addition, according to the *Dredging and Disposal Plan*, Gulf LNG would install and maintain turbidity curtains around the dredge area to limit the transport of turbid water beyond the vicinity of the dredging operations. Therefore, adverse impacts on federally listed species due to Project-related impacts on the seafloor are not expected.

2.3.4 Mobilization of Contaminated Sediments

Dredging and filling could also mobilize contaminated sediments. Contaminated sediments can have both direct adverse impacts on bottom fauna, and indirect effects as the toxic substances move up the food chain (Castro and Reckendorf, 1995). Gulf LNG tested sediments at the proposed dredging areas for the supply docks; this testing determined that the sampled sediments have either no or very low levels of contaminants. Gulf LNG tested BCDMMS sediments that would be used for fill at the Terminal Expansion site; sediments from station 10 may have had elevated contaminant levels of arsenic and cadmium, but still met the permissible concentrations for ocean disposal. Gulf LNG proposes to blend these sediments with the other sediments removed from the BCDMMS. Gulf LNG would consult with the Mississippi Department of Environmental Quality (MDEQ) and the COE prior to construction to determine if the blended sediments would be appropriate for use at the Terminal Expansion site. Any sediment not used would be transported to an approved site for upland disposal.

2.3.5 Underwater Noise

NMFS has identified pile-driving activities as having the potential to affect protected species (NOAA, 2012a). Other noise-related impacts that may occur as a result of Project activities include noise associated with construction vessels and equipment, and noise associated with marine vessel traffic during operations. These potential impacts and the measures Gulf LNG proposes to employ to minimize noise impacts are discussed below.

2.3.5.1 Pile Driving

Gulf LNG has proposed to build the supply docks using offshore pile-driving methods. Noise generated from this activity could impact protected species. The noise could result in the species' temporary displacement from the area of construction.

As part of the installation of each of the two docks, the sheet piles would be driven to a depth of 31 feet below msl with an impact-hammer. Pile-driving activities for both docks would be conducted concurrently; installation could take up to 120 days at the North Supply Dock and 65 days at the South Supply Dock. Impacts on water resources associated with the North Supply Dock would be intermittent over 40-60 days of the 120-day estimated construction period. For the South Supply Dock intermittent water resource impacts would occur over 20-30 days out of the 65-day schedule.

Pile driving near and within the Bayou Casotte waters could cause concussive noise and generate underwater sound pressure waves that could adversely affect nearby marine organisms, including fish, sea turtles, and marine mammals. Underwater noise levels are commonly referred to as a ratio of the underwater sound pressure to a common reference pressure of 1 micropascal (μPa) root mean-square pressure, which is expressed in decibels (dB) of sound intensity as dB referenced to 1 μPa (i.e., dB re: μPa). According to the currently established standard practice, noise levels are measured at a distance of 10 meters (m) and within the line of sight of the source (NOAA, 2012). There are insufficient peer-reviewed reliable data available for determining the noise level that would trigger the onset of behavior disturbance in fish; however, as a conservative measure, NMFS generally uses 150 dB re: µPa at 10 meters as the threshold for behavior effects to fish species of particular concern, citing that noise levels in excess of 150 dB re: 1 µPa can cause temporary behavior changes (startle and stress) that could decrease a fish's ability to avoid predators. The current interim thresholds protective of injury to fish are 206 dB re: 1 µPa (peak) and 187 dB re: 1 µPa (cumulative) sound exposure levels for fish 2 grams or greater, and 183 dB re: 1 µPa (cumulative) sound exposure level for fish of less than 2 grams (WSDOT, 2017).

Recent studies suggest an impact-hammer installing steel sheet pile would produce a peak sound pressure level of about 205 dB re: µPa at 10 meters and cumulative sound exposure levels of 178 dB re: µPa at 10 meters (ICF Jones & Stokes and Illingworth and Rodkin, Inc., 2009). The noise levels would startle, stress, and potentially cause injury to aquatic organisms in the vicinity.

Gulf LNG would follow NMFS-recommended best management practices to reduce pile driving-related noise impacts on aquatic organisms. Since Gulf LNG has not provided specific details regarding its proposed in-water acoustic monitoring to ensure that actual noise levels from pile driving would not result in injury to aquatic resources, we included a recommendation in our draft EIS that Gulf LNG file a *Pile Driving Mitigation Plan* that outlines specific mitigation measures, including acoustical in-water monitoring, that would be implemented to limit underwater noise impacts to no more than 183 dB re: 1 µPa.

2.3.5.2 Marine Vessel Noise

Noise generated from offshore vessels associated with Project construction and operation could cause protected species to temporarily disperse from, or avoid, areas where Project-related activities are occurring. Such impacts could temporarily displace protected species from commonly used foraging, breeding, or resting habitats. Aquatic species at the proposed supply dock areas are likely acclimated to noise associated with frequent marine traffic at the existing Terminal, and as previously stated, no foraging habitat has been identified at these sites. Further, Gulf LNG is not proposing to increase the number of LNG carriers or change the transit route that is currently authorized at the existing Terminal. Therefore, impacts on protected species in the vicinity of the supply docks due to noise generated by marine vessels is not expected to occur.

Periodic increases in underwater noise levels that would occur during ship transits associated with the Project could affect protected species that frequent deeper, offshore waters. It is anticipated that species would generally avoid areas with high noise levels during construction and operation of the proposed Project. Therefore, noise-related impacts associated with marine vessel traffic is only expected to temporarily displace protected species, resulting in no long-term impacts.

2.3.6 Vessel Strikes

Collisions between LNG shipping vessels operating within the Project area and protected species could occur causing injury or mortality. Most protected species inhabiting offshore waters within LNG shipping lands (i.e., sea turtles, whales, and the West Indian manatee) would be expected to avoid construction vessels if they are encountered within the Project area, resulting in their temporary displacement (FERC, 2006). It has been observed that sea turtles dive as an avoidance behavior to oncoming vessels, but this behavior may actually make the turtles more vulnerable as diving could place them in contact with the vessel's propellers or in the undertow created by the vessel.

Gulf LNG has committed to provide LNG ship captains with the *Vessel Strike Avoidance Measures and Reporting for Mariners*[3] (*Strike Avoidance Procedures*), which outline collision avoidance measures. Gulf LNG would instruct vessel operators and crews to follow the guidelines listed in the *Strike Avoidance Procedures*, which include:

- providing vessel crews with protected species identification training;
- maintaining a vigilant watch for marine protected species and slowing down or altering their course to avoid striking protected species;
- when whales are sighted, maintaining a distance of 100 yards or greater between the whale and the vessel;
- reducing vessel speed to 10 knots or less when mother and calf pairs, groups, or large assemblages of cetaceans are observed near an underway vessel (when safety permits);
- checking with various communication media for general information regarding avoiding ship strikes; and
- reporting any sightings of any injured or dead protected species immediately, regardless of whether the injury or death is caused by your vessel.

Gulf LNG would also include these *Strike Avoidance Procedures* in all commercial shipping agreements made with shippers using the Terminal. Therefore, vessel strikes would be unlikely to occur and would not adversely affect federally listed marine species.

2.3.7 Offshore Spills or Leaks of Hazardous Materials

Accidental spills or leaks of hazardous materials could occur during construction and operation in both nearshore and offshore waters. This would cause an adverse effect of water quality, which could negatively impact protected species using the area. Depending on the size of the release, species could experience direct injury or mortality. Refueling during Project construction and operations would not take place at the Terminal Expansion. Construction and LNG shipping vessels would refuel at sites designed for that purpose. Gulf LNG has not decided the exact refueling station(s) it would use, but they would most likely be located away from the Project in Bayou Casotte Harbor. Therefore, the greatest likelihood for a fuel spill to occur would be associated with a large collision or other accident. However, there are no records of such an event occurring with LNG shipping vessels. Because such incidents are highly unlikely to occur, associated adverse impacts on protected species are also very unlikely.

In the unlikely event that a release occurs in open water, it would be contained and removed to the extent possible, and the remaining sheen would be allowed to dissipate. Gulf LNG would minimize potential impacts associated with spills or leaks of hazardous materials during construction by implementing its *Spill Prevention Containment and Countermeasures Plan* (*SPCC Plan*). LNG carriers would operate within the international standards for oil spill prevention and control.

2.3.8 Stormwater Runoff

Stormwater discharges at the Terminal Expansion would be covered by appropriate permits, such as Gulf LNG's National Pollutant Discharge Elimination System (NPDES) permit, that include conditions to protect water quality. In addition, Gulf LNG would adhere to guidelines in its *Stormwater Pollution*

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[3] Available at: https://sero.nmfs.noaa.gov/protected_resources/section_7/guidance_docs/documents/copy_of_vessel_strike_avoidance_february_2008.pdf.

Prevention Plan (*SWPPP*) and its *SPCC Plan* to further prevent significant adverse impacts from occurring. All stormwater collected within the walled Terminal Expansion area would be pumped and discharged into the Mississippi Sound through both the existing and new outfalls at the existing Terminal's berthing area. Species in this area are already acclimated to freshwater runoff areas, and no adverse impacts are anticipated.

2.4 IMPACT ASSESSMENT OF PROTECTED SPECIES

As previously stated, the Project would be located in areas with species under both the FWS and NMFS jurisdictions. The following discussions provide the determination of the effect of the Project on the species identified as being under their jurisdiction.

2.4.1 U.S. Fish and Wildlife Service

A total of eight species were identified as being under the jurisdiction of only the FWS. This includes four endangered species, three threatened species, and one species that is currently under review.

2.4.1.1 Alabama Red-bellied Turtle

The Alabama red-bellied turtle occurs most commonly in the backwaters of upper Mobile Bay in areas with dense, submerged vegetation generally 1 to 2 m deep. It can also occur in river channels, and as a straggler in brackish water and salt marsh areas. It uses dense beds of vegetation for basking (NatureServe, 2015). The Alabama red-bellied turtle is known to occur in Jackson County, Mississippi (FWS, 2014). It seasonally inhabits salt marsh areas near the mouth of the West Pascagoula River and has been observed on Horn Island in the Mississippi Sound (Leary et al., 2008). No suitable basking or nesting sites were observed in the vicinity of the Project for this species, and there is no record of this species in the Bayou Casotte area. However, this species has been observed in similar habitat in Jackson County. Therefore, we have determined that the Project *is not likely to adversely affect* the Alabama red-bellied turtle.

2.4.1.2 Least Tern and Interior Least Tern

The least tern is one of the smallest of the tern species. It ranges from Maine to Venezuela and winters from the Gulf Coast southward. The coastal population breeds in the three coastal counties of Mississippi, including Jackson County. It typically nests on seacoasts, beaches, bays, estuaries, lagoons, lakes, and rivers (NatureServe, 2015). The interior populations nest on sparsely vegetated sandbars in the Mississippi River (MDWFP, 2001). While the coastal population of the least tern is federally listed as endangered, it is not state-listed as threatened or endangered. The interior least tern is both federally and state-listed as endangered (FWS, 2018; MNHP, 2015).

During biological surveys, Gulf LNG determined that there was no suitable nesting habitat for the least tern or the interior least tern on the Project site. However, the species could still forage on the site and in the general area and could be displaced during construction and operation to abundant suitable habitat adjacent to the Project area. Therefore, we have determined that the Project *is not likely to adversely affect* either the coastal or interior species of the least tern.

2.4.1.3 Piping Plover

The piping plover typically breeds and forages along sandy beaches and mudflats (NatureServe, 2015). It is a migratory species that winters in Atlantic and Gulf coastal regions of the United States and several Caribbean islands, and breeds in the northern United States and Canada. This species mainly uses wide, flat, open, sandy beaches to forage. Nesting territories occur on open beaches near small creeks or wetlands. Piping plover eat mostly insects, spiders, and crustaceans that occur on open beaches or mudflats. Threats to this species include habitat loss and degradation, particularly of coastal beaches, and nest disturbance and predation (FWS, 2015a).

Foraging habitat for the piping plover is present in the existing marsh mitigation area south of the existing Terminal. This site was created by Gulf LNG to mitigate for impacts during construction of the existing Terminal. During a COE visit to the Terminal Expansion site on December 15, 2014, two individuals were observed; however, the lack of habitat and increasingly industrialized nature of the Terminal Expansion site and immediately surrounding area, would limit the likelihood that the species would use the small amount of existing shoreline. Although the Project would result in some habitat loss, the piping plover likely occurs as an uncommon non-breeding winter visitor to the site. Further, there is abundant suitable habitat adjacent to the Project area. Navigation lighting at the proposed flare tower has the potential to affect birds by causing them to collide with structures or to become disoriented during migration. Most bird collisions occur at night, when navigation lighting is most visible. As discussed in section 2.3.2, to the extent practicable, Gulf LNG would incorporate appropriate measures from FWS's guidance to minimize lighting-related impacts on birds (FWS, 2013). Gulf LNG's design would include minimization measures such as the installation of lights that only meet the minimum requirements for obstruction avoidance and pilot warning, and omitting the use of guy wires in tower design to reduced Project lighting impacts on federally listed species. During construction, installation of piles for the Terminal Expansion and supply docks would generate noise. Given the industrialized nature of the Project area, it is likely that most avian species are accustomed to the level of noise generated by these activities or would avoid the construction area. Therefore, we have determined that the Project is *not likely to adversely affect* the piping plover.

2.4.1.4 Rufa Red Knot

The rufa red knot migrates long distances between nesting areas in mid- and high-arctic latitudes and southern non-breeding habitats as far as the coastal United States (Ridgely et al., 2003). The rufa red knot is thought to occur in Jackson County, Mississippi (FWS, 2014). This species was not observed in the vicinity of the Project, but there is suitable wintering foraging habitat (intertidal and other marine areas) at the Terminal Expansion site. The species could be present as a rare non-breeding visitor on the site during winter, fall, or spring migration (Cornell, 2015). The primary impacts of the Project on the rufa red knot would be the loss of foraging habitat. However, there is ample suitable foraging habitat for the rufa red knot in adjacent areas.

As stated in section 2.3.2, increased lighting during construction and operation could affect birds by causing them to collide with structures or to become disoriented during migration. However, Gulf LNG would use down-lighting to minimize the spread of light outside of the Project site and would incorporate the FWS recommendations regarding lighting into the Project lighting design to reduce light pollution and minimize lighting-related impacts on the red knot and all bird species. Therefore, we have determined that the Project *is not likely to adversely affect* the rufa red knot.

2.4.1.5 Wood Stork

The wood stork breeds in Mexico and migrates to the United States' Gulf Coast to forage (Audubon, 2014). The federal government considers wood storks observed in Mississippi to be visitors from Mexico and Central America and thus, they are not considered endangered. They prefer to forage in ponds, freshwater wetlands, flooded pastures, bayheads, and other shallow water (MDWFP, 2001). On the Mississippi Gulf Coast, wood storks primarily use the shallow areas of oxbows and wooded sloughs along the floodplains of large rivers and streams, particularly the Pascagoula River. Wood storks are occasionally observed in salt marshes along the Gulf Coast. Wood storks could occur at or near the Terminal Expansion site as non-breeding winter transients, but the site likely would not be a preferred stopover area. No sightings occurred during field surveys, and there are no known occurrences in the vicinity of the Project. Because there is an abundance of suitable habitat adjacent to the Project area and the species mobility, we have determined that the Project *is not likely to adversely affect* the wood stork.

2.4.1.6 West Indian Manatee

The West Indian manatee is federally listed as endangered and can be found in marine, estuarine, and freshwater environments. Manatees generally seek out natural warm water sites to forage, drink, and rest, including areas where industrial facilities discharge warm water. Most of their time is spent in freshwater and estuarine environments, but manatees will venture into salt water to travel to different locations. Manatees are herbivores that feed on a large variety of plants, including submerged, emergent, and floating vegetation. Mating can occur at any time of year and, while calving peaks in the spring months, calves may be present in any area at any time of the year and usually remain with the mother for 2 years. Major threats to this species include boat collisions, habitat loss, and forage species loss (FWS, 2015b).

Potential impacts on the West Indian manatee would be similar to those for whales. As noted by the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) (2001), no manatee foraging habitat has been observed in the vicinity of the Project, and manatees that may be observed within the area would likely be summer migrants (transients). Dredging and pile driving for construction for the supply docks, and the presence of and noise from barges and barge support vessels during construction and operation could affect the West Indian manatee. According to the *Dredging and Disposal Plan*, Gulf LNG would install and maintain turbidity curtains around the dredge area to limit the transport of turbid water beyond the vicinity of the dredging operations. We have included in section 4.6.2.1 of the draft EIS a recommendation that Gulf LNG file a *Pile Driving Mitigation Plan* that outlines specific mitigation measures, including acoustical in-water monitoring, that would be implemented to limit underwater noise impacts to no more than 183 dB re: 1 μPa. Although an occasional summer migrant manatee could pass through the area, there is a low risk of impacts from collisions with barges and support vessels. Gulf LNG would minimize collision with marine mammals by adhering to measures in the *Strike Avoidance Plan*. Based on the infrequent occurrence of the West Indian manatee in the Project area, the likelihood that any impacts on the species would be minor if they occurred, Gulf LNG's adherence to the *Strike Avoidance Plan* along with their commitment to continue consultation with NMFS to minimize potential impacts on protected species from vessel traffic, our recommendation regarding pile driving, and Gulf LNG's intent to use turbidity curtains during dredging, we have determined that the Project *is not likely to adversely affect* the West Indian manatee.

2.4.1.7 Saltmarsh Topminnow

The saltmarsh topminnow is endemic to brackish waters from Galveston Bay, Texas to the western panhandle of Florida. This species lives in estuaries, salt marshes, and back water sloughs, and breed in shallow, flooded marshes from March to August. This species is in decline largely due to habitat destruction caused by dredging and dredged material placement, dock and other bulk-head construction along marsh edges, shoreline erosion, and hurricanes (NOAA, 2009).

The filling of EEM wetlands and construction of the supply docks at the Terminal Expansion site would permanently eliminate some potential saltmarsh topminnow habitat. Impacts on habitat at the South Supply Dock are expected to be temporary as that area would be allowed to restore naturally following construction. Direct impacts, such as injury or mortality, could also occur during fill placement in wetlands. We expect that impacts on saltmarsh topminnow habitat would be offset by the creation of the EEM wetlands at a 50-acre site just south of the Terminal Expansion as part of Gulf LNG's wetland mitigation plan. Therefore, we conclude that the Project *would not contribute to a trend toward federal listing* of the saltmarsh topminnow.

2.4.2 National Marine Fisheries Service

A total of six marine mammal species were identified as being under the jurisdiction of only NMFS. This includes five endangered species and one species that is currently under review.

2.4.2.1 Whales

There are five federally protected species of whales with the potential to occur within the vicinity of the Project area; all are listed as endangered. The blue whale, fin whale, humpback whale, sei whale, and sperm whale, have all been observed in the Gulf of Mexico (COE, 2014). The Bryde's whale, which has been petitioned for listing as endangered, is also present in the Gulf of Mexico. Of these species, only the sperm whale and Bryde's whale are year-round residents of the Gulf of Mexico (Davis et al., 2000). The four remaining species are considered rare in the area. NMFS indicated that observations of blue, fin, humpback, and sei whales in the Gulf of Mexico were likely juveniles straying from the normal range of these stocks or are only occasional transients (NOAA, 2005). If present, these whales would most likely be in deeper, open waters and would not be expected to swim in nearshore areas.

The blue whale is the largest living animal on earth. Blue whales are migratory, moving toward the poles in the spring for feeding and returning to the subtropics in the fall to mate (NOAA, 1998). They generally prefer colder, open water, but the young are born in warmer waters of lower latitudes. The blue whale was historically over-harvested; however, continued decline of the species may be due to alterations in the food chain from commercial fishing and whaling (NatureServe, 2015).

Sei and fin whales are widely distributed in the world's oceans. Most populations of these whales were reduced by extensive commercial whaling in the mid-twentieth century. Although it is considered uncommon, the fin whale is known to occur in the Gulf of Mexico. Sei whales, however, are considered uncommon in the Atlantic waters off of the United States and tend to avoid semi-enclosed waterbodies such as the Gulf of Mexico (NOAA, 2010; 2011). The similarity of the sei and fin whales has caused confusion as to the whales' actual distribution and frequency of occurrence (NOAA, 2010).

Humpback whales are found in all oceans of the world, generally occurring in water over continental shelves, along their edges, and around some oceanic islands (NOAA, 1991). However, this species rarely occurs in the Gulf of Mexico. Humpback whale populations were historically depleted by over-harvesting and continue to be threatened by marine pollution, disturbance by vessel traffic, and entanglement in fishing gear (NatureServe, 2015).

Sperm whales occur widely throughout the world's oceans (American Cetacean Society, 2006). In the Gulf of Mexico, their population is concentrated along the upper continental slope at water depths between 600 and 3,300 feet (Jochens et al., 2008). They dive up to 1,640 feet to feed, primarily preying on medium-sized, deep-water squid (American Cetacean Society, 2006). Historical declines in sperm whale populations have been due to over-harvest by commercial whaling operations, which peaked at about 29,000 whales per year in the mid-1960s. The best estimate of abundance for sperm whales in oceanic waters of the northern Gulf of Mexico is 1,315 from data collected between 1996 and 2001 (NatureServe, 2015).

Bryde's whales are the only resident baleen whales in the Gulf of Mexico. They prefer highly productive tropical, subtropical, and warm temperate waters worldwide and can weigh up to 90,000 pounds and reach 55 feet in length. The best abundance estimate available for northern Gulf of Mexico Bryde's whales is 33 (NOAA, 2017). The primary threats facing this species are underwater noise, collisions with ships, and exposure to pollution. The Bryde's whale is currently proposed for listing and is under review.

Potential Whale Impacts

Dredging and dredged material placement would cause temporary, localized elevations in turbidity and would also generate underwater noise. However, dredging and dredged material placement would take place in nearshore waters along the Terminal Expansion site where whale species do not typically occur. Individuals that would travel in nearshore waters would be expected to avoid the area during dredging activities due to the high levels of turbidity and construction noise.

Underwater noise generated by pile driving has the potential to adversely affect whales. Whales depend on sound as they hunt for food, detect predators, find mates, and maintain their awareness in the sea; pile driving noise can impact whales by elevating ambient noise levels to the point of interfering with biologically important signals. Conversely, sounds emitted by whales for communication and identification can be masked and go unheard due to the increased noise in the marine environment. We have included in section 4.6.2.1 of the draft EIS a recommendation that Gulf LNG file a *Pile Driving Mitigation Plan* that outlines specific mitigation measures, including acoustical in-water monitoring, that would be implemented to limit underwater noise impacts to no more than 183 dB re: 1 μPa.

Whale Conclusions

With the exception of the sperm whale and Bryde's whale, the federally endangered whale species that could be affected by the Project are not generally found in the Gulf of Mexico however, suitable habitat may be present within the Project area. Federally endangered whales that do occur in the Gulf of Mexico are generally found in offshore waters. In addition, impacts to occasional whale visitors in nearshore waters would be mitigated with our recommendation that Gulf LNG file a *Pile Driving Mitigation Plan* that outlines specific mitigation measures to limit underwater noise impacts to no more than 183 dB re: 1 μPa. Therefore, Project activities in nearshore waters associated with the Terminal Expansion are not likely to affect these species. Since federally endangered whales that do occur in the Gulf of Mexico are generally found in offshore waters, we have determined that the Project *is not likely to adversely affect* blue, fin, humpback, sei, and sperm whales and *would not contribute to a trend toward federal listing* for Bryde's whales.

2.4.3 U.S. Fish and Wildlife Service and National Marine Fisheries Service

A total of seven species are under the jurisdiction of both the FWS and NMFS. This includes four endangered and three threatened species.

2.4.3.1 Gulf Sturgeon and Critical Habitat

The entire offshore portion of the Project area within the Mississippi Sound is designated as critical habitat for Gulf sturgeon (*Acipenser oxyrinchus desotoi*) (NOAA, 2007). Project activities (such as dredging, dredged material placement, and pile driving) can increase underwater noise and nighttime light levels; spills or leaks of hazardous materials from construction equipment or vessels could also potentially affect Gulf sturgeon or their critical habitat.

The Gulf sturgeon is a distinct subspecies of Atlantic sturgeon, historically observed from Charlotte Harbor, Florida to the Mississippi River (Ross, 2001). The Gulf sturgeon is an anadromous fish that migrates from saltwater into large coastal rivers in the spring between February and April. Reproductive fish move from the mouths of coastal rivers upriver to spawn. At present, the only known spawning locations in Mississippi are at Bouie Creek (about 160 miles north-northwest of the Project) and at the Pearl River (about 75 miles to the west of the Project). However, spawning may also occur in the Chickasawhay River about 225 miles north of the Project (FWS, 1995; GSMFC, 2005).

In late October through early November, adult sturgeon move downstream and forage in the estuaries adjacent to the mouth of rivers (Fox et al., 2001; 2002; Harris et al., 2005). They remain in the estuaries until winter temperatures drop, and then return to saltwater for the coldest 3 to 4 months of the winter (FWS, 1995; GSMFC, 2005). Adult Gulf sturgeons do not appear to feed during summer months when they reside in rivers (Wooley and Crateau, 1985; Gu et al., 2001).

When in estuary habitats, the diet of Gulf sturgeon comprises benthic organisms and varies locally. In the Suwannee River estuary in Florida, the diet is dominated by brachiopods (*Glottidia pyrimidata*); however, amphipods (*Ampelisca* spp.), brittle stars (*Ophiactis abyssicola*), and lancelets (*Amphioxus* spp.) are also included (Huff, 1975; Mason and Clugston, 1993). In Choctawhatchee Bay, Florida, the ghost shrimp (*Lepidophthalmus louisianensis*) is the major diet component and (Fox et al., 2002).

Potential Gulf Sturgeon Impacts

Adult Gulf sturgeon pass through the area in the vicinity of the Project at the mouth of the Pascagoula River on their outward migration to, and subsequent return from, the offshore barrier islands during the winter feeding period (FERC, 2006). Activities such as dredging and dredged material placement, increases in noise, and spills or leaks of hazardous materials could potentially affect Gulf sturgeon and its critical habitat in the vicinity of the Project.

Turbidity resulting from dredging activities is not in itself a problem for Gulf sturgeon, which naturally prefer turbid environments (LeBreton et al., 2004). However, increases in biological oxygen demand associated with turbidity resulting from disruption of reduced or anoxic sediments during dredging may cause sturgeon, if present, to avoid the area until dissolved oxygen levels increase. According to the *Dredging and Disposal Plan*, Gulf LNG would install and maintain turbidity curtains around the dredge area to limit the transport of turbid water beyond the vicinity of the dredging operations.

Gulf LNG's proposed wetland mitigation site is also designated as critical habitat for the Gulf sturgeon. Placement of dredged material at this site would bury soft-bottom sediment and result in temporary and localized increases in turbidity. While the turbidity (and the associated decrease in dissolved oxygen) is not expected to adversely affect the sturgeon, covering soft-bottom sediment and raising the elevation of the site would preclude its use as Gulf sturgeon habitat. However, it is expected that the Gulf sturgeon would use suitable habitat available in nearby, adjacent areas.

Pile driving has the potential to create repetitive noise that may be harmful to Gulf sturgeon in close proximity to the activity. However, other engine noises, small work boats, and general activity associated with pile driving are likely to elicit an avoidance response from the Gulf sturgeon that would keep them away from the construction area. Gulf LNG has also committed to using a soft-start technique when initiating all pile-driving activities. This technique is designed to elicit an avoidance response from fish in the vicinity, causing them to temporarily leave the area for the duration of the pile driving. The soft-start technique consists of commencing pile driving at low impact levels, then increasing to full-impact levels over a period of time sufficient for aquatic species to leave the area. This technique would thereby reduce the likelihood that fish would be exposed to injury causing sound levels (Savery and Associates, 2010). In addition, impacts to Gulf sturgeon would be mitigated with our recommendation that Gulf LNG file a *Pile Driving Mitigation Plan* that outlines specific mitigation measures to limit underwater noise impacts to no more than 183 dB re: 1 μPa.

Nighttime construction lighting could also result in adverse impacts on Gulf sturgeon. Gulf LNG would minimize the use of night lighting to the extent practicable and would employ mitigation measures to limit the spread of light to adjacent areas. Further, Gulf sturgeon in the area have likely acclimated to lighted conditions due to industrial activities at the existing Terminal and nearby industrial facilities.

Critical Habitat

The Project is in a portion of Mississippi Sound that NMFS has designated as final Gulf sturgeon critical habitat. Critical habitat includes open bays, including Pascagoula Bay, Point aux Chenes Bay, Grand Bay, and Sandy Bay. The northern boundary of the Mississippi Sound critical habitat is mainland shorelines between Heron Bay Point, Mississippi and Point aux Pins, Alabama (FWS, 1995; GSMFC, 2005). The southern boundary of the Mississippi Sound critical habitat is 1.2 miles offshore of the barrier islands (defined at 33 Code of Federal Regulations Part 80.815). There are seven primary constituent elements associated with the designated critical habitat for Gulf sturgeon. The designation of primary constituent elements (PCEs) helps to focus conservation efforts and impact minimization measures on those critical elements of the habitat that are essential to the conservation of the species. There are four PCEs of the designated critical habitat that are relevant to the Project: abundant food items, water quality, sediment quality, and safe and unobstructed migratory pathways.

<u>Abundant Food Items</u>

Known common prey items, such as brachiopods, amphipods, brittle stars, lancelets, and ghost shrimp, are either lacking or less dense (lower abundance) in benthic samples from the Project site than from known foraging areas, such as the Suwanee River or Choctawhatchee Bay. In contrast, the benthic community in the ship berthing and maneuvering area is dominated by macroinfaunal species that are known colonizers (e.g., the polychaete *Mediomastus* spp. and the bivalve *Gemma gemma*) (FERC, 2006). These opportunistic species are highly dominant in number, comprising over 60 percent of all benthic macroinfauna (FERC, 2006). Initial recolonization of dredged areas would commence in a matter of days or weeks, and these areas would become functional benthic communities similar to pre-dredge conditions or to adjacent reference locations in about 12 to 18 months (FERC, 2006). However, later successional stages of benthic recolonization would be more gradual (Applied Biology, Inc., 1979; Blake et al., 1996; Desprez, 2000; Hammer et al., 2005). Therefore, the temporary loss of benthos resulting from dredging of critical habitat, and the potential permanent shift in the benthic community that would reestablish in the deeper areas, would not result in an adverse modification of this primary constituent element, nor would it adversely affect Gulf sturgeon conservation as the impact is localized and short-term to temporary.

Construction of the wetland mitigation site would result in the permanent loss of about 50 acres of soft-bottom sediment. It is likely that benthic fauna such as polychaetes and oligochaetes would be buried during construction, resulting in a loss of prey available in the vicinity of the mitigation site. However, we do not anticipate substantial adverse impacts on the Gulf sturgeon given the abundance of soft-bottom habitat that is characteristic of the Mississippi Sound east and west of the mitigation site, which is inhabited by the same types of prey species that would be lost as a result of the construction of the wetland mitigation site.

<u>Water Quality</u>

Salinity near the Terminal Expansion site is higher than at the known feeding area at the mouth of the Pascagoula River, but is within the range observed in other areas known to be used by subadult and adult life stages (FERC, 2006). Other parameters measured near the Terminal Expansion site, such as dissolved oxygen, pH, and temperature, are within normal ranges (FERC, 2006). Other water quality parameters not specifically measured, such as hardness, turbidity, or contaminants, are likely to be similar to the characteristics of much of Mississippi Sound. As stated in section 2.3.4, analysis of sediment at the proposed supply dock basin showed that either very low, or no contaminants are present in the sediments at this site. Therefore, dredging would not result in any significant adverse effects on water quality when introduced into the water column. Further, Project-related spills or leaks of hazardous materials are unlikely to occur, and should one occur, Gulf LNG would adhere to its *SPCC Plan* to minimize impacts. Other than temporary and localized increases in turbidity during construction and maintenance dredging, the Project is not expected to alter water quality characteristics of the critical habitat. In addition, Gulf LNG would implement measures in its *Gulf LNG Plan* and *Gulf LNG Procedures* during construction of the Terminal Expansion to minimize the release of heavily sediment-laden water to sensitive resource areas and to prevent the release of contaminated discharges, thereby reducing the impact of the Project on water quality. Therefore, the Project would not result in adverse impacts on this primary constituent element. Temporary turbidity-related impacts on water quality would be minimized to the extent practicable and would not be significant.

Sediment Quality

The existing surficial sediments at the Terminal Expansion site are primarily sandy with no or very low concentrations of contaminants. Analysis of sediment collected at the proposed supply dock basins revealed that the sediments are suitable for beneficial use (BU). Therefore, dredging and filling activities at the Terminal Expansion would not cause the spread of contaminated sediments.

As mentioned previously, results of the analytical and toxicity testing conducted by Gulf LNG confirmed that sediment from nine of the BCDMMS sample locations can be used for BU. According to Gulf LNG, about 10.4 acres of sediments around station 10 may have elevated contaminant levels of arsenic and cadmium (Fugro, 2007). Because these sediments would meet the permissible concentration requirements for ocean disposal, Gulf LNG proposes to blend these sediments with the other sediments removed from the BCDMMS. Gulf LNG would consult with the MDEQ and the COE prior to construction to determine if the blended sediments would be appropriate for use at the Terminal Expansion site. Any sediment not used would be transported to an approved site for upland disposal.

Project-related spill or leaks of hazardous substances would have the most potential to affect sediment quality at the Terminal Expansion site. Should an unlikely release occur, Gulf LNG would minimize impacts through the use of its *SPCC Plan*. Therefore, due to the lack of contaminated sediments at the supply docks sites, Gulf LNG's ongoing correspondence with the MDEQ regarding the quality of fill that would be placed at the wetland mitigation site, and the unlikelihood of a Project-related release of hazardous materials at the Terminal Expansion, adverse impacts on this primary constituent element are not likely to occur.

Safe and Unobstructed Migratory Pathways

The movements of any subadult or adult Gulf sturgeon through the area would not be prevented by any of the proposed in-water structures or work associated with the Project. The dredged basins of the supply docks would be short enough to prevent the creation of a false inlet which could confuse the sturgeon and result in them accidentally moving upstream into freshwater at the mouth of the Pascagoula River. Subadult and adult Gulf sturgeon overwintering in Choctawatchee Bat were generally found to occupy the sandy shoreline habitat at depths of 2-3 meters (NOAA, 2007). Much of the in-water portion of the Project would be in shallow water (less than 4 feet) that would not likely be used currently for migration or for foraging by adults. While construction of the supply docks could result in some minor alterations to the movement patterns of Gulf sturgeon, the supply dock pilings would not obstruct any major Gulf sturgeon migratory pathways near the Project area. Therefore, the Project would not result in a meaningful alteration of the safe and unobstructed migratory pathways primary constituent element.

Gulf Sturgeon Conclusions

Gulf LNG would minimize impacts associated with dredging and lighting to the extent practicable, and hazardous spills are not likely to occur. Further, Gulf sturgeon in the vicinity of the Project are likely acclimated with industrial conditions and would avoid the area during construction and maintenance dredging. With the exception of the proposed compensatory wetland mitigation site, constructing and operating the Project would not result in adverse impacts on the Gulf sturgeon or its designated critical habitat and these impacts would be minimal given the abundance of similar suitable habitat adjacent to the Project area. Further, given the limited abundance of forage species currently in the Project area, creation of this wetland area could minimally increase the forage species abundance for Gulf sturgeon. Therefore, we have determined that construction and operation of the Project *is not likely to adversely affect* the Gulf sturgeon or its designated critical habitat.

2.4.3.2 Smalltooth Sawfish

The smalltooth sawfish belongs to a group of fish called elasmobranchs that includes rays, skates, and sharks. Although shark-like in appearance, they are actually rays, as their gills and mouths are found on the underside of their bodies. Sawfish get their name from their distinct rostrum—a long, flat snout edged with teeth—that looks like a saw. Smalltooth sawfish live in tropical seas and estuaries (semi-enclosed areas where rivers meet the sea) of the Atlantic Ocean. They are most at home in shallow, coastal waters, and sometimes enter the lower reaches of freshwater river systems. In the United States, they can be found off the coast of Florida. Smalltooth sawfish populations have declined dramatically due to habitat loss associated with coastal development and accidental capture in fisheries (NOAA, 2018). Suitable habitat is not present within the Project area, but juveniles of this species could occur as transients. In addition, Gulf LNG would minimize impacts associated with dredging and lighting to the extent practicable, and hazardous spills are not likely to occur. Therefore, we have determined that construction and operation of the Project *is not likely to adversely affect* the smalltooth sawfish or its designated critical habitat.

2.4.3.3 Sea Turtles

Four species of federally listed threatened and endangered sea turtles (Kemp's ridley, leatherback, green, and loggerhead) possibly occur in the waters near the Terminal Expansion in Jackson County, Mississippi (FERC, 2006). An additional species, the federally endangered hawksbill sea turtle, is not likely to occur near the Terminal Expansion site but could be present along LNG shipping routes (NOAA, 1993).

The federally endangered Kemp's ridley sea turtle is the smallest of the Gulf of Mexico sea turtle species. It occurs mainly in the coastal areas of the Gulf of Mexico and the U.S. Atlantic seaboard. Nesting occurs mainly in Mexico from May to July, but Kemp's ridley sea turtles also nest in small numbers along the Gulf Coast, primarily in southern Texas. Juveniles and sub-adults occupy shallow, coastal regions and are commonly associated with crab-laden, sandy or muddy water bottoms; young turtles often float on mats of *Sargassum* sp. Kemp's ridley sea turtles feed mostly on swimming crabs, but their diet also includes fish, jellyfish, and mollusks. The primary threat to this species is capture and entanglement in fishing gear, such as shrimp trawls, gill nets, and longlines. Egg collection by humans has also historically been a threat to the population (NOAA, 2015a). Nesting areas for the Kemp's ridley sea turtle are not present in or near the Terminal Expansion site; however, they could use the waters of the Mississippi Sound in the immediate vicinity of the Project during foraging.

The federally endangered leatherback sea turtle spends most of its time in the open sea, returning to nesting beaches during the reproductive cycle. They may be present in coastal waters only when nesting or following jellyfish concentrations. They feed mainly on soft-bodied animals, such as jellyfish and salps. Leatherbacks are the most migratory and wide ranging sea turtles. They have designated critical habitat in the U.S. Virgin Islands, the U.S. west coast, and Puerto Rico. The largest nesting assemblages are found on the coasts of northern South America and West Africa (NOAA, 2015b). Suitable nesting habitat for this species is not available in the vicinity of the Project.

The green sea turtle is federally listed as threatened. Green sea turtles inhabit both open ocean zones and coastal areas. Hatchlings are thought to live in deeper, offshore areas for the first several years of their lives where they feed on pelagic plants and animals near the water's surface (NOAA 2015c). Once juveniles reach a certain age and size, they migrate to nearshore foraging grounds, and become almost exclusively herbivorous. Green sea turtles nest on beaches. The two largest nesting populations are in Costa Rica and along the Great Barrier Reef in Australia (NOAA, 2015c). Suitable nesting habitat for this species is not available in the vicinity of the Project (NOAA, 1993).

The loggerhead sea turtle is federally listed as either threatened or endangered, depending on the distinct population segment. The greatest threats to this sea turtle include coastal development, incidental capture by commercial fisheries, illegal intentional harvest, and pollution. Loggerhead sea turtles inhabit continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters. Loggerheads were named for their relatively large heads, which support powerful jaws and enable them to feed on hard-shelled prey, such as whelks and conch. Loggerhead sea turtles nest from April to September in the southeastern United States. The FWS designated about 685 miles of nesting beaches in the Atlantic and Gulf coasts, including in Mississippi, as critical habitat for the loggerhead sea turtle. The nearest critical habitat to the Terminal Expansion is about 8 miles south (NOAA, 2015d). While no suitable nesting habitat occurs in the vicinity of the Terminal Expansion, the loggerhead sea turtle is likely the most common turtle offshore of the Terminal Expansion site.

The hawksbill is a small to medium-sized sea turtle that inhabits the tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. Although it has been recorded in the coastal waters of Mississippi, it is considered rare. Nesting occurs on undisturbed, deep-sand beaches, from high-energy ocean beaches to tiny pocket beaches several meters wide bounded by crevices of cliff walls; most typically beaches used by nesting turtles are low-energy, with woody vegetation near the waterline. In the continental United States, nesting sites are restricted to Florida where nesting is sporadic (NOAA and FWS, 1993).

It is thought that weedlines in the Gulf of Mexico serve as foraging habitat for post-hatchling hawksbills, whereas juvenile and adult hawksbill sea turtles inhabit coral reefs where they feed on sponges (NOAA and FWS, 1993). Hawksbills are also known to inhabit mangrove-fringed bays and estuaries, particularly along the eastern shore of continents where coral reefs are absent. Due to the lack of suitable foraging and nesting habitats, there is a low probability of this species occurring near the onshore Project area.

Potential Sea Turtle Impacts

There is no nesting habitat for sea turtles in the vicinity of the Terminal Expansion. Although foraging and transit habitat for the Kemp's ridley sea is present, the level of industrial activity in the area makes it highly unlikely that the Kemp's ridley sea turtle would use any habitat near the Terminal Expansion. If, however, sea turtles were present, they would be sufficiently mobile to avoid the area during the driving of sheet piles and dredging.

During construction, installation of sheet piles for the supply docks and the initial and maintenance dredging of the supply dock basins would generate noise and increased turbidity. The Port of Pascagoula would also create noise and a temporary increase in turbidity during maintenance dredging of the North Supply Dock. However, the Port of Pascagoula conducts annual maintenance dredging of the nearby Bayou Casotte Navigation Channel and Gulf LNG periodically conducts maintenance dredging at the adjacent marine berth of the existing Terminal. As a result, it is likely that most aquatic species are accustomed to the level of noise generated by dredging and the temporary and minor increases in turbidity. In addition, according to the *Dredging and Disposal Plan*, Gulf LNG would install and maintain turbidity curtains around the dredge area to limit the transport of turbid water beyond the vicinity of the dredging operations. Furthermore, according to the *Dredging and Disposal Plan*, Gulf LNG would install and maintain turbidity curtains around the dredge area to limit the transport of turbid water beyond the vicinity of the dredging operations. We have included in section 4.6.2.1 of the draft EIS a recommendation that Gulf LNG file a

Pile Driving Mitigation Plan that outlines specific mitigation measures, including acoustical in-water monitoring, that would be implemented to limit underwater noise impacts to no more than 183 dB re: 1 μPa. Impacts on aquatic species, including sea turtles, due to noise and occasional increases in turbidity during construction and operation of the Terminal Expansion would be minor due to the size of the supply docks, the short duration of construction, and the current frequency of dredging and other marine activities in the area.

Due to the lack of available habitat and avoidance of the area due to current industrial activities, sea turtles would likely continue to avoid the area near the Terminal Expansion. To minimize dredging impacts, Gulf LNG proposes to use a hydraulic dredge, which is not likely to entrain healthy sea turtles due to the noisy, slow moving nature of these types of dredges (NOAA, 2012b).

Potential impacts associated with Project lighting would be similar to those for the Gulf sturgeon. Like the Gulf sturgeon, sea turtles are likely acclimated to the current ambient light levels due to the industrial nature of Bayou Casotte and would seek nearby suitable habitat. As there is no sea turtle nesting habitat within the Project area, lighting impacts on nesting behavior would not occur.

Sea Turtle Conclusions

Gulf LNG did not observe any suitable sea turtle habitat or individuals during site surveys. In addition, foraging and transit habitats for the sea turtles are limited near the Terminal Expansion site. Construction barges and support vessels delivering equipment and materials to the site could travel through portions of the Gulf of Mexico during transit to the supply docks and could impact sea turtles. However, the barges would typically be very slow moving and easy for sea turtles to avoid. Therefore, based on the limited nesting, foraging, and transit habitat, Gulf LNG's measures to minimize impacts from dredging, lighting, pile driving, spills, and surface water runoff, and Gulf LNG's adherence to the *Strike Avoidance Plan* for construction vessels, we have determined that the Project *is not likely to adversely affect* the loggerhead, Kemp's ridley, green, leatherback, or hawksbill sea turtle species.

2.5 CONCLUSION

Twenty-one species (including 19 federally listed species and two species that have been proposed for listing) were identified as occurring or potentially occurring in the vicinity of the Project. Based on the impact avoidance, minimization, and mitigation measures detailed in this document, these species are not expected to be adversely affected by the construction or operation of the Project, because these species are either transient in nature (i.e., migratory or highly mobile over large territories); are unlikely to adversely respond to temporary and permanent impacts associated with the proposed Project and facilities; or there is a lack of suitable foraging or nesting habitat within the Project area.

In addition, we have determined that with the implementation of the FWS's and NMFS's avoidance and minimization recommendations, Gulf LNG's proposed construction procedures and mitigation measures described in its application, compliance with federal and state permit conditions, and adherence to our recommendations, the Project *is not likely to adversely affect* federally listed species. These construction procedures and mitigation measures include adhering to NMFS's and FWS's specific avoidance and minimization recommendations and complying with environmental conditions as stipulated in federal and state permits. Therefore, we conclude that requesting formal consultation with the FWS and with NMFS for this proposed Project is not required.

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APPENDIX C

ESSENTIAL FISH HABITAT

LIST OF TABLES

LIST OF ACRONYMS

CFR	Code of Federal Regulations
cfs	cubic feet per second
COE	Army Corps of Engineers
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
cy	cubic yards
dB	decibels
EEM	estuarine emergent
EFH	essential fish habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	*Endangered Species Act of 1973*
FERC	Federal Energy Regulatory Commission
FMP	Fishery Management Plan
GLE	Gulf LNG Energy, LLC
GLP	Gulf LNG Pipeline
GMFMC	Gulf of Mexico Fisheries Management Council
Gulf LLC	Gulf LNG Liquefaction, LLC
JCPA	Jackson County Port Authority
LNG	liquefied natural gas
MDEQ	Mississippi Department of Environmental Quality
MSA	*Magnuson-Stevens Fishery Conservation and Management Act of 1976*
msl	mean sea level
NEPA	*National Environmental Policy Act of 1969*
NGA	*Natural Gas Act of 1938*
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
Plan	*Upland Erosion Control, Revegetation, and Maintenance Plan*
Procedures	*Wetland and Waterbody Construction and Mitigation Procedures*
Project	Gulf LNG Liquefaction Project
SPCC Plan	*Spill Prevention, Control and Countermeasure Plan*
SWPPP	*Stormwater Pollution Prevention Plan*
USCG	U.S. Coast Guard
μPa	micropascal

1.0 INTRODUCTION

On June 19, 2015, Gulf Liquefied Natural Gas (LNG) Liquefaction Company, LLC (Gulf LLC)[1], Gulf LNG Energy, LLC (GLE), and Gulf LNG Pipeline, LLC (GLP) filed an application with the Federal Energy Regulatory Commission (Commission or FERC). Pursuant to Section 3 of the *Natural Gas Act of 1938*, as amended (NGA), Gulf LLC and GLE requested authorization to site, construct, and operate liquefaction and export facilities adjacent to and integrated with the existing GLE LNG Import Terminal (existing Terminal) in Jackson County, Mississippi. The proposed action is called the Terminal Expansion herein. The combined Gulf LLC, GLE, and GLP actions and facilities are referred to herein as the Gulf LNG Liquefaction Project (Project), and the applicants are collectively referred to as Gulf LNG. A description of the proposed action is provided in section 2.0 of the Project draft Environmental Impact Statement (EIS).

The *Magnuson-Stevens Fishery Conservation and Management Act of 1976*, as amended (MSA) was passed in order to promote fish conservation and management. The MSA granted the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) legislative authority for fisheries regulation within the United States' exclusive economic zone; a country's exclusive economic zone is a jurisdictional area containing all waters from 3 to 200 miles offshore, depending on specific geographical features. NMFS established eight regional fishery management councils, each responsible for the proper management and harvest of finfish and shellfish resources within their respective geographic regions. These fishery management councils have developed region-specific fisheries management plans (FMP), which outline measures to ensure the proper management and harvest of finfish and shellfish species within federal waters.

Recognizing that many marine fisheries are dependent on nearshore and estuarine environments for at least part of their life cycles, new habitat conservation provisions to the MSA (Public Law 94-265, as amended by the *Sustainable Fisheries Act of 1996* and Public Law 104-297, as amended in 1998) were added, along with other goals, to promote more effective habitat management and protection of marine fisheries. The protection of the marine environments important to marine fisheries, referred to as essential fish habitat (EFH), is required in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 United States Code 1802(10)). Biological, chemical, and physical characteristics of water and substrate are used to define EFH types; these habitat characteristics are then compared to the life cycle requirements for each considered species. A proposed action that would affect one of these defining characteristics (such as water temperature or water depth) would have an impact on EFH. Section 2.0 addresses EFH types in further detail.

Federal agencies that authorize, fund, or undertake activities that may adversely impact EFH must consult with NMFS. Although absolute criteria have not been established for conducting EFH consultations, NMFS recommends for EFH consultations to be consolidated through interagency coordination for other statute requirements such as the *National Environmental Policy Act of 1969*, as amended (NEPA) and the *Endangered Species Act of 1973*, as amended (ESA), in order to reduce duplication and improve efficiency. Generally, the EFH consultation process includes the following steps:

1. **Notification –** The action agency should clearly state the process being used for EFH consultations (e.g., incorporating EFH consultation into the EIS).

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[1] Gulf LNG Liquefaction Company, LLC is a Kinder Morgan operated company.

2. **EFH Assessment** – The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH should include:
   a. a description of the proposed action;
   b. an analysis of the effects (including cumulative effects) of the proposed action on EFH, the managed fish species, and major prey species;
   c. the federal agency's views regarding the effects of the action on EFH; and
   d. proposed mitigation, if applicable.
3. **EFH Conservation Recommendations** – After reviewing the EFH assessment, NMFS provides recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.
4. **Agency Response** – The action agency must respond to NMFS within 30 days of receiving the NMFS' recommendations to conserve EFH. The action agency may notify NMFS that a full response to conservation recommendations will be provided by a specified completion date agreeable to all parties. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact activity on EFH.

1.1 CONSULTATION PROCESS

For the existing Terminal (the LNG Clean Energy Project, docket numbers CP06-12 and CP06-13), the FERC staff prepared an EIS and an EFH assessment to assess the Terminal's construction and operation impacts on EFH and EFH species (FERC, 2006). As a part of those documents, the FERC staff consulted with NMFS about dredging, accidental releases of LNG, the number of LNG carriers, and potential LNG carrier transit routes (NMFS reference number F/SER/46: MT). In a January 22, 2007 letter to the FERC, NMFS concurred with our[2] determination that based on the implementation of conservation measures and the compensatory mitigation plan developed by Gulf LNG, the construction and operation of the Terminal would not have substantial adverse impacts on EFH or EFH species. Many of the potential EFH impacts from the existing Terminal, including LNG carrier transit routes, were addressed in the original 2006 assessment and are incorporated into this document by reference. This updated EFH assessment includes the discussion of ballast water discharge impacts from the LNG carriers, which were not addressed in our 2006 EFH analysis. Only impacts associated with the proposed construction and operation of the Terminal Expansion are discussed in this assessment.

The FERC staff attended conference calls with NMFS, which included input from NMFS regarding the EFH assessment for the Project, on December 10, 2014, June 29, 2015, and September 23, 2015. The FERC staff proposes to incorporate EFH consultations for the Terminal Expansion with the other interagency coordination procedures required under NEPA. We are requesting that NMFS consider the submittal of this draft EIS as our formal request for initiation of EFH consultation.

1.2 ESSENTIAL FISH HABITAT OVERVIEW

Our analysis of the effects, including cumulative effects, of the proposed action and associated mitigation on EFH, managed fish species, and major prey species, and our views regarding the effects of the proposed action on EFH are provided in the following sections.

Based on our review of the Project and in consultation with NMFS, we have concluded that construction and operation of the Project could affect EFH for 16 species, including: brown shrimp

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[2] "We," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

(*Penaeus aztecus*), white shrimp (*Penaeus setiferus*), gray snapper (*Lutjanus synagris*), lane snapper (*Lutjanus griseus*), red drum (*Sciaenops ocellatus*), Spanish mackerel (*Scomberomorus maculatus*), Atlantic sharpnose shark (*Rhizoprionodon terraenovae*), blacknose shark (*Carcharhinus acronotus*), blacktip shark (*Carcharhinus limbatus*), bonnethead shark (*Sphyrna tiburo)*, bull shark (*Carcharhinus leucas*), finetooth shark (*Carcharhinus isodon*), giant hammerhead shark (*Sphyrna mokarran*), scalloped hammerhead shark (*Sphyrna lewini*), spinner shark (*Carcharhinus brevipinna*), and tiger shark (*Galeocerdo cuvieri*) (see table 1) (Gulf of Mexico Fisheries Management Council [GMFMC], 1998; 2004; 2005; NMFS, 2009a).

TABLE 1

Essential Fish Habitat Species Potentially Affected by the Terminal Expansion

Common Name	Scientific Name	Life Stages in Estuarine Habitat
Brown shrimp	*Penaeus aztecus*	Post-larval, early juvenile
White shrimp	*Penaeus setiferus*	Post-larval, early juvenile
Gray snapper	*Lutjanus griseus*	Adult
Lane snapper	*Lutjanus griseus*	Adult
Red drum	*Sciaenops ocellatus*	Larval, post-larval, early juvenile, adult
Spanish mackerel	*Scomberomorus maculatus*	Early juvenile, late juvenile, adult
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*	Neonate, juvenile, adult
Blacknose shark	*Carcharhinus acronotus*	Adult
Blacktip shark	*Carcharhinus limbatus*	Neonate, juvenile, adult
Bonnethead shark	*Sphyrna tiburo*	Neonate, juvenile, adult
Bull shark	*Carcharhinus leucas*	Neonate, juvenile, adult
Finetooth shark	*Carcharhinus isodon*	Neonate, juvenile, adult
Great hammerhead shark	*Sphyrna mokarran*	Neonate, juvenile, adult
Scalloped hammerhead shark	*Sphyrna lewini*	Neonate, juvenile, adult
Spinner shark	*Carcharhinus brevipinna*	Juvenile
Tiger shark	*Galeocerdo cuvieri*	Juvenile

Source: GMFMC,1998; 2004; 2005; NMFS, 2009a

In addition to being designated as EFH for a variety of federally managed species, the Project area may provide nursery, foraging, and refuge habitats that support various recreationally and economically important marine fishery species such as Atlantic croaker, southern flounder, Gulf menhaden, spot, striped mullet, and blue crab. Such estuarine-dependent species serve as prey for other fisheries managed by the GMFMC and highly migratory species managed by NMFS.

2.0 ESSENTIAL FISH HABITAT

All estuarine systems of the Gulf of Mexico are considered essential habitat for fish species managed by the GMFMC (GMFMC, 1998). In 2005, the GMFMC amended seven FMPs in accordance with Subpart J of 50 Code of Federal Regulations (CFR) Part 600. The 2005 EFH Amendment defined EFH as areas of higher species density, based on the NOAA Atlas and functional relationships analysis for the following FMPs: Red Drum, Reef Fish, Coastal Migratory Pelagics, Shrimp, Stone Crab, Spiny Lobster, and Coral. In 2011, federal management of stone crab was removed (76 Federal Register 59064).

EFH is characterized as occurring within three zones: estuarine (inside barrier islands and estuaries), nearshore (60 feet or less in depth), and offshore (greater than 60 feet in depth). The GMFMC defines 12 standard habitat types underlying the estuarine water column, based on a combination of substrate and biogenic structure descriptions, which are present in the Gulf of Mexico. These 12 standard habitat types include: submerged aquatic vegetation (e.g., seagrasses, benthic algae), mangroves, drifting algae, emergent marshes (e.g., tidal wetlands, salt marshes, tidal creeks, rivers/streams), sand/shell bottoms, soft bottoms (e.g., mud, clay bottoms, silt), hard bottoms (e.g., live hard bottoms, low-relief irregular bottoms, high-relief irregular bottoms), oyster reefs, banks/shoals, reefs (e.g., reef halos, patch reefs, deep reefs), shelf edge/slope, and pelagic (GMFMC, 2004).

All impacts associated with the Terminal Expansion are located within the estuarine zone of the Mississippi Sound. The EFH that may be affected by the proposed Terminal Expansion includes estuarine water column, soft bottom sediment (i.e., estuarine benthic habitat), and emergent marsh (i.e., estuarine emergent [EEM] wetlands) (see table 2). Estuarine water column habitat serves as EFH for several species and their prey at various life stages by providing habitat for spawning, breeding, and foraging. Fish communities within the water column are determined by factors such as salinity, temperature, dissolved oxygen, and turbidity. The affected estuarine benthic habitat consists of subtidal unconsolidated, mixed sediments devoid of submerged aquatic vegetation or oyster reefs. This EFH type serves as important nursery and feeding areas for many fish and invertebrates, including bottom-dwelling (demersal) fish that prey upon aquatic species living on and in the sediments. Abutting emergent marsh provides important nursery and feeding areas and a source of protection from predation for many fish and invertebrate species.

TABLE 2 **Essential Fish Habitat Present in Mississippi Sound**		
Habitat Type	**Species**	**Life Stage**
Estuarine Soft Bottom		
	Brown shrimp	Post-larval, early juvenile
	White shrimp	Post-larval, early juvenile
	Gray snapper	Adult
	Lane snapper	Early juvenile, late juvenile
	Red drum	Larval, post-larval, early juvenile, adult
Estuarine Emergent Marsh		
	Brown shrimp	Post-larval, early juvenile
	White shrimp	Post-larval, early juvenile
	Red drum	Larval, post-larval, early juvenile, adult
Estuarine Water Column		
	Spanish mackerel	Early juvenile, late juvenile, adult
Estuarine a/		
	Atlantic sharpnose shark	Neonate, juvenile, adult
	Blacknose shark	Adult
	Blacktip shark	Adult
	Bonnethead shark	Neonate, juvenile, adult
	Bull shark	Neonate, juvenile, adult
	Finetooth shark	Neonate, juvenile, adult
	Great hammerhead shark	Neonate, juvenile, adult
	Scalloped hammerhead shark	Neonate, juvenile, adult
	Spinner shark	Juvenile
	Tiger shark	Juvenile

Sources: GMFMC, 2004; NMFS, 2006

a Information regarding specific estuarine habitats utilized by highly migratory species (sharks) is not provided by the GMFMC; therefore, the habitat type is not further refined.

3.0 FEDERALLY MANAGED SPECIES WITH ESSENTIAL FISH HABITAT IN THE PROJECT AREA

A detailed description of the life history characteristics and habitat preferences of each federally managed species in the Project area is provided below and is based primarily on the research referenced in Gulf LNG's application to the FERC, both Gulf LNG's and our consultation with NMFS, and a review of the applicable FMPs. Unless otherwise noted, the specific sources of information are provided in the citations at the end of each subsection.

3.1 SHRIMP FISHERY OF THE GULF OF MEXICO

Shrimp species within the Gulf of Mexico use a variety of habitats including estuarine and open ocean habitats as they grow from planktonic larvae to spawning adults. Larvae are primarily found in the open ocean. As larvae progress into the post-larval life stage, they begin to move into the benthic estuarine habitats. Adult habitat use varies between species and season but typically ranges from nearshore to offshore (GMFMC, 1981).

3.1.1 Brown Shrimp

Brown shrimp eggs and larvae inhabit offshore marine environments where spawning takes place. The eggs remain on the bottom (demersal) but larvae are present in the water column (planktonic). Brown shrimp begin to migrate to estuarine habitats as post-larvae, migrating on flood tides at night from February through April. The juvenile stage occurs within estuarine habitats, and post-larval and juvenile brown shrimp are common to highly abundant in all Gulf of Mexico estuaries from Apalachicola Bay in Florida to the Mexican border, although they are generally not present between December and February. They are typically associated with shallow vegetated habitats, silty sand, and non-vegetated mud bottom but densities are highest in marsh edge habitat and submerged vegetation. At maturity, the juveniles migrate back to ocean waters. Larval brown shrimp feed on phytoplankton and zooplankton; post-larvae feed on epiphytes (plants growing on other plants), phytoplankton, and detritus; juveniles and adults prey on polychaete worms, amphipods, chironomid larvae, algae, and detritus (GMFMC, 1998).

3.1.2 White Shrimp

White shrimp eggs and larvae inhabit nearshore marine waters. The eggs are demersal and the larvae are planktonic. Post-larvae migrate into estuarine habitats from May through November, with peaks occurring from June through September. After entering the estuaries, post-larval white shrimp become benthic and are generally present year-round in shallow water estuarine habitats on muddy-sandy substrates with high organic detritus content or in estuarine marsh habitats. Densities of post-larval and juvenile white shrimp are usually highest in marsh edge and submerged aquatic vegetation habitats. Juveniles are common to highly abundant in all Gulf of Mexico estuaries from the Suwannee River in Florida to Texas. When they reach maturity, they migrate from estuarine habitats back to marine habitats in late August and September. Larval white shrimp feed on phytoplankton and zooplankton, post-larvae feed on epiphytes, phytoplankton, and detritus, and juveniles and adults prey on polychaetes, amphipods, chironomid larvae, algae, and detritus (GMFMC, 1998).

3.2 REEF FISHERY OF THE GULF OF MEXICO

Throughout all life stages, estuarine-dependent and nearshore reef fish and snapper-grouper species are found inshore of the 100-foot contour in habitats such as attached macroalgae; submerged rooted vascular plants (seagrasses); estuarine emergent vegetated wetlands (salt marshes, brackish marsh); tidal creeks; estuarine scrub/shrub (mangrove fringe); oyster reefs and shell banks; unconsolidated bottom (soft sediments); artificial and coral reefs; and live/hard bottom. Snappers are common in all warm marine waters. Although most are inshore dwellers, some occur in open-water. Some species enter estuaries and mangroves, with the latter functioning as nursery grounds (GMFMC, 2004).

3.2.1 Gray Snapper

Gray snapper are considered to be one of the most abundant inshore snappers. They occur in marine, estuarine, and riverine habitats and are present within areas from about 20 miles offshore to inshore coastal plain freshwater creeks and rivers. Eggs and larvae are planktonic and occur primarily in offshore shelf waters. Post-larvae move into estuarine habitat and are often present over dense beds of submerged aquatic vegetation. Juveniles are present in estuaries, channels, bayous, ponds, submerged aquatic vegetation beds, marshes, mangrove swamps, and freshwater creeks. Adults are demersal and mid-water dwellers and may be present in mangroves, sandy beds of submerged aquatic vegetation, and coral reefs, or over sandy, muddy, or rocky bottoms. Juvenile gray snapper feed on estuarine-dependent prey, such as small shrimp, copepods, amphipods, and larval fish. Adults feed primarily on fish and secondarily on crustaceans (GMFMC, 1998).

3.2.2 Lane Snapper

Lane snapper occur throughout the shelf areas of the Gulf of Mexico from shallow waters to depths of about 400 feet. Lane snapper are demersal fish. Adults occur offshore over sandy bottoms, natural channels, banks, and reef structures. Juveniles off of the Gulf States use shallow, sandy, or muddy bottoms as nurseries. Habitat preferences of larvae and post-larvae are not well known. Lane snapper spawn from March to September throughout their range, with peak spawning occurring in July and August. Both sexes are able to spawn after the first year. Lane snapper are opportunistic predators feeding on a variety of prey such as small bottom fishes as well as shrimp, crabs, and cephalopods (Florida Museum, 2015; GMFMC, 1998).

3.3 RED DRUM FISHERY OF THE GULF OF MEXICO

3.3.1 Red Drum

Red drum occur in a variety of habitats in the Gulf of Mexico, ranging from water depths of about 130 feet offshore to very shallow estuarine waters. Red drum can tolerate salinities ranging from freshwater to highly saline water. They commonly occur in nearly all estuaries of the Gulf of Mexico year-round where they are present over a variety of substrates, including sand, mud, and oyster reefs. Estuarine wetlands are especially important as nursery habitat for larval, juvenile, and sub-adult red drum, and are also important habitat for the prey species of all life stages. Larval and post-larval red drum prey on mysids, amphipods, and shrimp. As they develop into juveniles their diet shifts to primarily crabs and fish. Crustaceans, including shrimp and crab, and fish are the most important prey items in the adult red drum diet (GMFMC, 1998).

3.4 COASTAL MIGRATORY PELAGIC SPECIES OF THE GULF OF MEXICO

Generally, the coastal migratory pelagic species are commonly distributed throughout the Gulf of Mexico from estuaries to marine waters. The distribution of these species is dictated by water temperature and salinity. The coastal migratory pelagic species infrequently occur in water less than 20 degrees Celsius and generally prefer high salinities. However, Spanish mackerels tolerate brackish waters and may often inhabit estuaries as nursery habitat (GMFMC, 1998).

3.4.1 Spanish Mackerel

The Spanish mackerel is a coastal migratory pelagic species that occurs over depths to 246 feet in the coastal zone of the Gulf of Mexico. Adults of this species are usually present in coastal waters out to the edge of the continental shelf. Adults inhabit higher salinity estuarine areas during seasonal migration, but are considered rare and infrequent in some Gulf of Mexico estuaries. Spawning grounds are offshore where spawning takes place from May to October. Nursery areas have been reported in estuaries and coastal waters year-round. Larvae most frequently occur offshore over the inner continental shelf in water depths from 30 to about 275 feet, but are most common in depths of less than 165 feet. Juveniles are present offshore, in beach surf, and also in estuaries, sounds, and marshes. However, they are generally not considered estuarine dependent. Most juveniles occur in waters ranging in depth from about 30 to 60 feet. Though occurring in waters of varying salinity, the juveniles appear to prefer marine salinity (GMFMC, 1998).

3.5 ATLANTIC HIGHLY MIGRATORY SPECIES IN THE GULF OF MEXICO

Highly migratory species may utilize a variety of coastal and ocean habitats. Sharks are the only highly migratory species pertinent to the Project. Shark habitat can be described in four broad categories: coastal, pelagic, coastal-pelagic, and deep-dwelling. Coastal species inhabit estuaries, nearshore areas, the continental shelf, and the continental slope. Atlantic sharpnose, blacknose, blacktip, bonnethead, bull, finetooth, great and scalloped hammerheads, spinner, and tiger sharks are all considered coastal species. Adult sharks are broadly distributed as adults, but often utilize estuaries as pupping and nursery areas during pupping season and through their neonate and young-of-year life stages (NMFS, 2009a; 1999).

3.5.1 Atlantic Sharpnose Shark

EFH for the adult stage of the Atlantic sharpnose shark is identified as waters less than 164 feet in depth from Mississippi Sound to Galveston and Laguna Madre, Texas (NMFS, 1999; 2002). The Atlantic sharpnose shark is a small coastal species that is a common year-round resident in the Gulf of Mexico. They are highly abundant in depths of less than 30 feet from spring through the fall. Juvenile and adult sharpnose sharks migrate to coastal waters beginning in April, with neonate sharks following in June. All life stages of the sharpnose shark generally remain inshore throughout the summer before emigrating offshore in the fall. Sharpnose sharks prey on a mix of rayed-fishes and invertebrates as juveniles and primarily rayed-fishes as adults (Carlson and Brusher, 1999; Carlson 2002; Bethea et al., 2006; Drymon et al., 2010, 2011).

3.5.2 Blacknose Shark

The EFH for blacknose shark is identified as shallow coastal waters, bays and estuaries (NMFS, 2009a). The blacknose shark is an inshore species that occurs primarily over sandy and coral bottoms in coastal tropical and warm temperate waters. Juveniles typically occur in shallow waters and adults in deeper waters, to depths of about 30 feet. Blacknose sharks are thought to breed annually in late spring to early summer in the Gulf of Mexico. Their prey consists of small bony fishes such as pinfish, croakers, and anchovies, as well as octopuses (Florida Museum, 2015).

3.5.3 Blacktip Shark

The EFH for blacktip shark is identified as waters shallower than 82 feet from the Florida Keys to Cedar Key, Florida and Cape San Blas, Florida to the Mississippi River delta, and from Galveston, Texas to Mexico (NMFS, 1999; 2002). Blacktip sharks are present in shallow coastal waters and in the offshore surface waters of continental shelves. Young-of-year and juvenile blacktip sharks have been captured in large numbers throughout Mississippi Sound and in Mobile Bay at depths less than 30 feet and salinities between 18 and 20 parts per thousand (Benson, 1982; NMFS, 1999; Parsons and Hoffmayer, 2007). Pupping occurs in the estuarine waters of shallow bay systems of the Gulf of Mexico throughout the spring and summer. Neonate blacktip sharks use estuarine waters as nurseries throughout the summer and fall and then migrate to deeper waters along with juveniles and adults as water temperatures decrease in the fall (NMFS, 2009a). Blacktip sharks primarily feed on fishes as well as rays, squid, shrimp and crabs (Florida Museum, 2015).

3.5.4 Bonnethead Shark

The EFH for bonnethead shark is identified as shallow coastal waters, inlets, and estuaries in the Gulf of Mexico (NMFS, 2009a). The bonnethead shark is a small hammerhead shark found in coastal waters at depths less than 82 feet between Mobile Bay, Alabama and San Padre Island, Texas. It may occur near inlets and estuaries, and often over sandy or muddy bottoms (Castro, 1983; NMFS, 1999; 2002).

Bonnethead sharks feed primarily on benthic crustaceans and molluscs, often within seagrass beds (NMFS, 2009b; Bethea et al., 2007).

3.5.5 Bull Shark

The EFH for bull shark is identified as shallow coastal waters, inlets, and estuaries in waters less than about 75 feet deep (NMFS, 2009a). The bull shark is managed under the Large Coastal Shark Management Unit through the Final Atlantic Consolidated FMP for Highly Migratory Species (NMFS, 2006). Bull sharks are a circumglobal species and in the Atlantic are distributed from Massachusetts to Florida, including the Gulf of Mexico. This shallow water species is common in both tropical and subtropical regions and in marine, estuarine, and freshwater habitats and can journey long distances up large rivers (NMFS, 1999). The bull shark typically occupies shallow coastal waters less than 90 feet deep and is generally demersal (Compagno, 1984). Bull shark nurseries have been recorded in low salinity estuaries extending from North Carolina to the Gulf of Mexico (McCandless et al., 2002). Mating occurs in late spring or early summer (June or July), with birth to live young occurring in estuaries and river mouths the following year, from April to June (Compagno, 1984; Castro, 1983). Bull sharks are opportunistic feeders that prey on a wide variety of bony fishes, shark species, and invertebrates. Additionally, stomach contents have revealed that this species also consumes sea turtles, sea birds, and marine mammals (Compagno, 1984).

3.5.6 Finetooth Shark

The EFH for finetooth shark is identified as shallow coastal areas such as bays and estuaries, out to depths of about 75 feet (NMFS, 2009a). They are managed under the Small Coastal Shark Management Unit through the Final Consolidated Atlantic Highly Migratory Species FMP (NMFS, 2006). In the Atlantic, the finetooth shark is distributed from North Carolina to Cuba and southern Brazil, including the Gulf of Mexico (Compagno, 1984). Little is known about habitat associations of this species. Finetooth sharks form large schools and are located in waters close to shore to depths of 10 meters (Compagno, 1984). Finetooth shark estuarine nursery areas have been documented from South Carolina to the Gulf of Mexico (Castro, 1993; McCandless et al., 2002). Finetooth sharks give birth to live young from May to June. This species feeds on bony fishes, crustaceans, and cephalopods (Compagno, 1984; Florida Museum, 2015).

3.5.7 Great Hammerhead Shark

EFH for the great hammerhead shark is identified as scattered coastal areas in the Gulf of Mexico from Alabama to Texas. Great hammerhead sharks are large, coastal, and semi-oceanic species that occur in coastal warm temperate and tropical waters, including the Gulf of Mexico. They may be found in shallow coastal areas such as over continental shelves and in lagoons but migrate seasonally to cooler waters during summer months. They give birth to live young during the spring and summer months. Great hammerheads have a varied diet, preying on bony fishes such as groupers, jacks, and flatfishes, other sharks, and invertebrates such as crabs, squid, and octopuses (NMFS, 2009a; Florida Museum, 2015).

3.5.8 Scalloped Hammerhead Shark

EFH for the scalloped hammerhead shark is identified as occurring off of Mississippi and Alabama from the shoreline to a depth of about 164 feet (NMFS, 1999; 2002). Scalloped hammerhead sharks are reported to enter enclosed bays and estuaries and are dependent upon coastal nursery habitats, where females give birth to live young during summers and neonates and juveniles may reside for extended periods (NMFS, 1999; 2002; Parsons and Hoffmayer, 2007; Duncan and Holland, 2006). Scalloped hammerhead sharks feed primarily on fish, including herring, mackerel, and anchovies, as well as invertebrates such as shrimp, crab, and squid (Florida Museum, 2015).

3.5.9 Spinner Shark

EFH for the spinner shark is identified as shallow coastal waters to a depth of about 600 feet. The spinner shark is a coastal-pelagic, warm-temperature and tropical species found inshore and over the continental shelf to depths upwards of 300 feet. They are considered highly migratory, moving inshore during the spring and summer to reproduce and feed. Spinner sharks bear live young at inshore locations. After birth, the pups move to shallow estuarine waters to gain protection from predators and find readily available prey. Spinner sharks feed primarily on pelagic bony fish, including herring, anchovies, mullet, bluefish, and tunas, as well as squid and octopuses (Compagno, 1984; Florida Museum, 2015).

3.5.10 Tiger Shark

EFH for the juvenile stage of the tiger shark is identified as waters shallower than 328 feet from Mississippi Sound to the Florida Keys (NMFS, 1999; 2002). Tiger sharks inhabit warm waters in deep oceanic and shallow coastal areas and the young are born in late May and early June in shallow coastal bay systems in the Gulf of Mexico (Florida Museum, 2015). Juvenile tiger sharks are considered to be nocturnal feeders, foraging for bony fishes and squid among benthic substrates (Lowe et al., 1996).

4.0 POTENTIAL EFFECTS ON ESSENTIAL FISH HABITAT

Gulf LNG would conduct the majority of the construction activities for the Terminal Expansion on land as discussed in section 2.3 of the draft EIS. With implementation of *Gulf LNG's Plan* and *Gulf LNG Procedures*[3] and Gulf LNG's updated *Spill Prevention, Control and Countermeasure Plan* (*SPCC Plan*), we conclude the potential for land-based activities to affect EFH or EFH species would be negligible; therefore, this EFH assessment primarily focuses on activities associated with the construction and operation of the North and South Supply Docks, filling of tidal marsh, dredging the wetland mitigation site barge access channel, and burying of soft bottom sediment for establishment of the compensatory wetland mitigation site. Section 4.6.2.1 of the draft EIS discusses the impacts associated with these activities.

During construction of the supply docks, Gulf LNG would install all sheet piling and bulkhead backfill from shore. Barges would be moored to the supply docks using lines or wires secured to bollards built into the supply dock structures; therefore, no mooring dolphins or other types of piling would be installed at the site. After installation of the piles, Gulf LNG would dredge the basins adjacent to the supply docks to a depth of 12 feet below mean sea level (msl). Dredging would remove about 100,000 cubic yards (cy) of sediment from 9.1 acres at the North Supply Dock and about 100,000 cy of sediment from 6.4 acres at the South Supply Dock. Gulf LNG would also permanently impact about 27.8 acres of EEM wetlands to accommodate construction staging areas, including heavy haul roads adjacent to the North and South Supply Docks, a new control and administrative building near the North Supply Dock, new Terminal Expansion facilities near the South Supply Dock, and the establishment of the flare exclusion zone.

Upon completion of construction of the Terminal Expansion, Gulf LNG would completely remove the South Supply Dock and restore the adjacent shoreline to pre-construction conditions. Gulf LNG would transfer ownership of the North Supply Dock to the Jackson County Port Authority (JCPA); the dock would remain part of the Project and used occasionally for delivery of materials, supplies, and equipment during operation. Gulf LNG estimates, based on similar sediment deposition rates for the existing LNG carrier berth, that about 10,000 cy of sediment would accumulate in each basin annually. Gulf LNG would conduct maintenance dredging of the supply docks on an as-needed basis, which is anticipated to be about every 3

[3] Gulf LNG would implement the measures and procedures identified in the 2013 FERC *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures).

years. Upon completion of construction, Gulf LNG would discontinue maintenance dredging at the South Supply Dock and allow the area to return to its natural bathymetric state. The JCPA, which conducts maintenance dredging at the existing marine berth, would assume responsibility for maintenance dredging of the North Supply Dock.[4]

As mitigation for the permanent impacts on wetlands at the Terminal Expansion, Gulf LNG would build a 50-acre coastal marsh site adjacent to the existing U.S. Army Corps of Engineers (COE)-created wetland mitigation site located along the southern edge of the Terminal Expansion property. An about 50-acre area would be enclosed, armored with riprap, filled with sediments from the COE Tombigbee Project (323,000 cy), and planted with native EEM wetland vegetation, primarily smooth cordgrass and black needlerush. The resulting site would consist of an intertidal vegetation complex of high and low marsh vegetation and tidal channels open to the Mississippi Sound through passive tidal inlets in the site's perimeter berm.

In order to construct the wetland mitigation site, Gulf LNG would dredge a channel beginning at the South Supply Dock and extending around the perimeter of the proposed wetland mitigation site to an approximate depth of 8 to 10 feet below msl. Sediment dredged from the barge access channel would total about 200,000 cy and would take about 100 days to complete. The dredged access channel would comprise the footprint of the perimeter berm. Barges would use the dredged channel to access the wetland mitigation site to deliver rock for the containment berm proposed for its perimeter. Gulf LNG would store the dredged sediment from the channel in the proposed mitigation site and then replace it in the dredged channel as the perimeter berm was constructed (i.e., the channel would be filled and rock would be placed over the just-filled portion of the channel).

Construction and operation of the Project have the potential to cause alteration and degradation of EFH. Potential effects on EFH would primarily consist of increased turbidity, decreased water quality, and increased sediment disturbance, suspension, and deposition (in the form of fill) in the area. The primary actions that may cause this include dredging, pile driving, and the filling of emergent marsh (GMFMC, 1998). Other Project-related activities with the potential to affect EFH include exacerbation of shoreline erosion due to construction vessel wakes and increased noise from vessels; increased lighting at the work dock area; discharge of hydrostatic test water into the waters adjacent to the existing marine berth; accidental release of petroleum products during construction; runoff from the Terminal Expansion site; and discharge of ballast water by LNG carriers during operation of the Terminal Expansion (GMFMC, 1998). The potential effects of all of these activities on EFH or EFH species are discussed below.

4.1 DREDGING

Gulf LNG would use either a hydraulic or clamshell dredge to remove sediment from the supply dock basins and wetland mitigation site barge access channel. Dredging would temporarily increase suspended sediment and turbidity in the water column, which would result in a temporary lowering of the water quality within a localized area surrounding dredging activities. Increases in turbidity can adversely affect fish physiology and behavior, resulting in less healthy individuals, reductions in fertility, and reduced foraging. However, turbidity levels are not expected to rise substantially above ambient conditions or exceed Mississippi Department of Environmental Quality (MDEQ) limits relative to ambient conditions. The COE (2014) reported that turbidity levels associated with dredging conducted during the construction of the berthing slip for the existing Terminal and other historical dredging operations in Mississippi Sound did not exceed MDEQ limits. Further, the COE (2014) reported that the effects of temporarily increased levels of suspended sediments due to dredging would be comparable to the common passage of a storm front with high winds and heavy wave action. The COE (2014) also reported that increased turbidity is typically confined to the time during dredging and about 2 to 3 hours after dredging ceases; after that time

[4] See Attachment No. 8 of accession number 20170929-5228.

period, suspended solids settle to background levels and the water column habitat is would be expected to revert to normal conditions. Gulf LNG filed a draft *Dredging and Disposal Plan* with the Commission on August 29, 2018[5] in which Gulf LNG states it would install and maintain turbidity curtains around the area being excavated to limit the transport of turbid water beyond the vicinity of the dredging operations. Additionally, the *Dredging and Disposal Plan* notes that Gulf LNG would monitor dredging-induced turbidity in accordance with any COE Section 401 permit requirements and report any turbidity levels that exceed limits provided in the permit. Therefore, we conclude the increase in turbidity due to dredging of the supply docks would be minor, temporary, and localized to the area immediately surrounding the supply docks and the wetland mitigation site barge access channel.

One or more life stages of any of the 16 managed EFH species may be present during the period of active dredging. However, a most of these species are mobile enough to avoid the dredging activities, dredging would be of limited duration (less than 6 months), and Gulf LNG would consult with NMFS to determine the most appropriate times of year for dredging at the supply docks to minimize impacts on EFH. Based on those measures and the ambient conditions of marine waters in the area to be dredged, we conclude that the impacts of dredging on EFH or EFH species in the water column would be temporary and minor.

Dredging of the supply dock basins and the wetland mitigation site barge access channel may also affect EFH or EFH species through removal of the upper portion of estuarine benthic habitat. After completion of dredging, the direct mortality of the benthic community in the dredged area would result in reduced species richness, species abundance, and biomass in the area. This would reduce the amount of prey available for EFH species within the area of the supply docks and the wetland mitigation site barge access channel. However, polychaetes, oligochaetes, and other similar species would rapidly recolonize the disturbed areas after completion of dredging, as these species take advantage of unoccupied space in newly exposed sediments through natural processes and rapid population growth (MMS, 2004). We anticipate that, based on published data, both the initial dredging and the maintenance dredging for the supply docks and the one time dredging for the wetland mitigation site barge access channel would result in temporary to short-term impacts on the benthic community and that the EFH species could forage in other nearby EFH areas and return to the supply dock areas after repopulation of the prey base. As a result, the impacts on EFH species would be minor, localized, and temporary.

Dredging would also result in an increase in underwater noise. Depending on the type of dredge chosen by Gulf LNG, sound frequency and intensity associated with this activity could cause a change in aquatic species behavior in proximity to each supply dock or could cause species to avoid the area. Underwater noise levels are commonly referred to as a ratio of the underwater sound pressure to a common reference (i.e., decibels [dB] re: 1 micropascal [μPa]). There are insufficient peer-reviewed reliable data available for determining the noise level that would trigger the onset of behavior disturbance in fish; however, as a conservative measure, NMFS generally uses 150 dB re: μPa at 10 meters as the threshold for behavior effects on fish species of particular concern, citing that noise levels in excess of 150 dB re: 1 μPa at 10 meters can cause temporary behavior changes (startle and stress) that could decrease a fish's ability to avoid predators. The current interim thresholds protective of injury to fish are 206 dB re: 1 μPa (peak) and 187 dB re: 1 μPa (cumulative) sound exposure levels for fish 2 grams or greater, and 183 dB re: 1 μPa (cumulative) sound exposure level for fish of less than 2 grams.

Peak noise levels underwater using a hydraulic dredge would be expected to be between 171 and 186 dB re: 1 μPa at 1 meter and would attenuate rapidly with distance (CEDA, 2011). Although noise levels would be above the threshold for changes in fish behavior, these levels would not exceed the threshold for injury or mortality in species. EFH species behavior may be affected, but these species would likely move out of the area temporarily during construction and return once underwater noise-generating

[5] See Attachment No. 3 of accession number 20180829-5060.

activities cease. Underwater noise levels associated with a clamshell dredge would be much lower. The COE notes noise associated with clamshell dredging operations is likely significantly less than 120 re: 1 μPa (COE, 2015). In addition, aquatic resources within the Project area are likely accustomed to regular fluctuations in noise from nearby industrial activity and maintenance dredging. Under these considerations, we conclude that adverse impacts on EFH species due to dredging noise would be minor, localized, and temporary.

4.2 PILE DRIVING

Pile driving to install sheet piles at the North and South Supply Docks would cause rapid concussive noise and generate underwater sound pressure waves that could adversely affect nearby EFH species and prey. An impact hammer would be used to install the sheet pile. Recent studies suggest an impact hammer would be expected to produce a peak sound pressure level of about 205 dB re: μPa at 10 meters and cumulative sound exposure levels of 178 dB re: μPa at 10 meters (ICF Jones et al., 2009). Noise at these levels would be expected to startle, stress, and potentially cause injury to aquatic organisms in the vicinity. Gulf LNG would follow NMFS-recommended BMPs to reduce pile driving-related noise impacts on aquatic organisms, including the following:

- employ a soft-start technique, wherein pile driving begins with low-impact hammering to produce noise levels above 150 dB re: 1 μPa but below the injury thresholds to drive mobile aquatic organisms away from the area; and
- conduct in-water acoustic noise monitoring to determine the noise impact zone where sound pressure levels would result in injury to aquatic resources.

These practices would reduce the likelihood aquatic species would be exposed to injury-causing sound levels (Savery and Associates, 2010). Upon completion of the sound-causing activities, individuals would no longer avoid the area and would likely return.

In section 4.6.2.1 of the draft EIS, we are recommending Gulf LNG file a *Pile Driving Mitigation Plan* that outlines specific mitigation measures, including acoustical in-water monitoring, that would be implemented to limit underwater noise impacts to no more than 183 dB re: 1 μPa. Therefore, we conclude that adverse impacts on EFH species due to pile driving would be temporary, localized, and minor.

4.3 FILL OF EMERGENT MARSH

The Terminal Expansion would permanently impact intertidal vegetated habitat through the fill of about 24.7 acres of EEM wetlands and the inclusion of 3.1 acres of EEM wetlands within the flare exclusion zone. EFH species may be present in the vegetation and tidal channels of the wetlands, some of which may also serve as prey for other EFH species. Tidal wetlands also provide foraging and nursery habitat for ecologically and economically important fisheries species such as the blue crab and Gulf menhaden. We do not anticipate substantial adverse impacts on the EFH species at the population level given the presence of unaffected tidal wetlands in the vicinity of the Terminal Expansion, including between the existing marine berth and the North Supply Dock and as part of the Grand Bay National Estuarine Research Reserve immediately to the east. In addition, completion of the compensatory wetland mitigation site adjacent to the Terminal Expansion site would offset the loss of wetland function caused by the filling of the tidal marsh. As a result, we anticipate that impacts on intertidal vegetative EFH would be short- to long-term and minor.

Construction of the wetland mitigation site would result in the permanent loss of about 50 acres of soft bottom sediment EFH. It is likely benthic fauna such as polychaetes and oligochaetes would be buried during construction, resulting in a loss of prey available for EFH species in the vicinity of the mitigation site. However, we do not anticipate substantial adverse impacts on the EFH species at the population level given the abundance of soft bottom habitat east and west of the mitigation site. In addition to prey species, one or more life stages of any of the 16 managed EFH species may be present during the period of construction when the habitat would be filled. However most of these species are mobile enough to avoid the construction activities. As a result, we do not anticipate substantial adverse impacts on EFH species. Additionally, the mitigation site itself is intended in part to compensate for any impacts on EFH and EFH species that may result as part of its creation.

4.4 VESSEL TRAFFIC

The increase in barge and barge-support vessel traffic at and near the supply docks during construction would result in a short-term increase in vessel traffic and noise in the area. During operation, barges and their support vessels would only deliver supplies when necessary or to facilitate maintenance dredging at the supply docks. Barge movements and the movements of support vessels and other supply vessels are not expected to substantially increase shoreline erosion, benthic sediment disturbance, or prop scarring in the immediate area, primarily because the vessels are slow moving and do not create substantial wakes. Some benthic sediment disturbance could occur when the barges are offloading at the supply docks; however, the major increase in barge traffic would be short-term. Underwater noise generated by large vessels calling on the supply docks is estimated to be between 180 and 190 dB re: 1 µPa at 1 meter and would attenuate rapidly with distance (CEDA, 2011). Noise would be greatest during vessel transport to the supply docks. However, noise would attenuate at a faster rate during vessel movement, and aquatic species would be subjected to the noise for only a short period of time as the vessels pass. Vessels moored at the docks would produce noise during engine start-up and if idling. Idling noise would be lower as the propeller would not be in use. Noise levels of vessels calling on the supply docks would be similar to the noise currently generated by vessels transiting Bayou Casotte. Based on these considerations, we conclude there would be no substantial adverse impacts of increased noise on EFH and EFH species, given that barge and support vessel traffic would be consistent with current vessel traffic noise occurring in proximity to the Terminal Expansion.

4.5 INCREASED LIGHTING

During construction and operation of the supply docks, lighting would be installed to illuminate work areas and for the safety of workers. Gulf LNG would direct lighting at the supply docks on the construction activity being conducted and the general safety lighting would consist of downlighting to minimize impacts on aquatic species. Artificial lighting over coastal waters has been shown to attract both juvenile fishes and larger predators (Keenan et al., 2007; Becker et al., 2013). Illumination of waters adjacent to the supply docks may be detrimental to juvenile fishes that may otherwise be able to avoid predation under natural circumstances. However, aquatic species in the area are likely acclimated to the current ambient light from the existing Terminal, including lighting on the existing marine berth, and the industrial nature of Bayou Casotte. Therefore, adverse impacts on EFH species due to nighttime lighting would not be substantial. Although certain EFH species could be drawn to light that shines on waters outside the work areas and may be subject to increased predation, we conclude that there would not be substantial adverse impacts at the population level.

4.6 STORMWATER RUNOFF

Hydrostatic testing of the Terminal Expansion facilities would use water withdrawn from the Port of Pascagoula's Industrial Water Supply and not directly from Bayou Casotte; therefore, no impacts on EFH would result from water intake for this purpose. Discharge of the freshwater hydrostatic test water could cause minor localized turbidity and changes in salinity and temperature at the end of the outfall pipe. Gulf LNG would not add any chemicals or biocides to the test water and would conduct discharges in accordance with its National Pollutant Discharge Elimination System (NPDES) permit (MSG13). As a result, we do not anticipate that there would be any substantial adverse impacts on EFH or EFH species due to these discharges. Section 4.3.2 of the draft EIS provides additional information on hydrostatic testing for the proposed Terminal Expansion.

Gulf LNG would implement the revised *SPCC Plan* and its *Gulf LNG Plan* and *Gulf LNG Procedures* to minimize the potential for petroleum or hazardous materials spills from land equipment or vessels berthed at the supply docks during construction and operation and to avoid or minimize impacts if a spill were to occur. Implementation of these procedures would minimize response time and ensure appropriate cleanup actions are taken in the event of a spill. Therefore, we conclude there would not likely be a substantial adverse impact on EFH or EFH species as a result.

During operation, the conversion of land to impervious surface areas at the Terminal Expansion site would result in an increased volume of stormwater runoff. Stormwater runoff from the Terminal Expansion would be discharged through the existing stormwater outfall and two new outfalls that would be installed in the vicinity of the existing outfall. The stormwater would be discharged into Bayou Casotte. Stormwater runoff from areas with a likelihood of oil contamination would be curbed or diked and the runoff treated through an oil-water separator prior to discharge. As required by the existing NPDES permit, stormwater would be observed and tested prior to discharge. If there is no visible oil sheen, floating solids, or foam other than trace amounts, and if the pH is between 6.0 and 9.0, the stormwater would be discharged into Bayou Casotte through the stormwater outfall structure.

Discharge volumes would be similar to but greater than discharge volumes from the existing Terminal. The discharges could create temporary and localized changes in salinity and/or temperature, in the area of the outfalls; however, these changes would be similar to those from the discharges from the existing Terminal, and it is likely that the EFH species and prey in the vicinity of the Project are acclimated to such conditions. Operations would not produce contaminants such as nutrients or other oxygen demanding elements that would contribute to decreased dissolved oxygen. As a result, we conclude that there would be no substantial adverse impact on EFH or EFH species as a result of the discharge of stormwater runoff.

4.7 BALLAST WATER DISCHARGE

During operation of the Terminal Expansion, LNG carriers would discharge ballast water at the existing marine berth while taking on LNG. Discharge volumes would range between about 9.7 million gallons and 23.0 million gallons, depending on the size of the vessel. Impacts on water quality, such as changes in salinity, temperature, or dissolved oxygen, resulting from the discharged ballast water would be localized and temporary (FERC, 2015). Likewise, the effects of the localized changes in water quality on EFH species and prey would also be minimal. The ballast water discharges would typically occur over a non-continuous period of about 30 hours at a rate of about 29 cubic feet per second (cfs). The discharged ballast water would be expected to mix with the surrounding water column relatively quickly given the proximity of the marine berth to the mouth of the Pascagoula River, which has an average outflow of about 14,746 cfs, and its exposure to outflow from Bayou Casotte and wind and tidal driven currents of the Mississippi Sound (COE, 2014). Furthermore, estuarine species common to coastal Mississippi are generally tolerant of fluctuating environmental conditions (Elliott and Quintino, 2007). Therefore, we conclude that there would be no substantial adverse impacts on EFH or EFH species as a result of the ballast water discharge.

Ballast water is regarded as a major source for introducing invasive species to coastal areas (Bailey, 2015). Consequently, LNG captains must comply with the ballast water management and discharge requirements of both the U.S. Coast Guard (USCG) (33 CFR 151.2030) and the U.S. Environmental Protection Agency (EPA, 2013). All LNG carriers would use a USCG-approved Ballast Water

Management System, which may include ballast water exchange in the open ocean or biocides treatment to destroy aquatic organisms in the ballast water. These regulations offer several options for ballast water management and are intended to limit the concentrations of organisms in ballast water discharges. The EPA regulates effluent discharge and requires actions such as training, management plans and practices, treatment measures, and monitoring, testing, and reporting requirements. All LNG carriers calling on the Terminal Expansion would be required to obtain a Vessel General Permit from the EPA, which, in part, regulates ballast water discharges under the authority of the NPDES permitting program. Therefore, we conclude that there would be no substantial adverse impacts on EFH or EFH species due to the introduction of exotic species resulting from the discharge of ballast water. Further, if biocides were included as part of a ballast water management technique, the concentration of residual biocides in the ballast water discharge would be required by the Vessel General Permit to meet or exceed regulatory limits for environmental compliance; therefore we conclude there would be no substantial adverse impacts on EFH or EFH species due to residual biocides in ballast water discharges.

Scouring of the benthic surface is another potential impact of ballast water discharge. Ballast water would be discharged by pumps regulated to maintain proper equilibrium with the volume of LNG being loaded onto the LNG carrier and would not be rapidly discharged. In addition, ballast water would be discharged horizontally, either through fittings located near the bottom of each side of the hull of the LNG carrier or through valves located above the waterline. In either instance, based on conservative calculations following Ervine and Flavey (1987), the force of the discharged water would be expected to dissipate prior to reaching the benthic surface at 42 feet below msl. Therefore, we conclude there would be no substantial adverse impacts on EFH.

LNG carriers would also withdraw water at the marine berth periodically to cool their boilers. Depending on the engine type, LNG carriers would take in between 15 and 42 million gallons of water for engine cooling while at the berth. The withdrawn water would be subsequently discharged back into Bayou Casotte. The potential impacts of a localized increase in water temperature due to the discharging of cooling water and entrainment of aquatic resources (e.g., the larvae of blue crab, white, brown, and pink shrimp, and assorted fish species) were assessed in the EIS for the existing Terminal (FERC, 2006) and are therefore not addressed herein.

4.8 CUMULATIVE IMPACTS

Cumulative impacts may result when the environmental effects associated with a proposed project are added to impacts associated with past, present, or reasonably foreseeable future projects within the area affected by the Project. Although individual impacts of the separate projects might be minor, the additive effects from all the projects could be significant. Additional discussion of cumulative impacts is provided in section 4.13 of the draft EIS.

Cumulative effects on EFH could occur due primarily to dredging or pile driving for several planned and currently in progress projects including: maintenance dredging conducted every 4 to 5 years at the Signal International, LLC East Bank Yard in Bayou Casotte; periodic dredging of the Pascagoula Harbor Navigation Channel; widening and dredging of the Pascagoula Navigation channel from Horn Island Pass to the entrance of Bayou Casotte Harbor for the Bayou Casotte Channel Improvement Project; maintenance dredging of the Bayou Casotte Ship Basin; and maintenance dredging of the North Supply Dock during operation of the Project.

The amount of material that would be dredged for these projects range from about 20,000 cy for the Signal International LLC East Bank to 3.4 million cy for the Bayou Casotte Harbor Channel Improvement Project, the largest dredging project within the cumulative impact area. While most of the planned dredging activities are currently in the planning stages, if those dredging activities occur at the same time, a cumulative impact on the water quality of Bayou Casotte may occur.

Prior to commencing dredging activities, Gulf LNG and the proponents of the other projects would be required to obtain authorization under Section 10/404 of the *Clean Water Act* (CWA) from the COE and corresponding Section 401 Water Quality Certification from the state. These authorizations would be contingent on the companies' use of best management practices to minimize effects on water quality and to ensure that state water quality standards are not violated. Additionally, the permits would require that the dredge material be tested before being disposed of in an approved offshore or onshore location. These measures would help to minimize any potential cumulative impacts on water quality as a result of foreseeable dredging activities in Bayou Casotte. Because water quality would return to pre-dredging conditions after dredging is completed, we conclude the resulting cumulative impact on EFH would not be substantial.

The impacts on EFH species of increases in turbidity due to dredging for the Terminal Expansion and the above projects would be temporary and localized to the dredged area and areas directly adjacent and a relatively short distance downstream. As a result, EFH species would experience localized effects. If dredging for the Project takes place at the same time as the Bayou Casotte Improvement Project, maintenance dredging of the Bayou Casotte Ship Basin, or the dredging activities at Signal International, LLC, the geographic extent of the temporary impacts would increase beyond the area affected by dredging for the supply docks. The impact area would be smaller if the dredging projects were not concurrent, but the total duration of impacts within the cumulative impact area would increase. In either case, we conclude that impacts in the cumulative impact area would not be substantial because these impacts would be temporary and localized and turbidity would return to pre-dredging levels after dredging is completed.

5.0 ESSENTIAL FISH HABITAT MITIGATION

Permanent impacts on EFH would occur due to the fill of emergent marsh and covering of shallow estuarine soft bottom habitat. In response, Gulf LNG has proposed in-kind compensatory mitigation for impacts on the emergent marsh EFH in the form of a 50-acre tidal marsh wetland at a site located directly offshore of the southern border of the proposed Terminal Expansion site.

Temporary impacts on shallow estuarine soft bottom EFH would result from dredging, pile driving, and other actions associated with construction and operation of the Project. For the dredging operations, Gulf LNG has analyzed EFH species seasonal abundance data from NOAA ELMR (2000) and other sources to determine whether scheduling construction during seasons of low abundance as a means to minimize potential EFH impacts would be feasible. These records indicate that eggs, larvae, and/or juveniles of at least one species are present during any given month of the year. Consequently, Gulf LNG would consult further with NMFS to assess how or whether the dredging schedule could be refined.

Additionally, Gulf LNG has already incorporated several strategies into the Project design to minimize potential impacts on EFH such as:

- requiring all vessels with ballast tanks to comply with comply with the ballast water management and discharge requirements of both the USCG (33 CFR 151.2030) and the EPA (EPA, 2013);
- updating the current Gulf LNG *SPCC Plan* and ensuring that Gulf LNG and their construction contractors would comply with all laws and regulations related to handling of fuels and lubricants, including 40 CFR 110, and related to vessel-to-vessel transfers, including 33 CFR 155; and
- ensuring Gulf LNG and their construction contractors follow the Gulf LNG *Stormwater Pollution Prevention Plan* (*SWPPP*) and abide by the Gulf LNG NPDES permit.

6.0 FERC'S VIEW REGARDING ESSENTIAL FISH HABITAT

Construction of the Terminal Expansion and the wetland mitigation site would involve permanent conversion of about 9.1 acres and short-term conversion of about 6.2 acres of shallow estuarine benthic habitat to deeper subtidal habitat and permanent conversion of about 50 acres of shallow estuarine habitat to intertidal vegetation habitat. This would result in direct mortality to benthic organisms. Construction and operation of the Terminal Expansion would also result in the permanent loss of 27.8 acres of EEM wetlands. However, the relatively small areas of estuarine water column and benthic habitat EFH impacted by construction and operation of the supply docks and construction of the mitigation site would be minor in consideration of the amount of similar habitat available in the vicinity of the Project, and Gulf LNG would offset the function of the impacted intertidal vegetative habitat by establishing the wetland mitigation site adjacent to the Terminal Expansion.

The depth to which the shallow estuarine benthic habitat would be dredged (12 feet below msl) would be generally shallow enough to prevent the onset of hypoxic conditions and subsequent permanent changes to benthic species diversity and total biomass (COE, 2014). At 12 feet below msl, the supply dock basins would be expected to recolonize with soft bottom benthic organisms soon after completion of dredging, thus providing a similar prey base for EFH species as the adjacent and nearby non-dredged areas (MMS, 2004). This temporary impact, as well as elevated water column turbidity levels, would re-occur with maintenance dredging, which would likely occur every 3 years. These events represent a minor increase in the already episodic nature of impacted benthic habitat and elevated turbidity due to relatively frequent maintenance dredging throughout Bayou Casotte and at the existing marine berth (the COE [2014] noted that maintenance dredging occurs within Bayou Casotte every 12 months).

Potential impacts on brown and white shrimp would be primarily limited to the post-larval and juvenile stages, as both stages occur in estuaries similar to the habitat present at the supply docks and wetland mitigation site. Adult stages of the species may also be present, but as most shrimp species approach adulthood, they migrate to deeper offshore waters. White shrimp may be present in inshore estuaries year-round, while brown shrimp are generally only present in estuaries between March and November. Direct mortality could occur during active dredging or during the creation of the wetland mitigation site; however, individuals are mobile and many could avoid the dredging and construction areas. Until conditions are conducive for repopulation after completion of dredging, individuals could use areas with suitable EFH in the vicinity of the Terminal Expansion. Impacts from each of the construction activities discussed above are expected to be localized and temporary to short-term, as would impacts on the prey species of brown and white shrimp and their EFH. We do not anticipate any substantial adverse impacts on white or brown shrimp.

Various life stages of the gray snapper, lane snapper, red drum, Spanish mackerel and Atlantic sharpnose, blacknose, blacktip, bull, bonnethead, finetooth, hammerhead, spinner, and tiger sharks could be present in the vicinity of the Terminal Expansion during construction and operation. Direct mortality could occur during active dredging, pile driving, or creation of the wetland mitigation site, but individuals would likely avoid the area during construction. Prey of these species in the water column or in the benthos may be impacted by construction activities; however, as discussed above, the impacts would be temporary to short-term, as prey species would be expected to return to the water column after construction and benthic prey would be expected to rapidly recolonize the dredged areas. In the interim, given the mobility of each these managed species, individuals would be able to readily use other suitable EFH in the vicinity of the Terminal Expansion. In addition, potential impacts from each of the construction activities discussed above and potential impacts due to use of the North Supply Dock during operation would be temporary to short-term or, in the case of the wetland mitigation site, would result in new EFH. Therefore, we do not anticipate any substantial adverse impacts on gray snapper, red drum, Spanish mackerel, or Atlantic sharpnose, blacknose, blacktip, bull, bonnethead, finetooth, hammerhead, spinner, or tiger sharks.

Based on this information, we conclude that effects on EFH and EFH species in and near the construction area of the Terminal Expansion would be localized and temporary to short-term, particularly with respect to the regular industrial use of Bayou Casotte and the Mississippi Sound in the vicinity of the Terminal Expansion. Further, creation of new tidal marsh on the Mississippi Sound as mitigation for the tidal wetlands that would be lost due to the Terminal Expansion would provide additional habitat for EFH species. Therefore, the Terminal Expansion would not have a substantial adverse impact on EFH or EFH species in the area.

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APPENDIX D

Gulf LNG Upland Erosion Control, Revegetation, and Maintenance Plan

Gulf LNG Liquefaction Project

Docket No. CP15-__-000

UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

Gulf LNG Liquefaction Company, LLC
a Kinder Morgan operated company

Gulf LNG Liquefaction Company, LLC,
Gulf LNG Energy, LLC and
Gulf LNG Pipeline, LLC

569 Brookwood Center, Suite 749
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June 2015

Contents

Gulf LNG Liquefaction Project Upland Erosion Control, Revegetation, and Maintenance Plan

I. APPLICABILITY

Gulf LNG Liquefaction Company, LLC ("GLLC"), Gulf LNG Energy, LLC ("GLE"), and Gulf LNG Pipleline, LLC ("GLP") (together "Companies") are adopting the FERC Plan (May 2013 Version) for the Gulf LNG Liquefaction Project ("Project Plan"), without modifications other than what is necessary to differentiate the Project, as a discrete facility, from pipeline construction requirements. All modifications to the original wording are shown in ***bold italic font***. This Project Plan will apply to all non-wetland areas of the Project. Wetland and waterbody features are addressed in the Gulf LNG Liquefaction Project Wetland and Waterbody Construction and Mitigation Procedures ("Project Procedures").

Deviations that involve measures different from those contained in this Project Plan will only be permitted as certificated by the Commission or by written approval of the Director of the Office of Energy Projects (OEP), or his/her designee, unless specifically required in writing by another Federal, State, or land managing agency for the portion of the Project on its land. Companies will file other agency requirements with the Secretary of the Commission (Secretary) prior to construction.

II. SUPERVISION AND INSPECTION

A. ENVIRONMENTAL INSPECTION

1. At least one Environmental Inspector is required onsite during construction and restoration (as defined by section V). The number and experience of Environmental Inspectors assigned to the Project shall be appropriate for the size ***of the construction area, the level of activity***, and the number/significance of resources affected.
2. Environmental Inspectors shall have peer status with all other activity inspectors.
3. Environmental Inspectors shall have the authority to stop activities that violate the environmental conditions of the FERC's Orders, stipulations of other environmental permits or approvals, or landowner easement agreements; and to order appropriate corrective action.

B. RESPONSIBILITIES OF ENVIRONMENTAL INSPECTORS

At a minimum, the Environmental Inspector(s) shall be responsible for:

1. Inspecting construction activities for compliance with the requirements of this Project Plan, the Project Procedures, the environmental conditions of the FERC's Orders, the mitigation measures proposed by project sponsor (as approved and/or modified by the Order), other environmental permits and approvals, and environmental requirements in landowner easement agreements.
2. Identifying, documenting, and overseeing corrective actions, as necessary to bring an activity back into compliance;
3. Verifying that the limits of authorized construction work areas and locations of access roads are visibly marked before clearing, and maintained throughout construction;
4. Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;
5. Identifying erosion/sediment control and soil stabilization needs in all areas;
6. Ensuring that the design of slope breakers will not cause erosion or direct water into sensitive environmental resource areas, including cultural resource sites, wetlands, waterbodies, and sensitive species habitats;
7. Verifying that dewatering activities are properly monitored and do not result in the deposition of sand, silt, and/or sediment into sensitive environmental resource areas, including wetlands, waterbodies, cultural resource sites, and sensitive species habitats; stopping dewatering activities if such deposition is occurring and ensuring the design of the discharge is changed to prevent reoccurrence; and verifying that dewatering structures are removed after completion of dewatering activities;
8. Ensuring that subsoil and topsoil are tested in agricultural and residential areas to measure compaction and determine the need for corrective action;
9. Advising the Chief Construction Inspector when environmental conditions (such as wet weather or frozen soils) make it advisable to restrict or delay construction activities to avoid topsoil mixing or excessive compaction;
10. Ensuring restoration of contours and topsoil;
11. Verifying that the soils imported for agricultural or residential use are certified as free of noxious weeds and soil pests, unless otherwise approved by the landowner;
12. Ensuring that erosion control devices are properly installed to prevent sediment flow into sensitive environmental resource areas (e.g., wetlands, waterbodies, cultural resource sites, and sensitive species

habitats) and onto roads, and determining the need for additional erosion control devices;

13. Inspecting and ensuring the maintenance of temporary erosion control measures at least:
    a. on a daily basis in areas of active construction or equipment operation;
    b. on a weekly basis in areas with no construction or equipment operation; and
    c. within 24 hours of each 0.5 inch of rainfall;
14. Ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts;
15. Keeping records of compliance with the environmental conditions of the FERC's Orders, and the mitigation measures proposed by the Companies in the application submitted to the FERC, and other federal or state environmental permits during active construction and restoration;
16. Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase; and
17. Verifying that locations for any disposal of excess construction materials for beneficial reuse comply with section III.E.

III. PRECONSTRUCTION PLANNING

Companies shall do the following before construction:

A. CONSTRUCTION WORK AREAS

1. Identify all construction work areas (e.g., construction right-of-way, extra work space areas, pipe storage and contractor yards, borrow and disposal areas, access roads) that would be needed for safe construction. ***Companies will*** ensure that appropriate cultural resources and biological surveys are conducted, as determined necessary by the appropriate federal and state agencies.
2. ***Companies will expand*** any required cultural resources and endangered species surveys in anticipation of the need for activities outside of authorized work areas.
3. Plan construction sequencing to limit the amount and duration of open trench sections, as necessary, to prevent excessive erosion or sediment flow into sensitive environmental resource areas.

B. DRAIN TILE AND IRRIGATION SYSTEMS

There are no known drain tile irrigation systems in use within the Project area, however, if Companies become aware of a drain tile system, then Companies will:

1. Attempt to locate existing drain tiles and irrigation systems.
2. Contact landowners and local soil conservation authorities to determine the locations of future drain tiles that are likely to be installed within 3 years of the authorized construction.
3. Develop procedures for constructing through drain-tiled areas, maintaining irrigation systems during construction, and repairing drain tiles and irrigation systems after construction.
4. Engage qualified drain tile specialists, as needed to conduct or monitor repairs to drain tile systems affected by construction. Use drain tile specialists from the project area, if available.

C. GRAZING DEFERMENT

There are no known grazing areas associated with the Project. If additional areas are added to the Project footprint that include grazing areas, then Companies will:

Develop grazing deferment plans with willing landowners, grazing permittees, and land management agencies to minimize grazing disturbance of revegetation efforts.

D. ROAD CROSSINGS AND ACCESS POINTS

Plan for safe and accessible conditions at all roadway crossings and access points during construction and restoration.

E. DISPOSAL PLANNING

Determine methods and locations for the regular collection, containment, and disposal of excess construction materials and debris (e.g., timber, slash, mats, garbage, drill cuttings and fluids, excess rock) throughout the construction process. Disposal of materials for beneficial reuse must not result in adverse environmental impact and is subject to compliance with all applicable survey, landowner or land management agency approval, and permit requirements.

F. AGENCY COORDINATION

Companies must coordinate with the appropriate local, state, and federal agencies as outlined in this Project Plan and/or required by the FERC's Orders.

1. Obtain written recommendations from the local soil conservation authorities or land management agencies regarding permanent erosion control and revegetation specifications.
2. Develop specific procedures in coordination with the appropriate agencies to prevent the introduction or spread of invasive species,

noxious weeds, and soil pests resulting from construction and restoration activities.

3. Develop specific procedures in coordination with the appropriate agencies and landowners, as necessary, to allow for livestock and wildlife movement and protection during construction.

4. Develop specific blasting procedures in coordination with the appropriate agencies that address pre- and post-blast inspections; advanced public notification; and mitigation measures for building foundations, groundwater wells, and springs. Use appropriate methods (e.g., blasting mats) to prevent damage to nearby structures and to prevent debris from entering sensitive environmental resource areas.

G. SPILL PREVENTION AND RESPONSE PROCEDURES

Companies will develop project-specific Spill Prevention and Response Procedures, as specified in section IV of the staff's Procedures. A copy must be filed with the Secretary of the FERC (Secretary) prior to construction and made available in the field on each construction spread. The filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC’s regulations.

H. RESIDENTIAL CONSTRUCTION

For all properties with residences located within 50 feet of construction work areas, ***Companies will***: avoid removal of mature trees and landscaping within the construction work area unless necessary for safe operation of construction equipment, or as specified in landowner agreements; fence the edge of the construction work area for a distance of 100 feet on either side of the residence; and restore all lawn areas and landscaping immediately following clean up operations, or as specified in landowner agreements. If seasonal or other weather conditions prevent compliance with these time frames, maintain and monitor temporary erosion controls (sediment barriers and mulch) until conditions allow completion of restoration.

I. WINTER CONSTRUCTION PLANS

The Project location is in a geographic region not likely to be affected by winter weather conditions. Winter construction plans are not anticipated for the Project.

If construction is planned to occur during winter weather conditions, project sponsors shall develop and file a project-specific winter construction plan with the FERC application. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC’s regulations.

The plan shall address:

1. winter construction procedures (e.g., snow handling and removal, access road construction and maintenance, soil handling under saturated or frozen conditions, topsoil stripping);

2. stabilization and monitoring procedures if ground conditions will delay restoration until the following spring (e.g., mulching and erosion controls, inspection and reporting, stormwater control during spring thaw conditions); and

3. final restoration procedures (e.g., subsidence and compaction repair, topsoil replacement, seeding).

IV. INSTALLATION

A. APPROVED AREAS OF DISTURBANCE

1. Project-related ground disturbance shall be limited to the construction right-of-way, extra work space areas, pipe storage yards, borrow and disposal areas, access roads, and other areas approved in the FERC's Orders. Any project- related ground disturbing activities outside these areas will require prior Director approval. This requirement does not apply to activities needed to comply with the Project Plan and Procedures (i.e., slope breakers, energy-dissipating devices, dewatering structures, drain tile system repairs) or minor field realignments and workspace shifts per landowner needs and requirements that do not affect other landowners or sensitive environmental resource areas. All construction or restoration activities outside of authorized areas are subject to all applicable survey and permit requirements, and landowner easement agreements.

2. The construction right-of-way width for a project shall not exceed 75 feet or that described in the FERC application unless otherwise modified by a FERC Order. However, in limited, non-wetland areas, this construction right-of- way width may be expanded by up to 25 feet without Director approval to accommodate full construction right-of-way topsoil segregation and to ensure safe construction where topographic conditions (e.g., side-slopes) or soil limitations require it. Twenty-five feet of extra construction right-of-way width may also be used in limited, non-wetland or non-forested areas for truck turn-arounds where no reasonable alternative access exists.

   Project use of these additional limited areas is subject to landowner or land management agency approval and compliance with all applicable survey and permit requirements. When additional areas are used, each one shall be identified and the need explained in the weekly or biweekly construction reports to the FERC, if required. The following material shall be included in the reports:

   a. the location of each additional area by station number and reference to previously filed alignment sheets, or updated alignment sheets showing the additional areas;

   b. identification of the filing at FERC containing evidence that the additional areas were previously surveyed; and

c. a statement that landowner approval has been obtained and is available in project files.

Prior written approval of the Director is required when the authorized construction right-of-way width would be expanded by more than 25 feet.

B. TOPSOIL SEGREGATION

1. Unless the landowner or land management agency specifically approves otherwise, prevent the mixing of topsoil with subsoil by stripping topsoil from either the full work area or from the trench and subsoil storage area (ditch plus spoil side method) in:

   a. cultivated or rotated croplands, and managed pastures;

   b. residential areas;

   c. hayfields; and

   d. other areas at the landowner's or land managing agency's request.

2. In residential areas, importation of topsoil is an acceptable alternative to topsoil segregation.

3. Where topsoil segregation is required, Companies must:

   a. segregate at least 12 inches of topsoil in deep soils (more than 12 inches of topsoil); and

   b. make every effort to segregate the entire topsoil layer in soils with less than 12 inches of topsoil.

4. Maintain separation of salvaged topsoil and subsoil throughout all construction activities.

5. Segregated topsoil may not be used for padding the pipe, constructing temporary slope breakers or trench plugs, improving or maintaining roads, or as a fill material.

6. Stabilize topsoil piles and minimize loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, tackifiers, or functional equivalents, where necessary.

C. DRAIN TILES

1. Mark locations of drain tiles damaged during construction.

2. Probe all drainage tile systems within the area of disturbance to check for damage.

3. Repair damaged drain tiles to their original or better condition. Do not use filter-covered drain tiles unless the local soil conservation authorities and the landowner agree. Use qualified specialists for testing and repairs.

4. For new pipelines in areas where drain tiles exist or are planned, ensure that the depth of cover over the pipeline is sufficient to avoid interference with drain tile systems. For adjacent pipeline loops in agricultural areas, install the new pipeline with at least the same depth of cover as the existing pipeline(s).

D. IRRIGATION

Maintain water flow in crop irrigation systems, unless shutoff is coordinated with affected parties.

E. ROAD CROSSINGS AND ACCESS POINTS

1. Maintain safe and accessible conditions at all road crossings and access points during construction.
2. If crushed stone access pads are used in residential or agricultural areas, place the stone on synthetic fabric to facilitate removal.
3. Minimize the use of tracked equipment on public roadways. Remove any soil or gravel spilled or tracked onto roadways daily or more frequent as necessary to maintain safe road conditions. Repair any damages to roadway surfaces, shoulders, and bar ditches.

F. TEMPORARY EROSION CONTROL

Install temporary erosion controls immediately after initial disturbance of the soil. Temporary erosion controls must be properly maintained throughout construction (on a daily basis) and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration is complete.

1. Temporary Slope Breakers
   a. Temporary slope breakers are intended to reduce runoff velocity and divert water off the construction right-of-way. Temporary slope breakers may be constructed of materials such as soil, silt fence, staked hay or straw bales, or sand bags.
   b. Install temporary slope breakers on all disturbed areas, as necessary to avoid excessive erosion. Temporary slope breakers must be installed on slopes greater than 5 percent where the base of the slope is less than 50 feet from waterbody, wetland, and road crossings at the following spacing (closer spacing shall be used if necessary):

Slope (%)	Spacing (feet)
5 - 15	300
>15 - 30	200
>30	100

   c. Direct the outfall of each temporary slope breaker to a stable, well vegetated area or construct an energy-dissipating device at the end of the slope breaker and off the construction right-of-way.

d. Position the outfall of each temporary slope breaker to prevent sediment discharge into wetlands, waterbodies, or other sensitive environmental resource areas.

2. Temporary Trench Plugs

Temporary trench plugs are intended to segment a continuous open trench prior to backfill.

a. Temporary trench plugs may consist of unexcavated portions of the trench, compacted subsoil, sandbags, or some functional equivalent.

b. Position temporary trench plugs, as necessary, to reduce trenchline erosion and minimize the volume and velocity of trench water flow at the base of slopes.

3. Sediment Barriers

Sediment barriers are intended to stop the flow of sediments and to prevent the deposition of sediments beyond approved workspaces or into sensitive resources.

a. Sediment barriers may be constructed of materials such as silt fence, staked hay or straw bales, compacted earth (e.g., driveable berms across travelways), sand bags, or other appropriate materials.

b. At a minimum, install and maintain temporary sediment barriers across the entire construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody, wetland, or road crossing until revegetation is successful as defined in this Project Plan. Leave adequate room between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition.

c. Where wetlands or waterbodies are adjacent to and downslope of construction work areas, install sediment barriers along the edge of these areas, as necessary to prevent sediment flow into the wetland or waterbody.

4. Mulch

a. Apply mulch on all slopes (except in cultivated cropland) concurrent with or immediately after seeding, where necessary to stabilize the soil surface and to reduce wind and water erosion. Spread mulch uniformly over the area to cover at least 75 percent of the ground surface at a rate of 2 tons/acre of straw or its equivalent, unless the local soil conservation authority, landowner, or land managing agency approves otherwise in writing.

b. Mulch can consist of weed-free straw or hay, wood fiber hydromulch, erosion control fabric, or some functional equivalent.

c. Mulch all disturbed upland areas (except cultivated cropland) <u>before</u> seeding if:

(1) final grading and installation of permanent erosion control measures will not be completed in an area within 20 days after the trench in that area is backfilled (10 days in residential areas), as required in section V.A.1; or

(2) construction or restoration activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions.

d. If mulching <u>before</u> seeding, increase mulch application on all slopes within 100 feet of waterbodies and wetlands to a rate of 3 tons/acre of straw or equivalent.

e. If wood chips are used as mulch, do not use more than 1 ton/acre and add the equivalent of 11 lbs/acre available nitrogen (at least 50 percent of which is slow release).

f. Ensure that mulch is adequately anchored to minimize loss due to wind and water.

g. When anchoring with liquid mulch binders, use rates recommended by the manufacturer. Do not use liquid mulch binders within 100 feet of wetlands or waterbodies, except where the product is certified environmentally non-toxic by the appropriate state or federal agency or independent standards-setting organization.

h. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat, unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

V. <u>RESTORATION</u>

A. CLEANUP

1. Commence cleanup operations immediately following backfill operations.

   Complete final grading, topsoil replacement, and installation of permanent erosion control structures within 20 days after backfilling the trench (10 days in residential areas). If seasonal or other weather conditions prevent compliance with these time frames, maintain temporary erosion controls (i.e., temporary slope breakers, sediment barriers, and mulch) until conditions allow completion of cleanup.

If construction or restoration unexpectedly continues into the winter season when conditions could delay successful decompaction, topsoil replacement, or seeding until the following spring, file with the Secretary for the review and written approval of the Director, a winter construction plan (as specified in section III.I). This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

2. A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion control structures are installed as specified in section IV.F. and inspected and maintained as specified in sections II.B.12 through 14. When access is no longer required the travel lane must be removed and the right-of-way restored.

3. Rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile. Rock that is not returned to the trench shall be considered construction debris, unless approved for use as mulch or for some other use on the construction work areas by the landowner or land managing agency.

4. Remove excess rock from at least the top 12 inches of soil in all cultivated or rotated cropland, managed pastures, hayfields, and residential areas, as well as other areas at the landowner's request. The size, density, and distribution of rock on the construction work area shall be similar to adjacent areas not disturbed by construction. The landowner or land management agency may approve other provisions in writing.

5. Grade the construction right-of-way to restore pre-construction contours and leave the soil in the proper condition for planting.

6. Remove construction debris from all construction work areas unless the landowner or land managing agency approves leaving materials onsite for beneficial reuse, stabilization, or habitat restoration.

7. Remove temporary sediment barriers when replaced by permanent erosion control measures or when revegetation is successful.

B. PERMANENT EROSION CONTROL DEVICES

1. Trench Breakers

a. Trench breakers are intended to slow the flow of subsurface water along the trench. Trench breakers may be constructed of materials such as sand bags or polyurethane foam. Do not use topsoil in trench breakers.

b. An engineer or similarly qualified professional shall determine the need for and spacing of trench breakers. Otherwise, trench breakers shall be installed at the same spacing as and upslope of permanent slope breakers.

c. In agricultural fields and residential areas where slope breakers are not typically required, install trench breakers at the same spacing as if permanent slope breakers were required.

d. At a minimum, install a trench breaker at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody or wetland and where needed to avoid draining a waterbody or wetland. Install trench breakers at wetland boundaries, as specified in the Procedures. Do not install trench breakers within a wetland.

2. Permanent Slope Breakers

a. Permanent slope breakers are intended to reduce runoff velocity, divert water off the construction right-of-way, and prevent sediment deposition into sensitive resources. Permanent slope breakers may be constructed of materials such as soil, stone, or some functional equivalent.

b. Construct and maintain permanent slope breakers in all areas, except cultivated areas and lawns, unless requested by the landowner, using spacing recommendations obtained from the local soil conservation authority or land managing agency.

In the absence of written recommendations, use the following spacing unless closer spacing is necessary to avoid excessive erosion on the construction right-of-way:

Slope (%)	Spacing (feet)
5 - 15	300
>15 - 30	200
>30	100

c. Construct slope breakers to divert surface flow to a stable area without causing water to pool or erode behind the breaker. In the absence of a stable area, construct appropriate energy-dissipating devices at the end of the breaker.

d. Slope breakers may extend slightly (about 4 feet) beyond the edge of the construction right-of-way to effectively drain water off the disturbed area. Where slope breakers extend beyond the edge of the construction right-of-way, they are subject to compliance with all applicable survey requirements.

C. SOIL COMPACTION MITIGATION

1. Test topsoil and subsoil for compaction at regular intervals in agricultural and residential areas disturbed by construction activities. Conduct tests on the same soil type under similar moisture conditions in undisturbed areas to approximate preconstruction conditions. Use penetrometers or other appropriate devices to conduct tests.

2. Plow severely compacted agricultural areas with a paraplow or other deep tillage implement. In areas where topsoil has been segregated, plow the subsoil before replacing the segregated topsoil.

   If subsequent construction and cleanup activities result in further compaction, conduct additional tilling.

3. Perform appropriate soil compaction mitigation in severely compacted residential areas.

D. REVEGETATION

1. General

   a. The project sponsor is responsible for ensuring successful revegetation of soils disturbed by project-related activities, except as noted in section V.D.1.b.

   b. Restore all turf, ornamental shrubs, and specialized landscaping in accordance with the landowner's request, or compensate the landowner. Restoration work must be performed by personnel familiar with local horticultural and turf establishment practices.

2. Soil Additives

   Fertilize and add soil pH modifiers in accordance with written recommendations obtained from the local soil conservation authority, land management agencies, or landowner. Incorporate recommended soil pH modifier and fertilizer into the top 2 inches of soil as soon as practicable after application.

3. Seeding Requirements

   a. Prepare a seedbed in disturbed areas to a depth of 3 to 4 inches using appropriate equipment to provide a firm seedbed. When hydroseeding, scarify the seedbed to facilitate lodging and germination of seed.

   b. Seed disturbed areas in accordance with written recommendations for seed mixes, rates, and dates obtained from the local soil conservation authority or the request of the landowner or land management agency. Seeding is not required in cultivated croplands unless requested by the landowner.

   c. Perform seeding of permanent vegetation within the recommended seeding dates. If seeding cannot be done within those dates, use appropriate temporary erosion control measures discussed in section IV.F and perform seeding of permanent vegetation at the beginning of the next recommended seeding season. Dormant seeding or temporary seeding of annual species may also be used, if necessary, to establish cover, as approved by the Environmental

Inspector. Lawns may be seeded on a schedule established with the landowner.

d. In the absence of written recommendations from the local soil conservation authorities, seed all disturbed soils within 6 working days of final grading, weather and soil conditions permitting, subject to the specifications in section V.D.3.a through V.D.3.c.

e. Base seeding rates on Pure Live Seed. Use seed within 12 months of seed testing.

f. Treat legume seed with an inoculant specific to the species using the manufacturer's recommended rate of inoculant appropriate for the seeding method (broadcast, drill, or hydro).

g. In the absence of written recommendations from the local soil conservation authorities, landowner, or land managing agency to the contrary, a seed drill equipped with a cultipacker is preferred for seed application.

Broadcast or hydroseeding can be used in lieu of drilling at double the recommended seeding rates. Where seed is broadcast, firm the seedbed with a cultipacker or roller after seeding. In rocky soils or where site conditions may limit the effectiveness of this equipment, other alternatives may be appropriate (e.g., use of a chain drag) to lightly cover seed after application, as approved by the Environmental Inspector.

VI. OFF-ROAD VEHICLE CONTROL

To each owner or manager of forested lands, offer to install and maintain measures to control unauthorized vehicle access to the right-of-way. These measures may include:

A. signs;

B. fences with locking gates;

C. slash and timber barriers, pipe barriers, or a line of boulders across the right-of-way; and

D. conifers or other appropriate trees or shrubs across the right-of-way.

VII. POST-CONSTRUCTION ACTIVITIES AND REPORTING

A. MONITORING AND MAINTENANCE

1. Conduct follow-up inspections of all disturbed areas, as necessary, to determine the success of revegetation and address landowner concerns. At a minimum, conduct inspections after the first and second growing seasons.

2. Revegetation in non-agricultural areas shall be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. In agricultural areas, revegetation shall be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the easement agreement specifies otherwise.

   Continue revegetation efforts until revegetation is successful.

3. Monitor and correct problems with drainage and irrigation systems resulting from pipeline construction in agricultural areas until restoration is successful.

4. Restoration shall be considered successful if the right-of-way surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless otherwise approved by the landowner or land managing agency per section V.A.6), revegetation is successful, and proper drainage has been restored.

5. Routine vegetation mowing or clearing over the full width of the permanent right-of-way in uplands shall not be done more frequently than every 3 years. However, to facilitate periodic corrosion/leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In no case shall routine vegetation mowing or clearing occur during the migratory bird nesting season between April 15 and August 1 of any year unless specifically approved in writing by the responsible land management agency or the U.S. Fish and Wildlife Service.

6. Efforts to control unauthorized off-road vehicle use, in cooperation with the landowner, shall continue throughout the life of the project. Maintain signs, gates, and permanent access roads as necessary.

B. REPORTING

1. The project sponsor shall maintain records that identify by milepost:

   a. method of application, application rate, and type of fertilizer, pH modifying agent, seed, and mulch used;

   b. acreage treated;

   c. dates of backfilling and seeding;

   d. names of landowners requesting special seeding treatment and a description of the follow-up actions;

   e. the location of any subsurface drainage repairs or improvements made during restoration; and

   f. any problem areas and how they were addressed.

2. The project sponsor shall file with the Secretary quarterly activity reports documenting the results of follow-up inspections required by section VII.A.1; any problem areas, including those identified by the landowner; and corrective actions taken for at least 2 years following construction.

   The requirement to file quarterly activity reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advanced notice provisions in the FERC's regulations.

APPENDIX E

Gulf LNG Wetland and Waterbody Construction and Mitigation Procedures

Gulf LNG Liquefaction Project

Docket No. CP15-__-000

WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

Gulf LNG Liquefaction Company, LLC
a Kinder Morgan operated company

Gulf LNG Liquefaction Company, LLC,
Gulf LNG Energy, LLC and
Gulf LNG Pipeline, LLC

569 Brookwood Center, Suite 749
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June 2015

WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

Gulf LNG Liquefaction Project

The table below identifies all changes proposed to the Wetland and Waterbody Construction and Mitigation Procedures for the Gulf LNG Liquefaction Project ("Project Procedures"). Within the text of the Project Procedures, the changes are ***italicized***.

Table of Changes		
Section	**Original Text**	**Proposed Text (Changes italicized in bold)**
VI.A.6	Do not locate aboveground facilities in any wetland, except where the location of such facilities outside of wetlands would prohibit compliance with U.S. Department of Transportation regulations.	***Project facilities are proposed to be constructed within wetlands to be permanently filled as part of the Project, primarily due to logistical concerns and available space limitations. All wetland impacts will be appropriately mitigated, and construction of the aboveground structures will result in no net loss of wetlands. Companies will provide copies of the wetland delineation report, wetland mitigation plans, and U.S. Army Corps of Engineers/Mississippi Department of Marine Resources permits and approvals prior to Project construction.***
VI.B	INSTALLATION	***Project access roads, including the heavy haul road from the North Marine Off-Loading Facility (MOF) will be constructed in delineated wetland areas. Additionally, Companies propose to clear and fill wetland areas at CSA 5 to maximize the useable area of the site for construction support. Companies will provide appropriate mitigation for the unavoidable loss of wetlands due to Project construction. Companies will provide copies of the wetland delineation report, wetland mitigation plans, and U.S. Army Corps of Engineers/Mississippi Department of Marine Resources permits and approvals prior to Project construction.***
VI.D	POST-CONSTRUCTION MAINTENANCE AND REPORTING	***Wetlands within the Project footprint will be permanently filled and mitigated for by creation of tidal marsh at an offsite location. Design, construction, and monitoring of the mitigation site will be by approval of the U.S. Army Corps of Engineers, the Mississippi Department of Marine Resources, and other regulatory agencies. Companies will file copies of their plans, approvals, and monitoring reports with the Secretary for review and approval by the Director.***

Contents

Gulf LNG Liquefaction Project Wetland and Waterbody Construction and Mitigation Procedures

I. APPLICABILITY

A. Gulf LNG Liquefaction Company, LLC (“GLLC”), Gulf LNG Energy, LLC (“GLE”), and Gulf LNG Pipleline, LLC (“GLP”) (together “Companies”) are adopting the FERC Procedures (May 2013 Version) for its Gulf LNG Liquefaction Project (Project), with requested variances, as well as modifications that are necessary to differentiate the Project, as a discrete facility, from pipeline construction requirements (“Project Procedures”). All modifications to the original wording are shown in ***bold italic font***. These Project Procedures will apply to all wetland areas of the Project.

Deviations that involve measures different from those contained in these Project Procedures will only be permitted as certificated by the Commission or by written approval of the Director of the Office of Energy Projects (OEP), or his/her designee, unless specifically required in writing by another Federal, State, or land managing agency for the portion of the Project on its land. Companies will file other agency requirements with the Secretary of the Commission (Secretary) prior to construction.

The intent of these Project Procedures is to assist project sponsors by identifying baseline mitigation measures for minimizing the extent and duration of project-related disturbance on wetlands and waterbodies. Companies have specified in their application for a new FERC authorization, and in individual measures in ***the FERC*** Procedures it considers unnecessary, technically infeasible, or unsuitable due to local conditions and fully describes any alternative measures it would use. Companies also explain how these alternative measures would achieve a comparable level of mitigation.

Once the Project is authorized, Companies may request further changes as variances to the measures in these Project Procedures. The Director of the Office of Energy Projects (Director) will consider approval of variances upon Companies’ written request, if the Director agrees that a variance:

1. provides equal or better environmental protection;
2. is necessary because a portion of ***the FERC*** Procedures is infeasible or unworkable based on project-specific conditions; or
3. is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

Project-related impacts on non-wetland areas are addressed in the Gulf LNG Liquefaction Project Upland Erosion Control, Revegetation, and Maintenance Plan (“Project Plan”).

B. DEFINITIONS

1. "Waterbody" includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes:

   a. "minor waterbody" includes all waterbodies less than or equal to 10 feet wide at the water's edge at the time of crossing;

   b. "intermediate waterbody" includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water's edge at the time of crossing; and

   c. "major waterbody" includes all waterbodies greater than 100 feet wide at the water's edge at the time of crossing.

2. "Wetland" includes any area that is not in actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology for identifying and delineating wetlands.

II. PRECONSTRUCTION FILING

A. The following information must be filed with the Secretary of the FERC (Secretary) prior to the beginning of construction, for the review and written approval by the Director:

1. site-specific justifications for extra work areas that would be closer than 50 feet from a waterbody or wetland; and

2. site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands.

B. The following information must be filed with the Secretary prior to the beginning of construction. These filing requirements do not apply to projects constructed under the automatic authorization provisions in the FERC's regulations:

1. Spill Prevention and Response Procedures specified in section IV.A;

2. a schedule identifying when trenching or blasting will occur within each waterbody greater than 10 feet wide, within any designated coldwater fishery, and within any waterbody identified as habitat for federally-listed threatened or endangered species. ***Companies*** will revise the schedule as necessary to provide FERC staff at least 14 days advance notice. Changes within this last 14-day period must provide for at least 48 hours advance notice;

3. plans for horizontal directional drills (HDD) under wetlands or waterbodies, specified in section V.B.6.d;

4. site-specific plans for major waterbody crossings, described in section V.B.9;

5. a wetland delineation report as described in section VI.A.1, if applicable; and

6. the hydrostatic testing information specified in section VII.B.3.

III. ENVIRONMENTAL INSPECTORS

A. At least one Environmental Inspector having knowledge of the wetland and waterbody conditions in the project area is required for each construction spread. The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.

B. The Environmental Inspector's responsibilities are outlined in the Upland Erosion Control, Revegetation, and Maintenance Plan (Plan).

IV. PRECONSTRUCTION PLANNING

A. ***Companies will*** develop project-specific Spill Prevention and Response Procedures that meet applicable requirements of state and federal agencies. A copy must be filed with the Secretary prior to construction and made available in the field on each construction spread. This filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

1. It ***is*** the responsibility of the ***Companies*** and their contractors to structure their operations in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to waterbodies or wetlands. ***Companies*** and their contractors must, at a minimum, ensure that:

   a. all employees handling fuels and other hazardous materials are properly trained;

   b. all equipment is in good operating order and inspected on a regular basis;

   c. fuel trucks transporting fuel to on-site equipment travel only on approved access roads;

d. all equipment is parked overnight and/or fueled at least 100 feet from a waterbody or in an upland area at least 100 feet from a wetland boundary. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and ***that Companies*** and their contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;

e. hazardous materials, including chemicals, fuels, and lubricating oils, are not stored within 100 feet of a wetland, waterbody, or designated municipal watershed area, unless the location is designated for such use by an appropriate governmental authority. This applies to storage of these materials and does not apply to normal operation or use of equipment in these areas;

f. concrete coating activities are not performed within 100 feet of a wetland or waterbody boundary, unless the location is an existing industrial site designated for such use. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;

g. pumps operating within 100 feet of a waterbody or wetland boundary utilize appropriate secondary containment systems to prevent spills; and

h. bulk storage of hazardous materials, including chemicals, fuels, and lubricating oils have appropriate secondary containment systems to prevent spills.

2. ***Companies*** and their contractors ***will*** structure ***their*** operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. At a minimum, ***Companies*** and its contractors ***will***:

a. ensure that each construction crew (including cleanup crews) has on hand sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of spilled materials and knows the procedure for reporting spills and unanticipated discoveries of contamination;

b. ensure that each construction crew has on hand sufficient tools and material to stop leaks;

c. know the contact names and telephone numbers for all local, state, and federal agencies (including, if necessary, the U. S. Coast Guard and the National Response Center) that must be notified of a spill; and

d. follow the requirements of those agencies in cleaning up the spill, in excavating and disposing of soils or other materials contaminated by a spill, and in collecting and disposing of waste generated during spill cleanup.

B. AGENCY COORDINATION

Companies will coordinate with the appropriate local, state, and federal agencies as outlined in these Project Procedures and in the FERC's Orders.

V. WATERBODY CROSSINGS

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply to the U.S. Army Corps of Engineers (COE), or its delegated agency, for the appropriate wetland and waterbody crossing permits.

2. Provide written notification to authorities responsible for potable surface water supply intakes located within 3 miles downstream of the crossing at least 1 week before beginning work in the waterbody, or as otherwise specified by that authority.

3. Apply for state-issued waterbody crossing permits and obtain individual or generic section 401 water quality certification or waiver.

4. Notify appropriate federal and state authorities at least 48 hours before beginning trenching or blasting within the waterbody, or as specified in applicable permits.

B. INSTALLATION

1. Time Window for Construction

Unless expressly permitted or further restricted by the appropriate federal or state agency in writing on a site-specific basis, instream work, except that required to install or remove equipment bridges, must occur during the following time windows:

a. coldwater fisheries - June 1 through September 30; and

b. coolwater and warmwater fisheries - June 1 through November 30.

2. Extra Work Areas

a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

b. ***Companies will*** file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from the water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the conditions that will not permit a 50-foot setback and measures to ensure the waterbody is adequately protected.

c. Limit the size of extra work areas to the minimum needed to construct the waterbody crossing.

3. General Crossing Procedures

a. Comply with the COE, or its delegated agency, permit terms and conditions.

b. Construct crossings as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.

c. Where pipelines parallel a waterbody, maintain at least 15 feet of undisturbed vegetation between the waterbody (and any adjacent wetland) and the construction right-of-way, except where maintaining this offset will result in greater environmental impact.

d. Where waterbodies meander or have multiple channels, route the pipeline to minimize the number of waterbody crossings.

e. Maintain adequate waterbody flow rates to protect aquatic life, and prevent the interruption of existing downstream uses.

f. Waterbody buffers (e.g., extra work area setbacks, refueling restrictions) must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

g. Crossing of waterbodies when they are dry or frozen and not flowing may proceed using standard upland construction techniques in accordance with the Plan, provided that the Environmental Inspector verifies that water is unlikely to flow between initial disturbance and final stabilization of the feature. In the event of perceptible flow, the project sponsor must comply with all applicable Procedure requirements for "waterbodies" as defined in section I.B.1.

4. Spoil Pile Placement and Control

a. All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings, must be placed in the construction right-of-way at least 10 feet from the water's edge or in additional extra work areas as described in section V.B.2.

b. Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.

5. Equipment Bridges

a. Only clearing equipment and equipment necessary for installation of equipment bridges may cross waterbodies prior to bridge installation. Limit the number of such crossings of each waterbody to one per piece of clearing equipment.

b. Construct and maintain equipment bridges to allow unrestricted flow and to prevent soil from entering the waterbody. Examples of such bridges include:

(1) equipment pads and culvert(s);
(2) equipment pads or railroad car bridges without culverts;
(3) clean rock fill and culvert(s); and
(4) flexi-float or portable bridges.

Additional options for equipment bridges may be utilized that achieve the performance objectives noted above. Do not use soil to construct or stabilize equipment bridges.

c. Design and maintain each equipment bridge to withstand and pass the highest flow expected to occur while the bridge is in place. Align culverts to prevent bank erosion or streambed scour. If necessary, install energy dissipating devices downstream of the culverts.

d. Design and maintain equipment bridges to prevent soil from entering the waterbody.

e. Remove temporary equipment bridges as soon as practicable after permanent seeding.

f. If there will be more than 1 month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the right-of-way is available, remove temporary equipment bridges as soon as practicable after final cleanup.

g. Obtain any necessary approval from the COE, or the appropriate state agency for permanent bridges.

6. Dry-Ditch Crossing Methods

a. Unless approved otherwise by the appropriate federal or state agency, install the pipeline using one of the dry-ditch methods outlined below for crossings of waterbodies up to 30 feet wide (at the water's edge at the time of construction) that are state-designated as either coldwater or significant coolwater or warmwater fisheries, or federally-designated as critical habitat.

b. Dam and Pump

(1) The dam-and-pump method may be used without prior approval for crossings of waterbodies where pumps can adequately transfer streamflow volumes around the work area, and there are no concerns about sensitive species passage.

(2) Implementation of the dam-and-pump crossing method must meet the following performance criteria:

(i) use sufficient pumps, including on-site backup pumps, to maintain downstream flows;
(ii) construct dams with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);
(iii) screen pump intakes to minimize entrainment of fish;
(iv) prevent streambed scour at pump discharge; and
(v) continuously monitor the dam and pumps to ensure proper operation throughout the waterbody crossing.

c. Flume Crossing

The flume crossing method requires implementation of the following steps:

(1) install flume pipe after blasting (if necessary), but before any trenching;

(2) use sand bag or sand bag and plastic sheeting diversion structure or equivalent to develop an effective seal and to divert stream flow through the flume pipe (some modifications to the stream bottom may be required to achieve an effective seal);

(3) properly align flume pipe(s) to prevent bank erosion and streambed scour;

(4) do not remove flume pipe during trenching, pipelaying, or backfilling activities, or initial streambed restoration efforts; and

(5) remove all flume pipes and dams that are not also part of the equipment bridge as soon as final cleanup of the stream bed and bank is complete.

d. Horizontal Directional Drill

For each waterbody or wetland that would be crossed using the HDD method, file with the Secretary for the review and written approval by the Director, a plan that includes:

(1) site-specific construction diagrams that show the location of mud pits, pipe assembly areas, and all areas to be disturbed or cleared for construction;

(2) justification that disturbed areas are limited to the minimum needed to construct the crossing;

(3) identification of any aboveground disturbance or clearing between the HDD entry and exit workspaces during construction;

(4) a description of how an inadvertent release of drilling mud would be contained and cleaned up; and

(5) a contingency plan for crossing the waterbody or wetland in the event the HDD is unsuccessful and how the abandoned drill hole would be sealed, if necessary.

The requirement to file HDD plans does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

7. Crossings of Minor Waterbodies

Where a dry-ditch crossing is not required, minor waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. except for blasting and other rock breaking measures, complete instream construction activities (including trenching, pipe installation, backfill, and restoration of the streambed contours) within 24 hours.

Streambanks and unconsolidated streambeds may require additional restoration after this period;

b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and

c. equipment bridges are not required at minor waterbodies that do not have a state-designated fishery classification or protected status (e.g., agricultural or intermittent drainage ditches). However, if an equipment bridge is used it must be constructed as described in section V.B.5.

8. Crossings of Intermediate Waterbodies

Where a dry-ditch crossing is not required, intermediate waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. complete instream construction activities (not including blasting and other rock breaking measures) within 48 hours, unless site-specific conditions make completion within 48 hours infeasible;

b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and

c. all other construction equipment must cross on an equipment bridge as specified in section V.B.5.

9. Crossings of Major Waterbodies

The Project does not involve the crossing of major waterbodies. If Project changes necessitate the crossing of major waterbodies, Companies will comply with the following requirements:

Before construction, *Companies will* file with the Secretary for the review and written approval by the Director a detailed, site-specific construction plan and scaled drawings identifying all areas to be disturbed by construction for each major waterbody crossing (the scaled drawings are not required for any offshore portions of pipeline projects). This plan must be developed in consultation with the appropriate state and federal agencies and shall include extra work areas, spoil storage areas, sediment control structures, etc., as well as mitigation for navigational issues. The requirement to file major waterbody crossing plans does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

The Environmental Inspector may adjust the final placement of the erosion and sediment control structures in the field to maximize effectiveness.

10. Temporary Erosion and Sediment Control

Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan; however, the following specific measures must be implemented at stream crossings:

a. install sediment barriers across the entire construction right-of-way at all waterbody crossings, where necessary to prevent the flow of sediments into the waterbody. Removable sediment barriers (or driveable berms) must be installed across the travel lane. These removable sediment barriers can be removed during the construction day, but must be re-installed after construction has stopped for the day and/or when heavy precipitation is imminent;

b. where waterbodies are adjacent to the construction right-of-way and the right-of-way slopes toward the waterbody, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the waterbody; and

c. use temporary trench plugs at all waterbody crossings, as necessary, to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the waterbody.

11. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any waterbody. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Use clean gravel or native cobbles for the upper 1 foot of trench backfill in all waterbodies that contain coldwater fisheries.

2. For open-cut crossings, stabilize waterbody banks and install temporary sediment barriers within 24 hours of completing instream construction activities. For dry-ditch crossings, complete streambed and bank stabilization before returning flow to the waterbody channel.

3. Return all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the Environmental Inspector.

4. Install erosion control fabric or a functional equivalent on waterbody banks at the time of final bank recontouring. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

5. Application of riprap for bank stabilization must comply with COE, or its delegated agency, permit terms and conditions.

6. Unless otherwise specified by state permit, limit the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.

7. Revegetate disturbed riparian areas with native species of conservation grasses, legumes, and woody species, similar in density to adjacent undisturbed lands.

8. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent that are less than 50 feet from the waterbody, or as needed to prevent sediment transport into the waterbody. In addition, install sediment barriers as outlined in the Plan.

In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the waterbody.

9. Sections V.C.3 through V.C.7 above also apply to those perennial or intermittent streams not flowing at the time of construction.

D. POST-CONSTRUCTION MAINTENANCE

1. Limit routine vegetation mowing or clearing adjacent to waterbodies to allow a riparian strip at least 25 feet wide, as measured from the waterbody’s mean high water mark, to permanently revegetate with native plant species across the entire construction right-of-way. However, to facilitate periodic

corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees that are located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in riparian areas that are between HDD entry and exit points.

2. Do not use herbicides or pesticides in or within 100 feet of a waterbody except as allowed by the appropriate land management or state agency.

3. Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of riparian areas.

VI. WETLAND CROSSINGS

A. GENERAL

1. ***Companies will*** conduct a wetland delineation using the current federal methodology and file a wetland delineation report with the Secretary before construction. The requirement to file a wetland delineation report does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

   This report shall identify:

   a. by milepost all wetlands that would be affected;

   b. the National Wetlands Inventory (NWI) classification for each wetland;

   c. the crossing length of each wetland in feet; and

   d. the area of permanent and temporary disturbance that would occur in each wetland by NWI classification type.

   The requirements outlined in this section do not apply to wetlands in actively cultivated or rotated cropland. Standard upland protective measures, including workspace and topsoiling requirements, apply to these agricultural wetlands.

2. Route the pipeline to avoid wetland areas to the maximum extent possible. If a wetland cannot be avoided or crossed by following an existing right-of-way, route the new pipeline in a manner that minimizes disturbance to wetlands. Where looping an existing pipeline, overlap the existing pipeline right-of-way with the new construction

right-of-way. In addition, locate the loop line no more than 25 feet away from the existing pipeline unless site-specific constraints would adversely affect the stability of the existing pipeline.

3. Limit the width of the construction right-of-way to 75 feet or less. Prior written approval of the Director is required where topographic conditions or soil limitations require that the construction right-of-way width within the boundaries of a federally delineated wetland be expanded beyond 75 feet. Early in the planning process the project sponsor is encouraged to identify site-specific areas where excessively wide trenches could occur and/or where spoil piles could be difficult to maintain because existing soils lack adequate unconfined compressive strength.

4. Wetland boundaries and buffers must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

5. Implement the measures of sections V <u>and</u> VI in the event a waterbody crossing is located within or adjacent to a wetland crossing. If all measures of sections V and VI cannot be met, the project sponsor must file with the Secretary a site-specific crossing plan for review and written approval by the Director before construction. This crossing plan shall address at a minimum:

   a. spoil control;

   b. equipment bridges;

   c. restoration of waterbody banks and wetland hydrology;

   d. timing of the waterbody crossing;

   e. method of crossing; and

   f. size and location of all extra work areas.

6. ***Project facilities are proposed to be constructed within wetlands to be permanently filled as part of the Project, primarily due to logistical concerns and available space limitations. All wetland impacts will be appropriately mitigated, and construction of the aboveground structures will result in no net loss of wetlands. Companies will provide copies of the wetland delineation report, wetland mitigation plans, and U.S. Army Corps of Engineers/Mississippi Department of Marine Resources permits and approvals prior to Project construction.***

B. INSTALLATION

Project access roads, including the heavy haul road from the North Marine Off-Loading Facility (MOF) will be constructed in delineated wetland areas. Additionally, Companies propose to clear and fill wetland areas at CSA 5 to maximize the useable area of the site for construction support. Companies will provide appropriate mitigation for the unavoidable loss of wetlands due to Project construction. Companies will provide copies of the wetland delineation report, wetland mitigation plans, and U.S. Army Corps of Engineers/Mississippi Department of Marine Resources permits and approvals prior to Project construction.

1. Extra Work Areas and Access Roads

   a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from wetland boundaries, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

   b. ***Companies will*** file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from wetland boundaries, except where adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the site-specific conditions that will not permit a 50-foot setback and measures to ensure the wetland is adequately protected.

   c. The construction right-of-way may be used for access when the wetland soil is firm enough to avoid rutting or the construction right-of-way has been appropriately stabilized to avoid rutting (e.g., with timber riprap, prefabricated equipment mats, or terra mats).

      In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing shall use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, limit all other construction equipment to one pass through the wetland using the construction right-of-way.

   d. The only access roads, other than the construction right-of-way, that can be used in wetlands are those existing roads that can be used with no modifications or improvements, other than routine repair, and no impact on the wetland.

2. Crossing Procedures

   a. Comply with COE, or its delegated agency, permit terms and conditions.

b. Assemble the pipeline in an upland area unless the wetland is dry enough to adequately support skids and pipe.

c. Use “push-pull” or “float” techniques to place the pipe in the trench where water and other site conditions allow.

d. Minimize the length of time that topsoil is segregated and the trench is open. Do not trench the wetland until the pipeline is assembled and ready for lowering in.

e. Limit construction equipment operating in wetland areas to that needed to clear the construction right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way.

f. Cut vegetation just above ground level, leaving existing root systems in place, and remove it from the wetland for disposal.

The project sponsor can burn woody debris in wetlands, if approved by the COE and in accordance with state and local regulations, ensuring that all remaining woody debris is removed for disposal.

g. Limit pulling of tree stumps and grading activities to directly over the trenchline. Do not grade or remove stumps or root systems from the rest of the construction right-of-way in wetlands unless the Chief Inspector and Environmental Inspector determine that safety-related construction constraints require grading or the removal of tree stumps from under the working side of the construction right-of-way.

h. Segregate the top 1 foot of topsoil from the area disturbed by trenching, except in areas where standing water is present or soils are saturated. Immediately after backfilling is complete, restore the segregated topsoil to its original location.

i. Do not use rock, soil imported from outside the wetland, tree stumps, or brush riprap to support equipment on the construction right-of-way.

j. If standing water or saturated soils are present, or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, use low-ground-weight construction equipment, or operate normal equipment on timber riprap, prefabricated equipment mats, or terra mats.

k. Remove all project-related material used to support equipment on the construction right-of-way upon completion of construction.

3. Temporary Sediment Control

Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the wetland or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench). Except as noted below in section VI.B.3.c, maintain sediment barriers until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan.

a. Install sediment barriers across the entire construction right-of-way immediately upslope of the wetland boundary at all wetland crossings where necessary to prevent sediment flow into the wetland.

b. Where wetlands are adjacent to the construction right-of-way and the right-of-way slopes toward the wetland, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the wetland.

c. Install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil and sediment within the construction right-of-way through wetlands. Remove these sediment barriers during right-of-way cleanup.

4. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any wetland. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Where the pipeline trench may drain a wetland, construct trench breakers at the wetland boundaries and/or seal the trench bottom as necessary to maintain the original wetland hydrology.

2. Restore pre-construction wetland contours to maintain the original wetland hydrology.

3. For each wetland crossed, install a trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from the

wetland, or as needed to prevent sediment transport into the wetland. In addition, install sediment barriers as outlined in the Plan. In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the wetland.

4. Do not use fertilizer, lime, or mulch unless required in writing by the appropriate federal or state agency.

5. Consult with the appropriate federal or state agencies to develop a project-specific wetland restoration plan. The restoration plan shall include measures for re-establishing herbaceous and/or woody species, controlling the invasion and spread of invasive species and noxious weeds (e.g., purple loosestrife and phragmites), and monitoring the success of the revegetation and weed control efforts. Provide this plan to the FERC staff upon request.

6. Until a project-specific wetland restoration plan is developed and/or implemented, temporarily revegetate the construction right-of-way with annual ryegrass at a rate of 40 pounds/acre (unless standing water is present).

7. Ensure that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species.

8. Remove temporary sediment barriers located at the boundary between wetland and adjacent upland areas after revegetation and stabilization of adjacent upland areas are judged to be successful as specified in section VII.A.4 of the Plan.

D. POST-CONSTRUCTION MAINTENANCE AND REPORTING

Wetlands within the Project footprint will be permanently filled and mitigated for by creation of tidal marsh at an offsite location. Design, construction, and monitoring of the mitigation site will be by approval of the U.S. Army Corps of Engineers, the Mississippi Department of Marine Resources, and other regulatory agencies. Companies will file copies of its plans, approvals, and monitoring reports with the Secretary for review and approval by the Director.

1. Do not conduct routine vegetation mowing or clearing over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of pipeline coating may be selectively cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in wetlands that are between HDD entry and exit points.

2. Do not use herbicides or pesticides in or within 100 feet of a wetland, except as allowed by the appropriate federal or state agency.

3. Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of wetland areas.

4. Monitor and record the success of wetland revegetation annually until wetland revegetation is successful.

5. Wetland revegetation shall be considered successful if all of the following criteria are satisfied:

   a. the affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation);

   b. vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction;

   c. if natural rather than active revegetation was used, the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and

   d. invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.

6. Within 3 years after construction, file a report with the Secretary identifying the status of the wetland revegetation efforts and documenting success as defined in section VI.D.5, above. The requirement to file wetland restoration reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advance notice provisions in the FERC's regulations.

   For any wetland where revegetation is not successful at the end of 3 years after construction, develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan to actively revegetate wetlands. Continue revegetation efforts and file a report annually documenting progress in these wetlands until wetland revegetation is successful.

VII. HYDROSTATIC TESTING

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply for state-issued water withdrawal permits, as required.

2. Apply for National Pollutant Discharge Elimination System (NPDES) or state-issued discharge permits, as required.

3. Notify appropriate state agencies of intent to use specific sources at least 48 hours before testing activities unless they waive this requirement in writing.

B. GENERAL

1. Perform 100 percent radiographic inspection of all pipeline section welds or hydrotest the pipeline sections, before installation under waterbodies or wetlands.

2. If pumps used for hydrostatic testing are within 100 feet of any waterbody or wetland, address secondary containment and refueling of these pumps in the project's Spill Prevention and Response Procedures.

3. The project sponsor shall file with the Secretary before construction a list identifying the location of all waterbodies proposed for use as a hydrostatic test water source or discharge location. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

C. INTAKE SOURCE AND RATE

1. Screen the intake hose to minimize the potential for entrainment of fish.

2. Do not use state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and/or local permitting agencies grant written permission.

3. Maintain adequate flow rates to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.

4. Locate hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable.

D. DISCHARGE LOCATION, METHOD, AND RATE

1. Regulate discharge rate, use energy dissipation device(s), and install sediment barriers, as necessary, to prevent erosion, streambed scour, suspension of sediments, or excessive streamflow.

2. Do not discharge into state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and local permitting agencies grant written permission.

APPENDIX F

Gulf LNG Unanticipated Discoveries and Emergency Procedures

CULTURAL RESOURCES INVENTORY OF THE PROPOSED GULF LNG LIQUEFACTION PROJECT – JACKSON COUNTY, MISSISSIPPI

Archeological or historical sites occasionally are discovered during construction projects, regardless of whether the project area has been subjected to a complete and thorough cultural resources survey and archeological inventory. As a result, Gulf LNG Liquefaction Company, LLC has planned for unanticipated archeological discoveries. When the initial steps in the Section 106 process (i.e., the identification and evaluation of historic properties) indicate that historic properties are likely to be discovered as a result of an undertaking, an unexpected discoveries plan generally is developed for the treatment of such properties. This plan often is included as documentation submitted to the State Historic Preservation Officer (SHPO) as part of the effort to assess the effects of the undertaking (36 CFR 800.11 [a]). This document represents such a plan.

If unanticipated cultural resources are discovered, several steps will be undertaken. Initially, Gulf LNG Liquefaction Company, LLC will make reasonable efforts to avoid or minimize the damage to the cultural resource (36 CFR 800.11 [b][3]). If significant cultural resources are discovered, the SHPO will be contacted immediately and they will be advised, and the Federal Energy Regulatory Commission (FERC) also will be informed. As much information as possible concerning the cultural resource, such as resource type (archeological or architectural), location, and size, as well as any information on its eligibility, will be provided to the SHPO and to the FERC. Then, if required, a mitigation plan will be prepared for the cultural resource discovered. This plan will be sent to the SHPO and to the FERC archeologist for review and comment. The parties involved will be expected to respond with preliminary comments in a timely manner, and final comments will be expected relatively soon after the special request is made. Gulf LNG Liquefaction Company, LLC policy will be to avoid further destruction to the resource until a formal data recovery mitigation plan can be executed.

Disposition of Human Remains

The discovery and/or disturbance of human remains is a sensitive issue that must be addressed if the situation arises. It is possible that human remains could be encountered if an unmarked grave or a cemetery is impacted by the planned undertaking. If human remains are discovered inadvertently or cannot be avoided, treatment of the remains will comply with applicable portions of the Antiquities Law of Mississippi (Mississippi Code Sections 39-7-1 *et seq.*) and, if applicable, the Policy on Granting Burial Excavation Permits (October 11, 1985 of the Mississippi Department of Archives and History).

In practice, Gulf LNG Liquefaction Company, LLC will make a reasonable effort to identify and locate parties who can demonstrate direct kinship with the interred individuals. If such people are located, Gulf LNG Liquefaction Company, LLC will consult with them in a timely manner to determine the most appropriate treatment of the recovered burials. If the unanticipated discovery consists of Native American human remains or associated funerary remains, then Gulf LNG Liquefaction Company, LLC will consult the SHPO and the FERC archeologist immediately regarding the appropriate measures to handle such a discovery. If it can be determined adequately that the disturbed burials have an affinity to any federally recognized Native American group or to other ethnic groups, a reasonable effort will be made to identify, locate, and notify leaders or representatives of these groups.

If an association with a specific Native American group or other ethnic group cannot be made, then Gulf LNG Liquefaction Company, LLC will make a reasonable effort to locate and notify group(s) that may have a legitimate interest in the disposition of the remains based on a determination of generalized cultural affinity by a recognized professional. Qualified groups will be provided an opportunity to consult in determining the appropriate treatment of the interment. It will be the claimants' responsibility, however, to document and validate their claim.

Gulf LNG Liquefaction Company, LLC or its agents will treat all discovered human remains with dignity and respect until they are re-interred. Any costs that accrue as a result of consultation, treatment, curation, etc., will be the responsibility of Gulf LNG Liquefaction Company, LLC. If human remains are exposed inadvertently during construction, Gulf LNG Liquefaction Company, LLC will proceed as in the case of a normal emergency discovery situation. The county medical examiner or coroner will be notified; the SHPO and the FERC also will be contacted immediately. A qualified professional archeologist will investigate the reported discovery within two days. Written authorization of excavation or re-interment of any historic graves also will be obtained.

Based on previous correspondence and the requirements submitted with respect to this Project, the following agencies and/or Native American Tribes may need to be contacted, as appropriate, in the event of discovery and/or disturbance of unanticipated human remains:

Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426
202-502-8046

Mississippi Department of Archives and History
Historic Preservation Division
Jim Woodrick, Division Director
P. O. Box 571
Jackson, MS 39205-0571
601-576-6908

Jackson County Sheriff's Office
Charles Britt, Sheriff
3104 Magnolia St.
Pascagoula, MS
228-769-3024

Jackson County Coroner's Office
Vicki Broadus, RN, Coroner
4111 Amonett Street
Pascagoula, MS
228-769-3197

FEDERALLY-RECOGNIZED GROUPS
Eastern Band of Cherokee Indians
Principal Chief Michell Hicks
P.O. Box 455
Cherokee, North Carolina 28719
828-497-7000

Mississippi Band of Choctaw Indians
Kenneth H. Carleton
Tribal Historic Preservation Officer/Archaeologist
101 Industrial Road
Choctaw, MS 39350
601-650-7316

APPENDIX G

Gulf LNG Spill Prevention, Control, and Countermeasure (SPCC) Plan

The Critical Energy Infrastructure Information in this Spill Prevention, Control and Countermeasure Plan have been removed from the Public Version.

KINDER MORGAN

Natural Gas Business Unit

SPILL PREVENTION, CONTROL, AND COUNTERMEASURE (SPCC) PLAN – SECTION A

Date of Current PE Certification: 8/16/2013

Date of Next SPCC Review: 8/16/2018

The following Plan has been updated to conform to the newly revised internal format for SPCC Plans. Although this Plan is consistent with federal requirements for SPCC Plans, the existence of this Plan for this facility does not necessarily reflect the determination that an SPCC Plan is required under federal law for this facility. The Plan for this facility may be established as a result of internal evaluations of appropriate facility management unrelated to federal requirements.

Kinder Morgan Corporate SPCC Template, Version 13 – March 2013

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SPCC PLAN – SECTION B

1.0 Summary of SPCC Activities

Periodically, the maintenance of this SPCC Plan includes inspection of oil storage tanks and equipment, training of facility personnel, and record keeping. These actions are summarized below, with certain activities requiring documentation as noted below and within the SPCC Plan. For any questions regarding this SPCC document or changes, contact the EHS Department for assistance.

Table 1. Summary of SPCC Activities

Frequency	Activity	SPCC Plan Reference	
		Section	Subsection
In the event of a spill or release	Contact Gas Control to issue an Emergency Response Line (ERL) Notification	A B	Section 5.1 Appendix B
Containment Draining	Document secondary containment drainage	A B	Section 6.9 (3) Appendix G
Every 5 years	Plan Re-Certification by PE	A B	Sections 3.1, 3.3 Appendix A
Every 5 years	Plan Review by Management	A B	Section 3.3 Appendix F
Monthly	Monthly Visual Inspection using Monthly Inspection Checklist in plan or equivalent	A B	Section 6.2 (1), (3) Appendix I
Annually	Annual Visual Inspection documented using the Annual Inspection Checklist in plan or equivalent	A B	Section 6.2 (2), (3) Appendix I
Annually	Provide SPCC Refresher training for oil-handling employees. (See OpsInfo action item for detail)	A	Section 6.3 (1), (2)
Annually	Provide Spill Briefing during a regularly scheduled safety meeting (See OpsInfo action item for detail)	A B	Section 6.3 (3) Appendix I
Always	Record keeping	A	Section 6.2 (5) Section 6.3 (1)
Changes to facility or structure	Notify EHS of changes to facility storage tanks or SC, such as tank additions, changes, removals, or repairs	A	Section 3.3

Section A contains Kinder Morgan's Natural Gas Business Unit SPCC procedures, contact information, and reporting requirements (e.g., general plan).

Section B contains site-specific information, including facility location, products and equipment, storage tanks, and secondary containment information located in the appendices (e.g. site-specific plan).

2.0 General Applicability and Scope

[Citation: 40 CFR §112.1(b); 112.3(a)&(e); 112.7(a); 109.3]

As required by Federal and State oil storage, transfer, and spill removal regulations, this Spill Prevention, Control, and Countermeasure Plan (SPCC Plan or Plan) has been prepared for the Kinder Morgan Natural Gas Business Unit in accordance with the following provisions:

- **Federal Spill Prevention, Control, and Countermeasure (SPCC) Requirements** (40 CFR §112) – Oil Pollution Prevention at non-transportation related facilities meeting the following criteria:
  - Due to its location, could reasonably be expected to discharge oil in quantities that may be harmful into or upon the navigable waters of the United States or adjoining shorelines; and
  - Having a completely buried storage capacity in excess of 42,000 gallons of oil, excluding the capacity of a completely buried tank and connected underground piping, underground ancillary equipment, and containment systems, that is currently subject to all of the technical requirements of 40 CFR 280 or 281 (Underground Storage Tank regulations); or
  - Having an aggregate aboveground oil storage capacity in excess of 1,320 gallons, excluding containers with a capacity less than 55 gallons.

- **State Discharge Notification Requirements** – Notification to the State and/or local emergency agencies in the event of a spill or release (See Section 5.0 for additional Citation and details)

The intended purpose of this SPCC Plan is to manage potential sources of oil releases, preclude a release to the environment, and outline appropriate initial responses in the event of an oil spill which could threaten human health or the environment.

A complete copy of this SPCC Plan is maintained at the facility, if the facility is normally attended at least four hours per day, or otherwise at the nearest regional field office and will be available to the EPA Regional Administrator for onsite review during normal workings hours. This SPCC Plan consists of two parts:

- **Section A** contains Kinder Morgan Natural Gas Business Unit SPCC procedures, contact information, and reporting requirements
- **Section B** contains site-specific information, including facility location, products and equipment, storage tanks, and secondary containment, located in the Appendices

3.0 Certifications and Reviews

In accordance to Federal SPCC requirements, a licensed Professional Engineer has reviewed and certified this Plan as adequate. Such certification will in no way relieve the owner or operator of a facility of his duty to prepare and fully implement both Section A and Section B of such Plan in accordance with the requirements. (Cf. 40 CFR §112.3(d)(2))

3.1 PROFESSIONAL ENGINEER CERTIFICATION

[40 CFR §112.3(d)]

"I hereby certify that being familiar with the provisions of the SPCC rules (40 CFR §112), attest that this SPCC plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of the SPCC rules. I also certify that procedures for required inspections and testing have been established."

Professional Engineer: BRIAN LAINE

State Registration No.: 19099

Registration State: MISSISSIPPI

16-AUGUST-2013
Date of PE Certification

BRIAN C. LAINE
LICENSED PROFESSIONAL ENGINEER
PE-19099
STATE OF MISSISSIPPI

3.2 MANAGEMENT COMMITMENT CERTIFICATION

[40 CFR §112.7(d)]

"Kinder Morgan is committed to the implementation of the procedures outlined in this SPCC Plan and the prevention of releases of oil to navigable waters of the United States and the environment. This SPCC Plan is approved by the management personnel below at a level of authority to commit the necessary resources to fully implement the Plan."

Terminal manager 8-20-13
Signature, Title Date

3.3 SPCC PLAN REVIEWS AND AMENDMENTS

[40 CFR §112.5]

In accordance with SPCC regulations, this SPCC Plan will be reviewed periodically for changes. The next scheduled SPCC review for Section A will be conducted 5-years from the current PE review and certification (as dated in Section 3.1); the next scheduled SPCC review for each Section B will be conducted within 5-years from the current PE review and certification, as stamped in Section B. Documentation of the SPCC Plan reviews is in Appendix F and any required corrective actions in Appendix H. Amendments to the SPCC Plan, if any, will dictate whether the Plan will require a PE review and certification.

Technical amendments, such as changes to the facility's design, operation, or maintenance that *materially affect* the potential for an oil spill or release at the facility, will require a PE review and certification as soon as possible but within six (6) months after any changes. Technical amendments include:

- Adding, replacing, or removing of tanks
- Reconstruction, replacement, or installation of piping systems
- Construction, alteration, or demolition of secondary containment
- Modifications of testing, inspection, and maintenance procedures

Administrative amendments, such as changes to the facility's personnel or contact information that *does not materially affect* the potential for an oil spill or release at the facility, will not require a PE review and certification. Administrative amendments can be made as necessary and include:

- Changes or updates to facility personnel or contact information
- Changes to training materials
- Other non-technical text changes

Any amendments made to the SPCC Plan will be implemented as soon as possible but not later than six (6) months following the preparation of the amendment. Amendments to Section A will be documented in Section 3.4 of Section A. Amendments to Section B will be documented in Appendix F,.

3.4 **SPCC PLAN AMENDMENT LOG – PART A**

Date of Amendment	General Description of Change Made[1]	Page Numbers of Changes	Name of Re-Certifying PE[2]	Name of Person Completing Amendment

Date of Amendment	General Description of Change Made[1]	Page Numbers of Changes	Name of Re-Certifying PE[2]	Name of Person Completing Amendment

Date of Amendment	General Description of Change Made[1]	Page Numbers of Changes	Name of Re-Certifying PE[2]	Name of Person Completing Amendment

4.0 General Facility Information

[40 CFR §112.7(a)(3)]

4.1 COMPANY INFORMATION

Facility Name

Kinder Morgan Natural Gas Business Unit

Facility Locations

Kinder Morgan Natural Gas Business Unit is associated with approximately 62,000-miles of natural gas pipelines throughout the United States. The facility location information is available in Appendix C, Figure 1.

Facility Owner/Operator

Kinder Morgan
1001 Louisiana Street, Suite 1000
Houston, TX 77002
Office Phone: (713) 369-9000

4.2 FACILITY DESCRIPTION

Kinder Morgan Natural Gas Business Unit primarily engages in operating natural gas compressor stations. Other operations include natural gas gathering, natural gas processing plants, meter and regulation stations, underground storage facilities, and other associated operations. The facility infrastructure may include aboveground bulk storage tanks, oil-filled operational equipment, and transfer areas. Oil products related to the maintenance and operation of the each facility are stored in the aboveground bulk storage tank(s).

Site specific facility information is included in Part B of this SPCC Plan.

4.3 FACILITY OIL STORAGE

[40 CFR §112.7(a)(3)&(k)]

Oil, as defined in 40 CFR §112.2, is stored at the facility. An inventory of the materials at the facility that are regulated under this SPCC Plan is presented in Appendix D. The locations of oil storing bulk storage tanks and other qualified oil-filled equipment may be found on the Facility Plot Plans, in Appendix C, Figure 2.

The facility utilizes engines and other equipment that are appurtenances to a DOT-regulated pipeline in order to keep the gas flowing. While the equipment above may store oil, it is utilized for the continuous operation of the DOT-regulated pipeline; therefore, that equipment and associated oil are transportation-related onshore facilities within DOT jurisdiction and are not included in this plan.

4.4 PROXIMITY TO NAVIGABLE WATERS

[40 CFR §109.5(b)(1)]

The closest navigable water body to a facility is identified on the figure in Appendix C. Surface drainage at a facility is governed by surface topography and the general directions of surface drainage are identified on the Facility Plot Plan.

5.0 Spill Response and Notification

[40 CFR §112.4(a); 112.7(a)(3)-(5)]

5.1 SPILL RESPONSE PROCEDURES

In the event of a spill or release, utilize the Kinder Morgan Emergency Response Line (ERL) system by notifying Kinder Morgan Gas Control and implement the facility Emergency Response Plan. The ERL process is designed to enhance and facilitate real-time communication of emergency events to all necessary Kinder Morgan stakeholders of incidents, including operations, corporate personnel, EHS, and local, state, or federal agency. Where required, notification to the agencies will be made by Kinder Morgan via the ERL system. In the event the ERL system is unavailable, notification can be made directly by the facility using the contact information provided in Appendix B and the Emergency Response Plan. The facility's Emergency Response Plan, which was developed in accordance with Kinder Morgan O&M Procedure 1900, contains all elements of a required oil spill contingency plan, as described in 40 CFR §109. Pertinent sections of the Emergency Response Plan for this SPCC Plan are as follows:

- **O&M Form OM1900-02 – Facility Personnel Responsibilities**
- **O&M Form OM1900-03 – Primary Notification Contacts**
- **O&M Form OM1900-04 – Emergency Contacts**
- **O&M Form OM1900-06 – Emergency Shutdown Device Locations**
- **O&M Form OM1900-07 – Facility Isolation**
- **O&M Form OM1900-10 – On Site Emergency Response Equipment**
- **O&M Form OM1900-11 – Contractors and Available Equipment**

Kinder Morgan has developed the ERL Incident Communication Protocol that will be followed in the event of a spill. The Incident Commander will direct the initial spill response actions. At a minimum, the following steps will be taken to reduce the magnitude of the spill and initiate containment and cleanup:

1. Account for personnel, assure their safety, and evacuate if a fire, explosion, or exposure hazard exists;
2. Remove all sources of ignition and position fire suppression equipment. Alert the local Fire Department if necessary;
3. Shut off pumps and close valves that allow fuel to flow to the segment of the system causing the spill. Plug or patch leak/discharge if possible;
4. Alert adjacent property owners/operators, as warranted by the incident;

5. As safety allows, attempt to contain the spill. Prevent or divert spilled fuel from approaching structures or draining towards water or storm drains using spill response material, such as sorbent material, spark-proof shovels, brooms, neoprene gloves, and other materials;
6. The Primary facility contact will conduct a safety assessment and determine additional cleanup actions, as needed; and
7. Update the Reportable Spill History Log in Section B, Appendix D.

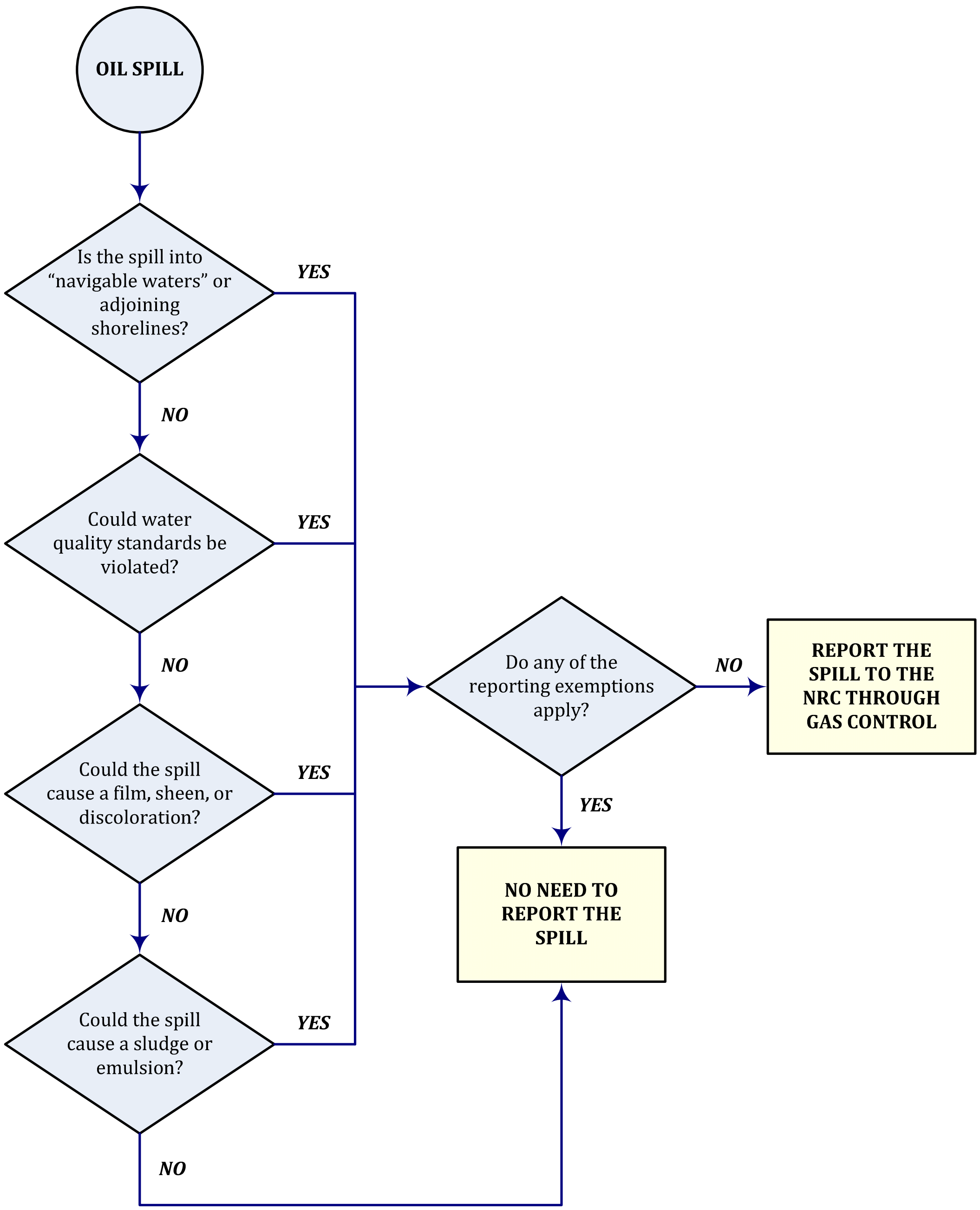
For all occurrences, the Incident Commander and the ERL System protocol will evaluate the incident for any additional requirements.

5.2 NATIONAL RESPONSE CENTER NOTIFICATION

[40 CFR §116]

Certain spills or releases of oil products must be reported to the National Response Center (NRC), as determined using the following flowchart.

Figure 1. NRC Federal Agency Reporting Flowchart



When notifying the National Response Center, provide the following information:

- Exact address or location
- Contact information of the Incident Commander
- Date and time of incident
- Type of oil discharged
- Estimated quantity discharged outside of containment

5.3 EPA DISCHARGE NOTIFICATION

[40 CFR §112.4(a)]

In the event of a release of any kind, implement the ERL System to determine if the release is immediately reportable to State or Federal Agencies. The EPA requires notification for any release or discharge, in any form, from this facility directly or indirectly into or upon the navigable waters of the United States or its adjoining shorelines with more than:

- 1,000-gallons in a single discharge, or
- 42-gallons in each of two or more discharges occurring within any consecutive 12-month period

Contact EHS to document the discharge details for submittal to the EPA's Regional Administrator (RA) within sixty-days (60) of the spill event using the "*EPA Release Notification Form*," available in the Appendix I or an equivalent form.

5.4 STATE AND LOCAL AGENCY NOTIFICATION

The State Agencies may also require notification of an oil spill or release to the appropriate agency office. Where required, notification to the State and Local Agencies will be made by Kinder Morgan via the ERL system.

6.0 Prevention Methods Provided

6.1 DRAINAGE CONTROL/DIVERSIONARY STRUCTURES AND CONTAINMENT

[40 CFR §112.7(c & d)]

A complete description of secondary containment and/or diversionary structures or equipment for each storage unit and petroleum-handling unit at the facility is included in Appendix D. Appendix D includes a description of the type of containment, material of construction, and containment capacity for each secondary containment structure.

The containment and/or diversionary structures or equipment to prevent a discharge at the facility are practicable.

6.2 INSPECTIONS AND RECORD KEEPING

[40 CFR §112.7(e)&(k); 112.8(c)(6)]

(1) Bulk Storage Tanks and Operational Oil-Filled Equipment

On a monthly basis, facility personnel will visually inspect the outside of all aboveground containers and equipment for signs of deterioration, discharges, or accumulation of oil inside secondary containment areas and document the inspection using the Monthly SPCC Inspection Checklist available in Appendix I or an equivalent checklist. Accumulated precipitation that will prevent the berms from containing the volume of the largest tank shall be removed in accordance with Section 6.8 of this SPCC Plan. In addition, secondary containment and bermed areas will be visually inspected after abnormally heavy rainfall events.

Drums or totes brought on-site are built or tested to the standard(s) or in-process inspection and testing procedures established by the drum manufacturer or the drum recycler, as applicable. While on site, drums will be visually inspected and documented at least monthly.

(2) Integrity Testing

Pursuant to 40 CFR 112.8(c)(6), integrity testing must be conducted on a regular schedule and when material repairs are made. The type of integrity testing to be conducted has been determined in accordance with industry standards including the appropriate qualifications for personnel performing tests and inspections, the frequency and type of testing and inspections, which take into account container size, configuration, and design (such as containers that are: shop-built, field-erected, skid-mounted, elevated, equipped with a liner, double-walled, or partially buried). "For shop-built containers of 30,000-gallons or less, where all sides of the container are visible or where all sides of the container are visible except the bottom and the bottom is sitting on an adequately designed, maintained, and inspected synthetic liner,"[3] annual visual inspections will be utilized. For tanks meeting this criteria, the Annual Checklist for External Condition Examination of Appendix I, or equivalent will completed by December 31 of each year. Kinder Morgan's tank integrity testing and inspection policy is outlined in the EHS Policy: SPCC Tank Integrity Testing.

In addition to periodic, regular integrity testing, the SPCC rule also requires frequent visual inspection. Kinder Morgan's policy is to conduct these general visual inspections at least monthly.

Integrity testing scope and schedules are centrally maintained in Kinder Morgan's Environmental Management Information System, OpsInfo.

(3) Aboveground Pipes, Valves, and Appurtenances

All aboveground pipes, valves, and appurtenances will be inspected on a monthly basis. The inspection will include an assessment of the general condition of flange joints, expansion joints, valve glands and bodies, catch pans, pipeline supports, locking of valves, and metal surfaces.

(4) Buried Pipes, Valves, and Appurtenances

All buried pipes, valves, and appurtenances will be integrity and leak tested at the time of installation, modification, construction, relocation, or replacement.

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[3] Cf. "SPCC Guidance for Regional Inspectors." Version 1.1, Section 7. February 3, 2006

(5) Record Keeping

Document the monthly inspection using the checklist available in Appendix I or an equivalent checklist. The inspection checklist will be used to document the occurrence and description of inspections and integrity testing performed at the facility. Signed and dated records of inspections and other pertinent information, such as spills, removal and disposal of spill contaminated materials, replacement or repair of equipment, and training are kept at the facility office for a minimum of 3 years.

6.3 PERSONNEL TRAINING AND SPILL PREVENTION PROCEDURES

[40 CFR §112.7(f)]

(1) Personnel Instructions

Personnel operating the facility are instructed on job responsibilities and duties. They are under the direct supervision of the facility manager who is responsible for establishing daily performance and duty guidelines. Training for oil-handling employees includes:

- Operation and maintenance of equipment to prevent the discharge of oil;
- Discharge procedures and protocols (cleanup methods and notification);
- Applicable pollution control laws, rules, and regulations;
- General facility operations, which includes instruction in proper inspection techniques, record keeping, and inventory control procedures; and
- The contents of the facility SPCC Plan.

Successful completion of this annual training includes successful completion of the Computer Based Training (CBT) for all oil-handling personnel. A written record of all training is maintained for a minimum of 3 years.

(2) Designated Person Accountable for Spill Prevention

The on-duty operator of the facility is the primary person accountable for spill prevention. This position is staffed on a rotating basis and thus no one person is accountable for spill prevention on site. The facility manager has the authority to commit all resources and personnel necessary for spill prevention and control at the facility. Unmanned facilities are intermittently inspected by on-duty personnel. The Gas Control Department is the primary responsible party outside of normal business hours. Refer to Appendix B for the contact information for the Kinder Morgan Gas Control and Federal and State agencies.

(3) Spill Prevention Briefings

SPCC spill prevention briefings are held at least once a year to assure adequate understanding of the SPCC Plan for the facility. Briefings will highlight and describe known discharges as described in 40 CFR §112.1(b), or failures, malfunctioning components, and recently developed precautionary measures. Spill prevention briefings will be documented using the Spill Prevention Briefing Record form in Appendix I or an equivalent form.

6.4 **SITE SECURITY**

[40 CFR §112.7(g)]

Site security measures are provided commensurate with the type of facility and facility location. Per SPCC regulation, onshore non-production facilities will comply with the site security requirements of 40 CFR §112.7(g) and onshore production facilities are not required to maintain site security measures.

6.5 **FACILITY LOADING/UNLOADING OPERATIONS**

[40 CFR §112.7(h)]

Occasionally, natural gas condensates and other wastes may be taken from the facility and oil may be delivered to the facility by tank trucks. Facility or delivery personnel are present during all loading and unloading events in designated areas Spill kits are available during loading and unloading operations to address minor spills or releases. Actions to contain and report any spills resulting from the truck loading/unloading would be immediate.

Where loading and unloading racks are available, the rack transfer area is provided with secondary containment to hold at least the maximum capacity of any single compartment of a tank car or tank truck. Warning signs, wheel chocks, or a complete vehicle walk-around are used at the loading/unloading racks to prevent vehicles from departing before complete disconnection of flexible or fixed transfer lines. The drivers remain with the trucks during transfer operations to monitor the transfer; inspect outlets, connections, and valves on the tanker truck before and after the transfer; and make adjustments as necessary.

All tank truck drivers are required to comply with Department of Transportation (DOT) regulations in 49 CFR Part 177 and facility standard operating procedures. All drivers must

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[4] As described in the EPA's "SPCC Guidance for Regional Inspectors." Version 1.1, Section 3.3.1. February 3, 2006.

be authorized and certified by Kinder Morgan or its subsidiaries to load or unload product at the facility. Truck loading and unloading procedures are maintained by the facility.

6.6 EVALUATION OF FIELD-CONSTRUCTED ABOVEGROUND CONTAINERS

[40 CFR §112.7(i)]

All field-constructed aboveground containers and tanks that are repaired, altered, or reconstructed will be evaluated for risk of discharge or failure due to brittle fracture or other catastrophe. In addition, if there has been a change in service that might affect the risk of a discharge or failure due to fracture or other catastrophe, a brittle fracture tank evaluation will be completed. Based on the results of the evaluation, appropriate action will be taken.

6.7 CONFORMANCE WITH OTHER APPLICABLE GUIDELINES

[40 CFR §112.7(j)]

Sections A and B of this plan provide detailed discussions of conformance with the applicable requirements and other effective discharge prevention and containment procedures used at the facility. State environmental agency spill prevention and reporting requirements and state oil and gas commission spill prevention and reporting requirements have been included in this plan where applicable. In the event of a reportable release, notification to Federal, State and local agencies will be made by Kinder Morgan via the ERL system.

6.8 FACILITY DRAINAGE

[40 CFR §112.8(b)]

Surface drainage within the facility is governed by surface topography. drainage flow arrows on the Facility Plot Plan indicate the general direction of flow for each site.

(1) Drainage from Diked Storage Areas

Within secondary containment structures, drainage is restrained by manual release valves. Precipitation that may accumulate in the containment areas is normally allowed to evaporate. If removal of the retained water within the containment structure is necessary, it will be inspected for the presence of oil (surface sheen) prior to discharge to ensure no oil will be discharged.

(2) Valves Used on Diked Area Storage

Diked or bermed areas at the facilities are at times equipped with drainage valves. Where drain valves are installed, flapper-type drain valves are not used to drain diked areas.

(3) Facility Drainage Systems from Undiked Areas

The undiked areas of the facility are limited to areas that contain aboveground transfer piping and operational equipment, whose primary purpose is not the storage of oil in bulk. A typical release from piping would consist of minor drips/leaks. For sites with aboveground piping located in undiked areas, the facility is equipped with spill kits and absorbents to be used as secondary containment in the event of a leak from the above ground piping. This type of active containment is appropriate to prevent discharged oil from reaching a navigable watercourse.

Storage vessels at the facility are generally provided with some type of secondary containment, such as earthen berms, concrete curbs, or steel containment rings. Regular inspections are made by facility operators and any leaks or releases from the tanks or transfer lines will be immediately contained using on-site spill control equipment such as absorbent pads, socks, and granular absorbent. General surface drainage patterns at the facility are shown on the Facility Plot Plans, Figure 2 in Appendix C.

(4) Final Discharge of Drainage

Drainage off the properties follows natural drainage patterns, governed by surface topography. Any spill/flow originating from any storage vessels considered in this SPCC Plan would be contained within a berm, in an on-site stormwater pond, or with absorbent materials. No oil would be discharged from the property.

Personnel and equipment are available to construct additional emergency containment basins or dikes that would contain any spill. Spilled oil that might accumulate will be contained with portable booms and recovered using a vacuum truck, pump, or other appropriate method, and then be properly disposed of or recycled.

(5) Facility Drainage for Multiple Unit Treatment Systems and Equipment:

Not applicable; there is not a multiple unit treatment system with continuous treatment of drainage waters occurring at the facility.

6.9 BULK STORAGE TANKS/SECONDARY CONTAINMENT

[40 CFR §112.8(c)]

(1) Tank Compatibility with its Contents

Materials used for all storage tanks are compatible with the product stored and the conditions of storage.

(2) Diked Area Construction and Containment Volume for Storage Tanks

Generally, all bulk storage units are located within secondary containment structures large enough to contain the entire contents of the largest tank in the containment structure while allowing for adequate freeboard to contain precipitation events. Appendix D includes a description of the type of containment and containment capacity. Detailed berm capacity calculations are provided in Appendix E of this SPCC Plan. Containment structure locations are shown in Figure 2 in Appendix C. For any case where the secondary containment is inadequately sized, an oil spill contingency plan (OSCP) will be incorporated into Section B the SPCC plan.

(3) Diked Area Inspection and Drainage of Rainwater

Prior to removal of accumulated water, precipitation that accumulates within diked or bermed areas is visually inspected for an oil sheen and only released to the ground if no sheen is present. If an oil sheen is evident, absorbent mats and pigs are used to trap the oil and then the water is released. If there is a considerable amount of oil, the water is removed using a vacuum truck. Removed water is disposed of in accordance with applicable local, state, and federal regulations. Any water removed from the containment areas via vacuum truck is not required to be inspected prior to removal.

Prior to the release of the water from the containment area, the responsible personnel visually inspect the water in the containment structure and note the appearance of the water in the Secondary Containment Drainage Log included in Appendix G of this SPCC Plan or an equivalent log. This log is also used to record the name of the employee draining the containment as well as the date, time, and approximate quantity of water removed. Water removed from the containment area via vacuum truck is not recorded in this log because it is not released to the surrounding area.

Accumulated precipitation that will prevent the berms from containing the volume of the largest tank will be removed in accordance with Section 6.8 of this SPCC Plan. In addition, diked and bermed areas will be visually inspected after abnormally heavy rainfall events.

(4) Corrosion Protection of Buried Metallic Storage Tanks

Not applicable; there are no completely buried metallic tanks at the facility that are SPCC-regulated.

(5) Corrosion Protection of Partially Buried Metallic Storage Tanks

Not applicable; there are no partially buried metallic tanks at the facility that are SPCC-regulated.

(6) Aboveground Tank Inspections

On a monthly basis, personnel will visually inspect the outside of all aboveground containers for signs of deterioration, discharges, or accumulation of oil inside diked areas and document the inspection on the monthly inspection checklist available in Appendix I or an equivalent checklist. Details on Kinder Morgan's Tank Integrity Testing Program can be found in Section 6.2(2) of this document.

(7) Control of Leakage through Internal Heating Coils

Generally, steam heating coils are not utilized for bulk storage tanks. Where applicable, internal steam heating coils will be monitored for contamination at the steam returns and exhaust line.

(8) Engineered Overflow Prevention Features

The bulk-oil storage containers at the facility are equipped with overflow prevention devices. See Appendix D for a list of these features. All overflow prevention devices are inspected and tested as part of the bulk storage tank examination and inspection protocol identified in Section 6.2 of this SPCC Plan.

(9) Observation of Disposal Facilities for Effluent Discharge

Where facility effluent treatment systems are utilized, the facility will inspect the system for possible upsets that could cause a discharge of oil.

(10) Visible Oil Leak Corrections from Tank Seams and Gaskets

On-site personnel immediately repair any visible oil leaks at the facility. Any spilled oil is cleaned up immediately using on-site spill response equipment and supplies.

(11) Appropriate Position of Mobile or Portable Oil Storage Tanks

Where applicable, mobile or portable oil storage tanks are positioned and/or located within secondary containment to prevent discharges of oil.

6.10 FACILITY TRANSFER OPERATIONS

[40 CFR §112.8(d)]

(1) Buried Piping Installation Protection and Installation

Kinder Morgan has developed procedures for protecting buried metallic pipelines from external corrosion in conformance with applicable codes, accepted industry practices and company specifications (Kinder Morgan O&M No. 903, "*External Corrosion Control for Buried or Submerged Pipelines*"). These procedures require that the Operations Supervisor evaluate their external corrosion control program with responsible corrosion personnel each calendar year. The following conditions are included in the program.

All buried piping that is installed or replaced on or after August 16, 2002 are provided with protective wrapping and coating and cathodic protection, or otherwise satisfy the corrosion protection provisions for piping in 40 CFR Part 280 or a state program approved under 40

CFR §281. Buried piping installed or replaced prior to August 16, 2002 are provided with protective wrapping and coating and cathodic protection if soil conditions warrant. Any buried equipment will be visually inspected for corrosion whenever exposed through excavation. Further inspection and correction will be conducted on the affected metal equipment if problems are identified.

(2) Not-in-Service and Standby Service Terminal Connections

When an oil transfer pipe is not in service or is in a standby service for an extended period of time, such as six months or greater, the pipe is ball-plugged or blind-flanged at the transfer point and is marked as to their tie-in connection.

(3) Pipe Support Design

All pipe supports at the facility are designed to minimize abrasion and corrosion and to allow for expansion and contraction. Pipe supports are routinely inspected as part of the general facility inspections described in Section 6.2 of this SPCC Plan.

(4) Aboveground Valve and Pipeline Examination

All aboveground valves and pipelines are routinely inspected as described in Section 6.2 of this SPCC Plan.

(5) Aboveground Piping Protection from Vehicular Traffic

Vehicular traffic is warned by clearance signs to ensure that vehicles will not endanger aboveground piping at the facility.

6.11 POTENTIAL FOR EQUIPMENT FAILURE

[40 CFR §112.7(b)]

An inventory of the materials at the facility that are regulated under this SPCC Plan is presented in Appendix D. This table outlines a variety of information including bulk and operational equipment storage units, product content, and secondary containment capacities.

6.12 FACILITY RESPONSE PLANS

[40 CFR §112.20 and §112.21]

This facility does not meet any of the Substantial Harm Determination criteria defined in *40 CFR §112.20* and does not require a Facility Response Plan. Certification of Substantial Harm Determination is included in Appendix I.

Gulf LNG Energy, LLC
a Kinder Morgan, GE company

Pascagoula, Mississippi

SPILL PREVENTION, CONTROL, AND COUNTERMEASURE (SPCC) PLAN – SECTION B

Date of Current PE Certification: 8/16/2013

Date of Next SPCC Review: 8/16/2018

Table of Contents

SPCC PLAN – SECTION B

Appendix A – Professional Engineer Certification

[40 CFR §112.3(d); 112.7(d)]

In accordance to Federal and State requirements, a licensed Professional Engineer has reviewed and certified this SPCC Plan – Part B as adequate. Such certification shall in no way relieve the owner or operator of a facility of his duty to prepare and fully implement both Section A and Section B of such Plan in accordance with the requirements.

PROFESSIONAL ENGINEER CERTIFICATION

"I hereby certify that I (or my agent) have visited and examined the facility, and being familiar with the provisions of 40 CFR §112, attest that the SPCC Plan is adequate for the facility and the secondary containment at the facility is adequate and built in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of the SPCC rules (40 CFR §112)."

Professional Engineer: BRIAN LAINE

State Registration No.: 19099

Registration State: MISSISSIPPI

16-AUGUST-2013

Date of PE Certification

BRIAN C. LAINE
LICENSED PROFESSIONAL ENGINEER
PE-19099
STATE OF MISSISSIPPI

DECLARATION OF THE AGENT FOR THE PROFESSIONAL ENGINEER

"I served as an agent for the Professional Engineer certifying this SPCC Plan by visiting the site, examining the facility, and providing technical details of the site layout and features, including but not limited to the dimensions of secondary containment."

Brian Gilliland Terminal Manager 8-20-13

Signature, Title Date

Appendix B – SPCC Contact Information

In the event of a spill or release, utilize the Kinder Morgan Emergency Response Line (ERL) system by notifying the Kinder Morgan Gas Control. Refer to the facility Emergency Response Plan for additional personnel and emergency contact information.

CONTACT	ROLE	PHONE NUMBER
Spill Notification:		
Kinder Morgan Gas Control	Emergency Response Line (ERL)	(800) 252-5960
Agency Notification:		
National Response Center (NRC)	Reportable Spill Notification	(800) 424-8802, 24-hour hotline
US EPA	Reportable Spill Notification	(866) 372-7745, 24-hour hotline
Mississippi DEQ Spill Notification	State Spill Notification	(601) 961-5171
Mississippi EMA	State Spill Notification	(800) 222-6362 (601) 832-8224, 24-hours
Jackson County EMA Earl Ethridge	Local Spill Notification	(228) 769-3111
Jackson County Fire Department	Emergency Services	(228) 769-3110
Pascagoula Fire Deparment	Emergency Services	(228) 762-3066
Jackson County Sheriff Dept.	Emergency Services	(228) 769-3064
Pascagoula Police Dept.	Emerency Services	(228) 762-2211

Appendix C – SPCC Figures

Facility Information

FACILITY NAME

Kinder Morgan Natural Gas Business Unit – Gulf LNG Energy, LLC

FACILITY LOCATION

Facility Address: 125 Industrial Road, Pascagoula, MS 39581

(GPS Coordinates: 30.324454°, -88.504052°)

FACILITY OWNER/OPERATOR

Kinder Morgan – Gulf LNG Energy, LLC
125 Industrial Road
Pascagoula, MS 39581
Office Phone: (228) 202-3651

FACILITY DESCRIPTION

Gulf LNG Energy is a liquefied natural gas (LNG) receiving terminal, storage, and gasification facility in Jackson County Mississippi, southeast of the City of Pascagoula. LNG is supplied and delivered to Gulf LNG via LNG carriers, unloaded, stored in two LNG storage tanks, regasified, and delivered by sendout pipe to metering facilities which connect to nearby, third-party-owned, interstate natural gas transmission systems which supply United States gas markets, as well as a gas treatment facility. The facility includes storage facilities for oil, as defined in 40 CFR §112.2.

PROXIMITY TO NAVIGABLE WATERS

Gulf LNG Energy is a port facility located immediately on the Bayou Casotte Channel in the Mississippi Sound.

Figure 1. Location Map (not to scale)

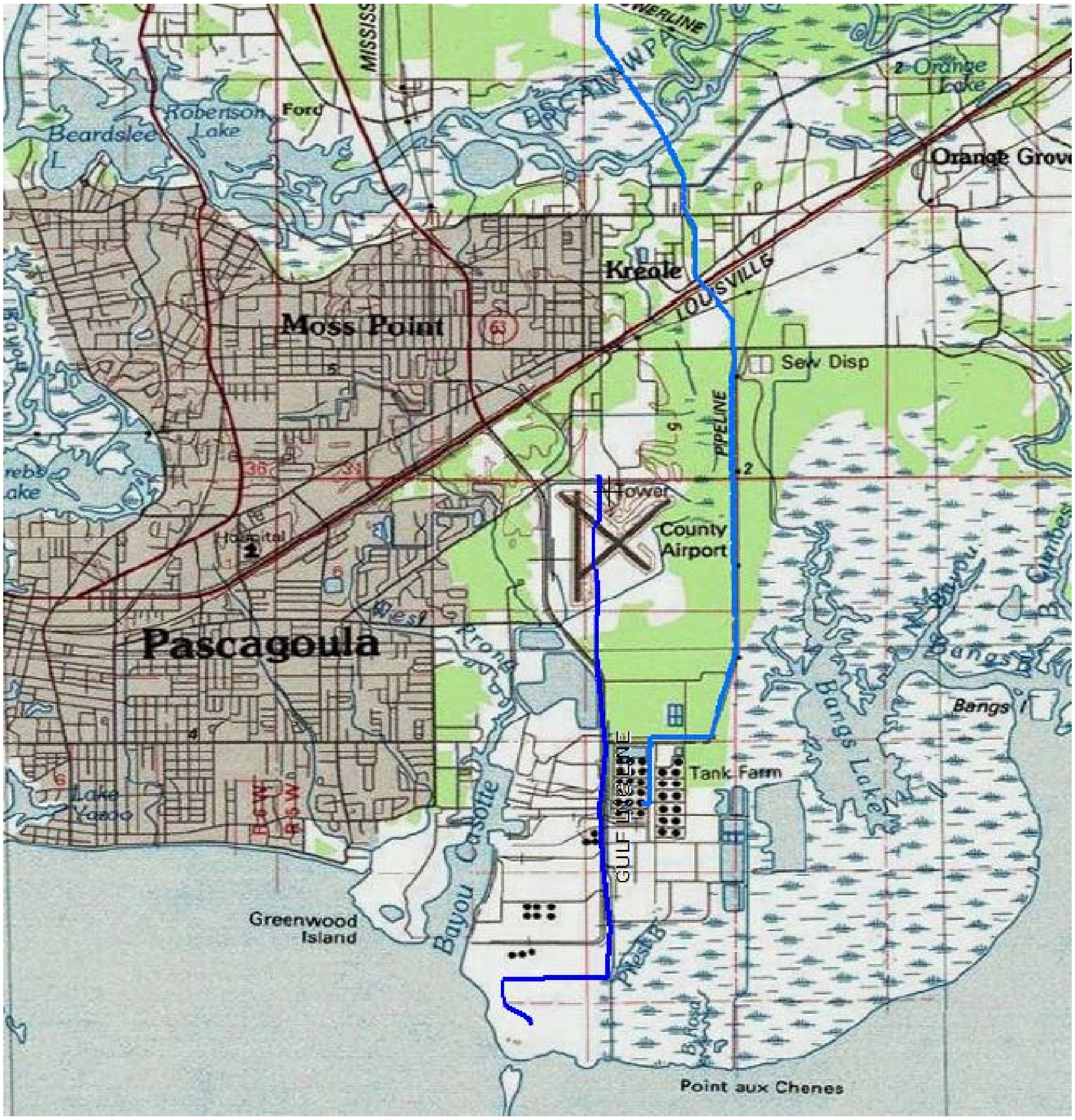

Figure 2. Facility Aerial Image

Appendix D – Bulk Storage and Transfer Area Tables

Appendix E – Secondary Containment Capacity Calculations

Appendix F – SPCC Plan Review and Amendment Logs

SPCC Plan Review Log

DATE OF REVIEW	REPRESENTATIVE, NAME AND TITLE	SIGNATURE	SPCC PLAN REVIEW FINDING (SELECT ONE)
			☐ I have completed review and evaluation of the SPCC Plan and WILL amend the Plan as a result. ☐ I have completed review and evaluation of the SPCC Plan and WILL NOT amend the Plan as a result.
			☐ I have completed review and evaluation of the SPCC Plan and WILL amend the Plan as a result. ☐ I have completed review and evaluation of the SPCC Plan and WILL NOT amend the Plan as a result.
			☐ I have completed review and evaluation of the SPCC Plan and WILL amend the Plan as a result. ☐ I have completed review and evaluation of the SPCC Plan and WILL NOT amend the Plan as a result.
			☐ I have completed review and evaluation of the SPCC Plan and WILL amend the Plan as a result. ☐ I have completed review and evaluation of the SPCC Plan and WILL NOT amend the Plan as a result.

[4] Note whether the change(s) are technical amendment, administrative amendment, or a 5-year review. Technical changes will require a PE re-certification. See Section 2.1 for additional information on amendment requirements to this SPCC Plan.

[5] Non-technical or administrative changes do not require a PE certification.

Appendix G – Containment Drainage Log

Containment Drainage Log

Date	Storage Unit	Cause of Liquid Accumulation	Appearance (Visual, odor, etc.)	Quantity Removed, Est. (Gallons or Inches)	Method of Removal and Disposal	Inspected By:
	*Previous Containment Drainage Logs are with the previous SPCC Plan Revision 5 (2013-04-10)					

Appendix H – Corrective Action Implementation Table

SPCC Corrective Actions

Issue / Deficiency	Proposed Corrective Action	Proposed Completion Date of Corrective Action	Actual Completion Date of Corrective Action	Name, Title and Signature Indicating that Corrective Action Was Completed

Appendix I – Forms, Logs, and Checklists

MONTHLY SPCC INSPECTION CHECKLIST

Date of Inspection: ______________ Facility/Location: ________________________________

Inspector Name and Signature: ____

INSPECTION ITEMS	ACCEPTABLE (Yes/No/NA)	CORRECTIVE ACTION*
A. BULK-STORAGE TANKS		
1. Seam integrity (no visible leaks)		
2. Equalizer lines are open		
3. Hi/Lo level alarms/shutdowns are operating (tested annually)		
4. Vacuum protection is unobstructed		
5. Tanks' hatches are latched closed		
6. Inspection for external tank corrosion		
7. Corrosion protection system is operating		
8. Tank foundations have not lost integrity (visual)		
9. Soil is not in contact with tank sides		
10. Drain valves are locked and/or blind-flanged		
11. Test liquid level sensing devices for proper operation		
12. Interstitial space of double-walled tanks shows no leaks using visual inspection or alarm indicator		
B. SECONDARY CONTAINMENTS		
1. Berms/firewalls have not eroded or lost integrity		
2. Foundation of firewall has not eroded		
3. Seals in joint of firewalls are intact		
4. Drain valves are closed and locked/sealed		
5. Drain valves have bull plugs or blind-flanges (unmanned locations)		

INSPECTION ITEMS	ACCEPTABLE (Yes/No/NA)	CORRECTIVE ACTION*
C. VESSELS AND EQUIPMENT		
1. Valve glands and bodies are in good condition		
2. Flange joints are properly aligned and tightened		
3. Gauge glasses are intact and operating		
4. Drip pan drains are unobstructed		
5. Equipment inspection for external corrosion		
D. PIPING AND PIPELINES		
1. Inspection for external corrosion		
2. Hi/Lo pressure shutdowns are operating (tested annually)		
3. Leak test performed after repairs		
4. Pipe supports adequately supporting pipe or pipeline		
5. Corrosion protection system is operating		
E. GENERAL FACILITY		
1. Drain ditches, catch basins, ponds are oil free and operating properly		
2. Loading ground line is being used properly		
3. Security gates are locked on a daily basis		
4. Have had agency reportable oil spills of 1,000 gallons or have had two or more spills or 42-gallons this year?		
5. Spill kit(s) contents are adequate		

* Describe the corrective action(s) taken, referencing the number from above:

____

____

____

ANNUAL CHECKLIST FOR EXTERNAL CONDITION EXAMINATION

Date of Inspection: ________________ Facility Name: ____

Tank Name/ID: ____

Inspector Name and Signature: ____

By December 31 of each year, complete this visual inspection for each tank which qualifies for frequent visual inspections. Retain a copy of the completed checklist for 36 months (3 years). Checklist follows API and STI Inspection Standards and guidelines for tank inspections. For questions on this checklist please contact your EHS representative.

INSPECTION ITEMS	ACCEPTABLE (Yes/No/NA)	CORRECTIVE ACTION*
A. IDENTIFICATION		
1. Size		
2. Date of Prior Inspection		
3. Measured or Estimated Liquid Level		
4. Tank Material		
5. What type of support is tank situated on (concrete, soil, etc.)?		
6. Contents		
B. FOUNDATION		
1. Tank properly supported, supports in good condition?		If NO, add follow up action to be taken and comments below.
2. Cracking or spalling of concrete pad or ring wall?		If yes, add follow up action to be taken and comments below.
3. Evidence of settlement or foundation washout?		If yes, add follow up action to be taken and comments below.
4. Grounding strap in good condition?		If NO, add follow up action to be taken and comments below.

Comments:

____

____

____

INSPECTION ITEMS	ACCEPTABLE (Yes/No/NA)	CORRECTIVE ACTION
C. TANK BOTTOM		
1. Visible signs of leakage around tank bottom?		If YES, add follow up action to be taken and comments below.
2. Inadequate drainage away from tank?		If YES, add follow up action to be taken and comments below.
Comments:		
D. TANK SHELL		
1. Active leaks?		If yes, add follow up action to be taken and comments below.
2. Signs of past leakage?		If yes, add number, location, and comments below.
3. Problems with structural integrity (Distortions, Warping)?		If yes, add type, location, and comments below.
4. Coating condition unsatisfactory?		If yes, add type, location, and comments below.
5. Evidence of paint failure?		If yes, add type, location, and comments below.
6. Severe corrosion and/or pits?		If yes, add type, location, and comments below.
Comments:		
E. ROOF DECK		
1. Holes?		If yes, add type, location, and comments below.
2. Inadequate drainage off of deck?		If yes, add type, location, and comments below.
3. Coating condition unsatisfactory?		If yes, add type, location, and comments below.
4. Severe corrosion and/or pits?		If yes, add type, location, and comments below.
Comments:		

INSPECTION ITEMS	ACCEPTABLE (Yes/No/NA)	CORRECTIVE ACTION
F. VENTING		
1. Vents free of obstruction?		If NO, add follow up action to be taken and comments below.
2. Thief hatch and vent valve seals air tight?		If NO, add follow up action to be taken and comments below.
3. Emergency vent operable? Lift as required?		If NO, add follow up action to be taken and comments below.
4. All tank openings properly sealed?		If NO, add follow up action to be taken and comments below.
Comments: ______________________________ ______________________________ ______________________________		
G. INSULATED TANKS		
1. Insulation in good condition?		If NO, add follow up action to be taken and comments below.
2. Are there noticeable areas of moisture on insulation?		If yes, add type, location, and comments below.
3. Mold on insulation?		If yes, add follow up action to be taken and comments below.
4. Is the insulation sufficiently protected from water intrusion?		If NO, add follow up action to be taken and comments below.
Comments: ______________________________ ______________________________ ______________________________		
H. TANK CONTAINMENT		
1. Containment structure in satisfactory condition?		If NO, add follow up action to be taken and comments below.
2. Drainage pipes/valves fit for continued service?		If NO, add follow up action to be taken and comments below.
3. Tank area clear of trash and vegetation?		If NO, add follow up action to be taken and comments below.
Comments: ______________________________ ______________________________ ______________________________		

INSPECTION ITEMS	ACCEPTABLE (Yes/No/NA)	CORRECTIVE ACTION
I. APPURTENANCES/MISCELLANEOUS		
1. Gas blanket system operational (if applicable)?		If NO, add follow up action to be taken and comments below.
2. Stairways/walkways structurally sound?		If NO, add follow up action to be taken and comments below.
3. Proper warning signs in place?		If NO, add follow up action to be taken and comments below.
4. If fiberglass tanks, all metal parts bonded or gas blanket operational?		If NO, add follow up action to be taken and comments below.
5. Cathodic protection system operational?		If NO, add follow up action to be taken and comments below.
6. Rectifier Reading?		
7. Pipeline properly supported?		If NO, add follow up action to be taken and comments below.
8. Flanged connection bolts tight and fully engaged with no sign of wear or corrosion?		If NO, add follow up action to be taken and comments below.
9. Has the liquid level sensing device been tested to ensure proper operation?		If NO, add follow up action to be taken and comments below.
10. Tank liquid level gauge readable and in good condition?		If NO, add follow up action to be taken and comments below.
11. Are overfill protection devices in proper working condition?		If NO, add follow up action to be taken and comments below.
12. Is electrical equipment in good condition? (grounding lines, lights, control boxes, etc.)		If NO, add follow up action to be taken and comments below.
Comments: ______________________________ ______________________________ ______________________________		
J. OTHER		
1. Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?		If yes, add type, location, and comments below.
Comments: ______________________________ ______________________________ ______________________________		

SPILL PREVENTION BRIEFING RECORD

INSTRUCTIONS: Briefings will be scheduled and conducted by the owner or operators for operating personnel at intervals frequent enough to assure adequate understanding of the SPCC plan for this facility. These briefings should also highlight and describe known spill events or failures, malfunctioning components, and recently developed precautionary measures. During these briefings there will be an opportunity for facility operators and other personnel to share recommendations concerning health, safety and environmental issues encountered during operation of the facility.

NOTE: This spill briefing is separate from the **annual** SPCC training for oil-handling personnel.

Date: ______________________________

Attendees:

____

____

____

____

____

Subjects and Issues:

____

____

____

____

____

Recommendations and Suggestions:

____

____

____

____

____

CERTIFICATION OF SUBSTANTIAL HARM DETERMINATION

1. Does the facility have a maximum storage capacity of oil greater than or equal to 42,000-gallons and do the operations include over water transfers of oil to or from vessels?

   [ ] Yes [✓] No

2. Does the facility have a maximum storage capacity of oil greater than or equal to 1,000,000-gallons and is the facility without secondary containment for each aboveground storage area sufficiently large to contain the capacity of the largest aboveground storage tank within the storage area?

   [ ] Yes [✓] No

3. Does the facility have a maximum storage capacity of oil greater than or equal to 1,000,000-gallons and is the facility located at a distance such that a discharge from the facility could cause injury to an environmentally sensitive area?

   [ ] Yes [✓] No

4. Does the facility have a maximum storage capacity of oil greater than or equal to 1,000,000-gallons and is the facility located at a distance such that a discharge from the facility would shut down a public drinking water intake?

   [ ] Yes [✓] No

5. Does the facility have a maximum storage capacity of oil greater than or equal to 1,000,000-gallons and within the past 5-years has the facility experienced a reportable spill in an amount greater than or equal to 10,000-gallons?

   [ ] Yes [✓] No

SUBSTANTIAL HARM CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

Brian Gilliland Terminal Manager 8-20-13

Signature, Title Date

Table 1. Reportable Spill History Log[1]

Spill Date	Spill Amount	Description and Location of Spill	Written Notification Date	Corrective Action Taken	Was SPCC Plan Amendment? (Y/N)

[1] As reportable per the National Response Center

EPA RELEASE NOTIFICATION FORM

INCIDENT DESCRIPTION

Reporter's Name ____________________ Title ____________________

Office Phone No. ____________________ Mobile Phone No. ____________________

Facility Address ____

County ____________________ Owner's Address ____________________

Spill Location ____

____

Source/Cause of Discharge ____

____

____

Date & Time of Discharge ____

Spilled Product ____________________ Est. Quantity ____________________

Water Impact ☐ Yes ☐ No If yes, Est. Qty into Water ____________________

RESPONSE ACTION(S)

Action(s) taken to Correct, Control, or Mitigate Release: ______

Any Injuries ______ Any Fatalities ______

Evacuation Needed ______ Number Evacuated ______

Description of Impacted Media: ______

Notification(s)

(Check all that have been contacted)

- ☐ National Response Center (NRC). (800) 424-8802
- ☐ State
- ☐ Fire
- ☐ Police
- ☐ Others

Appendix J – SPCC Plan Regulation Cross Reference

This SPCC Plan has been prepared in accordance with 40 CFR Part 112 and is organized as specified in the aforementioned regulation. The following cross-reference provides the location of the requirements listed in 40 CFR Part 112 and the equivalent requirements in this Plan.

Regulatory Cross-Reference Table

SPCC RULE CITATION	DESCRIPTION OF RULE	SECTION(S)
§112.1	General Applicability and Scope	2.0
§112.3	Requirement to Prepare and Implement SPCC Plan	---
(a)	Applicablility	2.0
(d)	Professional Engineer Certification	3.1, Appendix A
(e)	Plan Availability	2.0
§112.4	EPA Regional Adminstrator Notification Requirements	5.3, Appendix I
§112.5	Ammendment of the SPCC Plan	3.3, 3.4, Appendix F
§112.7	General requirements for SPCC Plans	---
(a)(1)&(2)	General requirements	2.0, Appendix J
(a)(3)	Physical Layout	4.0, Appendices C & D
(a)(4)&(5)	Response Plans	5.0, Appendices C & D
(b)	Reasonable potential for equipment failure	6.11, Appendices C & D
(c)	Secondary containment	6.1, 6.8, 6.9, Appendix D
(d)	Contingency planning	3.2, 5.1, 6.1
(e)	Inspections, tests, and records	6.2, Appendices G, H, & I
(f)	Employee training and discharge prevention procedures	6.3
(g)	Security (excluding oil production facilities)	6.4
(h)	Loading/unloading (excluding offshore facilities)	6.5

SPCC RULE CITATION	DESCRIPTION OF RULE	SECTION(S)
(i)	Brittle fracture evaluation requirements	6.6
(j)	Conformance with State requirements	6.7
(k)	Qualified Operational Oil-Filled Equipment	4.3, 6.2, Appendices C & D
§112.8	Requirements for onshore facilities (excluding production facilities)	---
(a)	General and specific requirements	2.0, 4.0, 5.0,
(b)	Facility drainage	6.8
(c)	Bulk storage containers	6.1, 6.8, 6.9, Appendices C & D
(d)	Facility transfer operations, pumping, and facility process	6.5, 6.10
§112.20	Substantial Harm Determination	6.12, Appendix I

APPENDIX H

Gulf LNG Plan for Unanticipated Discovery of Hazardous Materials

Plan for the Unanticipated Discovery of Hazardous Materials

Gulf LNG Liquefaction Company, LLC
a Kinder Morgan operated company

Gulf LNG Liquefaction Company, LLC,
Gulf LNG Energy, LLC and
Gulf LNG Pipeline, LLC

569 Brookwood Center, Suite 749
Birmingham, AL 35209

August 2015

Plan for the Unanticipated Discovery of Hazardous Materials

KINDER MORGAN INC.

Plan for the Unanticipated Discovery of Hazardous Materials

CONTENTS

1.0 Plan for the Unanticipated Discovery of Hazardous Materials

Contaminated soils or other, undocumented hazardous materials could be encountered during construction of the proposed Terminal and pipeline facilities. If such materials, as defined in applicable federal, state, and local regulations and guidelines, are encountered during construction of the Gulf LNG Liquefaction Project ("the Project"), Gulf LNG Liquefaction Company, LLC, Gulf LNG Energy, LLC, and Gulf LNG Pipeline Company, LLC (together "Companies") would implement the Plan for the Unanticipated Discovery of Hazardous Materials.

The procedures in this Plan for the Unanticipated Discovery of Hazardous Materials provide a basic framework for identifying and managing identified hazardous materials. Because of the wide range of properties and characteristics of "hazardous" materials, it is not practical to prepare a single, concise plan to address the investigation and management of unknown quantities of hazardous materials with a wide spectrum of hazardous characteristics. As a result, this Plan for the Unanticipated Discovery of Hazardous Materials is short and general, and is meant to apply to identification of relatively small volumes of hazardous materials with correspondingly "low" hazardous characteristics. In the event that large quantities of hazardous materials, or extremely hazardous substances are identified during construction, Companies will procure the services of a qualified third-party contractor to perform and/or oversee the initial investigation and potentially, sampling, removal, and disposal of impacted media. In such a case, this Plan for the Unanticipated Discovery of Hazardous Materials may be supplemented by the qualified third-party contractor with other, more intensive investigation and management measures that are specific to the suspected chemicals of concern.

2.0 Procedures

The procedures described below would be used to determine the extent, nature, and disposition of suspected contamination in areas which would be impacted by construction. The intent of these procedures is to mitigate impacts from unanticipated contaminated media during construction activities. This plan for management and handling of contaminated media encountered during construction includes the following:

- Excavation or subsurface activities;
- Contaminated media classification;
- Contaminated material handling and disposal requirements; and
- Dewatering and sedimentation control.

Potentially contaminated soil, material, and/or groundwater may be encountered during excavation, dewatering, or other Project construction activities. Typically, these media are identified by olfactory evidence (i.e., odors) or visual evidence (i.e., stained or discolored soil). In some cases, the presence of containers commonly associated with waste disposal, such as 55-gallon drums or 5-gallon buckets, might be indicative of the presence of potentially contaminated media.

A photo-ionization detector (PID) or similar device may be used by Companies' qualified third-party contractor to perform initial screening of soils suspected of being impacted by volatile organic compounds (e.g., gasoline, diesel, and hydraulic fluid, expected to be the most likely sources). Elevated PID readings will be verified through sampling and analysis. Sampling will be completed by the Companies' qualified third-party contractor. Once the PID has been "calibrated" with analytical data, the PID may be used to segregate impacted soils. Depending on the results of soil sample analysis, Companies may require collection and analysis of groundwater samples.

3.0 Management and Notification

The environmental inspectors ("EIs") will be responsible for ensuring that the contractor manages Project-related materials (e.g., soil and groundwater) in accordance with the Project permit conditions. In the event that the discovery of hazardous wastes or contaminated sites occurs, Companies would perform the following steps:

- Stop work associated with the hazardous wastes or contaminated sites;
- Cordon off or otherwise restrict access to the suspected area;
- Notify the EIs and construction manager;
- Secure the services of a qualified third-party contractor, if necessary;
- Notify the landowner(s) of the subjected parcel(s); and
- Consult with appropriate local, state, or federal regulatory agencies (as appropriate) with respect to the management and/or disposal of contaminated media.

4.0 Contaminated Material Storage

The construction contractor, under the supervision of the Companies' Environmental Manager and Inspectors, would identify where to stockpile or how to store suspected contaminated materials, including excavated spoils, or collected contaminated water.

An EI, in consultation with a qualified third-party contractor, if necessary would ensure that excavated materials, in particular contaminated material, are managed appropriately so as not to further spread environmental contaminants. Classifications such as "uncontaminated material," "non-hazardous contaminated material," or "hazardous materials" will be utilized to identify and manage material at the construction site. These material categories will be confirmed by chemical laboratory testing and appropriately managed in accordance with this Plan for the Unanticipated Discovery of Hazardous Materials. Materials will be managed in the interim period between detection or identification and receipt of analytical results (and ultimately disposal) in accordance with all applicable federal, state, and local government guidelines and regulations.

5.0 Safe Working Conditions

Where applicable, the construction contractor would be required to observe the following general provisions, which may be subject to alterations based on site conditions, to allow safe working conditions in performance of the work:

- All workers who will be managing, handling, or otherwise exposed to contaminated material will be appropriately trained for this task in accordance with all applicable federal, state, and local government guidelines and regulations;
- Allow EIs and/or a qualified third-party contractor to monitor material to determine requirements for handling and testing, along with disposition requirements for off-site disposal or treatment;
- Segregate excavated material based on field screening performed by the EIs and/or a qualified third-party contractor during excavation;
- Directly haul excavated, contaminated material off site to an off-site location approved by the Companies’ EI and/or a qualified third-party contractor and avoid stockpiling of such material on site whenever possible;
- Do not remove regulated material from the site for disposal or treatment without an approval for off-site disposal at a permitted landfill and a United States Environmental Protection Agency (“EPA”) hazardous waste manifest for off-site disposal or treatment of hazardous waste;
- Maintain Project documentation with accurate records of environmental conditions within the Project work area, material tracking and disposal transportation manifests, and disposal certifications. Documentation may include daily and monthly status reports or minutes of meetings;
- Suspend work in the area and notify Companies’ EIs and/or a qualified third-party contractor if the presence of potentially hazardous conditions is evident. These conditions include, but are not limited to, buried containers, drums or tanks, or explosive conditions due to contaminated vapors. Secure the area in order to restrict access until the conditions can be resolved;
- Observe appropriate provisions when transporting excavated material, including: handling material within established right-of-way limits, cleaning any material from public streets, covering all trucks during material handling, and transporting contaminated material in accordance with applicable agency solid waste and hazardous waste regulations;
- Observe appropriate provisions when stockpiling excavated material, including: avoiding soil stockpiles whenever possible by direct hauling of excavated materials off site for disposal, managing site grades to facilitate surface drainage, and preventing dust and leaching from stockpiles (by covering and utilizing temporary

berms or silt fence barriers). The EIs and/or a qualified third-party contractor will routinely inspect stockpiles during construction and record inspection observations; and

- Stockpiled materials classified as hazardous waste will be appropriately handled by storing the excavated material in containers, tanks, or a containment building in accordance with state agency and Resource Conservation and Recovery Act ("RCRA") provisions for the less-than-90-day storage permit exemption [40 Code of Federal Regulations ("CFR") 262.34].

6.0 Dewatering Systems and Treatment

Design and operation of the dewatering systems, including treatment if necessary, would be completed by Companies' contractor. The dewatering systems will be designed to limit migration of potentially contaminated groundwater. Companies' contractor will prevent erosion or sedimentation from stockpiled material or other construction areas, obtain all required treatment and discharge permits (in accordance with federal, state, and local publicly owned treatment works' ("POTWs") requirements), and arrange for sampling and analysis of water as required by permit conditions.

The Companies' EI and/or a qualified third-party contractor will prepare a brief report discussing the investigation from discovery to disposal for each discrete area of contaminated soils or other, undocumented hazardous materials identified. The report will include basic information regarding the discovery date/method, sampling methods and procedures, materials management procedures, rationale for analytical methods chosen, results, and recommended disposal practices. Appended to each report will be complete copies of the chain of custody for each sample, the analytical report, and manifests/disposal records as appropriate.

APPENDIX I

Gulf LNG Storm Water Pollution Prevention Plan

DRAFT
Storm Water Pollution Prevention Plan for the Gulf LNG Liquefaction Project

Gulf LNG Liquefaction Company, LLC

Gulf LNG Energy, LLC

569 Brookwood Village, Suite 749
Birmingham, Alabama 35209

Summary

Gulf LNG Liquefaction Company, LLC ("GLLC") and Gulf LNG Energy, LLC ("GLE") (together "Companies"), are developing the proposed Gulf LNG Liquefaction Project ("Project"), which will add liquefaction and export capabilities to GLE's existing Gulf LNG Terminal ("Terminal") located in Jackson County, Mississippi (Figures 1 and 2, Attachment B). On June 19, 2015, GLLC and GLE filed an application with the Federal Energy Regulatory Commission ("FERC") in Docket No. CP15-521 pursuant to Section 3 of the Natural Gas Act, requesting authority to construct and operate new natural gas liquefaction and export facilities at GLE's existing liquefied natural gas ("LNG") regasification Terminal located in Jackson County, Mississippi, near Pascagoula. Additionally, pursuant to Section 7(c) of the Natural Gas Act and FERC regulations, Gulf LNG Pipeline ("GLP") notified the FERC that minor modifications will be made to the existing pipeline facilities that currently interconnect with the Terminal under GLP's blanket authorization from the FERC.

The Project facilities will allow liquefaction of domestic natural gas delivered by pipeline; storage of the LNG in the Terminal's existing LNG storage tanks, and loading of the stored LNG into LNG carriers ("LNGCs") via the Terminal's existing marine berthing facility. The Terminal will retain its current capability to receive, store, regasify, and deliver natural gas into the interstate pipeline system, as originally constructed, thereby making the Terminal bi-directional in terms of LNG import and export.

This Stormwater Pollution Prevention Plan ("SWPPP") has been prepared to support a Large Construction Notice of Intent for the construction activities associated with development of the Project. The Project also includes the construction of two marine off loading facilities designed and engineered to accommodate typical construction and transportation barges. Marine facility structures will be constructed from waterborne construction platforms. The construction activities associated with the marine facility are not addressed in this SWPPP as the work will be subject to storm water controls dictated by the conditions of the Application for Rivers and Harbors Act Section 10, Clean Water Act Section 404 Permit and Section 401 Water Quality Certification, which is being coordinated by the U.S. Army Corps of Engineers ("USACE") and Mississippi Department of Marine Resources ("MDMR"). The Mississippi Department of Environmental Quality ("MDEQ") Large Construction Storm Water General Permit ("LCGP") MSR10 outlines a set of provisions construction operators must follow to comply with the requirements of the National Pollution Discharge Elimination System ("NPDES") storm water regulations.

Development, implementation, and maintenance of this SWPPP will provide GLLC and its construction contractor with the framework for reducing soil erosion and minimizing pollutants in storm water during construction of the Project.

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TO BE PROVIDED DURING DETAILED ENGINEERING

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Appendix A: Supporting Calculations

TO BE PROVIDED DURING DETAILED ENGINEERING

1.0 INTRODUCTION

This Storm Water Pollution Prevention Plan ("SWPPP") has been prepared for the construction activities associated with the expansion of the Terminal site and construction of Project facilities, which are illustrated on Figure 1. The Project also includes the construction of a marine facility consisting of two Marine Offloading Facilities ("MOFs") and a salt marsh wetland mitigation site. Marine facility structures will be constructed from waterborne construction platforms. The construction activities associated with the marine facilities are not addressed in this SWPPP as the work will be subject to approval of the Application for Rivers and Harbors Act Section 10, Clean Water Act Section 404 Permit and Section 401 Water Quality Certification, which are being coordinated by the Mississippi Department of Marine Resources ("MDMR") and the U.S. Army Corps of Engineers ("USACE").

The Mississippi Department of Environmental Quality ("MDEQ") Large Construction Storm Water General Permit ("LCGP") MSR10 outlines a set of provisions construction operators must follow to comply with the requirements of the National Pollution Discharge Elimination System ("NPDES") storm water regulations. The LCGP covers site over five acres and will be adhered to, as required, by GLLC.

Development, implementation, and maintenance of this SWPPP will provide GLLC with the framework for reducing soil erosion and minimizing pollutants in storm water during construction of the Project.

2.0 PROJECT FACILITIES AND SITE DESCRIPTION

2.1 Project Facilities

The Project facilities applicable to this SWPPP will consist of the following major components:

- Construction Support Areas ("CSAs")
- Salt Marsh Wetland Mitigation Site
- Facility Expansion
  - Metering facilities
  - Pipeline modifications
  - Pretreatment facilities
  - Liquefaction Trains
  - Ship loading modifications
  - Storm surge protection /containment wall extension
  - Utilities and support facilities

2.2 Site Condition – Before Construction

The existing site conditions are described as an existing LNG Terminal facility and vegetated land with elevations ranging from approximately three feet above sea level to thirteen feet above sea level. The uplands at the site were historcially formed by the unconfined placement of dredged material. The Bayou Casotte Dredged Material Management Site ("BCDMMS") is currently utilized by the USACE and the Port of Pascagoula for placement of dredged material from the Bayou Casotte Channel. Outside of extraordinary events, the USACE has no plans for additional disposal of dredge material to be deposited into BCDMMS until 2021 (post-construction start). Impacts to wetlands will be mitigated for as required by the conditions of the Joint Permit and Notification filed with the Mississippi Department of Marine Resources in June 2015. Site drainage runs from the uplands to the surrounding wetlands and thence to Mississippi Sound. All storm water falling within the BCDMMS is contained and will continue to be contained within a containment dike.

2.3 Site Condition – After Construction

The entire site will be stabilized with gravel, concrete, and grass. All drainage inside the storm surge protection wall will be routed into a storm water wet well and will be pumped out into the Mississippi Sound. The storm surge protection wall will prevent sediment from leaving the site. Portions of the site will be expanded into the existing the BCDMMS, relocating a segment of the existing containment dike. Roads within the existing and expanded facility will be paved. A new paved permanent access road will be constructed from the storm surge protection wall to the flare tower. A temporary heavy haul road will be constructed from the existing access road to the dikes, to the north and south MOFs. A total of approximately 135.4 acres will be disturbed for the construction of the Terminal and associated temporary and permanent access roads.

2.4 Adjacent Properties

Adjacent properties include:

- The BCDMMS, which is located northeast of the existing Terminal
- The Chevron Pascagoula refinery, which is located north of the Terminal access road along its east-west corridor.

2.5 Soils

The area to be disturbed for the construction of the Project facilities generally consists of poorly draining, slowly permeating soils typical of those in marshes. Based on historical information, the existing terminal and surrounding area were submerged under the waters of the Mississippi Sound as recently as 1952. Soil borings completed during the geotechnical investigations for the original Terminal identified 35 to 50 feet of very soft to soft clays and very loose to loose sands and silts across the area and verify the extent of fill material added to this area. A significant portion of the property to be developed with the expansion of the existing terminal is currently located within the BCDMMS, an area that was also submerged under the waters of the Mississippi Sound. Soils are loose or soft in consistency and include sand, silt, sandy clays, and clayey sands. The water table is high and soils are saturated much of the year. Underlying this upper varied layer is a thick deposit of highly compressible soft gray clay containing lenses and pockets of fine sand. In the BCDMMS area, as expected, the surface soils consist of very soft to soft clays (dredged material). A significant portion (approximately 46 acres) of the land around the existing terminal that will be impacted by the proposed Project is currently within the BCDMMS. The BCDMMS is used by the USACE Mobile District for placement of dredged materials from maintenance activities in the Pascagoula Harbor area. Although the soils in this area are mapped as mucky sandy clay loam, frequently flooded, as described above, surface soils in this area are most likely former dredged material that has been deposited in the past 60 years over formerly submerged areas. Like the surface soils that currently underlie the existing terminal, these soils may or may not possess the chemical and physical characteristics of the Axis mucky sandy clay loam, frequently flooded.

Existing meter stations to be modified are located on loamy sands while the two MOFs, the North MOF and the South MOF, will be constructed in the open waters of the adjacent west Mississippi Sound, but outside the limits of the Bayou Casotte Shipping Channel. The North MOF will be a permanent structure while the South MOF will be used only during construction. The North MOF will be constructed adjacent to north edge of the existing Terminal and the existing marine berthing facility. The South MOF will be constructed adjacent to the south edge of the existing Terminal and the existing marine berthing facility. Since these will be constructed in open water and are not relevant to the SWPPP, brief references will be made but, no further detailed discussion will be included in this document.

At CSAs 1, 2, 3, 4, and 6, minor ground disturbing activities, such as leveling and surface improvement with aggregate, are proposed in upland areas consisting of silty loam, loamy sand, and fine sandy loam. At CSA 5, GLLC intends to clear the entire site and fill the onsite wetland areas in order to maximize the amount of useable space during construction, and to provide access to the Project site. Soils in this area consist of mucky sandy clay loam, frequently flooded.

2.6 Receiving Waters

2.6.1 Surface Water

The Project is located adjacent to the Mississippi Sound, south of the entrance to Bayou Casotte. The Mississippi Sound is a relatively shallow elongated estuary separated from the Gulf of Mexico by barrier islands and bounded on the north by small bays, marshes, bayous, rivers, and coastal beaches.

It is located in the Mississippi Coastal watershed or Coastal Streams Basin (U.S. Geological Survey ("USGS") cataloging number 03710009) which lies within the South Atlantic Gulf Region, Pascagoula Sub-region, and Pascagoula Mississippi Accounting Unit. The Mississippi Coastal watershed drains southern Mississippi with ultimate discharge into the Gulf of Mexico. The majority of the watershed falls within Harrison and Hancock Counties, with smaller portions encompassing Jackson, Stone, Pearl River, and Lamar Counties, as well as portions of Alabama.

2.6.2 Total Maximum Daily Loads

The Total Maximum Daily Load ("TMDL") is a calculation of the maximum amount of a pollutant a water body can receive and still meet water quality standards. Typically, the pollutants of concern associated with construction activity include sediment, and other sediment-related parameters (e.g., turbidity, total suspended solids, etc.). Other pollutants may also be of concern, depending on local conditions.

As required by the LCGP, if a TMDL has been established for the water where the Project will discharge and the TMDL (or the state authority) indicates that it applies to construction or storm water discharges, the Plan is required to be consistent with the requirements of that TMDL.

Neither the Environmental Protection Agency ("EPA") and/or the MDEQ have established TMDL requirements for discharge into the Mississippi Sound, the water body where the ultimate construction storm water discharge will occur. Accordingly, the construction storm water discharges from this Project will not be subject to specific TMDL requirements.

3.0 CONSTRUCTION SEQUENCE

The construction sequence for the SWPPP includes the construction of the temporary heavy haul road and dredging of the MOFs, followed by modifications to the BCDMMS and associated site prep, pilings, and construction of foundations - including the storm surge protection wall extension. Additionally, demolition of the existing storm surge protection wall and construction in the existing and new process areas will occur. The existing storm surge protection wall will remain in place and operate as intended until the new, modified storm surge protection wall is completed.

3.1 Mobilization, Construction Staging Areas, Heavy Haul Road

Upon receipt of Project permits and clearances, Project labor and supervision with necessary equipment will be mobilized to the site to prepare the temporary construction facilities and to commence site preparation earthworks activities. Additional labor and equipment will be mobilized to the site as required to facilitate each subsequent phase of the work.

Temporary facilities necessary to support Project construction will be located in the general vicinity of the Project. The temporary CSA facilities will include equipment and material laydown areas, contractor offices and parking areas, warehouses, and workshops. Due to space constraints within the existing facility, it will be necessary to locate and utilize a significant portion of the required temporary facilities offsite in the general Pascagoula area. Each of the proposed sites has been used previously for industrial purposes and will require a minimum amount of site preparation prior to use. Areas where sensitive resources have been identified (i.e., wetland features) at the CSAs will largely be excluded from use and will be protected during construction by fencing off and placing signs at no-access areas, and through implementation of BMPs, including the requirements of the Project Plan and Procedures. At CSA 5, GLLC intends to clear the entire site and fill the onsite wetland areas in order to maximize the amount of useable space during construction, and to provide access to the Project site.

GLLC also proposes to use two on-site areas totaling approximately 11.7 acres to support construction activities. One area is located at the northwest portion of the Project boundary adjacent to the North MOF, the North Marsh Staging Area, and the other area is located in the southeast portion of the Project boundary adjacent to the South MOF, the South Marsh Staging Area. These areas will be filled as necessary during initial site preparation for use during construction. Following temporary use, the North Marsh Staging Area will be incorporated into the permanent Terminal design for storage, parking, and turnarounds, and as the location of the new Terminal administrative offices. The South MOF will be removed after temporary use and the shoreline area restored.

Before construction work commences, the temporary erosion control devises (“ECDs”) will be installed around sensitive areas, along portions of the CSAs, north and south marsh staging areas, and along the temporary heavy haul road where necessary to prevent the unfiltered discharge of storm water runoff from the construction area into adjacent wetlands and the ultimate receiving waters. Construction entrance/exit structures will be installed at CSAs, as needed, to prevent mud from exiting the site.

Initial construction activities will include clearing and grubbing, leveling of existing grades and hauling and compacting imported soils to achieve the final elevation. ECDs will remain in place and be maintained throughout the duration of the construction work.

In the case segments of the temporary heavy haul road not located on the dike, infiltration ditches will be cut on both sides of the road inside of the ECDs as necessary to control stormwater runoff. Once the road has achieved its final sub base elevation, a base course material will be placed as a final surface to stabilize the underlying compacted soils and to provide for suitable vehicular access. The road embankment slopes on both sides of will be stabilization. ECDs will remain in place and be maintained throughout the duration of the construction work.

Specifically, heavy haul road construction sequence steps include:

- Implement ECDs
- Clear vegetation
- Grub to remove organic material
- Scarify and re-compact loose soils to a recommended density.
- Place geogrid and geotextile fabric
- Place 8 or 12 inches of imported fill and compact to a recommended density
- Cut road side ditches
- Place remainder of fill to achieve the sub base elevation
- Stabilized road final top surface with an approved MDOT base course material
- Stabilized road embankments with hydro-seeding
- Maintain SWPPP control measures

3.2 Expansion of Existing Facility

Approximately 120.0 acres of land will be disturbed in order to expand the existing Terminal site (this total excludes MOFs). This area is vegetated, with elevations ranging from three feet to thirteen feet, and slopes varying from one to four percent. The soils consist of previously placed dredged materials a portion of which are located within the BCDMMS. Prior to construction, ECDs will be installed, as necessary to prevent the unfiltered discharge of storm water runoff from the construction area into adjacent wetlands and the ultimate receiving waters.

Two LNG trains and associated facilities will be constructed in this area.

The grade will then be cut, which will expose soft to firm clay fill or fine grained clayey sandy fill. To provide a good working surface, the exposed surface soil will be chemically stabilized with lime-fly ash to a depth of eight to ten inches and then be re-compacted. Any free water will be drained from the site by establishing positive drainage with ditches or pumping from the sumps. Low lying areas with standing water will be backfilled with coarse aggregate such that standing water is no longer exposed. A non-woven, needle-punched geo-fabric will be placed over, and in good contact with, the prepared ground surface prior to placement of general fill. A bi-axial Geogrid equivalent to Tensar BX 1200 will be placed on top of the geofabric and extend at least 10 feet beyond the toe of the proposed general fill. This will act as a separator between the subgrade and the structural fill used to raise the site elevation to the design level. The initial fill layer will be 16 inches thick of well graded, coarse aggregate over the geofabric and compacted.

A second bi-axial Geogrid layer will then be placed over the well graded aggregate. A 16-inch thick second layer of well-graded aggregate will be placed over the second bi-axial Geogrid. Aggregate layer will be compacted and general fill will then be placed and compacted to raise the site grade to elevation 4 feet.

Select fill will be used to raise the grade in areas from elevation 4 feet to the design grade of elevations, varying from 10 to 15 feet, and placed in uniform loose lifts not exceeding eight inches thick and extending across the entire planed raised area. The estimated volumes of material required to raise the grade across the Project construction areas, and for construction of the storm surge protection wall and the storm water protection system, are 816,887 cubic yards and 258,110 cubic yards, respectively.

Site grading will also include finish grading of the entire site for roadways, culverts, ditches, ramps and swales etc. Finish grading will include concrete paving, with curbs for surfaced process areas, general gravel surfacing and applications of top soils, seeding and mulching for grass areas.

The existing Terminal is currently surrounded by the storm surge protection wall. The wall protects the existing Terminal from a storm surge event. It will be extended and supplemented to encircle the entire expanded Terminal facility, including the new liquefaction facilities. The perimeter system extension will start just east of the facility's southeast corner and encircle the planned expansion area, ajoining the existing section located on the north side of the facility in the vicinity of the current main facility gate, thus providing a full surround enclosure for the purposes of storm surge.

The existing storm surge protection system is approximately 1,800 feet in length. The extended (new) storm surge protection system for the new facilities will consist of a new earthen perimeter levee and a new concrete wall. The earthen perimeter levee will be constructed on the north and east sections of the Project site. The earthen levee will connect the two ends of the existing levee for the BCDMMS that will be bisected by the new Project area; one end on the northwest side and the other on the southeast side of the Project area. The concrete wall will be located on the south side of the Project area. This wall will be tied into the existing storm surge protection wall on the west and the new levee on the east.

The new perimeter levee footprint will be cleared and grubbed to remove woody vegetation and then stripped of 12 inches of organic material. A sheet pile will then be driven in the center of the levee. The stripped area will be covered with geotextile fabric and the fabric will be covered with a geogrid material. Clean sand will be placed on the geogrid material. Over this clean sand, clayed sand base material will be placed to bring the levee up to the bottom of the crushed stone surface. The exterior and interior of the levee will have a slope of 3:1. Both exterior and interior surfaces will be plated with on-site clayey silt dredged material. Crushed stone slope protection material will be used on the interior surface and armor rock slope protection material will be used on the exterior surface of the levee. Similar to the existing Terminal's surge wall construction methodology, a 40 foot wide work platform section will be required to construct the wall and install necessary piles. The wall construction area will be cleared, grubbed and stripped similar to the earthen levee. In addition, the area will be excavated and sand will be placed on the geogrid material. Additional geogrid material will then be placed on top of the sand and stone material will be placed and compacted to form the new premier levee.

Before construction work commences on the new facilities, ECDs will be installed. Two silt fences placed five feet apart will be installed at the outside limits of the storm surge protection wall and sediment basins will be constructed to prevent sediments and pollutants from entering into the adjacent wetlands and ultimately into Mississippi Sound. Swales will direct concentrated storm water flow collected from overland runoff to the temporary sediment basins. The swales will be designed to maintain velocities at three feet per second or less to control erosion. Check filter dams will be constructed to slow down the flow and filter sediments that are eroded from un-stabilized areas. The temporary sediment basins will be sized in accordance with MSR10.

After the grading has been finished, a suitable base material will be placed and compacted; the base material will serve as a soil stabilizer. A temporary sediment basin will remain and serve as a temporary storm water collection pond to control storm water retained within the wall prior to release through gravity outfall with flap gate and gate valve protection. Furthermore, the temporary ECDs installed at the perimeter of the wall will be removed after the wall is complete.

Construction sequence steps:

- Implement ECDs
- Construct temporary sediment basins
- Clear vegetation
- Grub below grade to remove organic materials
- Re-grade landscape by excavating and filling areas to the designed elevations, compact as necessary
- Place geogrid or geotextile fabric
- Construct swales
- Construct storm surge protection wall
- Remove ECDs around wall
- Maintain remaining ECDs during construction of Project facilities

3.3 Construction Duration

The duration of construction activities associated with this SWPPP is expected to be approximately 64 months.

4.0 EROSION AND SEDIMENT CONTROL MEASURES

The purpose of this section is to identify the types of erosion and sediment controls that will or may be used during construction. The controls will provide soil stabilization for disturbed areas and structural controls to divert runoff and remove sediment.

4.1 Vegetative Control and Soil Stabilization Practices

Vegetation Preservation

All vegetated areas adjacent to construction work areas will be left in place as the construction areas are being disturbed.

Dust Control

Roads and surfaces that have been cleared and grubbed will be periodically sprayed with water to prevent or reduce dust emissions. Dust control will be an on-going practice throughout the construction period.

Stabilized Soil

Soil will be stabilized using agricultural limestone at the entry/exit point of the site and along roadways. This material will also be used to stabilize much of the areas once complete.

Hydro-Seeding

Hydro-seeding typically consists of applying a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment. Any areas that are disturbed during the course of the construction activities, which do not have specific surface treatment specifically indicated, will be hydro-seeded.

Construction Road Surfacing

Construction roads in will be surfaced with an approved MDOT base course material immediately after the sub base is prepared.

4.2 Structural Control Practices

Check Filter Dams

Check Filter Dams are constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. Check Filter Dams will be placed in drainage ditches near their respective outfalls. Check Filter Dams will be installed immediately following completion of the ditch. Check Filter Dams are illustrated on drawing DW-1424-008, provided in Part 5.

Erosion Control Devices

ECDs will be placed around the perimeter of the proposed perimeter storm surge protection wall as well as on both sides of the access road. ECDs will be maintained and will not be removed until final stabilizing measures, such as hydro-seeding or mulching, have been installed and are functioning, or the storm surge protection wall is installed preventing uncontrolled run off to wetlands and the receiving water. ECDs are illustrated on drawing DW-1424-009, provided in Part 5.

Construction Entrance/Exit

Construction Entrance/Exit structures will be installed. Construction Entrance/Exit Structures are illustrated in Part 5.

Swales

Swales are used to intercept runoff and divert it around un-stabilized areas or divert sediment laden runoff to an erosion control device. Swales are illustrated in Part 5.

Sediment Basins

Sediment basins are used to precipitate sediment out of runoff draining from an un-stabilized area. The drainage area to a single Sediment basin shall not exceed twenty-five (25) acres. The basins will be cleaned when the capacity has been reduced by half. Sediment basins are illustrated in Part 5.

Pipe Slope Drains

Pipe slope drains will be used to channel concentrated runoff that the swales carry from Phase III, down a temporary road bank slope to Phase II, to an energy dissipater, and to another drainage swale system. Pipe Slope Drains are illustrated in Part 5.

4.3 Structural Control Practices – Others Available for Use

Diversion/Interceptor/Perimeter Dikes

Dikes are used to intercept runoff and divert it around un-stabilized areas or to divert sediment laden runoff to an erosion control device. Dikes are illustrated in Part 5.

Paved Flumes

A paved flume may be used in lieu of pipe slope drains to drain storm water. Paved flumes are illustrated in Part 5.

4.4 Coordination of Control Measures with Construction Activities

Structural controls will be coordinated with construction activities so the controls are in place before construction begins. The following practices will be coordinated with construction activities:

- The temporary perimeter controls (ECDs) will be installed before clearing and grading begins.
- Clearing, grubbing and grading will not occur in an area until it is necessary for construction to proceed.
- The stabilized construction site entrance and sediment basins will be constructed before clearing and grading begins in the Terminal expansion area.
- Once construction activities cease permanently in an area, that area will be stabilized, in accordance with Figure 6.

4.5 Supporting Calculations

The Project's storm water calculations will based based on the Natural Resources Conservation Service ("NRCS") Technical Release 55 ("TR-55") Method. TR-55 is a procedure to calculate and analyze the storm water runoff volume, peak rate of discharge, hydrographs and storage volumes required for storm water management structures in small watersheds.

The TR-55 method provides several options to calculate storm water runoff. The option used on this Project was the Graphical Peak Discharge ("GPD"). The storm data that GPD calculations require are, Time of Concentration, Storm Frequency, Drainage areas, Runoff Curve Numbers ("CN"), and Rainfall Distribution Type.

The Project's storm water calculations will be provided during detailed engineering.

4.5.1 Calculation Results Summary

TO BE PROVIDED DURING DETAILED ENGINEERING

5.0 IMPLEMENTATION SEQUENCE

During detailed engineering, GLLC will prepare a detailed listing of construction activities, which coordinates the timing of major land-disturbing activities together with the necessary erosion and sedimentation control measures planned for the Project.

6.0 MODIFICATION OF CONTROLS

This Plan, including the site erosion and sediment control plans and applicable structural control measures (see Part 5), will be revised whenever there is a change in the design, construction method, operation, maintenance procedure, etc., that may impact the discharge of 'pollutants' to the receiving water.

The plan will also be amended if inspections or investigations by site staff or by local, state, or federal officials determine that the controls are ineffective in eliminating or significantly reducing pollutants in storm water discharges from the construction site. Modifications to this Plan must be made within seven (7) calendar days following significant changes or inspections that require such modifications. See Part 6 for the Plan Amendment Log.

7.0 POST CONSTRUCTION CONTROL MEASURES

Stabilization measures shall be initiated as soon as possible in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased, unless the duration of the temporary stoppage will be less than 21 days. See Figure 6 for final surface soil stabilization treatments.

8.0 NON-STORM WATER DISCHARGE MANAGEMENT

The following non-storm water discharges have been reviewed and found to be permissible under the SWPPP:

- Fire hydrant flushing
- Waters used to wash vehicles where detergents are not used
- Waters used to control dust
- Potable water including uncontaminated water line flushing
- Routine external building wash down that does not use detergents
- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred and where detergents are not used
- Uncontaminated ground water or spring water
- Uncontaminated air conditioning or compressor condensate
- Foundation or footing drains where flows are not contaminated with process materials such as solvents
- Uncontaminated excavation dewatering
- Landscape irrigation

Other non-storm water discharges will be eliminated to the extent feasible at the construction site. However, in the event other non-storm water discharges become necessary during construction, appropriate management practices will be developed and the SWPPP will be formally amended per the procedures described in Section 6.0.

9.0 HOUSEKEEPING PRACTICES

Good housekeeping and spill control practices will be followed during construction in order to minimize storm water contamination.

9.1 Spill Prevention Control and Countermeasure Plan

A Spill Prevention Control and Countermeasure ("SPCC") Plan, specifically tailored for the construction activities was submitted to FERC and will be implemented in accordance with the EPA's rules and guidelines set forth in Title 40 Code of Federal Regulations, Part 112. A copy of the SPCC Plan is provided in Part 11. The SPCC Plan will be updated and tailored effectively, as needed, to eliminate fuel, lubricating oil or other hazardous material from entering into the receiving waters caused by change in design, construction method, operation, maintenance procedure, etc. The updates will be made in accordance with the SWPPP Amendment Process.

9.2 Designated Areas for Equipment Maintenance and Repairs at the Site

A designated area will be provided to maintain and repair equipment that requires regular maintenance. Equipment that ceases to function or operate properly, and has been mobilized to an area other than a designated area, will be repaired at the location where it ceased to function. Operators or mechanics will be trained to properly prepare the area for minimization of impacts in the event of a spill (i.e., drip/drain pans, oil-absorbent materials, temporary containment dikes, etc.) and to report spills to the SWPPP Coordinator.

9.3 Concrete Chute Wash Off Handling

Vehicles handling concrete shall wash off the concrete chutes into a pit that has been lined with impervious material. The material shall be hauled off to a local approved site for disposal.

9.4 Construction and Non-Hazardous Waste Materials

All solid non-hazardous waste materials will be collected and stored in metal dumpsters rented from a local, licensed, solid waste management company. All trash and construction debris from the site will be deposited in the dumpsters. The dumpsters will be emptied as necessary, or as required by local regulation. Waste material shall be hauled to a local approved land fill site. Any disposal will be in accordance with federal, state, and local regulations. Burying of construction materials on site will not be permitted. All personnel will be instructed regarding the correct procedure for collection, storage, and disposal of waste materials.

9.5 Storage and Handling of Potentially Toxic Materials

All potentially toxic material such as paint, acid, solvents, and asphalt products, chemical additives for soil stabilization, and concrete curing compounds or additives shall be segregated and stored in a metal building with proper ventilation. The metal building shall be impounded with an impervious bottom material and a wall one (1) foot high, to contain spills from reaching the ground surface. Toxic materials shall be properly labeled and have a material safety data sheet ("MSDS") for proper usage and safety when handling the material on file at the site. Personnel shall be trained in accordance to the Occupational Safety and Health Administration guideline on handling hazardous material. The SPCC Plan contains appropriate provisions for the storage and handling of potentially toxic materials.

9.6 Vehicle and Vehicle Tracking

All vehicles exiting the Construction Site will travel through construction entrance/exit structural controls to prevent mud from tracking onto the public road. Any mud or clots of soil that deposit on the public road at the exit point will be scrapped up and disposed of.

9.7 Sanitary Facilities

Construction office structures will be provided with sanitary facilities and appropriate holding tanks. Holding tanks will be pumped out and serviced as required by conditions and by local regulation. Pump out and service will be performed by an approved sanitary waste management contractor.

Sanitary waste from outdoor portable units shall be collected as necessary and as required by local regulation. Service will be provided by an approved sanitary waste management contractor.

9.8 Significant Material Inventory

Pollutants that result from clearing, grading, excavation, and building materials, and have the potential to be present in storm water runoff, are listed in Table 9-1. This table includes information regarding material type, chemical and physical description, and the specific regulated storm water pollutants associated with each material. The list of Potential Construction Site Storm Water Pollutants will be maintained and updated as necessary to reflect existing site inventories.

Table 9-1 Potential Construction Site Storm Water Pollutants

MATERIAL TRADE NAME	CHEMICAL / PHYSICAL DESCRIPTION	STORM WATER POLLUTANTS (1)
Pesticides (insecticides, fungicides, herbicides, rodenticides)	Various colored to colorless liquid, powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbamates, arsenic
Fertilizer	Liquid or solid grains	Nitrogen, phosphorous
Cleaning Solvents	Colorless, Liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates
Asphalt	Black solid	Oil, petroleum distillates
Concrete	White solid	Limestone, sand
Glue, Adhesives	White or yellow liquid	Polymers, epoxies
Paints	Various colored liquid	Metal oxides, stoddard solvent, talc, calcium carbonate, arsenic
Curing Compounds	Creamy white liquid	Naphtha
Wastewater from construction equipment washing	Water	Soil, oil & grease, solids
Hydraulic oil / fluids	Brown oily petroleum hydrocarbon	Mineral oil
Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE
Diesel Fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes
Antifreeze / Coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)
Erosion sediments	Solid Particles	Soil, Sediment

(1) Data obtained from Material Safety Data Sheets (MSDS) when available

10.0 RESPONSIBILITIES, INSPECTIONS & MAINTENANCE PROCEDURES

10.1 On-Site Operator

Table 10-1 defines the role and responsibilities of on-site operators.

Table 10-1 On-site Operators' Roles and Responsibilities

OPERATOR	ROLE	PERMIT STATUS	RESPONSIBILITIES
GLLC	Owner	Co-Permittee	Operational control over the construction plans & specifications, including the ability to make modifications to those plans and specifications
To Be Determined	Prime Contractor	Co-Permittee	Day-to-day operational control of those activities at the site, including the activities of subcontractors, which are necessary to ensure compliance with SWPPP

This SWPPP has been developed to address construction activities occurring on site. All entities working at this site will adhere to the requirements of the SWPPP to ensure the protection of water quality. Each operator will have equal responsibility for maintaining compliance with the requirements of the LCGP. Identified representatives from each permitted entity will share in the maintenance and inspection tasks required by this SWPPP.

10.2 Responsibilities

GLLC will designate a SWPPP Project Coordinator ("Coordinator"), who has the authority to stop activities that violate the environmental conditions of the LCGP or other applicable local, state, or federal permit. More specifically, the Coordinator's duties include but are not limited to the following:

- Establish the SWPPP Team;
- Implement the SWPPP;
- Implement and oversee employee training;

- Conduct, or provide for, inspection and monitoring activities;
- Oversee maintenance of control measures;
- Identify other potential pollutant sources and make sure they are added to the plan;
- Identify deficiencies in the SWPPP and make sure they are corrected; and
- Confirm that changes in construction plans are addressed in the SWPPP.

The SWPPP Team will be comprised its Coordinator and Inspectors. The Inspectors will work under the direction of the Coordinator to assist in such tasks as confirming that housekeeping and monitoring procedures are implemented, confirming the integrity of the structural control measures, and assisting in documenting compliance requirements of the LCGP. Table 10-2 lists the members of the SWPPP Team along with their respective responsibilities.

Table 10-2 SWPPP Team Responsibilities

Team Member	Responsibility
Coordinator	Coordinates overall implementation of SWPPP, updates plan as needed, conducts routine inspections, reviews Best Management Practices, and communicates with the Prime Contractor concerning plan modifications and storm water related activities concerning fuel oil pipeline and storage.
Vegetative and Structural Control Inspectors	Inspects erosion and sediment control measures to see if they have been installed according to the SWPPP and reports necessary repairs to structural controls and maintenance requirements.
Environmental Inspector(s)	Reviews and determines if the plan is in compliance with MDEQ LCGP MSR10 Guidelines

The ultimate FERC Authorization for the Project is anticipated to require the Environmental Inspector(s) to be responsible for the following storm water associated components:

- Compliance with the requirements of this SWPPP, the environmental conditions of the FERC Authorization, and other applicable environmental permits and approvals;
- Identifying, documenting, and overseeing corrective actions, as necessary to bring activities back into compliance;
- Verifying the limits of authorized construction work areas and locations of access roads are properly marked before clearing;

10.3 Inspections

Inspection and maintenance of temporary erosion control measures will be performed at least every seven days, and: after each rainfall event having precipitation greater than half an inch.

Discharge locations must be inspected to ascertain whether erosion control measures are effective in preventing significant impact to the receiving waters. Where discharge locations are not accessible, nearby downstream locations will be inspected to the extent that such inspections are practicable.

Locations where vehicles enter or exit the site will be inspected for evidence of off-site sediment tracking.

Each inspection required by this permit, shall be documented by an Inspection Report Filed on the Inspection and Certification Form (See Part 7). Completed forms shall be retained within Part 8 of this permit document for three years after the permit expires or is terminated. In addition to the required entries on the Inspection and Certification Form, the following information shall be entered:

- Weather information for the period since the last inspection (or commencement of construction activity if first inspection) including:
  - Best estimate of the beginning of each storm event
  - Duration of each storm event
- Weather information and a description of discharges occurring at the time of inspection
- Location(s) of discharges of sediment or other pollutants from site
- Locations of control measures that need to be maintained
- Locations of control measures that failed to operate as designed or proved inadequate for a particular location
- Locations where additional control measures are needed that did not exist at the time of inspection and
- Corrective action required including changes to the SWPPP necessary and

implementation dates.

The report must identify incidents of non-compliance with the permit conditions. Where a report does not identify incident of non-compliance, the report must contain a signed certification, per the permit signatory requirements, that the construction Project or site is in compliance with the SWPPP and the permit.

10.4 Maintenance Procedures

All erosion and sediment control measures and other protective measures identified in the SWPPP must be maintained in effective operating condition. If site inspections identify control measures that are not operating effectively, maintenance must be performed at the earliest date possible, but no more than seven (7) calendar days after initial identification of the problem. Table 10-3 describes the typical maintenance procedures for the sediment control measures shown on Figures 3 through 5.

Table 10-3 Maintenance Procedures for Erosion and Sediment Control Measures

CONTROL	MAINTENANCE PROCEDURE
Check Filter Dams	• Sediment will be removed when it reaches a height of six inches
Silt Fence	• Repaired as needed when fence becomes torn, knocked down, under-cut, or other event that causes fence to not perform as designed. • Sediment will be removed from fence when design capacity is reduced by 1/3.
Construction Entrance/ Exit	• If off-site sediment tracking has occurred, sediment on the roadway will be swept daily • Entrance will be maintained as necessary to minimize off-site tracking
Swales	• Repair swale banks and grade bottom to issue positive flow.
Sediment Basin	• Sediment will be removed from basin when design capacity is reduced to 27 cubic yards or the sediment has reached one foot.
Pipe Slope Drains	• Sediment will be removed at the energy dissipater with a height of six inches.

11.0 EMPLOYEE CONTINUING EDUCATION AND TRAINING

An employee-training program will be developed and implemented to educate employees about the requirements of the SWPPP. All employees will be trained prior to their first day of work on the construction site. This education program will include background on the components and goals of the SWPPP as well as hands-on training. Training topics will include (but are not limited to):

- Erosion control measures applicable to the Project;
- Spill prevention and response;
- Proper material handling;
- Disposal and control of waste;
- Equipment fueling, and proper storage, washing, and inspection procedures;
- Endangered or threatened plant or animal species that have been identified as potentially being impacted by the Project;
- Cultural resources that have been identified as potentially being impacted by the Project.

12.0 TERMINATION OF COVERAGE

A Notice of Termination shall be submitted to the Permit Board 30 days after the following conditions are met:

- Final Stabilization has been achieved on portions of the site for which the coverage recipient is responsible;
- Other owner(s) or operator have assumed control over areas of the site that have not achieved final stabilization.

13.0 RETENTION OF RECORDS

Copies of the SWPPP and documentation required by this permit, including records of data used to complete this permit, will be retained for at least three years from the date this permit coverage expires or is terminated.

14.0 REFERENCES

1. Mississippi Storm Water Pollution Prevention Plan (SWPPP) Guidance Manual for Construction Activities by General Permits Branch, Office of Pollution Control, dated May 2005.

2. Coastal Construction Manual, Forth Edition, Federal Emergency Management Agency (FEMA) – Mitigation Directorate.

FIGURES

TO BE PROVIDED DURING DETAILED ENGINEERING

PART 5: Drawings – Erosion and Sediment Control Measures

TO BE PROVIDED DURING DETAILED ENGINEERING

PART 6: Record of Storm Water Pollution Prevention Plan Amendments

TO BE PROVIDED

PART 7: Construction Activity Records

TO BE PROVIDED

PART 8: Completed Inspection and Certification Forms

TO BE PROVIDED

PART 9: Upland Erosion Control, Revegetation and Maintenance Plan

TO BE PROVIDED

PART 10: Wetland and Waterbody Construction and Mitigation Procedures

TO BE PROVIDED

PART 11: Spill Prevention, Containment, and Countermeasure Plan

TO BE PROVIDED

APPENDIX J

Gulf LNG Migratory Bird Impact Assessment and Conservation Plan

MIGRATORY BIRD
IMPACT ASSESSMENT AND CONSERVATION PLAN

Gulf LNG Liquefaction Project

JACKSON COUNTY, MISSISSIPPI

Gulf LNG Liquefaction Company, LLC
a Kinder Morgan operated company

Gulf LNG Liquefaction Company, LLC,
Gulf LNG Energy, LLC and
Gulf LNG Pipeline, LLC

Submitted to:

U.S. Fish and Wildlife Service
Mississippi Field Office Ecological Services
6578 Dogwood View Pkwy, Suite A
Jackson, MS 39213

August 2018

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BA	Biological Assessment
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
BVA	Barry A.Vittor & Associates, Inc.
CH2M	CH2M Hill Engineers, Inc.
CSA	construction support area
Companies	Gulf LNG Liquefaction Company, LLC, Gulf LNG Energy, LLC and Gulf LNG Pipeline, LLC
EEM	estuarine emergent wetland
ESA	Endangered Species Act
ESD	emergency shutdown
FERC	Federal Energy Regulatory Commission
GLE	Gulf LNG Energy Company, L.L.C.
GLLC	Gulf LNG Liquefaction Company, L.L.C.
GLP	Gulf LNG Pipeline Company, L.L.C.
MBTA	Migratory Bird Treaty Act
MOF	marine offloading facility
MOU	Memorandum of Understanding
MP	milepost
OD	outside-diameter
PEM	palustrine emergent wetland
PFO	palustrine forested wetland
Plan	Migratory Bird Impact Assessment and Conservation Plan
Project	Gulf LNG Liquefaction Project
PSS	palustrine scrub-shrub
ROW	right-of-way
T&E	Threatened and Endangered
Terminal	The existing Gulf LNG Terminal in Jackson County, Mississippi
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

1.0 INTRODUCTION

Gulf LNG Liquefaction Company, LLC ("GLLC"), an affiliate of Gulf LNG Energy, LLC ("GLE") and Gulf LNG Pipeline, LLC ("GLP", together, "Companies"), intend to add liquefaction and export capabilities to GLE's existing liquefied natural gas ("LNG") import terminal ("Gulf LNG Terminal" or "Terminal") located near the City of Pascagoula in Jackson County, Mississippi. GLLC filed its application with the Federal Energy Regulatory Commission ("FERC") on June 19, 2015. The Project, currently under review, has been assigned FERC Docket No. CP15-521-000. Construction requires clearing of vegetation and ground disturbances which may occur during breeding and nesting seasons for migratory birds.

This Migratory Bird Impact Assessment and Conservation Plan ("Plan") provides a summary of habitat types identified within the Project area; likely impacts to those habitats from construction of the Project; migratory birds likely to be found in the Project area and protected under the Migratory Bird Treaty Act ("MBTA") of 1918 (16 United States Code ["U.S.C."] §§ 703-712), the Bald and Golden Eagle Protection Act ("BGEPA") (16 U.S.C. §§ 668-668d); and an assessment and analysis of potential impacts to migratory birds identified by the United States Fish and Wildlife Service ("USFWS") as Birds of Conservation Concern ("BCC").

To evaluate potential MBTA and BCC concerns, a desktop review and field habitat assessment was conducted to identify bird species known or likely to occur within the Project area based on existing breeding bird survey data, field survey information, and the habitat types impacted by the Project. Migratory birds likely to occur in the Project area and species of State concern are also identified. However, the major focus of this Plan is on USFWS BCC species due to their high conservation priority status.

1.1 PROJECT OVERVIEW

The Project will involve construction in two phases of two liquefaction trains, each capable of producing approximately 5 million tonnes per annum (5 MTPA) of LNG for export, along with the required support utilities and infrastructure and modifications to the GLE Terminal, GLP Pipeline, and certain GLP meter stations to enable bidirectional operations. The Project will be located within areas previously evaluated and assessed in conjunction with the FERC's earlier review and approval of the Terminal in Docket No. CP06-12. The Project will be constructed on approximately 135 acres[1] adjacent to and encompassing the existing Terminal south of Pascagoula, Mississippi, and at six offsite construction support areas ("CSAs") totaling about 94.5 acres (Appendix A). These totals include modifications to be made at two existing metering facilities on the Gulf LNG pipeline. Total acreage for the metering facilities is approximately 3 acres.

The footprint of the proposed Project facilities is shown on Project site figures in Appendix A. Construction of the Project will be performed primarily within the indicated Project footprint, which includes additional land area adjacent to the Terminal that will be acquired through a lease agreement with the Port of Pascagoula and the State of Mississippi. Two marine offloading

[1] Includes two marine offloading facilities

facilities ("MOFs") will be constructed in support of Project construction. The North MOF will remain as a permanent structure, but the South MOF will be removed upon completion of construction activities. Access to the Project site will be via existing public roads. Additional access roads will be developed as internal features within the Project footprint, and impacts for these roads are included in the overall Project impact analyses.

Additional offsite areas will be required for Project staging, warehouse yards, contractor offices, and parking. The use of offsite areas will be negotiated with private landowners for the duration of the construction period.

1.2 REGULATORY GUIDANCE

Migratory Bird Treaty Act

Birds likely to occur in the Project area include those listed under the MBTA (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755, as amended) (USFWS 2011). The USFWS is the principal federal agency charged with protecting and enhancing populations and habitat of migratory bird species. A migratory bird is any species or family of birds that live or reproduce in or migrate across international borders at some point during their annual life cycle. The MBTA established federal responsibilities for protecting nearly all species of birds, eggs, and nests (USFWS 2011). A total of 1,007 species are protected under the MBTA (USFWS 2011). Those species not protected by the MBTA include game birds, such as the ring-necked pheasant and wild turkey, and non-native invasive species, such as the European starling and house sparrow. Despite the title, the MBTA also protects birds that are not migratory, such as mourning doves and chickadees.

Bald and Golden Eagle Protection Act

The BGEPA provides additional protection to bald and golden eagles. The BGEPA prohibits the take, possession, sale, purchase, barter, offer to sell, purchase, or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit [16 U.S.C. § 668(a)]. "Take" under this statute is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or disturb" 50 C.F.R. § 22.3. "Disturb," in turn, is defined as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." Id. If a proposed project or action would occur in areas where nesting, feeding, or roosting eagles occur, then project proponents may need to take additional conservation measures to achieve compliance with the BGEPA.

United States Fish and Wildlife Service Birds of Conservation Concern

The USFWS BCC are those species, subspecies, and populations of migratory and non-migratory birds that the USFWS has determined to be the highest priority for conservation actions (USFWS 2008). The purpose of the BCC list is to prevent or remove the need for additional threatened and endangered ("T&E") species listings under the Endangered Species Act ("ESA") by implementing proactive management and conservation actions needed to conserve these species. The USFWS maintains a list of BCC (USFWS 2008) in which species are prioritized and listed by Bird Conservation Regions ("BCRs"). The United States is divided into 35 different BCRs. The Project area is located in BCR 27: the Southeastern Coastal Plain.

Executive Order 13186

Executive Order 13186 of January 10, 2001, identifies the responsibility of federal agencies to protect migratory birds and their habitats, and directs executive departments and agencies to undertake actions that will further implement the MBTA. Executive Order 13186 includes a directive for federal agencies to develop a memorandum of understanding ("MOU") with the USFWS to promote the conservation of migratory bird populations, including their habitats, when their actions have, or are likely to have, a measurable negative effect on migratory bird populations. Whereas the MBTA only protects migratory birds, Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. In March 2011, the FERC and the USFWS entered into a MOU regarding the implementation of Executive Order 13186.

2.0 METHODS

Working with CH2M Hill Engineers, Inc. ("CH2M"), representatives of Barry A.Vittor & Associates ("BVA") conducted biological surveys of approximately 88 acres in the vicinity of the existing Terminal and surrounding Project areas on several occasions in June-July, 2014. Surveys were not completed within the boundaries of the Bayou Casotte Dredge Material Management Site ("BCDMMS"), which comprises an estimated 46 acres to be developed with liquefaction and support facilities (i.e., the Gulf LNG Site) within the approximate 120-acre BCDMMS area. Five of the CSAs were surveyed in August 2014. Additional surveys at CSA 5 (10 acres added to increase the study area to 44.3 acres) and the newly added CSA 6 (18 acres) were conducted on March 24 and 25, 2015. These areas were surveyed for sensitive environmental features (e.g., T&E species and their potential habitat, wetlands, and waterbodies). Offshore areas (approximately 15.5 acres) where Project facilities are proposed were not surveyed during this field effort.

3.0 RESULTS

This section presents a description of the habitats traversed by the Project, and identifies the specific migratory bird species (with their associated habitat preferences), and the bird species expected to occur in or near the Project area.

3.1 HABITATS LIKELY TO BE IMPACTED IN THE PROJECT AREA

The Project facilities are proposed for construction at GLE's existing Terminal site, which is located in Jackson County, Mississippi at the end of Highway 611 and is situated adjacent to the federally maintained Bayou Casotte Navigation Channel on the Mississippi Sound. The Terminal is part of the Port of Pascagoula. The existing Terminal site consists of approximately 33 acres of commercial/industrial land. The proposed Project modifications to the Terminal will consist of land areas immediately adjacent to and within the existing Terminal footprint. Some of the existing Terminal footprint (11.24 ac) will be modified to incorporate the liquefaction facilities; however, 22.74 ac used during construction will remain essentially unchanged from the existing footprint. As discussed previously, the Project will require six offsite CSAs near the Terminal. The proposed CSAs consist of land previously used for commercial/industrial activities. Additionally, the existing Destin Metering Station, the existing Gulfstream Metering Station, and the existing Transco/FGT Interconnect will be modified to achieve bi-directional flow as a part of the Project.

The predominant land use type within the area of the proposed Project is commercial/industrial land (the existing Terminal facilities, consisting of structures, asphalt, and gravel), estuarine emergent ("EEM") wetlands, and the adjacent BCDMMS. Land use within the proposed Project boundaries also includes open water and scrub-shrub areas adjacent to the existing Terminal facility.

Existing land uses surrounding the proposed Project area, including the proposed offsite CSAs and metering facilities, consist of a mixture of industrial and commercial land, residential land, upland forest, scrub-shrub, open space, estuarine emergent and palustrine wetlands and open water (Bayou Casotte Harbor and Mississippi Sound). The proposed Project boundary at the Terminal and surrounding areas are zoned industrial.

3.2 MIGRATORY BIRD SPECIES IN OR NEAR THE PROJECT AREA

Avian diversity within the Project site and the surrounding area is species-rich, especially in regard to shore birds, wading birds, and waterfowl. Previous experience with this site and other adjacent coastal areas in Mississippi and Alabama has shown the property to contain one of the highest concentrations of birdlife in the region. The proposed Project site is an important stop-over area for migratory shorebirds in the spring and fall seasons, offering both foraging and resting habitat necessary to rebuild fat reserves. The property also hosts a large wintering aggregation of shorebirds and waterfowl. The isolation of the site and relatively pristine marsh habitat provides adequate protection from human disturbance and is ideal for large congregations of birds. The surrounding area is also a well-known location for local and visiting birders. Sanctioned field trips to the adjacent Chevron Plant are organized and run at least twice a year. Table 1 presents a list of migratory bird species expected to occur in Mississippi coastal areas of Jackson County.

During a limited survey by BVA on March 18, 2005, 49 species of the birds listed in Table 1 were observed at the Terminal site, as noted in the table by superscript. The most numerous birds observed were shore birds. Eleven species of shorebirds were observed along the tidal mud flats and shoreline of Mississippi Sound bordering the Terminal site. Although not observed, dunlin (*Caldidris alpina*) is expected to occur. No effort was made to count individual numbers for each species, but total shorebird numbers were estimated at approximately 500 individuals in the various flocks. A single individual of Wilson's plover (*Charadrius wilsonia*) was observed on the Terminal site. This species is tracked by the Mississippi Natural Heritage Program ("MNHP") as critically imperiled (S1). Wilson's plover is one of two dozen taxa ranked as a species of "high concern" in the 2004 update of the U.S. Shorebird Conservation Plan (U.S. Shorebird Conservation Plan 2004 and Brown et al. 2001, respectively). The remainder of the 49 species observed consisted of wading birds, waterfowl, raptors, and perching birds. No individual bird species were noted during the June – August 2014 field surveys, but two additional species (American bittern and Cooper's hawk) were observed during the October 13, 2014, survey (Table 1).

TABLE 1
Commonly Occurring Bird Species in Coastal Jackson County, Mississippi, and Bird Species Observed in the Project Vicinity

Common Name	Scientific Name
Shore Birds	
American Oystercatcher [1,2]	*Haematopus palliatus*
Black Skimmer [1]	*Rynchops niger*
Forster's Tern [1]	*Sterna forsteri*
Least Tern [1]	*Sterna albifrons*
Caspian Tern [1]	*Sterna caspia*
Gull-billed Tern [1]	*Sterna nilotica*
Royal Tern [1]	*Sterna maxima*
Sandwich Tern [1]	*Sterna sandvicensis*
Common Tern [1]	*Sterna hirundo*
Snowy Plover [1]	*Charadrius alexandrinus*
Wilson's Plover [2]	*Charadrius wilsonia*
Killdeer [2]	*Charadrius vociferus*
American Avocet [1]	*Recurvirostra americana*
Black-necked Stilt [1, 2]	*Himantopus mexicanus*
Herring Gull [2]	*Larus argentatus*
Laughing Gull [1, 2]	*Larus atricilla*
Brown Pelican [1,2]	*Pelecanus occidentalis*
American White Pelican [1]	*Pelecanus erythrorhynchos*
Double-crested Cormorant [2]	*Phalacrocorax auritus*
Western Sandpiper [2]	*Calidris mauri*
Least Sandpiper [2]	*Calidris minutilla*
Stilt Sandpiper [2]	*Calidris himantopus*
Wading Birds	
Great Blue Heron [1]	*Ardea herodias*
Little Blue Heron [1, 2]	*Egretta caerulea*
Tricolored Heron [1,2]	*Egretta tricolor*
Green Heron [1]	*Butorides viresans*
Yellow-crowned Night Heron [1]	*Nyctanassa violacea*
Black-crowned Night Heron [1]	*Nycticorox*
Snowy Egret [1,2]	*Egretta thula*
Cattle Egret [1]	*Bubulcus ibis*
Great Egret [1,2]	*Ardea alba*
Reddish Egret [1]	*Egretta rufescens*

TABLE 1
Commonly Occurring Bird Species in Coastal Jackson County, Mississippi, and Bird Species Observed in the Project Vicinity

Common Name	Scientific Name
White-faced Ibis [1]	*Plegadis chihi*
Glossy Ibis [1]	*Plegadis facinellus*
White Ibis [1,2]	*Eudocimus albus*
Least Bittern [1]	*Ixobrychus exilis*
American Bittern [1, 3]	*Botaurus lentiginosus*
King Rail [1]	*Rallus elegans*
Clapper Rail [1,2]	*Rallus longirostris*
Virginia Rail [2]	*Rallus limicola*
Purple Gallinule [1]	*Porphyrula martinica*
Common Gallinule [1]	*Gallinula chloropus*
Sora [2]	*Porzana carolina*
Greater Yellowlegs [2]	*Tringa melanoleuca*
Lesser Yellowlegs [2]	*Tringa flavipes*
Willet [2]	*Catoptrophorus semipalmatus*
Waterfowl	
Greater Scaup [2]	*Aythya marila*
Lesser Scaup [1,2]	*Aythya affinis*
Ringneck [1]	*Athya collaris*
Gadwall [1]	*Anas strepera*
Blue –winged Teal [2]	*Anas discors*
Green-winged Teal [1]	*Anas carolinenis*
Mallard [1]	*Anas playtyrhynchos*
American Widgeon [1]	*Anas americana*
Northern Pintail [1]	*Anas acuta*
American Coot [1]	*Fulica americana*
Wood Duck [1]	*Aix sponsa*
Mottled Duck [1,2]	*Anas fulvigula*
Hooded Merganser [2]	*Lophodytes cucullatus*
Red-breasted Merganser [2]	*Mergus serrator*
Raptors	
Osprey [1,2]	*Pandion haliaetus*
Black Vulture [1]	*Corvus ossifragus*
Northern Harrier [1,2]	*Circus cyaneus*
American Kestrel [1,2]	*Falco sparverius*
Red-tailed Hawk [2]	*Buteo jamaicensis*
Cooper's Hawk [3]	*Accipiter cooperii*
Perching Birds	
Gray Kingbird [1]	*Tyrannus dominicensis*

TABLE 1
Commonly Occurring Bird Species in Coastal Jackson County, Mississippi, and Bird Species Observed in the Project Vicinity

Common Name	Scientific Name
Eastern Kingbird [2]	*Tryannus*
Eastern Phoebe [2]	*Sayornis phoebe*
Fish Crow [1]	*Corvus ossifragus*
Marsh Wren [1,2]	*Cistothrous palustris*
Eastern Meadowlark [1]	*Sturnella magna*
Red-winged Blackbird [1,2]	*Agelaius phoeniceus*
Boat-tailed Grackle [1]	*Quiscalus major*
Seaside Sparrow [1]	*Ammodramus maritimus*
Mourning Dove [2]	*Zenaida macrooura*
Purple Martin [2]	*Progne subis*
Tree Sallow [2]	*Tachycineta*
Gray Catbird [2]	*Dumetella carolinensis*
Northern Mockingbird [2]	*Mimus polyglottos*
Cedar Waxwing [2]	*Bombycilla cedrorum*
Yellow-rumped Warbler [2]	*Dendroica coronata*
Yellow-throated Warbler [2]	*Dendroica dominica*
Eastern Towhee [2]	*Pipilo erythropthalmus*
Savannah Sparrow [2]	*Passerculus sandwichensis*
Swamp Sparrow [2]	*Melospiza georgiana*
Brown-headed Blackbird [2]	*Molothrus alter*
Northern Cardinal [2]	*Cardinalis*

[1] Denotes commonly occurring species.
[2] Denotes species observed on the Project site during March 18, 2005 survey.
[3] Denotes species observed on Project site during October 13, 2014 wetland survey.
Survey taxonomy follows that of the American Ornithological Union's Checklist of North American Birds, Seventh Edition
Common bird species source: USACE, 1983

Avian species found on the open waters of Mississippi Sound bordering the site primarily include gulls and terns, but also pelicans, cormorants, and waterfowl (Table 1). Pelagic deepwater species such as shearwaters (Family Procellariidae) storm petrels, (Family Hydrobatidae), and tropicbirds (Family Phaethontidae) occur well past the 100 fathom depth in the Gulf of Mexico and are not expected nearshore except as wind-blown vagrants from hurricanes and tropical storm events. These latter species could be encountered offshore by LNG carriers ("LNGCs").

Examples of locally breeding gulls and tern species found during the summer months include the resident laughing gull (*Larus atricilla*), least tern (*Sterna antillarum*) royal tern (*Sterna maxima*), Caspian tern (*Sterna caspia*), sandwich tern (*Sterna sandvicensis*), common tern (*Sterna hirundo*) and gull-billed tern (*Sterna nilotica*). Black skimmer (*Rhynchops niger*) is also a common resident. Less common (i.e., not listed as common in Table 1) individuals of sooty tern (*Sterna fuscata*) may possibly occur as occasional waifs.

During the winter months, the year-round residents (laughing gull, royal tern, and Caspian tern) are present, plus an influx of migratory species and winter residents, such as Forster's tern (*Sterna forsteri*) and herring gull (*Larus argentatus*). Several other less common species not listed in Table 1 also may be found in the area in winter. These species include the ring-billed gull (*Larus delawarensis*) and Bonaparte's gull (*Larus philadelphia*). Possible vagrants, rare, and accidental species include Franklin's gull (*Larus pipixcan*), great black-backed gull (*Larus marinus*), lesser black-backed gull (*Larus fuscus*), and glaucous gull (*Larus hyperboreus*). There are a few records of brown noddy (*Anous stolidus*) from the Mississippi coast, all related to tropical storms. Both parasitic jaeger (*Stercorarius parasiticus*) and pomarine jaeger (*Stercorarius pomarinus*) have been documented in the open waters in Mississippi Sound. Parasitic jaeger has been recorded annually since 1974, primarily during the winter months (dates range from August to May 6; Turcotte & Watts, 1999). Pomarine jaeger is considered accidental in Mississippi, usually occurring further offshore than parasitic jaeger (Turcotte & Watts 1999).

Examples of the Order Pelecaniformes found on open water areas near the Project site include brown pelican (*Pelecanus occidentalis*) and the American white pelican (*Pelecanus erythrorhynchos*; primarily in the winter months). Less common species not listed in Table 1 include the magnificent frigate bird (*Fregata magnificens*), which might be expected as occasional visitors during the summer months and during spring migration. The northern gannet (*Morus bassanus*) also may occur offshore in slightly deeper waters in the winter season. The masked booby (*Sula dactylatra*) would be a casual to accidental vagrant during the summer months. The winter months would see large numbers of double-crested cormorants (*Phalacrocorax auritus*) with occasional non-breeding individuals remaining over the summer.

Wintering waterfowl may be found in large rafts just offshore of the Project site. Common species (Table 1) and less common species (not listed in Table 1) include redhead (*Aythya americana*), ring-necked duck (*Aythya collaris*), greater and lesser scaup (*A. marila* & *A. affinis*), all three scoters; surf scoter (*Melanitta perspicillata*; rare in winter), black scoter (*Melanitta nigra*; rare in winter), white-winged scoter (*Melanitta fusca*; rare in winter), bufflehead (*Bucephala albeola*; common in winter), common goldeneye (*Bucephala clangula)*, long-tailed duck (*Clangula hyemalis*; rare), red-breasted merganser (*Mergus serrator*; common), common merganser (*Mergus merganser*; extremely rare), hooded merganser (*Lophodytes cucullatus*), and ruddy duck (*Oxyura jamaicensis*). Common loon (*Gavia immer*) would be the most expected loon species offshore in winter with perhaps a few lingering into the summer months. Red-throated (*Gavia stellata)* and Pacific loon (*Gavia pacifica*) are occasionally sighted along the upper Gulf Coast in winter. Wintering grebes would consist primarily of horned grebe (*Podiceps auritus*) and also eared grebe (*Podiceps nigricollis*); less frequently encountered.

Other species of migratory birds that are not shore birds, wading birds, or waterfowl also may occur at the Project site. These species (Passeriformes or perching birds and raptors) may be seasonal migratory transients or residents in the coastal area, or both, depending on the species. These species could use the Project sites and the adjacent and surrounding areas for resting, foraging, or nesting. The perching birds and raptors use onshore habitats, from marshes to uplands, for foraging; some raptors (e.g., osprey) also may use offshore areas for foraging.

TABLE 2
State Bird Species of Concern Identified for the Project Area [1]

Common Name	Scientific Name	Heritage Rank	Presence of Habitat
Gull-Billed Tern	*Gelochelidon nilotica*	S1B, S3, S4N	Listed by MDWFP letter of August 27, 2014, as a species of concern possibly occurring within 2 miles of the proposed Project area.
Least Tern	*Sternula antilllarum*	S3B	Listed by MDWFP letter of August 27, 2014, as a species of concern possibly occurring within 2 miles of the proposed Project area; the coastal population is distinct from the interior least tern; possible foraging habitat near the Project area.
Royal Tern	*Thalasseus maximus*	S1B, S4N	Listed by MDWFP letter of August 27, 2014, as a species of concern possibly occurring within 2 miles of the proposed Project area; prefers ocean coasts for breeding; possible foraging habitat near the Project area.

[1] Includes species identified in letters from MDWFP dated May 12, 2014, and August 27, 2014.

State Rank:
S1 - Critically imperiled in Mississippi because of extreme rarity (5 or fewer occurrences or very few remaining individuals or ac) or because of some factor(s) making it vulnerable to extirpation.
S2 - Imperiled in Mississippi because of rarity (6 to 20 occurrences or few remaining individuals or ac) or because of some factor(s) making it vulnerable to extirpation.
S3 - Rare or uncommon in Mississippi (on the order of 21 to 100 occurrences).
S4 – Apparently secure.
B – Breeding
N – Non-breeding

Source: NatureServe 2014

3.3 Birds of Conservation Concern within the Project Area

The Project is located in Bird Conservation Region (“BCR”) 27 - Southeastern Coastal Plain. This region includes extensive riverine swamps and marsh complexes along the Atlantic and Gulf Coasts, which provide critical wintering areas, important wintering and spring migration areas, and important nesting and foraging habitats for various migratory bird species, including Birds of Conservation Concern. Birds of Conservation Concern does not include birds that are game birds, are federal threatened or endangered species, are peripheral to the U.S., are resident game birds (except for candidate species), or are non-native. Birds of Conservation Concern in this region that could be affected by the Project are listed in Table 3 (USFWS 2008).

TABLE 3
USFWS Birds of Conservation Concern for BCR 27 - Southeastern Coastal Plain (USFWS 2008)

Red-throated Loon	Sandwich Tern
Black-capped Petrel (nb)	Black Skimmer
Audubon's Shearwater (nb)	Common Ground-Dove
American Bittern (nb)	Chuck-will's-widow
Least Bittern	Whip-poor-will
Roseate Spoonbill (nb)	Red-headed Woodpecker
Swallow-tailed Kite	Loggerhead Shrike
Bald Eagle (b)	Brown-headed Nuthatch
American Kestrel (paulus ssp.)	Bewick's Wren (bewickii ssp.)
Peregrine Falcon (b)	Sedge Wren (nb)
Yellow Rail (nb)	Wood Thrush
Black Rail	Blue-winged Warbler
Limpkin	Black-throated Green Warbler
Snowy Plover (c)	Prairie Warbler
Wilson’s Plover	Cerulean Warbler
American Oystercatcher	Prothonotary Warbler
Solitary Sandpiper (nb)	Swainson's Warbler
Upland Sandpiper (nb)	Kentucky Warbler
Whimbrel (nb)	Bachman's Sparrow
Long-billed Curlew (nb)	Henslow's Sparrow
Marbled Godwit (nb)	LeConte's Sparrow (nb)
Red Knot (rufa ssp.) (a) (nb)	Nelson's Sharp-tailed Sparrow (nb)
Semipalmated Sandpiper (Eastern) (nb)	Saltmarsh Sharp-tailed Sparrow (nb)
Buff-breasted Sandpiper (nb)	Seaside Sparrow (c)
Short-billed Dowitcher (nb)	Painted Bunting
Least Tern (c)	Rusty Blackbird (nb)
Gull-billed Tern	Sandwich Tern

(a) ESA candidate, (b) ESA delisted, (c) non-listed subspecies or population of Threatened or Endangered species, (d) Migratory Bird Treaty Act protection uncertain or lacking, (nb) non-breeding in this BCR

Priority bird species from this list include the Painted Bunting, Bachman’s Sparrow, Swainson’s Warbler, and Loggerhead Shrike.

Painted Bunting

Painted buntings are colorful medium-sized finches that forage on the ground in dense cover or among grasses. Migrating and summer breeding populations are known from the general Project area (Cornell 2015e). Migrating painted buntings prefer dense weeds and semi-open forest understory. They breed in dense brush and prefer areas adjacent to thick grassy areas or woodland edges. None of these preferred habitats occur at any of the Project sites.

Bachman's Sparrow

Bachman's sparrow is a plain sparrow, brownish gray above and buffy underneath and occurs along the Gulf coast (Dunning 2006). It feeds on grass seeds and insects. This bird breeds on the coastal plain and piedmont of the southeast U.S. from extreme south Virginia south to central Florida and west to east Texas and southeast Oklahoma, including in the general Project area. It nests in pine woodlands and open habitats with a dense ground layer of grasses and a few dense shrubs with an open understory. None of this habitat occurs at any of the Project sites.

Swainson's Warbler

Cornell (2015f) describes this bird as a "skulking bird of the southern canebrakes and rhododendron thickets" that would go undetected, except for its "loud, ringing song." It is a summer breeding resident in the general Project area and breeds in forests with thick undergrowth. It feeds on insects and spiders by foraging on the forest floor. None of its preferred habitat is on any of the Project sites.

Loggerhead Shrike

Cornell (2015g) describes the loggerhead shrike as a "songbird with a raptors habits." This species is a year-round resident in the general Project area and inhabits open country with short vegetation and a few shrubs or low trees, particularly those with spines or thorns. Shrikes forage around agricultural fields, pastures, and other, similar open areas, including roadsides. They have a broad diet, including insects and other arthropods, amphibians, reptiles, small mammals, and birds. Shrikes prefer nesting in shrubs and trees, but will nest in brush piles and similar areas. Preferred nesting and foraging habitat does not occur on any of the Project sites.

3.3 IMPACTS TO OTHER SPECIES OF CONCERN

Piping Plover

Although suitable habitat exists at the Project site for piping plover, it is suitable wintering (foraging) habitat. Critical wintering habitat also exists on the barrier islands across Mississippi Sound. While not observed during surveys, two individual piping plovers were observed incidentally at the Expanded Terminal site during a USACE site visit in December 2014. The piping plover would not nest at the Project site.

The primary impacts from the Project on the piping plover would be disturbance of foraging during construction, the loss of any preferred foraging areas of sandy flats and sandy mudflats by the filling of these areas, and the installation of the liquefaction facilities and support areas. The overall impact on foraging is expected to be negligible, however, because although the piping plover has been observed at the Expanded Terminal site, it is not commonly observed there, and there is ample suitable foraging habitat for the piping plover in adjacent areas and on the barrier islands offshore. Development of the proposed Gulf LNG mitigation site likely would provide foraging opportunities for this species.

Project construction and operations will add to the existing lighting at the Project site and the broader Port area, but potential impacts on migrating piping plovers is expected to be negligible. To the extent they are compatible with the operational and safety needs of the Expanded Terminal, recommendations from the USFWS will be incorporated into the Project lighting design to reduce light pollution and minimize avian mortality resulting from collisions with the proposed flare structure. For these reasons, Project impacts on the piping plover are expected to be negligible.

Brown Pelican

Although suitable habitat was observed at the Project site for the brown pelican, no rookeries were observed during surveys, and, in fact, the Mississippi Museum of Natural Science (MDWFP 2014) characterizes the brown pelican as not nesting in Mississippi. As of 2010, there were no known nesting records of brown pelicans in Mississippi (Defenders of Wildlife 2010). Where brown pelicans nest, they usually prefer small, predator-free coastal islands, an environment not represented by the Project site. Therefore, the Project is unlikely to affect individual or breeding brown pelicans.

Brown pelicans are known to roost/loaf and feed along Mississippi's Gulf Coast, but no roosting/loafing brown pelicans have been observed at the Project site, so pelican roosting/loafing would not be affected by construction and operation of the new facilities. Individual brown pelicans have been observed foraging in proximity to the south marsh mitigation area of the Project area. Foraging brown pelicans likely would avoid construction activities, but the area of avoidance would be negligible compared to foraging habitat available in adjacent areas, and brown pelicans likely would reclaim any lost foraging area once construction is completed. Brown pelican interaction with the operation of the new facilities would be similar to what occurs with the existing facilities, and no adverse impacts on brown pelicans related to the existing facilities have been noted.

In summary, the Project is unlikely to directly impact brown pelican individuals, including their nests and young. In addition, the Project is unlikely to indirectly impact brown pelicans' behavior, particularly their foraging and roosting behavior.

Red Knot

Although suitable habitat exists at the Expanded Terminal site for the red knot, it is suitable wintering (foraging) habitat. The red knot would not nest at the Project site. If the red knot occurs at the Expanded Terminal site, the primary impacts from the Project on this species would be disturbance of foraging during construction, the loss of any preferred foraging areas by the filling of these areas, and the installation of the liquefaction facilities and support areas. The overall impact on foraging is expected to be negligible, however, because in addition to the lack of evidence that the red knot uses the Project site, there is ample suitable foraging habitat for the species in adjacent areas.

Peregrine Falcon

The presence of peregrine falcons in the proposed Project area is unlikely. Suitable nesting habitat is not present on the site; however, potential foraging habitat may be present in the shore area, particularly during waterfowl migration periods from April to mid-May and in September and October (Turcotte and Watts 1999). A large wintering aggregation of waterfowl and shorebirds, which would offer ideal prey for this species, are within the vicinity of the Project, but not at the Project site. Construction activities, including dredging and filling, may have a temporary impact on foraging (an insignificant amount of potential foraging habitat will be removed by the North MOF dock), but there is ample and probably better foraging habitat in adjacent areas.

Peregrine falcons prefer to perch and nest on tall structures, such as skyscrapers, water towers, cliffs, and power pylons. It is possible a peregrine falcon in the Project area could be attracted to the flare tower as a potential perching site, which could make it vulnerable to injury or death in the event the flare was activated while it was perching. However, the probability that a rare falcon would perch on the flare tower at the same time the flare was activated is extremely low, and assessment of potential impacts related to this combination of events is highly speculative. Because the peregrine falcon occurs in the Project area as a non-breeding winter population, it is unlikely the flare tower would be used as a nesting site. Therefore, impacts to nesting falcons will not occur from Project activities.

Mississippi Sandhill Crane

While the Mississippi sandhill crane could occur as a migratory transient on the Project sites (more likely at the Expanded Terminal site or adjacent to it), there is no habitat attractive to it on the sites. Because the species is highly unlikely to occur on the Project sites, there will be no impacts on this species.

Bald Eagle

The presence of the bald eagle in the proposed Project area is unlikely. Suitable nesting habitat is not present on the site. However, the waters of Mississippi Sound may provide foraging habitat, and construction activities, including dredging, may have a temporary impact on foraging habitat (an insignificant amount of potential foraging habitat will be removed by the North MOF dock). Because it is unlikely that the bald eagle uses the area around the Project site for foraging and because there is ample foraging area for this species elsewhere, construction and operation of the proposed Project is not expected to have a significant impact on this species or its habitat.

Wood Stork

The wood stork occurs in Jackson County only as a non-breeding winter resident. While wood stork individuals could occur in the coastal parts of the Project (Expanded Terminal site) as transients, there is better foraging habitat in the area (Grand Bay Savanna). If a wood stork did stop on one of the Project sites, the primary potential Project impact would be to cause it to move to another foraging area. No mitigative action is needed to avoid impacts to this species.

Gull-Billed Tern

The gull-billed tern could occur on the Expanded Terminal site as a forager, but sufficient gravelly or sandy beach nesting habitat does not occur at this site. Gull-billed terns could be displaced temporarily from feeding and resting at the site during construction and operation of the Project, but ample alternative habitat exists in adjacent areas. Other than temporary or inconsequential displacement, no impacts to this species are expected to occur from Project activities, and no mitigative action is needed to avoid or minimize impacts.

Least Tern

No suitable nesting habitat (sandy or gravelly beaches) for the least tern exists on the Project site, but the species could forage in the area. Construction activities, including dredging and filling and operation of the proposed Project, could displace terns from foraging areas temporarily, but ample adjacent habitat exists for foraging. Other than this temporary or inconsequential displacement, no impacts to this species are expected to occur from Project activities, and no mitigative action is needed to avoid or minimize impacts.

Royal Tern

The royal tern may occur in the Project area, but would be seen only resting at the Expanded Terminal site, because there is no nesting habitat there. It does breed along the Gulf coast, but prefers ocean beaches for nesting. Foraging for this plunging bird species is over open water. At most, individuals of this species would be displaced temporarily by Project activities to adjacent foraging and resting habitat, which is plentiful in the area. Impacts to this species, if any, would be temporary and insignificant overall.

4.0 IMPACTS AND MITIGATION

The Project has the potential to affect migratory birds, including birds of conservation concern. The majority of the offsite Project areas (CSAs and metering facilities) are previously developed sites and activities at these locations is unlikely to affect migratory bird species. The primary areas of disturbance that might affect roosting, foraging, and nesting behavior of migratory birds is at CSA 5, where the Companies propose to clear and fill the entirety of the site; however, the forested component of this site is considered suboptimal habitat due to the predominance of exotic tree species (Chinese tallow) and considerable disturbance from previous industrial activities. Construction at the MOFs associated with the Project may disrupt foraging activities of some species of birds, and construction at the Expanded Terminal would temporarily limit foraging, resting, and nesting activities at EEM areas adjacent to the existing Terminal.

The primary construction impacts to migratory birds and bird habitat will result from the cutting, clearing, and/or removal of existing vegetation at the Expanded Terminal site. These actions likely will remove nesting habitat and could impact migratory birds through the loss of nests (including those with eggs and/or young). Other impacts could include possible loss of migratory birds themselves, reduction in migratory bird productivity, displacement, or loss of second nesting opportunities. Of these potential impacts, only the loss of second nesting activities represents a significant probability. The other impacts are unlikely, because of the relatively small area of impact and the availability of ample suitable available habitat adjacent to the Project. If site preparation at the Expanded Terminal occurs during the nesting season, GLLC will adopt USFWS guidelines specific to the area to avoid impacts to nesting birds. These guidelines may involve pre-construction nesting surveys, the removal of nesting habitat before the start of nesting, or another conservation method that is consistent with current Service guidance regarding the MBTA.

Another potential impact to migratory birds and resident species, including listed species and species of concern, is collision with the flare tower. The proposed flare is located on the immediate coastline (~100 meters inland), occurring within a region well recognized as an important migratory pathway and stopover area for migrating passerines. The Project area is also a known congregation area for large numbers of wintering and migrating shorebirds. The placement of towers on coastlines and along migratory routes has been identified as especially dangerous for migrating birds.

To the extent it is compatible with the operational and safety needs of the Expanded Terminal, GLLC will incorporate the appropriate measures from the USFWS 2013 guidelines for communication towers into its flare design to minimize impacts to migratory birds (USFWS 2013b). This information is provided to the USFWS in the Project Biological Assessment ("BA"), which addresses threatened and endangered migratory birds, and it is expected that if the USFWS requires additional protective measures for threatened and endangered migratory birds, they will provide those requirements subsequent to their review of the BA. Those requirements will be protective of all migratory birds, whether specifically protected or not.

The flare tower will have no guy wires. The primary potential impact of the flare tower on migratory birds likely would be from lighting at night that could attract birds into colliding with the tower. To reduce impacts on migratory birds related to the lighting, GLLC will install hazard lights that meet only the minimum requirements for pilot warning and obstruction avoidance and will use other lighting criteria (acceptable to the Federal Aviation Administration) specified in the guidelines to reduce the potential for bird collisions. To the extent allowed by Homeland Security, other lighting at the facility will be down-shielded and of the minimum intensity required to provide adequate lighting for remote monitoring and security.

Bird nesting in the typical flare derrick structure is generally not a major concern, because the open structure of the derrick is not conducive to nest building. This contrasts with nest building in overhead transmission line towers, where bird nesting has been a common problem. The close spaced bracing of the horizontal truss structures of overhead transmission line towers are ideally suitable for nest building. There are no comparable close spaced bracings in the open structure of the flare derrick. Further, it has been observed that birds do not normally nest near flare tips. The reason for this is not clear, but it could be due to the heat and noise near the tip itself. GLLC will monitor the flare structure for bird nesting activities. If an issue with bird nesting is identified, GLLC will work with USFWS to develop appropriate mitigation specific to the situation.

Dredging or filling of wetlands for construction and operation of the Project will result in permanent impacts to coastal marsh and freshwater wetland. GLLC proposes to create approximately 50 acres of tidal salt marsh as compensatory mitigation for unavoidable losses of wetlands associated with the Project.

Tidal marsh vegetation will be composed predominantly of smooth cordgrass (*Spartina alternaflora*) and black needlerush (*Juncus roemerianus*), supplemented with other plants from nearby marshes and other planted tidal marsh species. Hydrologic connection to the site would be created through tidal channels that would also provide access to the Mississippi Sound for fisheries and aquatic resources. A successful marsh creation adjacent to the existing USACE marsh would enhance and enlarge coastal habitat to provide contiguous wetland foraging and nesting habitat along the Mississippi coastline.

5.0 SUMMARY

The Project is in a region of extensive riverine swamps and marsh complexes that provide critical wintering areas, important wintering and spring migration areas, and important nesting and foraging habitats for various migratory bird species, including Birds of Conservation Concern. The Project area most likely to harbor migratory birds is the Expanded Terminal area; however, no evidence of nesting was observed during surveys. The CSA and metering station components of the Project would not be attractive to migratory birds. The Expanded Terminal area could provide nesting habitat for some migratory birds.

Several migratory bird species and Birds of Conservation Concern may be present on or adjacent to the Expanded Terminal site at various times throughout the year or may occur as transients along the Mississippi Sound (including Bayou Casotte) or even temporarily within the Expanded Terminal boundaries. Migratory birds occur within the Project area year round. It should be noted that although the primary concern with the Project is for impacts to nesting migratory birds there could also be impacts to migration and wintering habitat for these species. Some of these species may be displaced temporarily from feeding, resting, and nesting areas, if any; (no nesting activity or nests were observed during surveys) as construction progresses for the Project.

Ample alternative habitat exists in adjacent areas, and because of their mobility, birds will be expected to use these other available habitat areas during construction. This adjacent habitat also likely will be used to replace habitat that is occupied by the installed Project facilities or otherwise becomes unsuitable because of Project operational activities. Because ample alternative habitat is available in the Project area for migratory birds and Birds of Conservation Concern, it is not likely that the construction or operation of the Project will cause a long-term change in migration patterns through the area or otherwise significantly affect these species.

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APPENDIX K

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APPENDIX L

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